The use and implications of GIS in regional visioning & satisfying regional economic potential

2007 ESRI International User Conference Presentation Proposal

Paper #:	**1050**
Session Title:	**Futuristic City Planning with GIS**
Date:	**Tuesday, June 19, 2007**
Primary Author:	**Iris Patten**
Secondary Author:	**Margaret Carr**

ABSTRACT

Title:
The use and implications of GIS in regional visioning & satisfying regional economic potential

Primary Author: Iris Patten
Secondary Author: Margaret Carr

Over the next 50 years the vast projected population increase will present several challenges to the East Central Florida region. These challenges include pursuing opportunities associated with competing in the global economy, protecting environmental and agricultural resources, and developing a transportation plan that will address expected demand. The Land Use Conflict Identification Strategy (LUCIS), developed by Margaret Carr and Paul Zwick of the University of Florida, employs role playing and suitability modeling to predict areas where future land use conflict will likely occur. Carr and Zwick's findings for the myregion.org regional visioning process are illustrated in the first part of this presentation which concluded that the amount of greenfield development that has occurred over the past 440 years will be consumed over the next 40 years if current development patterns persist. Applying LUCIS resulted in an illustration of development patterns and provided a means to distinguish the driving forces behind the outcome, given specific policy decisions and assumptions.

The second part of this presentation modified the LUCIS strategy by incorporating a more detailed economic analysis, which included indicators of Richard Florida's Creative Class, to determine whether the East Central Florida region has suitable environments for creative industries. Creative industries attract occupations that are high-quality, high-earning, and service oriented (also known as creative occupations). Using projections of new employment for creative industries through 2050, this study allocated employment centers and distributed employment resulting in a development plan that accommodates highly skilled workers and maximized the economic potential of the region. The results of this analysis suggest that although the region has the necessary tools in place to compete globally and attract higher quality occupations, the region does not have enough suitable land available to accommodate industries that minimize land use conflict and have values related creative environments.

This presentation explains how the outcomes of both mapping exercises provide a pathway to answer the question "What should be done in order to make a regional vision work and participate in a global economy".

CHAPTER 1
myregion.org: "How Shall We Grow?"

Project Goal

In early 2000, myregion.org was established to coordinate the development of a plan for Central Florida's future growth. In Spring 2005 the University of Pennsylvania design studio produced PennDesign VII: Central Florida, a report illustrating the growth potential of Central Florida in the year 2050. The PennDesign final report indicated extensive amounts of sprawl and unsustainable infrastructure if current development patterns continued into the future. PennDesign also created an alternative scenario illustrating a potential alternative pattern of growth if natural resources were preserved and more efficient infrastructure were in place. The alternative offered hope to the East Central Florida region. The outcomes from the PennDesign model incited the formal myregion.org How Shall We Grow? (HSWG) regional visioning exercise. The HSWG regional visioning exercise was a coordinated effort between residents, private, public and civic organizations to pursue more sustainable growth patterns through developing proactive strategies to accommodate future populations.

The HSWG regional visioning effort consists of a three step process. During Phase 1, residents, activists and leaders from throughout the 7 county region identified key issues to be addressed. From the collective input of 3,000 people, myregion.org organizers began crafting strategies to positively impact the future. Phase 2 involved collecting existing regional conditions about strengths, weaknesses, values, demographics, and future population growth. This research was later used as inputs for the actual visioning process. Specific research included a regional profile and indicators report; research on demographic trends; surveys of the region's values and "social capital"; development of illustrative future development scenarios; and identification of critical environmental resources. Phase 2 also engaged over 7,000 residents

in a series of community meetings and online surveys in an effort to gather their input and shape elements to visually illustrate a preferred pattern of growth for the future. Phase 3, which began in April 2007, involves further coordination with regional leaders and residents as myregion.org prepares to develop policies and strategies that further the outcomes of Phase 2.

Scenario Modeling in Central Florida: Land Use Conflict Identification Strategy (LUCIS)

The Land Use Conflict Identification Strategy (LUCIS) is a scenario modeling strategy that employs role playing and suitability modeling to predict areas where future land use conflict will likely occur. The strategy's six step process includes 1) developing a hierarchical set of goals and objectives that become suitability criteria, 2) inventory of available data, 3) determining suitabilities, 4) combining suitabilities to represent preference, 5) reclassifying preference into three categories of high, medium, and low, and 6) comparing areas of preference to determine the quantity and spatial distribution of potential land use conflict (Carr and Zwick, 2005, p. 89). The LUCIS strategy was used to develop the trend scenario and two of the three alternative scenarios for the formal HSWG visioning exercise[i].

LUCIS stops short of representing alternative futures, but instead focuses on the comparison of the results of three suitability analysis purposefully designed to capture biases inherent in the motivations of three stakeholder groups: conservationists, developers and farmers and ranchers dedicated to an agricultural future. A comparison of the suitabilities results in the identification of areas of potential future land use conflict (Carr and Zwick, 2005, p. 90).

The results of LUCIS can be used to develop alternative scenarios for allocation of projected population when combined with defined assumptions about (1) the sequencing and speed of the conversion of existing conservation and agricultural lands to urban use; (2) the densities at which new population can be allocated; and (3) permanent set asides (or lack thereof)

of lands with high conservation and agricultural suitability. The result is a range of alternative future land use scenarios with associated build out populations and dates (Carr and Zwick, 2005, p. 93).

Phase 2: Community Input

In preparation for the Central Florida regions' anticipated growth-principles, indicators, and scenarios were developed (myregion.org, 2006, p. 33). A "principle" is a comprehensive and fundamental law, doctrine, or assumption (myregion.org, 2006, p. 32). An "indicator" is a value or group of statistical values that taken together give an indication of the status or condition of an article or item (myregion.org, 2006, p. 33). These indicators were used to compare the scenarios developed from community input. Table 1-1 provides a summary of considered measures which relate to the five highest-priority principles identified by the community (myregion.org, 2006, pp. 33-34).

Community participation played a significant role in the Central Florida Regional Growth Vision: first in completing the draft of the Guiding Principles then in determining which indicators were most important to the residents of this region. The community was then tasked with determining where future density should be placed during the "How Shall We Grow" Chip Game and Dot Game. These "games" required residents to accommodate future population within their counties by placing dots of varying density on a map. Dots from all seven counties were ultimately synthesized and, using GIS technology, serve as the foundation for the "The People's Choice Map", which is a reflection of the region's development preferences and values.

The results of the PennDesign model were the catalyst for the formal visioning effort. The myregion.org staff and its regional partners desired to use a model similar to PennDesign to analyze input from the community that would illustrate its values but also depict future growth patterns. The LUCIS model was chosen to model three of the four scenarios because it provided

the flexibility to allocate population into TAZs, would accommodate the ecological and physical constraints within the region, and it considers the suitability of lands for urban development before allocating future population. The remaining scenario was modeled by Renaissance Planning Group using the PLAC3S model.

A "scenario" provides alternative methods or development patterns of accommodating future population growth (myregion.org, 2006, p. 33). Each scenario emphasized a "theme" which, to various degrees, encompassed the region's growth principles. Notable themes included a continuation of current trends, an emphasis on the creation of new compact centers, and an emphasis on alternative modes of transit. In addition to the trend scenario, these themes formed the basis of the three alternative scenarios that were modeled by Renaissance Planning Group and the University of Florida. Before scenarios were populated, assumptions (Table 1-2) relating to transportation networks, non-developable areas, and density were established and used as constraints during allocation. The Trend scenario accommodates future growth according to existing density and policy. Scenario A, the Green Areas Scenario, set aside the most critical lands and habitat before population was allocated to the region. Scenario B, Centers, connected cities, towns and villages using a basic rail network. Scenario C, Corridors, included a more extensive rail transportation, including streetcar, light rail, and commuter rail. The scenarios were analyzed and compared using performance measures that address the region's principles (Figures 1-1 through 1-4 and Table 1-3). During analysis, GIS and specialized modeling software (i.e. for land use, transportation, and air quality) was used to evaluate additional quantitative impacts. The LUCIS was used to model every scenario except Scenario B, which was modeled by Renaissance Planning Group.

Results of the HSWG exercise concluded that if current development policies and density continue as many "green fields" (i.e. farms, fields, woods, and wetlands) will urbanize in the next 45 years as were urbanized in the last 440 (Laurien, 2007, slide 54). The Trend Scenario will urbanize more than 10 times more threatened/endangered species habitat than any of the other three alternative scenarios. Scenario A (Green Areas) preserves more sensitive land (4,627 square miles) than any of the other scenarios. Scenario B (Centers) preserves the next largest amount of sensitive land at 4,198 square miles and Scenario C (Corridors) follows at 3,816 square miles. With regard to traffic and air quality, Scenarios B and C will require Central Florida residents to spend lesser amounts of time in the car than the Trend or Scenario A, which will result in lesser CO_2 emissions. Scenario C also offers more affordable housing options and will produce more than $450 billion more Gross Regional Product than the Trend Scenario. Overall, the Trend Scenario provides the least opportunity in terms of housing options, preservation of sensitive environments, and economic strength. Each of the three alternative scenarios provides some level of economic efficiency with lesser impacts to the physical environment than the Trend Scenario.

In January 2007, the residents of the East Central Florida region were asked to vote on each scenario and choose which overall element best represented how they would like their region to grow over the next 50 years. Phil Laurien, Executive Director of the East Central Florida Regional Planning Council summarized the results as follows:

- The Trend was the least preferred alternative by 86.5 % of respondents.
- The Green Areas scenario was the most preferred by 27.2 % of respondents, and second choice of 18%.
- The Centers scenario was the most preferred by 38.2 % of respondents, and second choice of 41.4 %.

- The Corridors scenario was the most preferred by 31.1 % of respondents and second choice of 31.1 %.

Clear Loser: the Trend

These results spoke loudly that the Trend, the current development pattern of low density sprawl in central Florida is not what people want for the future. But the other alternatives provided no clear winner.

No Clear Winner

Just a few percentage points separated the Centers, Corridors, and the Green Areas. This was understandable, even predictable, since all three had a strong conservation element, and some alternative transportation (transit, streetcar, light rail, commuter rail). As a result none of these three scenarios was markedly different to the average respondent. (email communication Phil Laurien, East Central Florida Regional Planning Council on March 14, 2007)

Summary

The Trend and 3 alternative scenarios depict 4 significantly different futures for East Central Florida. The survey taken from residents after the final scenarios were developed indicated that residents are ready for a change. The idea that 3.6 million people are coming seems like more of a reality when you see large portions of your county that are currently undeveloped colored a shade of yellow in 2050 indicating that some type of urban development will occur. The LUCIS model determines which lands are more preferable for urban development and allocates population into those lands first. In each scenario in which LUCIS was used, population had to be allocated into lands preferred for agriculture just to satisfy future demand. The economic analysis performed for the HSWG efforts also indicated that if a scenario other than the Trend is realized then the Gross Regional Product[ii] will be at least $28 billion more than that in the Trend Scenario. To generate this level of economic growth high wage jobs that require highly skilled and educated workers, also known as creative occupations, must exist within the region. This study will determine whether East Central Florida can accommodate the new influx of creative employee expected by 2050.

Table 1-1. Summary of potential measures according to each guiding principle

Principle	Topic Area	Potential Measure (Examples)
Preserving open space, recreation areas, farmland, water resources, and critical environmental areas	Open spaces, farmland, natural beauty and critical environmental areas	Total acres of open spaces, farmland, and critical environmental areas protected
		Total length hard versus soft edges between urban and open, farm, environmental land (hard edges defines as densities greater than 4 dus per acre)
Provide universal access to the highest quality of education, healthcare, and cultural amenities	Education	Ratio of population to education capacity at all levels
		Number and percentage of people living within walking access to schools
	Health care	Number of uninsured
		Number and percentage of people living within x miles of a hospital
Provide a variety of transportation choices	Availability of choices	Number and percentage of system miles in network (roads, transit, bike/ped)
		Percentage of population and employment within one-quarter mile of public transportation service
	Efficiency of choices	Total daily, per capita and per household vehicle miles and hours of travel
		Total daily, per capita and per household hours of delay
Encourage a diverse, globally competitive economy		Population and employment capacity within 2 miles of regional transit stations and highway interchanges
		Population within 20 minutes of regional activity centers
Foster distinctive, attractive and safe places to live		Number and percentage of people living and working in well-designed/mixed communities
		Total size of urban footprint
Create a range of obtainable housing opportunities and choices		Regional distribution of housing by type
		Number and percentage of housing units in mixed versus single use communities

(myregion.org, 2006, p. 5)

Table 1-2. Assumptions used in trend and 3 alternative scenarios of myregion.org Central Florida Growth Vision

Scenario	Description of assumptions
Trend	• Population is allocated according to existing gross density and policy
Scenario A: Green Areas	• Preserve primary sensitive lands plus threatened and endangered species habitat, which goes beyond just the seven "environmental jewels"[iii]. • New urban development is mostly placed outside sensitive areas and habitat. • 20% of new growth will occur in redevelopment. • 80% of new growth to green fields; use development preference map for guidance. • Transportation Improvements: Planned Florida Interstate Highways; Strategic Inter-modal System Roads; 2025-2030 Long Range Transportation Plan Cost Feasible Plans; DOT commuter rail Deland to Kissimmee; Active Freight Rail; Existing Arterials
Scenario B: Centers	• Transportation Improvements: Renaissance Planning Group designs 370 mile new road network and 413 mile rail and streetcar network in addition to Planned Florida Interstate Highways, Strategic Inter-modal System Roas, 2025-2030 Long Range Transportation Plan Cost Feasible Plans, DOT commuter rail Deland to Kissimmee, Active Freight Rail, Existing Arterials. • Seven "environmental jewels" preserved and enhanced. • 20% of new growth will occur in urban redevelopment in existing centers. • 80% of new growth to green fields; most will go to new centers of mixed use densities ranging from 4-10 units per acre, higher near rail stations.

Table 1-2. Continued

Scenario	Description of assumptions

Scenario C: Corridors	• Spend more money on transit than on road improvement.
	  o DOT commuter rail enhanced
	  o Additional light rail and streetcar network
	• Planned Florida Interstate and Strategic Inter-modal System Roads, 2025-2030 Long Range Transportation Plan Cost Feasible Plans, Active Freight Rail, Existing arterials
	• Seven “environmental jewels” mostly preserved.
	• 20% new growth goes to urban redevelopment, then as much new growth placed within 1/3 mile of transit stops as can be absorbed at 30 units/acre, first redeveloping old commercial sites and then remaining growth goes to green fields using development preference map as a guide, leaving quality existing neighborhoods intact.

(Adapted from the Laurien, 2007)

Table 1-3. Potential future population distribution by scenario and county

County	2005 Population	BEBR 2050	Trend 2050	Green Areas 2050	Centers 2050	Corridors 2050
Brevard	531,970	932,704	888,333	914,981	958,939	967,129
Lake	263,017	653,766	531,942	831,354	662,686	652,410
Orange	1,043,437	2,230,650	1,819,062	1,477,974	2,203,565	2,203,642
Osceola	235,156	688,296	413,624	669,095	752,315	588,742
Polk	541,840	969,088	1,507,076	1,595,293	977,565	1,097,067
Seminole	411,744	775,265	623,145	593,375	681,169	589,836
Volusia	494,649	874,001	1,340,569	1,041,647	894,077	1,022,564
Total Population	3,521,813	7,123,770	7,123,751	7,123,719	7,130,317	7,121,390

(Reprinted with permission from Laurien, P. (2007). Myregion.org presents: How Shall We Grow? Central Florida's Four Futures. *Slides used for Media Week January 2007*. East Central Florida Regional Planning Council)

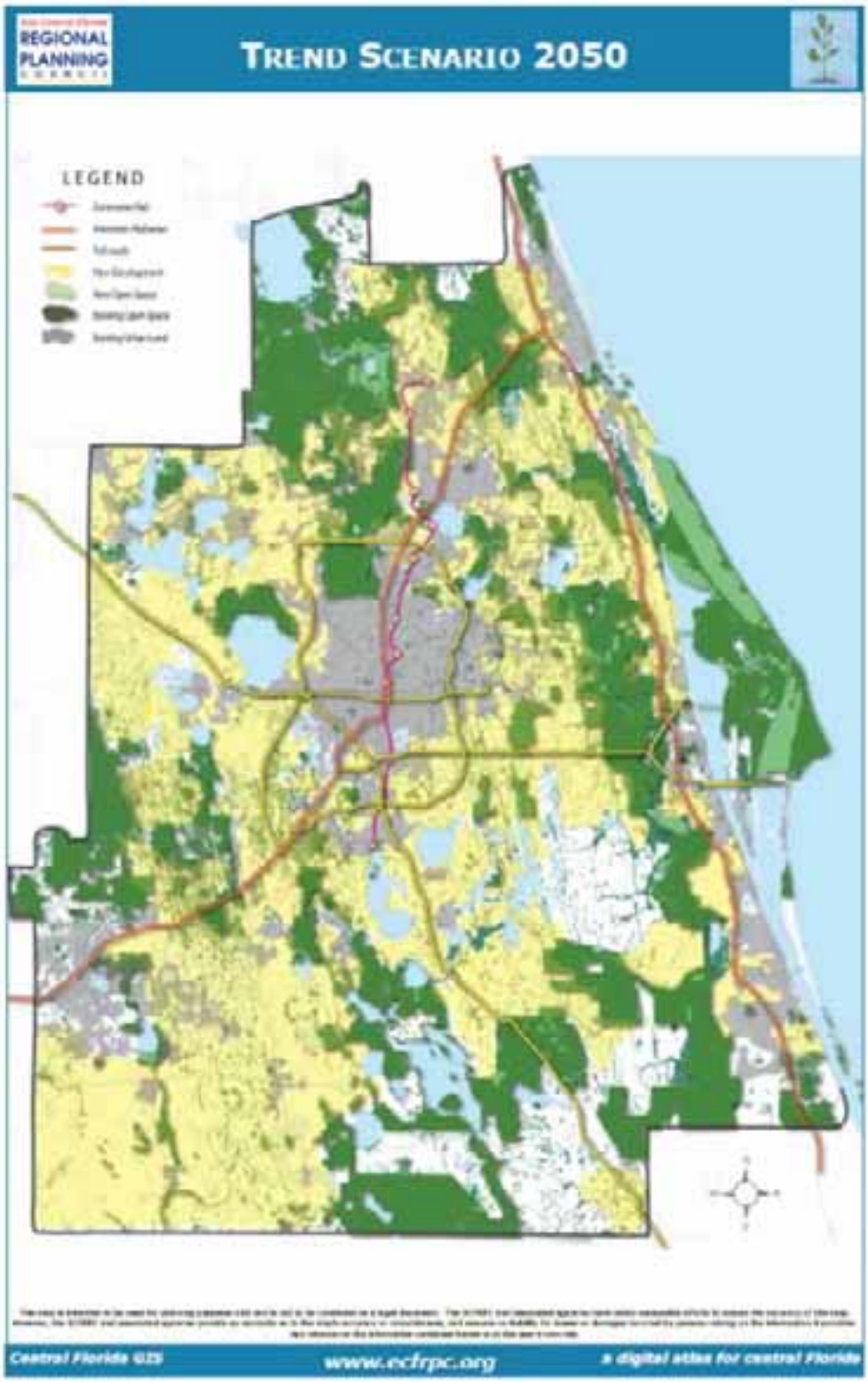

Figure 1-1. Illustration of growth patterns for Trend Scenario
(Reprinted with permission from *Trend Scenario 2050* [Map]. (2007). East Central Florida Regional Planning Council)

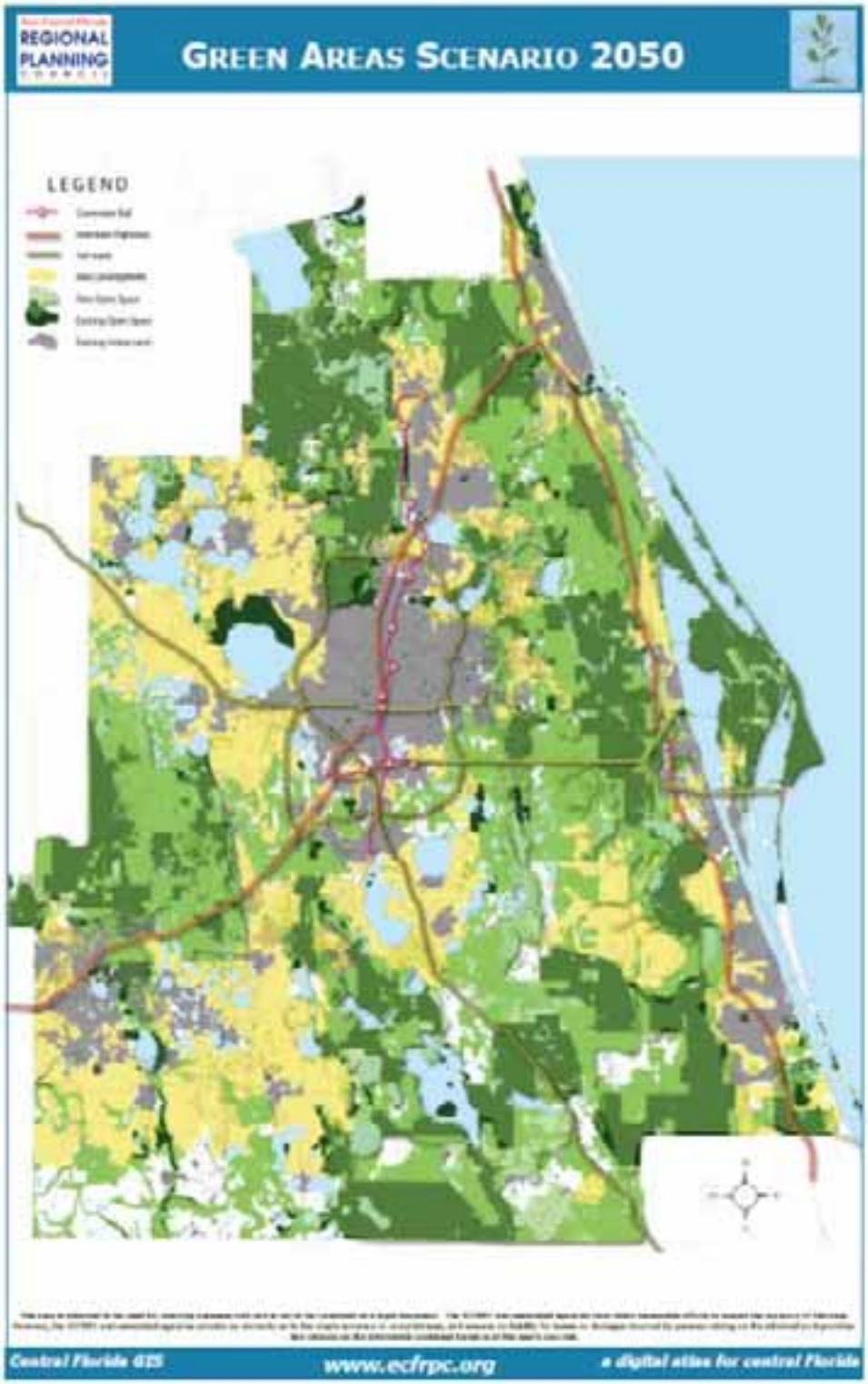

Figure 1-2. Illustration of growth patterns for Scenario A (Green Areas)

(Reprinted with permission from *Green Areas Scenario 2050* [Map]. (2007). East Central Florida Regional Planning Council)

Figure 1-3. Illustration of growth patterns for Scenario B (Centers)

(Reprinted with permission from *Centers Scenario 2050* [Map]. (2007). East Central Florida Regional Planning Council)

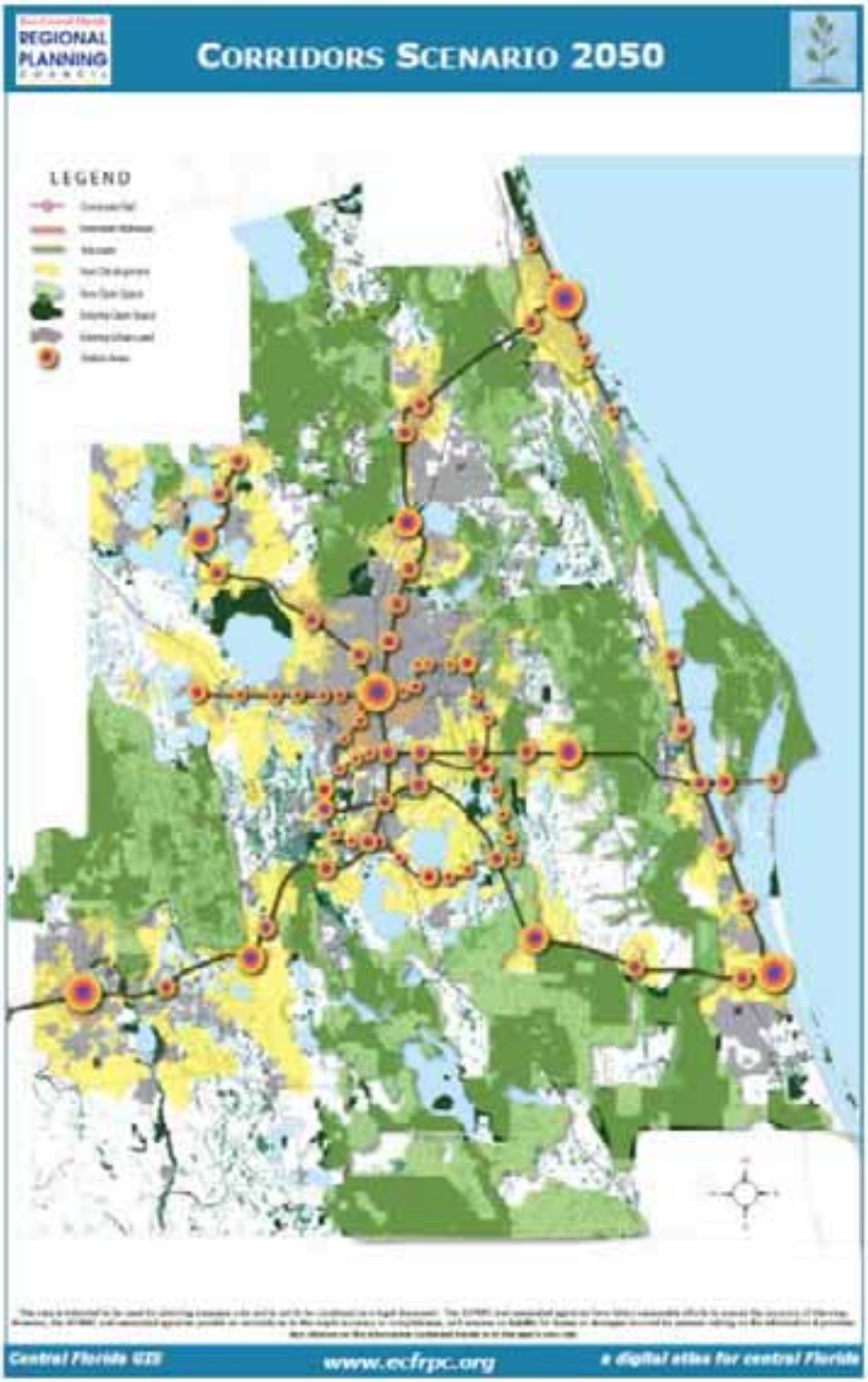

Figure 1-4. Illustration of growth patterns for Scenario C (Corridors)

(Reprinted with permission from *Corridors Scenario 2050* [Map]. (2007). East Central Florida Regional Planning Council)

CHAPTER 2
STUDY AREA

The East Central Florida region, composed of 7 counties has a total land area of 7,488 square miles. The counties within this region are Brevard, Lake, Orange Osceola, Polk, Seminole, and Volusia. This region is further divided into 4 Metropolitan Statistical Areas[iv] (MSAs); Melbourne-Titusville-Palm Bay, Lakeland-Winter Haven, Orlando, and Daytona Beach. Using spatial statistics within GIS, the geographic center of the region is within Orange County. Major cities (Table 2-1) within the region include Palm Bay (Brevard County), Melbourne (Brevard County), Clermont (Lake County), Leesburg (Lake County), Orlando (Orange County), Apopka (Orange County), Kissimmee (Osceola County), St. Cloud (Osceola County), Lakeland (Polk County), Winter Haven (Polk County), Sanford (Seminole County), Altamonte Springs (Seminole County), Daytona Beach (Volusia County), and Port Orange (Volusia County). The total regional population in 2005 was 3,521,813[v]. Through the year 2050 population is expected to more than double to over 7.1 million people (Table 2-2).

The region is composed of 97 municipalities, each with a unique set of land use regulations. With the exception of Polk County, six counties are under the auspices of the East Central Florida Regional Planning Council (ECFRPC). Polk County is a member of the Central Florida Regional Planning Council. Polk County was included in this exercise not only because of its shares borders with three other counties within the ECFRPC, but also because the large number of Polk County residents who commute to a county within the ECFRPC region for work, shopping, or recreation. When a job is lost or housing costs in the ECFRPC region increase, the effects are felt in Polk County. The implications of future growth are felt across all 7 seven counties through the local and regional economy, transportation and housing sectors.

The Economy

In 2006, the largest private employer within the region is Walt Disney World in Orange County with 53,500 employees (Table 2-3). Orange County is not only the geographic center of the region, but it is also the economic heart. If Orange County were removed from the region, the largest regional private employer, located in Volusia County, would employ almost 9,000 people. If you include Orange County, there are five employers who employ more than 9,000 people. More importantly, 9 out of 10 of Orange County's top private employers are creative industries. Creative industries hire individuals that are highly skilled and stimulate economic growth. Among the region's highest ranked largest private employer with the least number of employees is Leesburg Regional Medical Center located in Lake County at 2,300 employees. Lake County also has the least number of creative industries within its top ten employers. The presence of creative individuals in the East Central Florida region is the core of my study. The concentration of creative industries contributes to the Creativity Index, which in Richard Florida's research is a statistically significant indicator of a region's economic potential and is discussed further in Chapter 3.

Residents of a particular county often fall victim to the assumption that economic shifts in a neighboring county or county within the larger region has no effect on they live. This couldn't be further from the truth. This is evident from the number of people who work outside of the MSA in which they reside (Table 2-4). Individuals of Volusia and Polk County have the highest percentage of residents who work outside of their MSA of residence, 20% and 16% respectively. Individuals who live in Orange County have the lowest percentage of residents who work outside of their MSA. It is important to understand that a MSA is a statistical area, not a political boundary, and the Orlando MSA constitutes more than one county. Since the Orlando MSA has

the lowest percentage, it reinforces the concept of interlinkages between counties within a region, especially with respect to commuting patterns and housing.

Transportation

Transport corridors can be seen as backbones of transportation networks – linking major articulation points (e.g. hubs) – and towards which freight and passenger fluxes converge. Most often, they lie at the intersection of economic, demographic and geographic spaces as they perform both market-serving and market-connecting functions (Slack, 2006). The transportation corridors within East Central Florida are complex and its major interchanges are suggestive of rapidly growing places of work and residence.

Orange County is the most accessible county by roadway (Table 2-5) in the region with 1 federal interstate, 2 federal highways, and 10 state highways. The arrangement of these systems encourages economic activity and linkages between adjacent counties. Walt Disney World, Orange County's largest employer, is situated near the convergence of Interstate 4, Florida's Turnpike and State Highway 417. From Osceola County Walt Disney World is adjacent to US-192 and is not far from the Florida Turnpike. The University of Central Florida (UCF), the 9th largest employer in Orange County, is proximal to SR-417 and SR-50. Florida's Turnpike and Interstate 95 are principal arterials that feed into major thoroughfares that will lead you to the UCF campus.

Other counties within the region offer as many accessibility options the potential for growth is there. In Brevard County the major federal interstate is I-95 with federal highways US-1 and SR-A1A providing access to the coast. Residents in coastal neighborhoods have expressed additional transportation access routes between the mainland and the barrier islands, which would assist in evacuations during hurricanes and support the additional demand resulting from barrier island development.

The importance of Polk County as an area that links the east coast of Florida with the west is inherent in layout of its transportation corridors. Interstate 4 connects residents and businesses of Orange and Osceola to Polk County and vice versa. Access to Interstate 75 on the west side of Polk County provides additional access to Hillsborough and Pasco Counties as well as all points north and south. Interstate 75 bisects the state of Florida but provides a way for residents of Florida's east coast to access the Hillsborough County and its port without ever going through its county seat, Tampa. The numerous transportation options available to residents of Polk County support the 16.6% of residents who work outside the Lakeland-Winter Haven MSA. It is important to note that the current cost feasible transportation plans do not call for new roads, only improvements to existing infrastructure.

Other modes of transport within the region include rail and water (Table 2-5 and 2-6). Active rails exist within each county but Orange and Volusia Counties are the only two counties with passenger rail. Amtrak provides nonstop auto train service between the northeast and Sanford. Rail is the primary mode of transportation for mining and agriculture, especially in Polk and Osceola counties. Rail in Central Florida is also the cheapest way to move materials such as timber and building materials to long distance destinations. For example, CSX Transportation services the major seaports within Florida and has access to 23,000 miles of rail, reaching 23 states (JAXPORT, 2007). Industries that are core to the Central Florida economy rely heavily upon rail freight to meet their transportation needs.

Port Canaveral is located in Brevard County and is the major seaport on the west coast. This port supports the cruise and cargo industries, commercial fishing, the foreign trade zone and industrial park, federal government agencies, and the recreational parks all of which support economic activities within the region. This port has significant economic impact on Brevard

County, the Central Florida Region, and the State of Florida. In Brevard County, Port Canaveral generates more than 34,000 jobs, $1.1 billion in wages, $1.5 billion in economic impact, and accounts for almost 17% of the county's total economic worth. In Central Florida, Port Canaveral generates more than 50,000 jobs, $1.8 billion in wages, and produces an economic impact of $2.3 billion. Around the state, Port Canaveral generates more than 90,000 jobs, $3 billion in wages, and has an economic impact of $3.9 billion (Fishkind and Associates, 2005). Its physical location opens up the Atlantic Ocean and eastern seaboard for trade and future economic growth.

The Port of Tampa is the closest port to Polk County. The Port of Tampa is Florida's largest port, handling approximately 50 million tons of cargo per year. This port is the largest economic engine in West Central Florida. The port is located in Tampa and provides the most direct route to Mexico, Latin America, and the Caribbean. Tampa is also the closest full service U.S. port to the Panama Canal (Tampa Port Authority, 2007). In addition to cargo services the port also provides passenger cruise lines and is adjacent to the mixed use retail, entertainment and residential Channelside District.

Two major regional airports (Table 2-6) are located within the East Central Florida region; Orlando/Sanford International Airport in Seminole County and Orlando International Airport (OIA) in Orange County. Located just 18 miles north of Orlando, the Orlando/Sanford International Airport services 6 airlines and provides domestic and international service to destinations including Europe and the Caribbean. Orlando International Airport is located within Orlando and is the largest airport in the region with 4 runways spanning 12,005 feet. Orlando International Airport serves more global destinations than any other airport within the region; 3 airlines service the Bahamas, 3 airlines service Canada, 3 airlines service the Caribbean, 4

airlines service Central America and 5 airlines service Europe. This airport also provides cargo service and FedEx has a fleet based at OIA to provide regional shipping services. The airports around the region serve as entry and exits points for cargo, business travel and tourism.

Summary

Transportation corridors and the presence of large industries are important indicators of economic activity and growth. The East Central Florida region has the economic potential to become a major powerhouse in global and regional economies due to its complex transportation networks and presence of several industries that hire large numbers of creative individuals. The creative and creative industries are attracted to regions with mass transit. One downfall of the East Central Florida region is that they have not yet integrated mass transit into its transportation infrastructure. This study will try to evaluate whether this region can still attract creative industries given future employment demands and existing infrastructure.

Table 2-1. Largest cities and population, for each county

County	City	County Population*	City 2005 Population*	% of County Population
Brevard		531,970		
	Palm Bay		91,888	17.2%
	Melbourne		75,060	14.1%
	Unincorporated		210,260	39.5%
Lake		263,017		
	Clermont		20,017	7.6%
	Leesburg		17,467	6.6%
	Unincorporated		146,221	55.6%
Orange		1,043,437		
	Orlando		217,567	20.8%
	Apopka		34,801	3.3%
	Unincorporated		677,185	64.9%
Osceola		235,156		
	Kissimmee		58,223	24.8%
	St. Cloud		24,700	10.5%
	Unincorporated		152,233	64.7%
Polk		541,840		
	Lakeland		90,851	16.8%
	Winter Haven		28,724	5.3%
	Unincorporated		338,250	62.4%
Seminole		411,744		
	Sanford		49,252	12.0%
	Altamonte Springs		42,616	10.4%
	Unincorporated		203,021	49.3%
Volusia		494,649		
	Daytona Beach		65,129	13.2%
	Port Orange		54,630	11.0%
	Unincorporated		114,961	23.2%
* Population as of April 1, 2005				

(Adapted from Bureau of Economic and Business Research (BEBR). (2006). *Florida Population Studies (Detailed Bulletins 145)*. Gainesville, Florida: University of Florida)

Table 2-2. Regional 2005 population and 2050 projected population, by county

County	2005 Population*	2050 Population*
Brevard	531,970	932,704
Lake	263,017	653,766
Orange	1,043,437	2,230,650
Osceola	235,156	688,296
Polk	541,840	969,088
Seminole	411,744	775,265
Volusia	494,649	874,001
TOTAL POPULATION	3,521,813	7,123,770

(Adapted from Bureau of Economic and Business Research (BEBR). (2006). *Florida Population Studies (Detailed Bulletins 145)*. Gainesville, Florida: University of Florida)

Table 2-3. Major private sector employers

County	Employer	Business Line	Number of Employee
Brevard			
	United Space Alliance	NASA Space Flight Operations Contractor	6,500
	Harris Corporation	International Communications Equipment Company	6,500
	Health First, Inc.	Integrated Healthcare Delivery System	6,100
	Space Gateway Support	Base Operations for NASA & 45th Space Wing	3,000
	Wuesthoff Health System	Full-Service Healthcare System	2,500
	Northrop Grumman Corporation	Global Aerospace & Defense Company	2,000
	The Boeing Company	Payload Processing for Shuttle Operations	1,800
	Sea Ray Boats, Inc.	Boat Manufacturer	1,200
	MC Assembly	PC Board Assembly	1,200
	Rockwell Collins	Avionics Systems Manufacturer	1,120

Table 2-3. Continued

County	Employer	Business Line	Number of Employee
Lake			
	Leesburg Regional Medical Center	Healthcare	2,300
	Village of Lake Sumter, Inc.	Retirement Community	2,200
	Florida Hospital – Waterman	Healthcare	1,400
	Sprint	Telecommunications	811
	G&T Conwyar Company	N/A	550
	Bailey Industries	Manufacturing	509
	Accent	Architecture	500
	Dura-Stress	Concrete Supply & Storage	425
	Lake Port Square	N/A	400
	Casmin Incorporated	Construction	300
Orange			
	Walt Disney World	Entertainment	53,500
	Orange County Public Schools	Education	22,807
	Adventist Health Systems	Healthcare	17,059
	Universal Orlando	Entertainment	14,500
	Orlando Regional Healthcare System	Healthcare	12,000
	Orange County Government	Government	6,577
	Lockheed Martin	Combat System	5,700
	Central Florida Investments	Real Estate Developers	5,000
	University of Central Florida	Education	4,808
	Darden Restaurants	Corporate Headquarters	4,675

Table 2-3. Continued

County	Employer	Business Line	Number of Employee
Osceola			
	McLane/Sunset, Inc.	N/A	900
	Florida Hospital – Kissimmee	Healthcare	794
	Osceola Regional Medical Center	Healthcare	522
	Hyatt Orlando – Kissimmee	Hotel/Resort	500
	Walt Disney Imagineering	Artistic Production	450
	Splendid China	Amusement Park	400
	Orange Lake Resort & Country Club	Resort & Country Club	400
	Mercury Marine	Maine Electronic Equipment	400
	Tupperware Corporation	Housewares	300
	Lerio Corporation	Plastic Products	120
Polk			
	Publix Super Markets	Retail Food	8,500
	Wal-mart	Retail General Merchandise	5,500
	Lakeland Regional Medical Center	Hospital/Medical	4,000
	MOSAIC	Phosphate Mining	3,000
	Winter Haven Hospital	Hospital/Medical	2,500
	GEICO	Insurance	2,000
	State Farm Insurance	Insurance	1,500
	Watson Clinic	Medical	1,300
	GC Services	Call Center	1,200
	Florida Natural Growers	Citrus Processors	1,000

Table 2-3. Continued

County	Employer	Business Line	Number of Employee
Seminole			
	Seminole County Public Schools	Education	8,824
	Convergys Corporation	Billing Software	1,747
	Seminole Community College	Education	1,673
	Sprint PCS	Telecommunications	1,550
	Siemans ICN	Telecommunications	1,500
	Seminole County Government	Government	1,247
	First USA	Credit Card Processing	1,200
	U.S. Postal Processing Plant	Postal Service	1,000
	American Automobile Association	Travel Services	825
	Florida Hospital – Altamonte Springs	Healthcare	800
Volusia			
	Volusia County School Board	School Board	8,998
	Halifax Staffing	Medical	6,330
	Publix Super Markets	Grocery	2,798
	Wal-Mart	Retail	2,206
	Vision HW Inc.	Management Services	1,667
	Embry-Riddle Aeronautical University	University	1,513
	Florida Hospital Ormond Memorial	Medical	1,403
	Daytona Beach Community College	Community College	1,334
	Winn Dixie Stores Inc	Grocery	1,290

(Adapted from Enterprise Florida. (2007). County Profiles. Retrieved April 20, 2007, from http://www.eflorida.com/countyprofiles/CountyProfiles.asp?level1=3&level2=127&level3=335&region=)

Table 2-4. Employment patterns of workers 16 years and over who live in a MSA

County	MSA	Total Workers 16+ living in a MSA (Estimate)	Total Workers 16+ worked in MSA of residence (Estimate)	% of Total Workers in MSA	Total Workers 16+ worked outside MSA of resident (Estimate)	% of Total Workers in MSA
Brevard	Melbourne-Titusville-Palm Bay	228,806	214,597	93.8%	13,075	5.7%
Lake	Orlando	106,111	98,900	93.2%	5,291	5.0%
Orange	Orlando	490,871	477,595	97.2%	12,622	2.6%
Osceola	Orlando	106,445	100,813	94.7%	5,489	5.2%
Polk	Lakeland/ Winter Haven	227,493	187,099	82.2%	37,864	16.6%
Seminole	Orlando	198,737	189,913	95.6%	8,037	4.0%
Volusia	Daytona Beach	203,068	158,579	78.1%	40,796	20.1%
NOTE: * All estimates are within 1% standard of error.						

(U.S. Census Bureau; 2005 American Community Survey; generated by Iris Patten; using American Factfinder; < http://factfinder.census.gov/servlet/DatasetMainPageServlet?_program=ACS&_submenuId=&_lang=en&_ts=>; (08 March 2007).

Table 2-5. Transportation corridors (roads) within the East Central Florida region

County	Federal Interstates	Federal Highways	State Highways	Railroads
Brevard	I-95	US-1, US 192	SR-A1A; 5; 46; 50; 405; 407; 501; 520, 524; 528	Florida East Coast Railway
Lake	None	US-27, US 441	SR-19, 33, 40, 44, 46, 50, 56, 439, 445, 561	CSX Transportation, Florida Central
Orange	I-4	US-441, US 17/92	SR-15, 408, 417, 419, 426, 436, 482, 520, 525, 527	Amtrak, CSX, Florida Central
Osceola	I-4	US-192, US-441, US 17/92	SR-15, 424, 419, 530, 532, 545, Florida Turnpike	CSX Transportation, Florida Central
Polk	I-4	US-27, US 98	SR-60	CSX Rail
Seminole	I-4	US-17/92	SR-46, 417, 419, 426, 427, 434, 436	CSX Transportation, Florida Central
Volusia	I-4; I-95	US-1, US-17, US-40, US-92		CSX, Florida East Coast Railway, Amtrak

(Adapted from Enterprise Florida. (2007). County Profiles. Retrieved April 20, 2007, from http://www.eflorida.com/countyprofiles/CountyProfiles.asp?level1=3&level2=127&level3=335&region=)

Table 2-6. Ports and airports within the East Central Florida region

	Nearest Airport with Scheduled Commercial Airline Service	# Runways	Longest Paved Runway (ft)	General Aviation Airports	Local Deep Water Port	Miles to Closest Port
Brevard	Melbourne International Airport	3	10,200	Space Coast Regional Airport; Merritt Island Airport	Port Canaveral	1
Lake	Orlando International Airport	3	12,005	Leesburg Regional Airport	Canaveral Port Authority	73
Orange	Orlando International Airport	4	12,005	Orlando Executive Airport	Canaveral Port Authority	46
Osceola	Orlando International Airport	4	12,005	Kissimmee Municipal Airport	Canaveral Port Authority	49
Polk	Tampa International Airport	3	11,002	Lakeland Linder Regional	Tampa Port Authority	49
Seminole	Orlando/Sanford International Airport	4	9,600	Orlando/ Sanford Airport	Canaveral Port Authority	48
Volusia	Daytona Beach International Airport	3	10,500	Deland Municipal Airport; Ormond Municipal Airport; New Smyrna Municipal	Canaveral Port Authority	72

(Adapted from Enterprise Florida. (2007). County Profiles. Retrieved April 20, 2007, from http://www.eflorida.com/countyprofiles/CountyProfiles.asp?level1=3&level2=127&level3=335&region=)

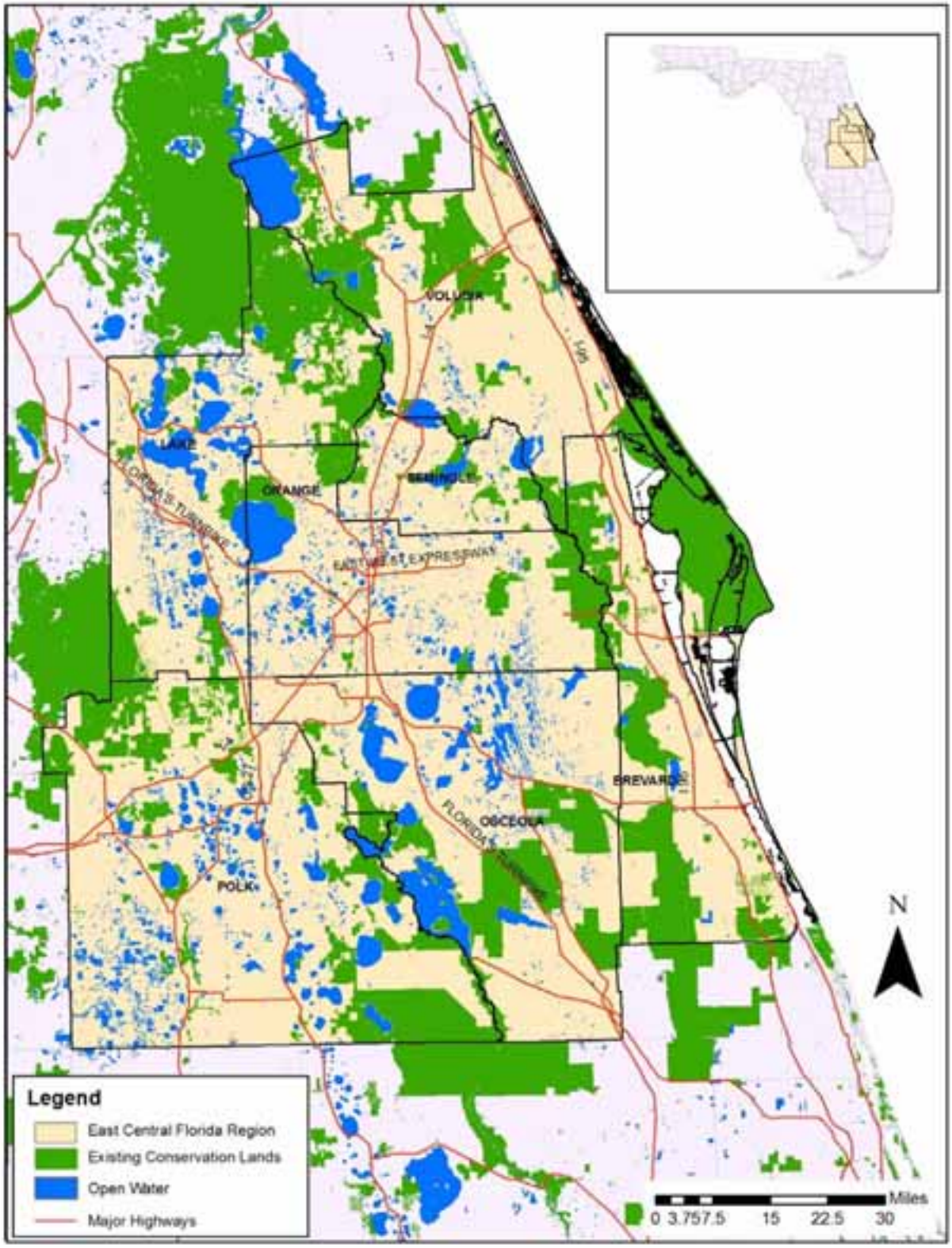

Figure 2-1. Study Area, 7 county East Central Florida region

CHAPTER 3
METHODOLOGY

This paper builds on the myregion.org HSWG regional visioning process and applies advanced GIS technologies to determine whether the economic potential exists within the East Central Florida region to accommodate industries that require high-quality, innovative employees and skills. A major outcome of the original visioning process was to understand potential growth patterns given various assumptions. The original visioning efforts also identified several economic indicators including projected gross domestic product and average per capita salary for each alternative. An outcome not identified, but one my study addresses, is the identification of lands within the region suitable for innovation and high tech industries. This paper will also examine whether the land suitable for these industries are sufficient in area to accommodate future employment projections in a way that minimizes land use conflict and diversifies the economy.

Explanation of the Model

Creative individuals drive the economy, therefore they seek locations that stimulate innovation and provide opportunities that validate their identity and enable them to flourish. Keeping this in mind, what matters to the Creative individual is far different than what mattered to those in our parents' generation. Building a model that would measure growth patterns and potential locations for employment centers in the year 2050 that are conducive to attracting the Creative Class involved modifying the 5 step LUCIS strategy. The Carr and Zwick methodology considers agricultural, conservation, and urban land uses as individual stakeholders. In Carr and Zwick's LUCIS model, each stakeholder uses a five step process to determine its suitability of a given land area. The outcome of this process is a surface[vi] that visually depicts the most

preferable use of land with respect to agriculture, conservation or urban land uses. The five step process (Figure 3-4), as defined by Carr and Zwick (p. 12) are

- **Goals and objectives**: Define goals and objectives that become the criteria for determining suitability.
- **Data inventory**: Identify data resources potentially relevant to each goal and objective.
- **Suitability**: Analyze data to determine relative suitability for each goal.
- **Preference**: Combine the relative suitabilities of goal to determine preference for the three major land-use categories.
- **Conflict**: Compare the three land-use preference to determine likely areas of future land-use conflict.

The first basic step of my study was to modify the Carr and Zwick LUCIS model to include the goals, objectives, and sub-objectives that reflect the values of creative individuals. In addition to the Carr and Zwick hierarchical relationship of goals, objectives, and sub-objectives for agriculture, conservation and urban stakeholders (Figures 3-1, 3-2, and 3-3), the hierarchical relationship of the Creative was added as Goal 5 under the urban land use type (Figure 3-3). The second basic step involved collecting the appropriate GIS and quantitative data to measure those indicators. The third step involved using models to measure the suitability of land within the region for each stakeholder. The fourth step created a community/stakeholder preference value (represented in terms of a weighted value, and calculated using the analytical hierarchy process (AHP[vii])), combined the suitability surface for each stakeholder, and created a map that identified conflict between all stakeholders. The fifth step involved using the conflict surface and the final suitability surface for Goal 5 to determine appropriate locations for creative industries and allocating creative centers of employment that minimized land-use conflict and satisfied the local demand for creative industries.

Identifying the Indicators

The first step identified indicators that measure the values and bias of the Creative Class as well as values and bias of each land use. This project divided the indicators into two groups:

those that identify land use suitability for the Creative Class and those that identify suitability of the agriculture, conservation, and urban land uses. Once all indicators were identified, they were translated into a set of corresponding goals and objectives representative of each stakeholder.

As mentioned in the previous section, this study applied the original goals and objectives for agriculture, conservation, and urban as defined by Carr and Zwick (2007, p. 229)[viii]. Through previous research, Richard Florida (Florida, 2002) identified values of the Creative. It is believed that these values have never been previously translated into a formal set of goals and objectives that can serve as criteria to measure land use suitability. This is why the indicators for the Creative and those for agriculture, conservation, and urban land uses were initially divided into two groups. Ultimately, this study added the goals and objectives of the Creative Class to those developed by Carr and Zwick. Below is an explanation of indicators that quantify the attractiveness of an area for the Creative Class (also known as "Creative Centers").

Creative Indicators

The Creative Class seek places that provide economic opportunity, are highly efficient, offer a high level of amenities and are environmentally stimulating. Creative Centers, which are areas composed of a high concentration of creative people, thrive because creative people want to live there. Companies that require the skills offered by these individuals follow them – or, in many cases, are started by the Creative themselves. Creative Centers have four common characteristics:

- High concentrations of innovation and high tech industry growth
- Increases in regional employment and population
- High-quality amenities and experiences
- Openness to diversity of all kinds

These characteristics were used in developing indicators for determining suitability of land within the study area for potential locations of future creative industries.

Clustering of Creative Industries

The advent of the Internet and modern telecommunications stimulated an ideology that it was no longer necessary to work or *be* together. Yet after more than 25 years since the inception of the Internet, people remain highly concentrated. Residential growth patterns around the country indicate that people are looking to become even more concentrated, moving back into central cities or into areas that are higher density, promote walkability, provide cultural amenities and posses a sense of place. The high-tech, knowledge-based creative-content industries that drive economic growth continue to concentrate in specific places such as Austin, Silicon Valley, or New York (Florida, 2004, p. 219), primarily due to the tendency of firms to cluster together.

Clustering produces a "productive efficiency" (Florida, 2004, p. 220). Companies cluster in order to draw from concentrations of talented people who power innovation and economic growth (Florida, 2004, p. 220). Clustered industries are typically "similar and/or related that together create competitive advantages for member firms and the regional economy" (Barkley and Henry, 2001, p. 2). David Barkley and Mark Henry, economists at Clemson University, cite four benefits of industry clustering that support Richard Florida's productive efficiency theory:

- **Clustering Strengthens Localization Economies**. Cost savings are achieved through greater availability of specialized input suppliers and business services; a larger pool of trained, specialized workers; public infrastructure investments geared to the needs of a particular industry; financial markets familiar with the industry; and an enhanced likelihood of interfirm technology and information transfers.

- **Clustering facilitates Industrial Reorganization**. Increased global competition and the emergence of new production technologies (e.g., computer-aided manufacturing) encourage reorganization between large firms engaged in mass production to small firms focused on specialty production. Proximity between the more specialized firms and their input suppliers and product markets enhances the flow of goods through the production system. Ready access to product and input markets also enables firms to more quickly adapt to market changes. And a spatial concentration of firms provides the pool of skilled labor required by the computer-aided technologies.

- **Clustering Encourages Networking Among Firms.** Networking is cooperation among firms to take advantage of complementaries, exploit new markets, integrate activities, or

pool resources or knowledge. This cooperation occurs more naturally and frequently within industry clusters. Networking firms are more likely than non-networking firms to engage in collaborating and information sharing in marketing, new product development, and technological upgrading. The networking firms also report that their competitiveness and profitability are enhanced by interfirm cooperation and collaboration.

- **Clustering Permits Greater Focusing of Public Resources.** A cluster approach enables regions to focus their recruitment, retention and expansion, and small business development programs rather than attempting to provide assistance for many different business types. Also, because of linkages among firms in a cluster, programs supporting specific businesses will have relatively large multiplier effects for the area economy. The total employment and income gains from recruiting (or retaining) cluster members will likely exceed those associated with non-cluster firms of similar size.

The creative often look for regions that have a diversified economy, since the creative often don't anticipate staying with the same company for very long. Creative markets must offer a "thick labor market" conducive to a horizontal career path. The gathering of people, companies and resources into particular places with particular specialties and capabilities generate efficiencies that power economic growth.

These spatial efficiencies also encourage a more transparent flow of knowledge (Feldman, Aharonson, and Baum, 2005). Breschi and Lissoni describe knowledge spillovers as pure externalities but suggest that information "flows more easily among agents located within the same area, thanks to social bonds that foster reciprocal trust and frequent face-to-face contacts. Therefore, geographical clusters offer more innovation opportunities than scattered locations" (Breschi and Lissoni, 2001, p. 258). From this discussion the first indicator was drawn:

- Indicator #1: Identify locations proximal to existing creative industries.

Author and futurist Joel Kotkin believes that wealth accumulates wherever intelligence clusters evolve (Florida, 2004, p. 220). Intelligent people are far less constrained than other determinants of economic productivity such as the abundance of raw materials or the proximity to dense populations or modes of transport. The true importance of knowledge relates to the

theory of human capital. University of Chicago economist Robert Lucas identifies two special characteristics of human capital.

1. With effort, human capital can be acquired without limit and it doesn't take more effort to acquire it when you have more of it. This allows economies to grow without slowing as they become richer, a possibility that the neoclassical model of Petty, Smith and Becker denied[ix].
2. Higher average levels of human capital in an economy raise the level of productivity of everybody in that economy, not just the productivity of those whose human-capital level is higher. Thus human capital is an externality.

(Nowlan, 1997, p. 1)

Furthermore, research by Patricia Beeson, an urban economist at the University of Pittsburgh, has cited that investments in higher education infrastructure predict subsequent city and regional growth far better than investments in physical infrastructure like canals, railroads, or highways (Florida, 2004, p. 222). Therefore, the second indicator is:

- Indicator #2: Identify locations proximal to educated people.

Kevin Lynch observed that the distinct qualities of an urban area that appeal to an individual's aesthetic senses affect an individual's perceptual satisfaction with the urban environment (Chapin and Kaiser, 1979, p. 284). The siting of key functional areas and buildings in relation to residential and recreational opportunities is significant in general land use planning but also contributes to the quality of place for the Creative Class. Sociologists Richard Lloyd and Terry Nichols Clark of the University of Chicago note that "workers in the elite sectors of the postindustrial city make 'quality of life' demands, and … increasingly act like tourists in

their own city" (Florida, 2004, p. 224). Modern creative work demand unpredictable work schedules and readily accessible recreation. This leads to the third indicator:

- Indicator #3: Identify locations proximal to existing trails, parks, or recreational opportunities.

A city or region's ability to facilitate the interaction between people and the community is important in a highly creative environment. Places that embrace the culture of the Creative Age (i.e. places where the Creative can fit in) are an important gauge of the Creative. Nightlife is a key indicator, especially one with a wide mix of experiential options. These include music venues, neighborhood art galleries, performance spaces and theaters. Previous studies indicate the highest-rated nightlife options were cultural attractions (from the symphony and theater to music venues) and late-night dining, followed by small jazz and music clubs and coffee shops. Bars, large dance clubs and after-hours clubs ranked much farther down the list (Florida, 2002, p. 225). Amenities such as historic buildings, boutiques, and non-franchised stores and restaurants create an "authentic" environment, which contributes to unique and original experiences. Thus, the Creative are attracted to unique environments and forms the framework for the fourth indicator:

- Indicator #4: Identify locations proximal to cultural activities, historic structures, and nightlife.

The Creative Capital Theory, developed by Richard Florida, states that regional growth is driven by the location choices of creative people–the holders of creative capital–who prefer places that are diverse, tolerant, and open to new ideas. The gay index signifies tolerance and is measured by the number of gay individuals in an area. Florida's research indicates that the gay-index does better than other individual measures of social and cultural diversity to predict high-tech location (Florida and Gates, 2002, p. 33); because high tech industries locate in diverse,

tolerant areas. The presence of gays in metropolitan areas signals diversity and progressive environments. Furthermore, Richard Florida's studies show that when compared to the Milken Institute Tech Growth Index, which measures growth in output of high-tech industries within metropolitan areas, the concentration of gays also indicate the potential for economic growth. Thus the fifth indicator is drawn:

- Indicator #5: Identify areas with concentrations of gay populations.

Social cohesion and business ties are based upon trust and often facilitate inter-firm cooperation and the exchange of ideas. Furthermore, diversity encourages participation and serves as an asset in global economic advantage. Smallbone, Bertotti, and Ekanem (2005, p. 49) consider ethnic diversity as a potential source of creativity and innovation as well as informal networking. Creative industries that either locate within areas of highly diverse populations or employ a diverse workforce are exposed to a blended knowledge base and cultural perspectives. This creates international network links, which are a source of competitive advantage, and enable these companies to use their cross-cultural knowledge and experience in product development and marketing (Smallbone, Bertotti, and Ekanem, 2005, p. 49). Taube (2006, pp. 3-4) also indicates that diversity creates an additional connection for non-local sources of information and knowledge. The potential for additional economic growth due to embracing diversity is the underlying premise behind the sixth indicator:

- Indicator #6: Identify areas with concentrations of diverse cultures.

Data Collection

GIS data used to measure land use suitability can be grouped into seven broad categories (Zwick and Carr, 2007, p. 90). These categories are: geophysical, biological/ecological, demographic, economic, political, cultural, and infrastructure (Table 3-1). Once the goals and

objectives were established, data was collected for each objective and sub-objective then mapped and measured, using ArcGIS[x], for spatial accuracy. It is important to note that this study used the final suitability surfaces for the agriculture and conservation land uses that were previously run by Carr and Zwick for the East Central Florida Regional Growth Vision. Therefore, there was no need for this study to recollect data or run the models used for these two stakeholders. Although, this study employed the same objectives and sub-objectives as the Carr and Zwick model and included the following aspects: 1) we modified several of the inputs for the urban land use; 2) added the additional Creative goal; and 3) reran the urban stakeholder. The following discussion reflects those methods undertaken for the urban stakeholder.

Suitability Modeling

The third step makes use of ArcGIS ModelBuilder[xi] and methods developed by Carr and Zwick to diagram and simulate land use suitability. This step also employs Spatial Analysis tools to measure proximity and suitability of each quarter acre of land within the region with respect to the values and bias of each stakeholder. Depending upon the intent of the objective and/or sub-objective, models utilize various raster analysis tools to measure proximity. Commonly used tools include Euclidean Distance, Extract by Attributes, Extract by Mask, Zonal Statistics, and Reclassify.

Suitability is measured in units of utility value, also known as a single utility assignment (SUA). The Reclassify tool within ArcGIS is used to assign a utility value to each cell[xii] within the dataset that represents an indicator. LUCIS employs a value range of 1 to 9 (Table 3-2), with 1 representing low suitability and 9 representing high suitability. NoData can be assigned to unsuitable areas, but care must be taken because once used in a model, NoData will eliminate attribute information from subsequent analyses for the cells containing the NoData value (Carr and Zwick, 2007a, p. 103). For additional details and a step-by-step explanation of how to create

an SUA, refer to Chapter 8 in Carr and Zwick's *Smart Land-Use Analysis: The LUCIS Model* (Carr and Zwick, 2007a).

Once a SUA has been created for each objective and/or sub-objective, the SUAs are combined to create a simple multiple utility assignment (MUA). The MUA process combines layers using weights or percentage of influence that equal 1.0 (100%) (Carr and Zwick, 2007a, p. 57; p. 103). The MUA process can also include the use of conditional statements, which process multiple raster data by selecting cells for the output raster based on "if-then-else" processing (Carr and Zwick, 2007a, p. 37). A MUA was developed for each urban stakeholder goal.

Weighted Suitability

Before a final suitability raster for the urban stakeholder was created, a preference value for each urban goal was developed, this is step four. The Expert Choice software was used to develop a preference value using the analytical hierarchy process. The AHP analysis produces a weight for each stakeholder goal. These goals are combined using a map algebra equation (i.e. the Single Utility Assignment tool) according to the weight produced from AHP. The result is a final preference map for each stakeholder. Each map depicts areas preferred for a specific land use.

Conflict Identification

Step five identifies conflict. Three main tasks are required to complete this step: (1) remove lands whose use will not change, (2) normalize and collapse preference results, and (3) combine the normalized and collapsed preference rasters to identify areas of conflict (Carr and Zwick, 2007a, p. 137).

The LUCIS model identifies preference values for various land use types and indicates future changes in land uses, although there are areas whose land use are permanently designated and will not change. These areas include open water, roads, existing urban areas (excluding

vacant platted), and existing conservation lands. A single raster mask is created from these datasets and cells whose land use will not change are removed before identifying conflict.

The final preference raster developed in step three for each stakeholder has values that range between 1 and 9, but may not include the value 9. For a value of 9 to result, at least one cell in the study area would have to be optimally suited for every measure of suitability included in the goals, objectives, and sub-objectives for that land-use category (Carr and Zwick, 2007a, p. 139). The probability of this occurring is very low, so Carr and Zwick recommend normalizing the values before comparing preferences (Carr and Zwick, 2007a, p. 139).

Once the surfaces are normalized, each of the three normalized rasters is combined into three classes that correspond to high, medium, and low preferences. This method is called "collapsed preference" and identifies the relationships among the three land uses. Collapsed preference mapping identifies places where conflict between land-use categories exists and how strong the conflict might be (Carr and Zwick, 2007a, p. 139). For this study, values were reclassified using the standard deviation method. This method was chosen to produce as even a distribution of preference values as possible. The distributed values are characterized using a designation of 1, 2, and 3, which describe the level of preference.

To visualize the conflict between the surfaces of the three stakeholders, a method referred to as "conceptualized conflict" by Carr and Zwick was used. As mentioned above, the collapsed preference surface is characterized using values of 1, 2 and 3. Cells with the value of 1 indicate low preference, 2 medium preference, and 3 high preference. To combine all three surfaces into one, each collapsed preference surface must be on a different scale. This paper utilizes the same categories as Carr and Zwick: agriculture preference is collapsed to produce values of 100, 200,

and 300; conservation preference is collapsed into categories of 10, 20, and 30; and urban preference maintains its current categories of 1, 2, and 3 (Carr and Zwick, 2007a, p. 149).

The values in the resultant final preference surface range from 111 to 333. The first digit in each number is representative of agriculture preference, the second digit representative of conservation preference and the third digit represents the urban preference. Additionally, areas of moderate conflict are identified when two land use types have the same preference value and severe conflict occurs when all three land use types have the same preference value. For example, preference value 122 has a moderate conflict between conservation and urban land uses. Severe conflict exists with three of the potential preference value combinations, 111, 222, or 333 (Table 3-3 and Figure 3-6).

The objective of this project was to build upon the work done by Carr and Zwick for East Central Florida to identify areas that, because of physical and economic characteristics, can be described as "Creative Environments" and encourage the location of creative industries. A Creative Environment is conducive to creative industries, which contribute to attracting a higher level of jobs and increase the quality of place. The final preference surface described above is the first step involved in identifying areas that are more appropriate for a specific land use. Included in areas where "urban preference dominates" are residential, commercial, industrial and creative environments.

To distinguish areas that are most appropriate for urban development and most appropriately categorized as Creative Environments (as opposed to appropriate for specifically residential or specifically industrial), the next step requires us to remove from the final preference map areas that are preferred for urban uses (i.e. Urban "Wins") **and** areas suitable for Creative Environments (Figure 3-3).

Urban Goal 5 represents the suitability surface for Creative Environments. Areas identified with a value of 8[xiii] or higher indicate a high degree of suitability. This study used a conditional statement to identify areas in Urban Goal 5 that have values of 8 or higher and intersect with those areas in the final preference surface that are suitable for urban development.

Among the goals for the urban stakeholder (i.e. residential, retail, office/commercial, and industrial) within the definition of "urban areas" represented by the Carr and Zwick conflict surface, creative occupations more generally fit within the description of office/commercial. The specific occupations that place great value in working in an environment classified as creative are:

- Computer and mathematical occupations
- Architectural and engineering occupations
- Life, physical, and social science occupations
- Education, training and library occupations
- Arts, design, entertainment, sports, and media occupations
- Management occupations
- Business and financial occupations
- Legal occupations
- Healthcare practitioners and technical occupations
- High-end sales and sales management

(Florida, 2002, p. 328)

Thus far we have identified areas that provide a high quality of place and are appropriate for urban development. To further narrow down available lands for developing employment centers that require high quality employees, we used a conditional statement to identify areas that are also suitable for Office/Commercial development.

Allocating Employment Centers

The economic impact forecasting tool REMI (2007) determines employment projections and sector impact analysis by industrial sector. The three industrial categories are extraction, manufacturing, and service. Interaction between people and the propagation of knowledge and creativity is the basis of the service sector. In the year 2050 the East Central Florida region will employ a total of 1,796,734 people. Compared to 2005 employment figures, this includes an increase of 832,400 people in the service sector. Of these, over one-third will be new employees in occupations classified as creative[xiv]. To allocate industries that employ creative individuals and those that support the creative we first identify land areas necessary to accommodate these industries.

This project allocates three building sizes that represent future employment centers for creative industries. As the buildings are placed within the region, the number of employees each building holds is subtracted from the new employees expected from 2005 to 2050. Table 3-4 lists the sizes and respective number of employees per building.

The surface developed thus far indicates lands suitable for employment centers that provide a good quality of place and also offers good quality jobs. The attribute table associated with the grid lists the number of cells that fit this criterion. Each cell is comparable to a land area of 1 quarter acre. The cells listed in the attribute table represent contiguous and individual cells. To identify lands that have a contiguous area suitable for different building sizes we use the Region Group[xv] function within ArcMap. The "Number of Neighbors" option within the Region Group dialog box can be changed to include more or less neighboring cells in evaluating connectivity[xvi]. Each record in the attribute table of the resultant surface represents a contiguous set of cells with the total size of that record identified by the number in the Count field. This

produces a result that allows you to classify areas of contiguous available land by size and place small, medium and large employment centers.

Allocate Industry by County

The Bureau of Labor Statistics defines the location quotient as a "ratio that compares the concentration of a resource or activity, such as employment, in a defined area to that of a larger area or base" (Bureau of Labor Statistics, 2007b). Indicators such as the location quotient provide a means to determine the economic base of a county or region. In this analysis, the location quotient is used to determine the concentration of creative specializations within the local (county) economy compared to the state's economy. When the location quotient is less than 1, local employment for creative industries is less than was expected for a given creative industry. Therefore, that specific creative industry is not meeting local demand for a given creative good or service. If the location quotient is equal to 1 the local creative employment is exactly sufficient to meet the local demand for a given creative good or service. Lastly, if the location quotient is greater than 1 the local employment for creative industries is greater than the need (Florida State University, 2006).

For each county the location quotient for creative industries was calculated. The sectors that include occupations characterized as creative are: NAICS[xvii] 51 Information; NAICS 52 Finance and insurance; NAICS 54 Professional and technical services; NAICS 55 Management of companies and enterprises; NAICS 61 Educational services; NAICS 62 Health care and social assistance; and NAICS 71 Arts, entertainment, and recreation[xviii]. For each county the average location quotient for these sectors was calculated and the result represents the local demand for creative occupations.

To build upon existing local demand for high-tech innovative services the seven counties were sequentially ordered from greatest to least location quotient. This represents the procession

of employment center allocation. Once I created individual rasters for each county containing the groupings of adjacent cells, I began to allocate the first cluster of employment centers. The first round of allocation placed large then medium then small buildings. To accomplish this, I selected records from the newly created county grids of grouped cells with enough contiguous cells to **at least** accommodate the largest size building (Table 3-5). To avoid wasting greenfields and avoid creating a homogeneous urban landscape of mono-sized buildings, I created an Excel spreadsheet that took the total count of cells and allocated buildings of each size. The number of buildings that could be accommodated from each group of contiguous cells depended upon how many multiples (each multiple represents 1 building) of each respective building cell count (Table 3-5) could be extracted from the total number of contiguous cells.

For example, first we select records with grouped cells of larger than 38 for the county with the highest location quotient. The attribute table of the records that fit this criteria will often have counts that are much larger than 38 and allow for the allocation of more than 1 large building. If there are cells remaining following the allocation of all multiples of 38 then we allocate medium buildings by determining the number of 19 cell multiples in the remainder. When the spreadsheet looks for multiples of 19, it is allocates medium size employment centers. From the remaining cells after the medium size building allocation, the spreadsheet looks for multiples of 10. Small employment centers are roughly 2.3 acres, which is equivalent to 10 cells. It is possible to have cells remaining after the last employment center allocation. These could be urban parks or some other use that benefits the overall working and physical environment.

To determine the number of employees accommodated through each county's allocation, take the number of new employees expected for the region and subtract the capacity of the building allocated. For example, if the original number of new employees expected in 2050 is

832,400 and during the first allocation described above we placed 2 large, 2 medium and 1 small employment center in Orange County, then we would have 826,880 employees left after the Orange County allocation (Figure 3-3).

After placing employment centers using the large–medium–small building progression, the process begins again but this time only allocate medium and small buildings; allocating medium buildings first then small. During this allocation select records with grouped cells greater than or equal to 19 and less than 38 from the same county used for the first allocation. The number of medium size buildings that can be accommodated within each county by using the Excel spreadsheet which looks for multiples of 19 within each contiguous group of cells. From the remaining cells after the medium size building allocation, the spreadsheet looks for multiples of 10, which represents the number of cells needed for a small building. All remaining cells after the small building allocation can be used for urban parks or another sustainable use. If there are employees remaining after the medium– small building allocation, select those cells from your each county's attribute table that are greater than or equal to 10 cells but less than 19. With these cells small buildings can be allocated using the same process. Once all allocation sequences have been exhausted for a given county, repeat the process using the county with the next highest location quotient (Figure 3-7).

The process described above outlines a method for allocating employment centers to satisfy future creative employment projections while creating a diverse clustered development pattern for industries that incite economic growth.

Table 3-1. Categories for land use analysis data

GIS data category	Description
Geophysical	Datasets that describe abiotic (nonliving) native characteristics, including geology, soils, hydrology, hydrogeography, climate, and aspect.
Biological/Ecological	Datasets that describe biotic (living) native characteristics, including vegetation, animal habitat, species distribution, and measures of biological diversity.
Demographic	Datasets that describe human populations and their distribution, including census, population densities, ethnicity, income levels, age, and people per household.
Economic	Datasets that describe landownership, costs and associated cost trends, property parcels, market value per acre, assessed value per parcel, and year built.
Political	Datasets that represent politically derived constructs like zoning districts, comprehensive plan units, city limits, county limits, water management district boundaries, regional planning council boundaries, state boundaries, and publicly owned conservation lands.
Cultural	Datasets that capture the distribution and character of cultural features, including land use and land cover, national register historic sites, state register historic sites, eligible historic sites, and cultural features sorted by period of historic significance.
Infrastructure	Datasets that represent the spatial distribution and character of the physical infrastructure needed to support human settlement like roads, sanitary sewers, storm sewers, airports, and railroads.

(Carr, M., & Zwick, P. (2007a). *Smart Land-Use Analysis: The LUCIS Model*. Redlands, California: ESRI Press. P. 90)

Table 3-2. Assigned SUA values

Suitability value	Description
9	Highest suitability
8	Very high suitability
7	High suitability
6	Moderately high suitability
5	Moderate suitability
4	Moderately low suitability
3	Low suitability
2	Very low suitability
1	Lowest suitability

(Carr, M., & Zwick, P. (2007b). An application of LUCIS (Land Use Conflict Identification Strategy) in South Central Florida: An example of GIS for land use planning & design. *LAA 6656 & URP 6341 Class Slides*. University of Florida slide 18)

Table 3-3. Combinations of preference rankings

	Areas of conflict		Areas of no conflict
Code	Description	Code	Description
111	All in conflict, all low preference	112	Urban preference dominates
122	Moderate conservation preference conflicts with moderate urban preference	113	Urban preference dominates
133	High conservation preference conflicts with high urban preference	121	Conservation preference dominates
233	High conservation preference conflicts with high urban preference	123	Urban preference dominates
221	Moderate agriculture preference conflicts with moderate conservation preference	131	Conservation preference dominates
212	Moderate agriculture preference conflicts with moderate urban preference	132	Conservation preference dominates
222	All in conflict, all moderate preference	211	Agriculture preference dominates
313	High agriculture preference conflicts with high urban preference	213	Urban preference dominates
323	High agriculture preference conflicts with high urban preference	223	Urban preference dominates
331	High agriculture preference conflicts with high conservation preference	231	Conservation preference dominates
332	High agriculture preference conflicts with high conservation preference	232	Conservation preference dominates
333	All in conflict, all high preference	311	Agriculture preference dominates
		312	Agriculture preference dominates
		321	Agriculture preference dominates
		322	Agriculture preference dominates

(Carr, M., & Zwick, P. (2007a). *Smart Land-Use Analysis: The LUCIS Model*. Redlands, California: ESRI Press. p. 148)

Table 3-4. Employment Center Building Sizes

Building Size	Building Capacity (Employees per 1000 GSF[xix])	Total number of Employees
Under 100,000 GSF (2.3 acres)	4.8	480
100,000 to 200,000 GSF (4.6 acres)	4.4	880
Over 200,000 GSF (9 acres)	3.5	1,400

(Institute of Transportation Engineers. 1998. *Trip Generation: Trip Generation Rates, Plots, and Equations*. 6th Ed. Washington, D.C.: Institute of Transportation Engineers)

Table 3-5. Cells needed to accommodate building allocation

Building Size	Acres	Cells
Large Building Under 100,000 GSF	2.3 acres	10
100,000 to 200,000 GSF	4.6 acres	19
Over 200,000 GSF	9 acres	38

(Institute of Transportation Engineers. 1998. *Trip Generation: Trip Generation Rates, Plots, and Equations*. 6th Ed. Washington, D.C.: Institute of Transportation Engineers)

Agriculture Suitability:
Statement of Intent: Identify lands most suitable for agricultural use.

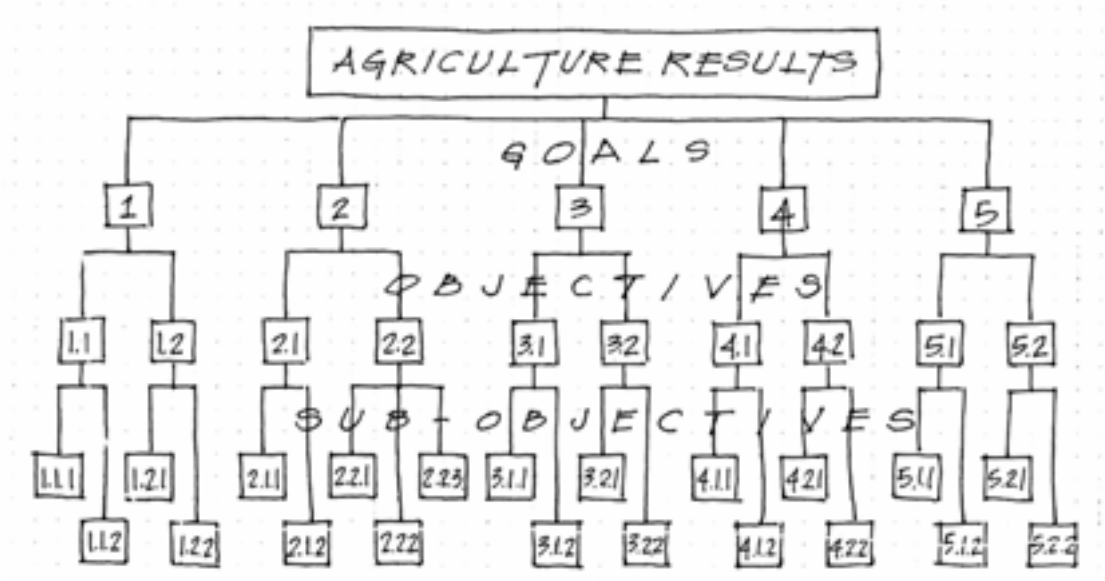

Figure 3-1. Diagram of hierarchical relationships of goals, objectives and sub-objectives for agricultural land use suitability analysis

---

Conservation Suitability:
Statement of Intent: Identify lands most suitable for permanent protection through the application of conservation strategies.

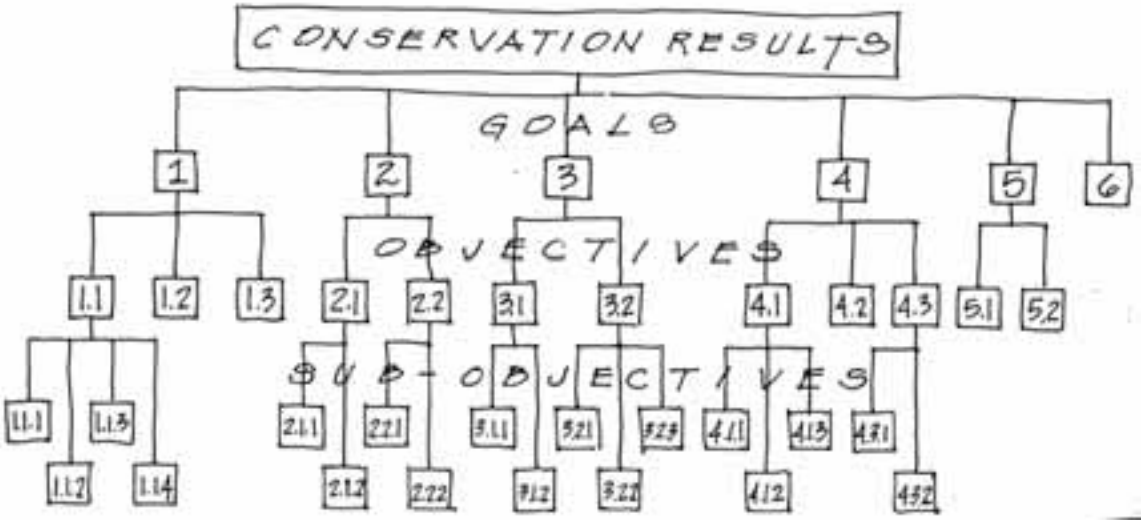

Figure 3-2. Diagram of hierarchical relationships of goals, objectives and sub-objectives for conservation land use suitability analysis

Statement of Intent: Identify lands most suitable for urban development

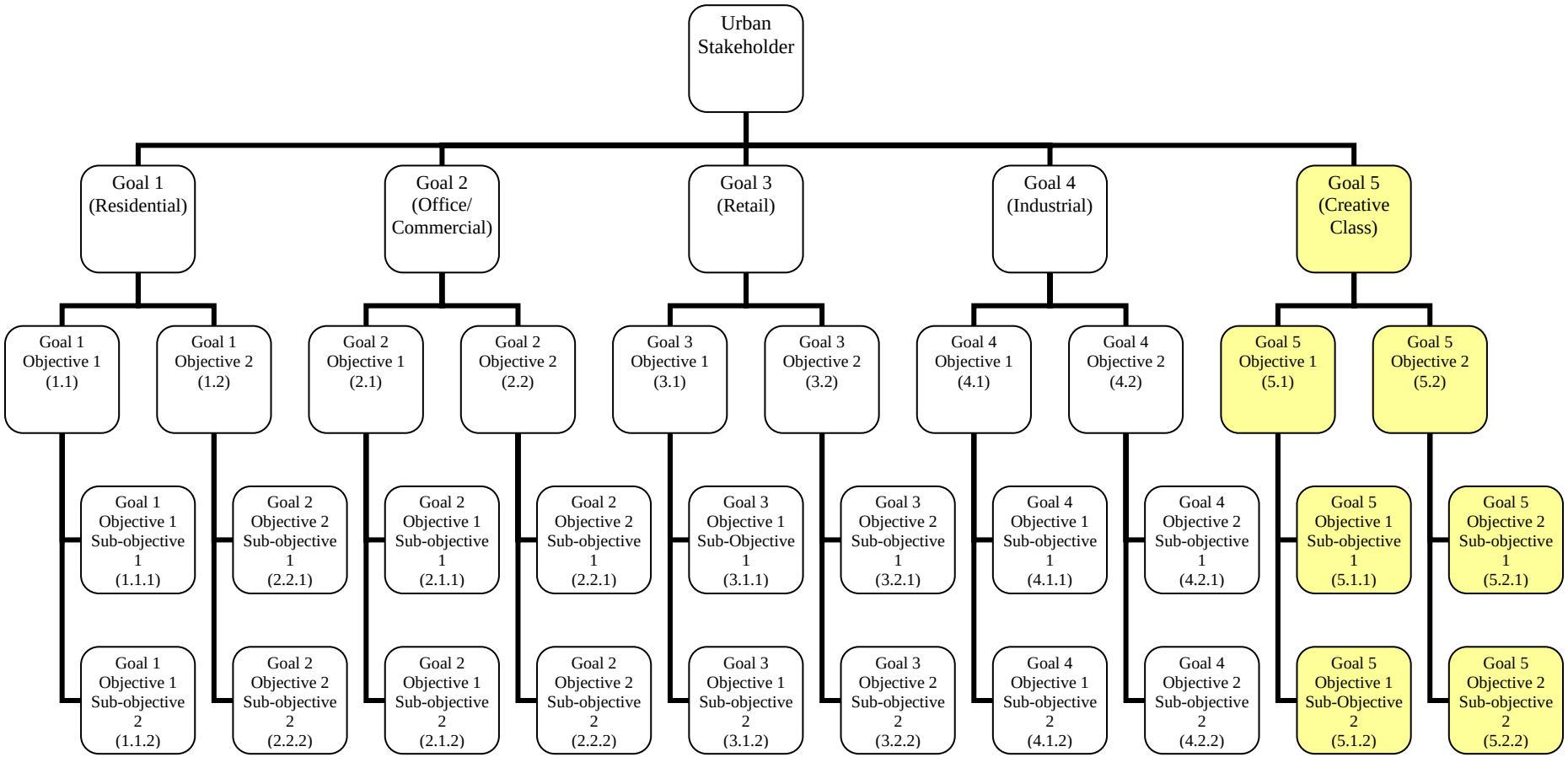

Figure 3-3. Diagram of hierarchical relationships of goals, objectives and sub-objectives for Urban land use suitability analysis and includes objectives for the Creative

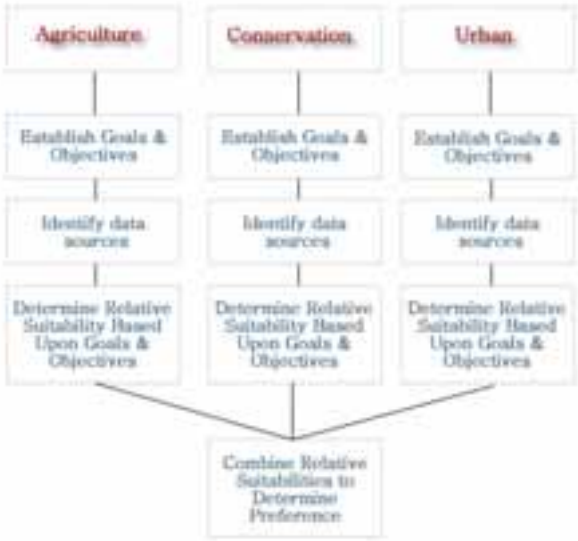

Figure 3-4: LUCIS strategy process flow

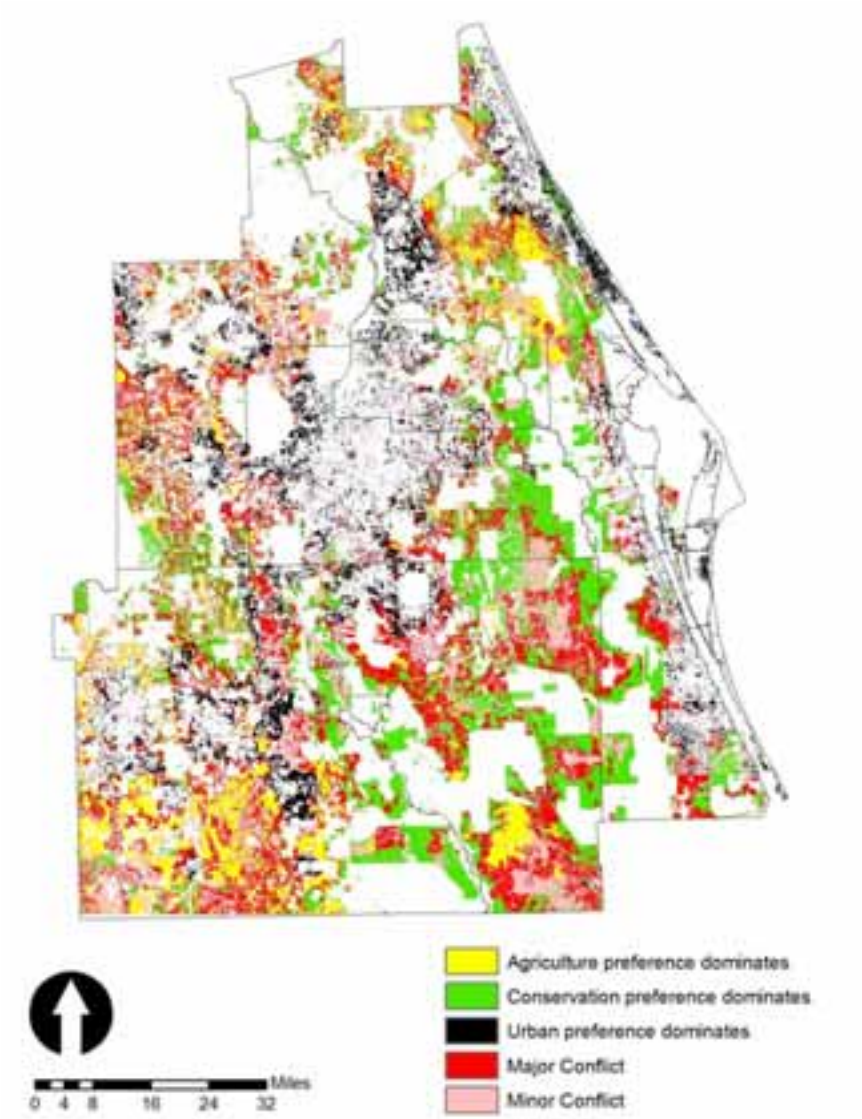

Figure 3-5: Final preference map

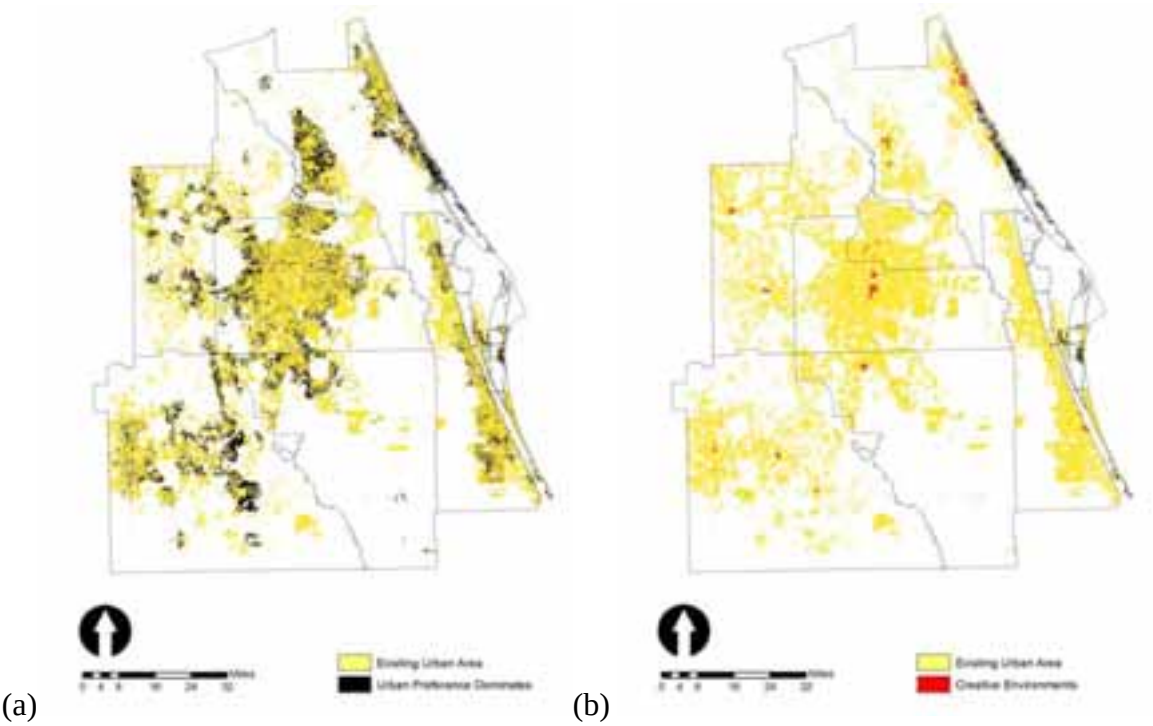

Figure 3-6: Suitable locations for Urban Areas and Creative Environments. A) the intersection of areas where the urban preference dominates and B) that are suitable for creative environments produce areas

Beginning New Employment	832,400
Large Building Allocation (2 @ 1,400/building)	2,800
Medium Building Allocation (2 @ 880/building)	1,760
Small Building Allocation (2 @ 480/building)	960
Employment Remaining for Allocation	826,880

Figure 3-7. Example employment allocation calculation

CHAPTER 4
FINDINGS AND RESULTS

This study focused on the use of census and other relevant economic data to reveal the potential of the East Central Florida region to accommodate industries that employ creative individuals with ideas, talents, and services that sustain the economy. The following chapter will report findings for each Creative indicator separately then relate this to the spatial findings that resulted from our suitability analysis. The trends revealed from the quantitative analysis and how they correspond to the spatial arrangement of Creative Environments is worth discussing.

The Creative Index

Richard Florida uses the Creative Index as a way to measure a region's position in the Creative Economy. The Creative Index is comprised of four factors: (1) the Creative Class share of the workforce; (2) innovation, measured as patents per capita; (3) high-tech industry, using the Milken Institutes widely accepted Tech Pole Index (a.k.a the High-Tech Index); and (4) diversity measured by the Gay Index, the Melting Pot Index and the Bohemian Index (Florida, 2002, p. 244; p. 261). These socio-economic factors influence the inventiveness of regions and provide a reasonable indicator of future economic growth (Ceh, 2001).

The next four sections apply the factors of the Creative Index to the seven county East Central Florida region. The final section in this chapter is a discussion of whether the Creative Index for the East Central Florida region correlates in any way to the results concluded from the spatial analysis outlined in Chapter 3. The same indicators established in the Methodology are used in developing the Creative Index.

The Creative Class Share of the Workforce

According to Florida, there are four major classes of occupations; Creative Class, Working Class, Service Class, and Agriculture (Table 4-1). REMI projects that the share of Creative

Class employment in 2050, with respect to its share of the service sector as well as its share of the overall workforce in Orange County (Table 4-2) is twice as much as the Polk County, the county with the next highest creative employment rate. Orange County is the center of the region and is presently home to large companies that offer creative occupations (Table 2-3). Orange County also offers high quality educational opportunities that offer advanced degrees (i.e. University of Central Florida) that have historically served as incubators for high tech industries (i.e. Burnham and Innovation Way). Compared to other counties within the region, Orange offers greater transportation options (i.e. Orlando International Airport, Florida's Turnpike, I-4 Corridor; Tables 2-5 and 2-6) as compared to other counties within the region. The Creative Class share of the Service Sector in 2050 (Table 4-2) indicates that across the region people have sorted themselves into classes not associated with creative occupations.

Interestingly, higher percentages of the Creative Class are not limited to areas that you would typically associate with high-tech corridors or artistic centers. An example is Polk County. REMI projects that following Orange County, it has the next highest percentage of creative occupations in 2050. Polk County is typically associated with agricultural or manufacturing activities; namely companies such as Tropicana or IMC-Agrico Phosphate Mining Company. Although the location of Polk County, between Hillsborough and Orange, offers significant economic and geographic benefits, these benefits can be applied to attracting industries that are not resource dependent and generate greater shares of wealth. The proximity to Interstate 75 and, to a greater degree, Interstate 4 creates a portal for knowledge spillover from Hillsborough and Orange County to flow into Polk County and vice versa. When comparing Polk to Volusia or Brevard, who also have relatively high shares of creative employment as a percentage of the entire service sector, Polk isn't landlocked by the ocean and therefore creates a

seam for the greater Central Florida region that extends from Pinellas County eastward to Volusia and Brevard Counties. Polk County has countless benefits because of location and access which can be exploited to encourage creative industries to locate in the county.

The notion of propelling a multi-ton rocket against gravity into other galaxies takes a bit of creativity and specific knowledge. The Kennedy Space Center ("KSC") in Brevard County employs hundreds of individuals with specific knowledge about rocket propulsion and physics so that research and exploration is possible outside of the Earth that we know. The presence of KSC in Brevard County and the collocation of industries around KSC that support the space program can be attributed to the high share of creative individuals within the county. According to the Bureau of Labor Statistics, in 2006 manufacturing had the highest location quotient, 2.24 (Bureau of Labor Statistics, 2007a), among all Brevard County industries; indicating that although creativity is needed to support the mission and future ideas of the space program, it is the physical materials its supporting services that sustain the Brevard County economy.

Other counties, such as Osceola and Seminole are being passed by. Osceola County is historically known as a bedroom community[xx] to Orange and Polk Counties. Maps indicate that Osceola County is primarily composed of undeveloped land, although much of this land belongs to large land holders. If current development patterns around the region continue, Osceola County will continue to serve as a bedroom community. An example is the proposed Innovation Way project in Southeast Orange County, which will add an additional 20 million square feet of manufacturing, light industrial, biotech, warehouse, telecommunications, office and small businesses. This project offers countless economic benefits but early speculation from local government officials indicates that affordable housing in the immediate vicinity of the project is inadequate. This leads me to believe that the burden for accommodating those in need of

affordable housing will continue to rest upon Osceola County. Although projects like Innovation Way look to neighboring counties more for providing amenities than talent, the potential exists for Osceola and Seminole Counties to increase their share of creative employment.

Talent Index

Within the region there are a total of 33 colleges and universities. Twenty-two are community colleges, ten are private colleges, and one is a state university. Among these only eleven offer degrees beyond a Bachelor's. The University of Central Florida (UCF) conferred the most degrees (53.3% or 5,460[xxi]) related to creative occupations. The ability of UCF to confer such a large number of degrees has translated into a burgeoning technology and research industry in southeast Orange County. Other universities that deserve mention include Florida Institute of Technology and Bethune Cookman University who also have high rates of conferred technical and innovative degrees, 38.0%[xxii] and 36.2%[xxiii], respectively.

Innovation Index

Economic growth is driven by innovation and invention, both of which are vital to a region's economic vitality. During the first part of the twentieth century, three quarters of economic growth in the U.S. was linked to industrial inventions (Ceh, 2001, p. 298). Feldman and Florida (1994) indicate that

> …the capacity of regions to invent is ever more dependent on the agglomeration of [specialized] skills, knowledge, institutions and resources that [mold] the technical infrastructure of regions. (Ceh, 2001, p. 298)

Patent information can also be used by corporations to measure the success of R&D employees and spending (Ceh, 2001, pp. 300-301). This study uses the presence of new technology as measured by the number of patents issued[xxiv] to determine an area's level of innovation.

Within the region, Brevard County (32.5%) issued the highest number of patents over a ten year period[xxv] followed by Orange County (26.7%) (Table 4-3). Brevard County is the location of Kennedy Space Center and relies upon new technology to support its space program. Protection of new technologies and inventions is important and this can be achieved through the use of patents. Supporting patents may be acquired by companies which are located in close proximity to KSC and capitalize upon the efforts of the space program. This is illustrated by the 199 patents issued to Lockheed Martin scientists and engineers for technologies related to the aerospace industry (Space War, 2003).

In previous research done by Richard Florida, he found a statistical correlation between concentrations of innovation and educational opportunities. Further support for Brevard County's Innovation Index rank could be attributed to the location of Florida Institute of Technology (FIT). As mentioned in the previous section, FIT is an institution specializing in technical training, especially training needed for creative industries. Students that earn doctoral degrees possess a higher amount of creative capital. The University of Central Florida conferred the most PhDs among any of the regional universities and ranks second in the number of patents issued per capita.

Milken Index Tech Pole

The Milken Index provides a measure to rank Metropolitan Statistical Areas (MSAs) on their economic performance and their ability to create, as well as keep, the greatest number of jobs in the nation. The East Central Florida region is comprised of 4 MSAs: Melbourne-Titusville-Palm Bay, Lakeland-Winter Haven, Orlando, and Daytona Beach. Among the largest 200 cities, in 2005 three out of four region MSAs rank in the top ten of the Milken Index Tech Pole. Lakeland ranks at #33 but improved from number 87 the previous year. The top ten have similar characteristics: strong and growing service sectors, a robust tourism, growing

populations, and an increase in the number of retirees (Milken, 2007). The number one ranked best performing city is the Palm Bay-Melbourne-Titusville area, located in Brevard County. This supports Richard Florida's theory that technology and talent, both indices that Brevard County ranks high in, are complementary and support the overall creative environment.

The Diversity Index

Diversity is indicative of a mix of influences and differences, which thrive in environments with a "tolerance for strangers and intolerance for mediocrity" (Florida, 2002, p. 227). Talented individuals seek environments in which they live and work to be open to dissimilarity. During previous research, Florida statistically determined that the Gay Index, Melting Pot Index, and Bohemian Index (collectively known as the Composite Diversity Index or "CDI") were the strongest predictors of creative population growth during 1990 and 2000 (Florida, 2002, p. 263). The population of the East Central Florida Region will surpass 7.5 million people (BEBR, 2006) by the year 2050. This estimate doubles the current regional population. According to Richard Florida's research, the Bohemian Index and the CDI are the only significant predictors of population and employment growth in regions with an average population of 2.2 million. He recommends these regions develop strategies to bolster their openness to diversity and invest their resources in the development of vibrant local artistic and cultural communities (Florida, 2002, p. 263).

The Gay Index

Diversity can be measured in numerous ways, but it is a good indicator for an area's openness and tolerance to different kinds of people and ideas (Florida, 2002, p.45; p. 258). The Gay Index is a measure of "the over- and under-representation of coupled gay people in a region relative to the United States as a whole" (Florida, 2002, p. 333). Once again, Orange County had the highest percentage of gay population, 0.32% (Table 4-4). In previous statistical research by

Richard Florida, five of the top ten 2000 Gay Index regions also rank among the nation's top ten high-tech regions. As we have seen in indicators described previously in this study, Orange County has been within the top two counties with respect to innovation and education, both indicators of a strong high tech industry.

The Melting Pot Index

The Melting Pot Index, as defined by Richard Florida, measures the relative percentage of foreign-born people in a region (Florida, 2002, p. 333). This study does not include the concentration and influence of immigrants in calculating the Melting Pot Index[xxvi]. Instead, I examined the concentration of the four minority ethnic groups recognized by the U.S. Census Bureau (Blacks/African Americans, Asians, Hispanics, Other and Multi-race) and investigated the regional concentration of minorities to determine if there were any spatial patterns existed. The statistics indicate that Orange County has the highest percentage of Blacks/African Americans and Asians; compared to its total population (Table 4-5). Orange County also has the highest level of diversity (gay population) and is home to UCF, which confers the most degrees for creative occupations. In addition to academics, UCF also has the highest enrolled number of minority students[xxvii].

With the exception of Blacks and Asians, Osceola County is the only other county with high percentages of minority populations. Further analysis would be needed to determine whether creative employees are commuting from Osceola to Orange or Brevard counties; counties that rank high in other indices. Using projected population estimates and average rates of growth for each ethnic group through 2050, Osceola County continues to lead the region with the highest concentrations of three of the five minority ethnic groups.

Spatial Comparisons

Steps 1 through 4 of the Chapter 3 produce a GIS raster that identifies locations around the seven county region that provide a good quality of life and are conducive to high quality jobs. First, I identified undeveloped lands preferable for urban uses in the future. These uses include residential, office/commercial, retail, and industrial. The total land area for the region preferable for urban uses is 314,792 acres. I then developed a surface that graphically displayed areas not only preferable for urban uses but were specifically suitable for creative environments. These areas are tolerant, have high levels of diversity and are in areas that promote clustering among industry and the transfer of ideas. The total land area for these "Creative Environments" was 20,287. Finally, we identified areas that were not only Creative Environments but also were suitable for office/commercial uses. This further narrowed the amount of available land to 9,058 acres.

Sam Bitar, an economist with the East Central Florida Regional Planning Council, used the REMI economic modeling software to determine employment for the years 2005 through 2050. He determined that 832,400 new people will be employed in the service sector for the East Central Florida region. Over one-third of these new employees will work in industries classified as creative. The foundation of my research was to determine whether the region could accommodate employment centers that would satisfy new employment, minimize impact to other land uses, and distribute employment centers to counties within the region in a manner that would satisfy regional demand for creative industries.

I developed a very simplistic method to distribute 2050 service employment and allocate employment centers. Although roughly one-third of the 832,400 individuals will work in creative industries, I attempted to allocate the entire projected new service employment using the assumption that remaining employees would provide support services to the creative. First,

employment centers were categorized as either small, medium, or large. Then the average location quotient for creative industries was calculated for each county (Table 4-6). The sequence of allocation depended upon the current strength of creative industries for each county. Next, employment centers were allocated from the largest building size to the smallest among a contiguous land area. This created a variation of company sizes within a small area, thus cluster of industries (Tables 4-7 and 4-8).

The distribution of new employees is affected not only by a county's need to fulfill the economic demand for creative industries, but by the amount of land area within the county that has an environment which creates the quality of place industries want to locate. Using my model, I determined that the region could only accommodate 62,760 employees, or 7.5%, of the 832,400 new service employees the region projects by the year 2050 (Table 4-8). According to allocation sequence, Volusia County was the first county in which the potential existed to allocate employment centers. Orange and Polk counties did not have enough contiguous land area available to accommodate large employment centers. Brevard and Lake Counties suffered the same problem of inadequate contiguous land area, and were unable to receive any large employment centers. Osceola County did have enough contiguous land available to accommodate large employment centers, but it is Volusia County that could absorb most employees in employment centers of at least 9 acres.

For the second allocation only medium and small buildings were placed. Once again, Orange County did not have enough contiguous land area in creative environments to accommodate buildings of 4.6 acres. All other counties in the region are able to accommodate medium size employment centers. Again, it is Volusia County who absorbed the most

employment; accounting for 58% of all creative employment that occupy medium size employment centers.

For the third and final allocation in which only small employment centers are placed, all counties were able to absorb some share of new employment. Once again Volusia absorbed the most employment accounting for 18 buildings and 8,640 employees. In total Volusia will attract 55% of the new creative employment and Orange County will attract the least by absorbing only 1,440 employees accommodated in three new employment centers.

Spatial Findings

As constraints were applied to lands suitable for urban land uses (as identified by the collapsed preference surface and classified by the final conflict surface as "Urban Wins"), the amount of viable land for creative environments (as identified by the urban goal 5 preference surface) and creative environments that are also suitable for office/commercial use significantly decreased (Table 4-9). More importantly, the constraint that caused the most significant reduction of land suitable for creative environments is when lands appropriate for creative environments **and** suitable for office/commercial development were selected (Table 4-10). The cells that fit these criteria are considered creative environments. This is important in that it validates the importance of the added Creative Goal (i.e. Goal 5 under the Urban stakeholder). Areas that are ideal for office/commercial development are not necessarily suitable creative environments.

Earlier discussion within this chapter indicated that once employment centers were allocated, Volusia County absorbed the largest number of anticipated employment. This is due in large part to the amount of contiguous land available for development. For the sake of simplicity, this study allocated employment centers under the assumption that each employment center would be a 1 story building. In areas like Orange County where the largest contiguous

area is 18 acres, the only possibility of accommodating large numbers of people would be to build upwards. Therefore if we were to place a building of 2 stories on the land area with 18 contiguous cells only then would we be able to allocate a "large" employment center which would accommodate an additional 1,440 employees within the region. Furthermore, it is possible to accommodate additional creative employees throughout the region by manipulating the floor area ratio[xxviii].

Volusia County will absorb the largest share of new creative industries and employees over the next 50 years. According to 2006 employment estimates, Volusia County's employment currently meets the local demands for service sector jobs that are high-tech and innovative[xxix]. Although Volusia County has the most scattered spatial arrangement of new creative industries the most notable spatial pattern is that the more dense concentrations of new creative employment are located near major transportation corridors or clusters of major arterial roads (Figure 4-1). Proximity to major roads was a sub-objective within every goal of the urban stakeholder but was not included as a sub-objective of the Creative Goal. Also, since Volusia County will absorb the most new creative industries within the region, this study also implies that Volusia will play a more significant role in the regional economic growth.

Osceola County, which has the lowest location quotient, will accommodate the third highest number of new creative industries and employees. Osceola County has the largest contiguous land area available for allocation of employment centers. Interestingly, the next largest contiguous land area in Osceola County is 19 cells or 4.5 acres. All potential creative environments in Osceola County identified by this study are in close proximity to the Orange County line. These industries can benefit from knowledge spillover from Orange County (i.e. Innovation Way) (Figure 4-2).

Orange County ranked seventh within the region for lands suitable for new creative employment. According to 2006 employment estimates, creative employment exceeds the county demand by 50% (Table 4-6). The lack of land area presents spatial challenges to Orange County since the county has significant transportation (i.e. I-4 Corridor and Orlando International Airport), economic, and educational opportunities (i.e. the University of Central Florida). For these reasons it is advantageous for companies to continue to locate within Orange County. It is important to note that the larger concentrations of new creative industries occur near the Seminole County line. In Seminole County larger concentrations of new creative industries occur in the same relative area as the Orange County creative industries (Figure 4-3). A relationship like this does not occur along the shared county boundary of Orange County and any other county. As indicated by the People's Choice Map, residents would like increased densities in these areas, therefore taller buildings with smaller footprints may be more appropriate for areas suitable for new creative industry in Orange County.

Seminole County is the smallest county within the region, with respect to land area, yet it absorbs the second highest number (42 buildings) of creative industries. This study also indicates that the distribution of employment between medium and small industries was almost equal, collectively contributing 11.7% (7,360 jobs) to regional employment. Seminole County is currently experiencing phenomenal growth in the Sanford (Figure 4-4) and Heathrow area (Figure 6-3), especially within high-tech innovative industries. The key to Seminole's continued growth will be increasing floor area ratios (i.e. building up), take advantage of the transportation infrastructure (i.e. Interstate 4 and Sanford Airport), and exploiting its proximity to Orange County and the resources that Orange County provides.

Lake County ranks fourth in the percentage of new creative employment for 2050 that is absorbed. Like Seminole County, Lake County has a unique geographic location due to its proximity to Orange County, the economic engine of the region. Lake County also serves as a gateway to North Central and West Central Florida counties. Existing development patterns within Lake favor residential development serving those who work in Marion, Sumter, Volusia, Orange, Polk and Seminole Counties. Local officials have suggested that they would like to find a balance between encouraging additional office/commercial development, residential demand, and the preservation of the local ecological resources. Consequently, these three goals appeal to and are essential in attracting the creative.

The results of this study indicate that due to the large lot development patterns that currently exist, it would be difficult to locate an employment center with a large footprint in Lake County. The largest footprint conducive to a creative industry is 5.7 acres. This resulted in the placement of only medium and small buildings which collectively absorb a total of 5,520 future creative employees. Although Lake County is less dense than Seminole, it faces the same problem of accommodating a needed population of individuals that drive economic growth. I offer the same solution for Lake County that I suggested for Seminole: increase floor area ratios (i.e. building up), take advantage of the transportation infrastructure (i.e. Florida Turnpike and Interstate 75), exploit its shared boundaries with the neighboring seven counties, and exploit the high-tech economic resources that Orange and Seminole County's can provide.

Polk County has the largest land area (1,874 sq. miles; 1,199,360 acres) than any other county but will only accommodate 6.6% of new creative employment through 2050. An examination of the final conflict surface reveals that urban clearly wins 72,768 acres; if you remove existing urban areas this is only 7.5% of the total land area for Polk County. The conflict

surface suggests Polk County has more land suitable for agriculture or where agriculture is in conflict with conservation (Table 4-11 and Figure 4-4). This is one potential reason why Polk County does not have many lands suitable for creative industries.

Brevard County ranks just behind Polk in the suitability of lands for creative industries. Polk absorbs only 2,800 new employees, primarily due to the lack of available land to place new employment centers. According to the Creative Index, Brevard County is one of the most suitable counties' for innovation and high-tech companies. The problem is that after accommodating existing urban areas, open water, road networks, and existing conservation lands only 34% of the county is available for future development (Table 4-12). Of the remaining 224,379 acres available for future development the conflict surface (Figure 4-4) indicates that Brevard County is primarily in major conflict between all three stakeholders (Table 4-13). This presents a problem when accommodating future creative employment. According to this study, Brevard County can only support 5 new creative employment centers employing 2,800 people. As in the cases of Seminole and Lake Counties, Brevard should explore building up in order to accommodate more creative employees.

Results

Using the model and methods described in the previous chapter, the results do not support my hypothesis that the East Central Florida region can accommodate future creative employment centers, according to the principles of the creative class, if current policy and development patterns persist. Although the Creativity Index indicated that several counties within the region (i.e. Orange and Brevard) currently have the resources and amenities available to compete in a Creative Economy, the region is unable to accommodate the needed number of industries that command a high level of skills, encourage clustering of industries that innovate, and provide services or products that are used in the global economy.

Sensitivity Analysis

The discussion that accompanied the findings within this chapter offer explanations about the numerical and spatial results. The importance of the indicators used and the effects variables within those indicators placed upon the final result can be verified through the use of sensitivity analysis. Marian Scott of the University of Glasgow defines sensitivity analysis as:

> Sensitivity analysis (SA) is a general methodology used to evaluate the sensitivity of model output to changes in model input, i.e. the rate of change of the response function relative to the input parameters. (Scott, 2003)

As an example, I offer the following discussion which outlines the steps taken and findings of manipulating the weight of various ethnicities on the suitability of lands for creative industries.

Sensitivity Analysis Findings

Within the Melting Pot Index I examined the concentration of five ethnicities (Blacks/African Americans, Asians, Hispanics, Other and Multi-race) around the region and question whether any spatial patterns exist. This index was also spatially represented and evaluated as Goal 5, Objective 5.1, and Sub-Objective 5.1.4. Within the suitability model, this sub-objective weights each ethnicity equally as 20%. To determine the sensitivity of each respective ethnic group in determining suitable creative environments, I performed the following four aspects: 1) modified the weight of each ethnicity so that one ethnicity was given a weight of 40% and the remaining ethnicities were given an equal weight of 15%; 2) created a new preference surface for Urban Goal 5; 3) created a new collapsed preference surface for the Urban Goal; and finally, 4) created a new conflict surface.

By changing the weight of each ethnicity the amount of land suitable for urban development varies (Table 4-14). An implication that cannot be seen from the data tables is depending upon the ethnicity that was weighted the most, the high preference value for the diversity sub-objective and the number of values within each standard deviation interval used to

develop the collapsed preference surface changed. This explains the variation in the amount of land suitable for urban use.

To determine whether the sensitivity of ethnicity influenced the amount of land suitable for creative environments I calculated the amount of land identified as highly preferable (i.e. values greater than 8) from the Creative Goal surface. I then used these areas to calculate the number of acres that were identified as "Urban Wins" in the final conflict surface and were preferable for office/commercial development. What I learned was that the amount of acres suitable for creative environments remained the same, regardless of which ethnicity possessed the greatest weight. Therefore, the results of this sensitivity analysis indicate that diversity influences the amount of land suitable for urban environments but has negligible influence on creating additional creating environments.

Table 4-1. Description of Class Occupations. The Creative Class has two major sub-components: a Super-Creative Core and Creative Professionals.

Class Name	Description
Super-Creative Core	• Computer and mathematical occupations • Architectural and engineering occupations • Life, physical, and social science occupations • Education, training and library occupations • Arts, design, entertainment, sports, and media occupations
Creative Professionals	• Management occupations • Business and financial occupations • Legal occupations • Healthcare practitioners and technical occupations • High-end sales and sales management
Working Class	• Construction and extraction occupations • Installation, maintenance, and repair occupations • Production occupations • Transportation and material moving occupations
Service Class	• Health care support occupations • Food preparation and food-service-related occupations • Building and grounds cleaning and maintenance occupations • Personal care and service occupations • Low-end sales and related occupations • Office and administrative support occupations • Community and social services occupations • Protective service occupations
Agriculture	• Farming, fishing, and forestry occupations

(Florida, R. (2002). *The rise of the creative class*. Nee York: Basic Books, p. 328)

Table 4-2. Creative Class share of the Service Sector in 2050

County	% of Service Sector	% of Total Workforce
Brevard	8.7%	4.4%
Lake	5.8%	2.9%
Orange	19.7%	10.1%
Osceola	5.2%	2.7%
Seminole	5.3%	2.7%
Volusia	9.2%	4.7%
Polk	9.8%	5.0%

(Regional Economic Models, Inc. (2007). *Policy Insight*. Retrieved March 16, 2007 from http://www.remi.com/software/software.shtml)

Table 4-3. Number of patents issued between 1990 and 1999

County	# of patents (1990-1999)	% of patents issued within region
Brevard	1188	32.5%
Lake	129	3.5%
Orange	974	26.7%
Osceola	73	2.0%
Seminole	632	17.3%
Volusia	349	9.6%
Polk	309	8.5%

(U.S. Department of Commerce, 2000)

Table 4-4. Gay population and share of total population

County	# of gays		% of gays (total)	Total county pop (2000)
	Males	Females		
Brevard	420	440	.18	476,230
Lake	250	201	.21	210,528
Orange	1737	1170	.32	896,344
Osceola	200	185	.22	172,493
Seminole	381	371	.21	365,196
Volusia	499	475	.22	443,343
Polk	545	469	.21	483,924

(U.S. Census Bureau; Census 2000, Summary File 3 (SF 3); generated by Iris Patten; using American Factfinder; <http://factfinder.census.gov/>; (08 March 2007).)

Table 4-5. Regional population, by ethnic group

County	Blacks		Multi-Race		Hispanics		Asians		Other	
	#	%	#	%	#	%	#	%	#	%
Brevard	40,000	8.4	8,429	1.8	21,970	4.6	7,152	1.5	5,168	1.1
Lake	17,503	8.3	2,477	1.2	11,808	5.6	1,667	0.8	3,966	1.9
Orange	162,899	18.2	30,771	3.4	168,361	18.8	30,033	3.4	53,889	6.0
Osceola	12,702	7.4	6,257	3.6	50,727	29.4	3,802	2.2	15,631	9.1
Seminole	34,764	9.5	7,944	2.2	40,731	11.1	9,115	2.5	11,175	3.1
Volusia	41,198	9.3	6,347	1.4	29,111	6.6	4,430	1.0	8,071	1.8
Polk	65,545	13.5	8,253	1.7	45,933	9.5	4,515	0.9	18,466	3.8

(Adapted from U.S. Census Bureau; Census 2000, Summary File 3 (SF 3); generated by Iris Patten; using American Factfinder; <http://factfinder.census.gov/>; (08 March 2007).)

Table 4-6. Average location quotient of Creative Industries

County	Average Location Quotient of Creative Industries
Orange	1.43
Polk	1.06
Volusia	1.01
Seminole	0.94
Brevard	0.81
Lake	0.71
Osceola	0.57

(Adapted from Bureau of Labor and Statistics (BLS). (2007a). *Location Quotient*. Retrieved March 18, 2007, from http://www.bls.gov/data)

Table 4-7. Distribution of new employment centers, 2005-2050

County	Large Buildings	Medium Buildings	Small Buildings
Orange	0	0	3
Polk	0	2	5
Volusia	9	15	18
Seminole	0	4	8
Brevard	0	1	4
Lake	0	3	6
Osceola	2	1	7

Table 4-8. Distribution of new employees, 2005-2050

County	Large Buildings (# of bldgs) Cap	Medium Buildings (# of bldgs) Cap	Small Buildings (# of bldgs) Cap	Total (# of bldgs) Cap	% of total new regional creative employment
Orange	(0)	(0)	(3) 1,440	(3) 1,440	2.3%
Polk	(0)	(2) 1,760	(5) 2,400	(7) 4,160	6.6%
Volusia	(9) 12,600	(15) 13,200	(18) 8,640	(42) 34,440	54.9%
Seminole	(0)	(4) 3,520	(8) 3,840	(12) 7,360	11.7%
Brevard	(0)	(1) 880	(4) 1,920	(5) 2,800	4.5%
Lake	(0)	(3) 2,640	(6) 2,880	(9) 5,520	8.8%
Osceola	(2) 2,800	(1) 880	(7) 3,360	(10) 7,040	11.2%
			TOTAL	(88) 62,760	100%

Table 4-9. Land area calculations for suitability analysis

Suitability	# of acres
Collapsed Urban: Areas with high preference (Preference Value = 3)	321,482
Final Conflict: Urban Wins	305,511
Goal 5, Creative Class: Values greater than and equal to 8[xxx]	17,632
Areas where Urban Wins and are preferred for Creative Environments	1,473
Areas where Urban Wins, preferred for Creative Environments, and preferable for office/commercial development	893

Table 4-10. County land area calculations

County	Total # of acres	Greatest number of contiguous cells	Greatest number of contiguous land (in acres)	Least number of contiguous cells
Entire 7 County Region	893	84	19.9	1
Orange	455	18	4.3	1
Polk	377	28	6.6	1
Volusia	1,233	66	15.7	1
Seminole	438	31	7.4	1
Brevard	322	36	8.5	1
Lake	462	24	5.7	1
Osceola	475	84	19.9	1

Table 4-11. Polk County conflict summary

Conflict Type	# of cells	# of acres
Agriculture Wins	540,639	129,812
Conflict: Agriculture and Conservation	460,346	109,319
Conflict: Agriculture and Urban	272,898	64,805
Urban Wins	306,426	72,768

Table 4-12. Breakdown of land usage for Brevard County

Use	Land Area (Acres)
Total County Land Area	651,520
Lands available for future development (This figure removes existing urban, roadways, open water, and existing conservation)	224,379

Table 4-13. Conflict Surface stakeholder share for Brevard County

Conflict type	# of cells	# of acres
Agriculture Wins	17,542	4,166
Conservation Wins	112,563	26,731
Urban Wins	123,608	29,354
Severe Conflict	260,430	61,845

Table 4-14. Land most preferable for urban use (from the collapsed urban surface)

	Method 1 (equal weight given to all ethnicities; in acres)	Method 2 (40% weight given to Asians; in acres)	Method 3 (40% weight given to Other; in acres)	Method 4 (40% weight given to Mixed Races; in acres)	Method 5 (40% weight given to Hispanics; in acres)	Method 6 (40% weight given to Black/African Americans; in acres)
Collapsed Urban (High Preference)	321,482	348,446	348,532	348,517	349,384	348,086
Final Conflict: Urban Wins	305,511	324,948	324,991	324,954	325,668	324,686

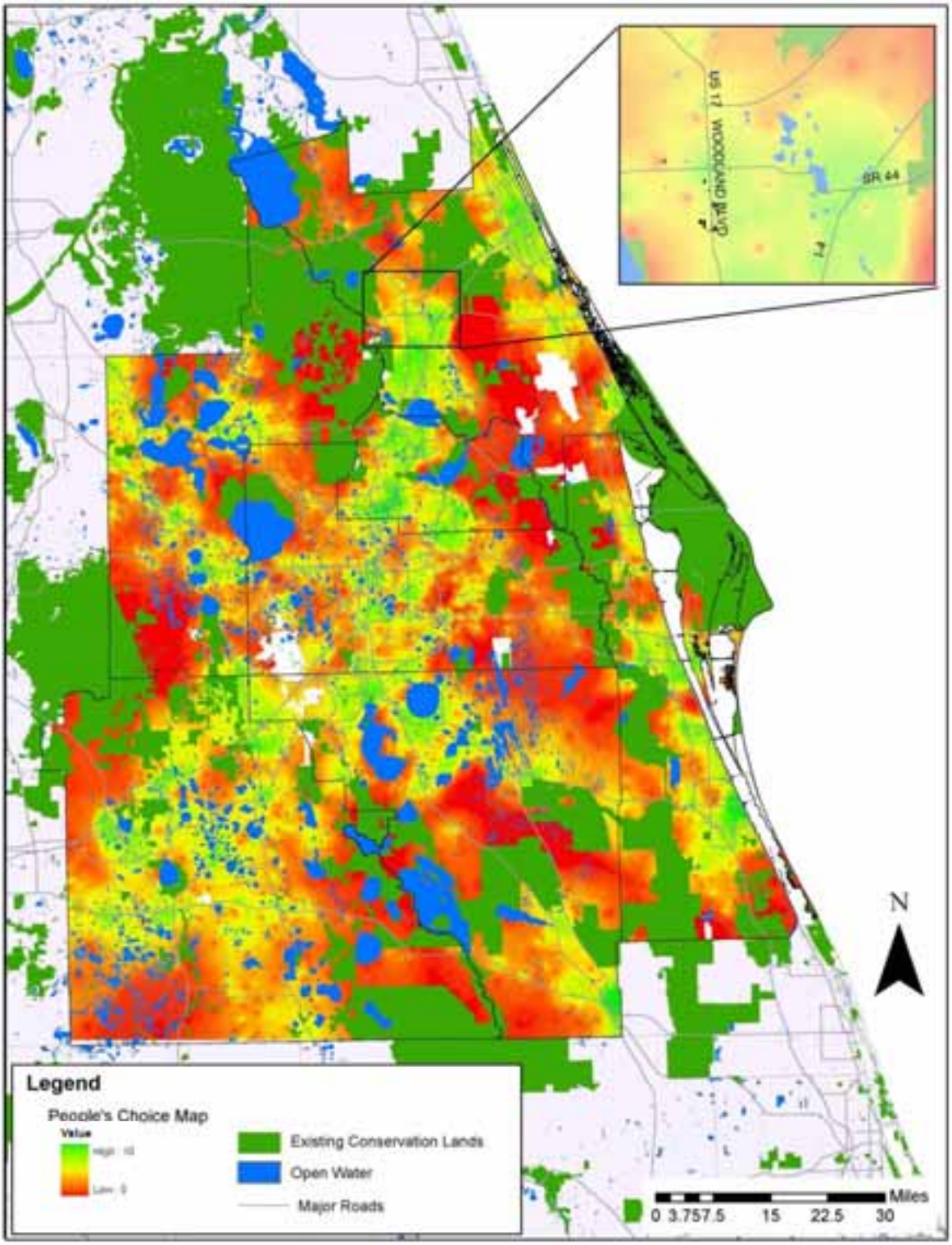

Figure 4-1. People's Choice Map with new Creative Industry locations for Volusia County

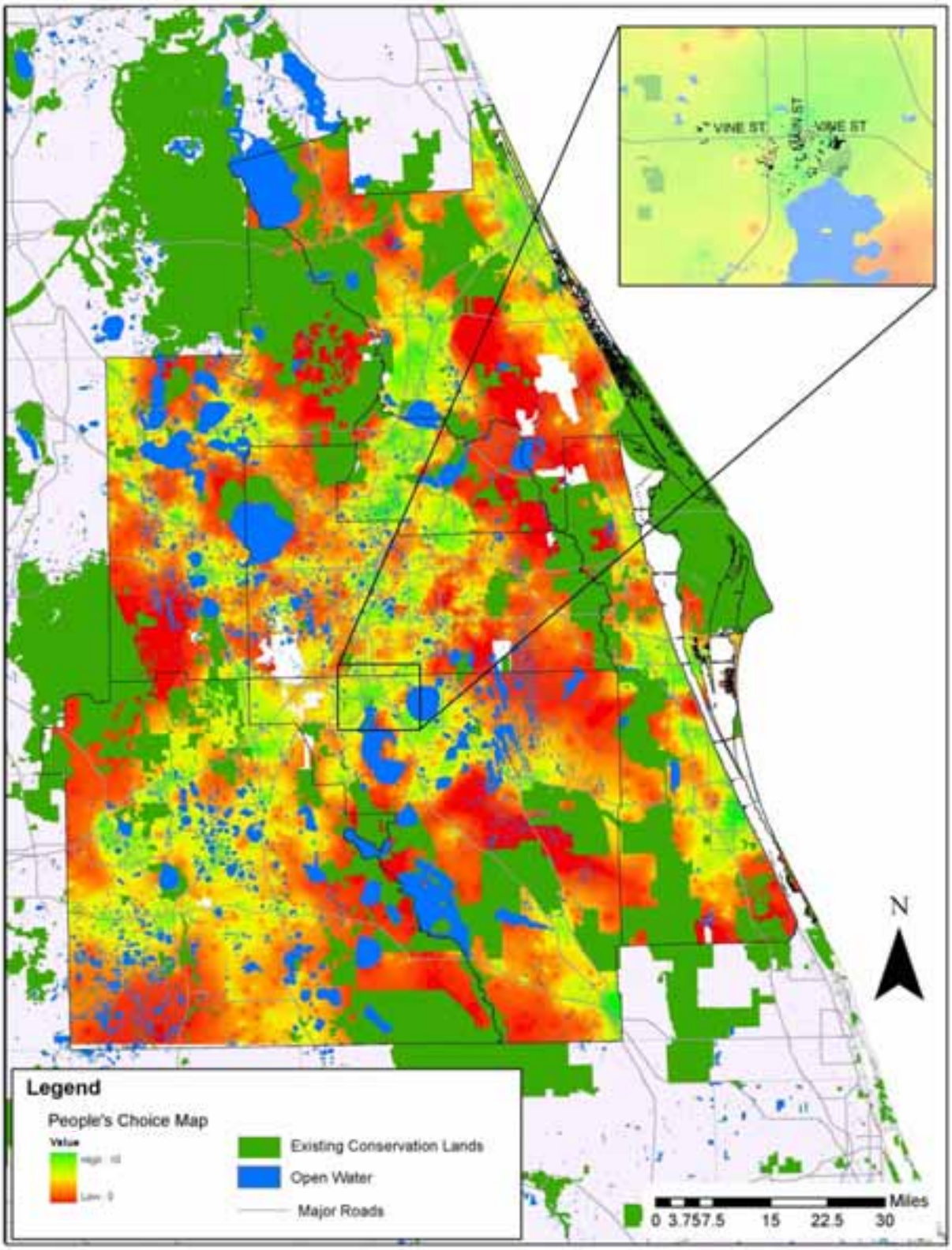

Figure 4-2. People's Choice Map with new Creative Industry locations for Osceola County

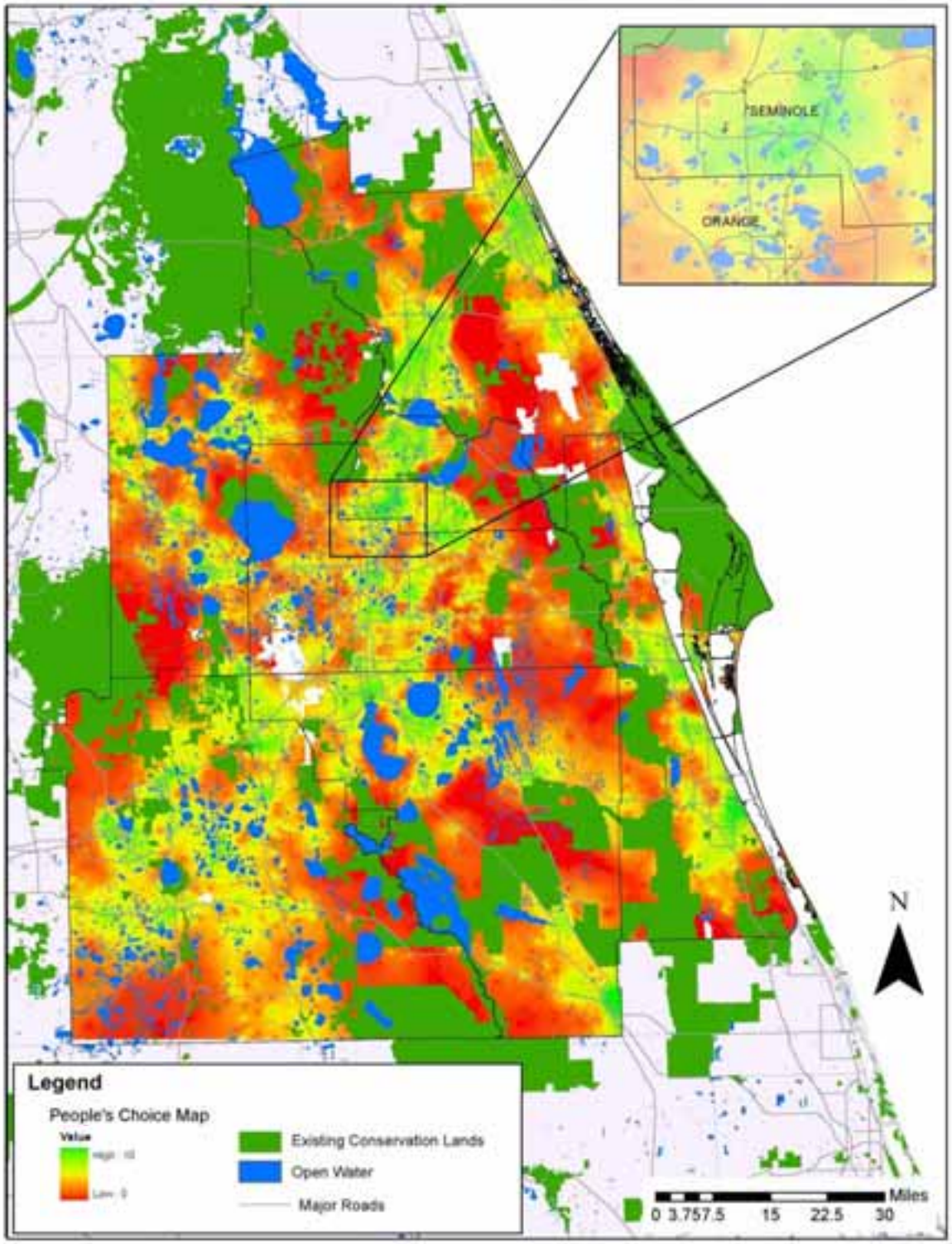

Figure 4-3. People's Choice Map with new Creative Industry locations for Orange and Seminole Counties

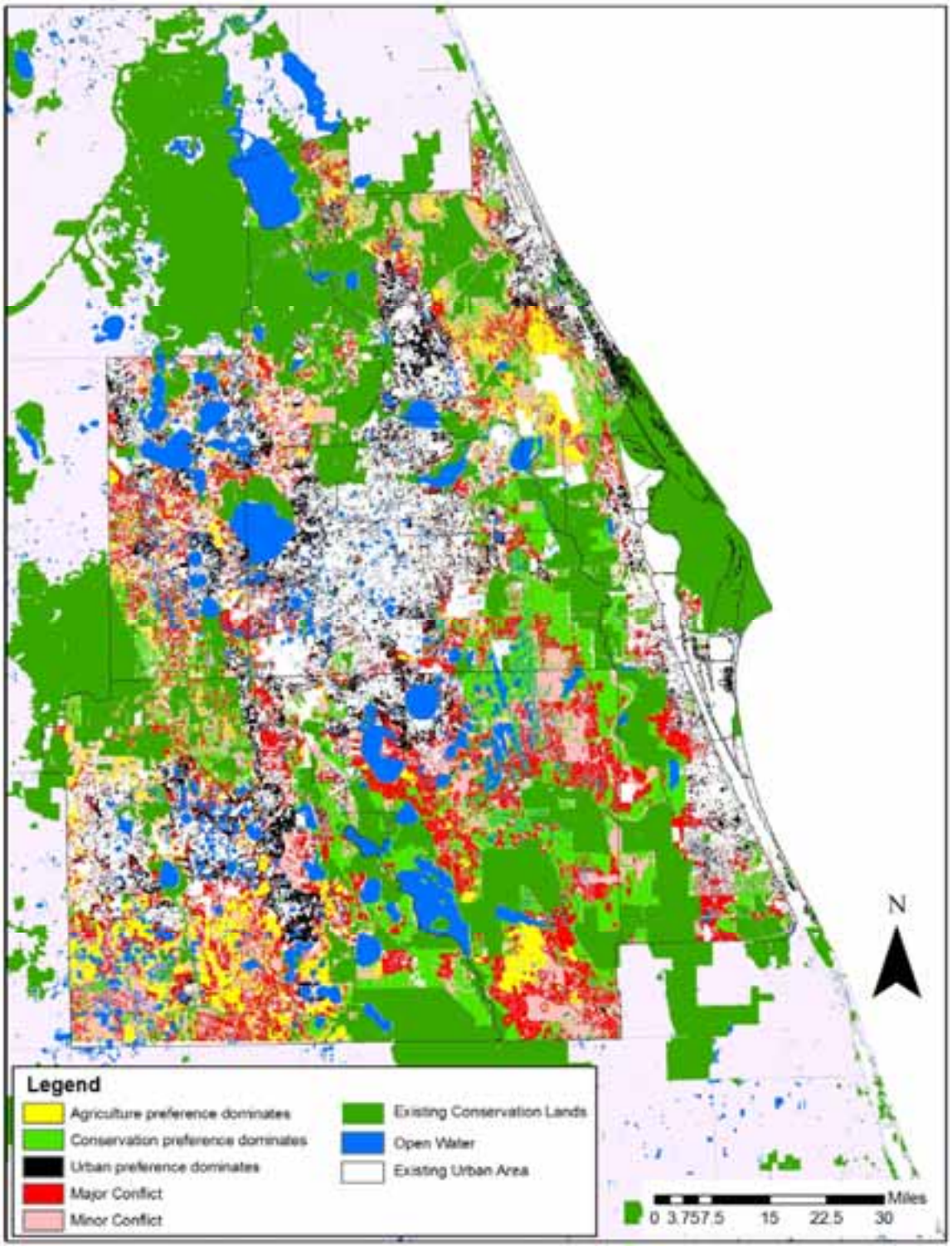

Figure 4-4. Final Conflict Surface

CHAPTER 5
CONCLUSION

A megalopolis is an interconnected corridor. The connection is typically defined by commuting patterns or an economic interdependence. This study attempted to use the principles of the creative class to determine whether the East Central Florida region could attract the types of industries and people that encourage higher rates of clustered high tech, highly innovative industries necessary for a megalopolis to thrive. Through detailed discussion (Chapter 2) we concluded that social and economic traits of the Creative Class align with those of the individuals and industries in other megalopolis regions around the U.S. We then used weighted suitability analysis and the identification of socio-cultural and economic indicators of the Creative to evaluate the spatial suitability of land areas within the region so that we could allocate approximate locations of creative employment centers that would satisfy the new employment through 2050.

We hypothesize that the seven county East Central Florida region will attract creative individuals and industries to satisfy the demands of each county's economy collectively allowing this region to compete in a global market. Employment projections indicated that if current development patterns and policy continue through 2050 an additional 832,400 people will be employed in the service sector in occupations that are high tech and/or innovative. This study concludes that the East Central Florida region is incapable of supporting creative industries due a lack of contiguous land areas to support the number of industries needed to support new creative employment.

Within the region only 62,760 creative employees can be accommodated in employment centers in areas conducive to creative environments. This translates into 88 new employment centers. Although the spatial demand for creative industries was not met, the Creativity Index, a

quantitative measure of a region's suitability for creative people and industries, indicates that the region has the qualities necessary to attract high tech innovative firms that can successfully compete in a global economy. This study demonstrates the capabilities of suitability analysis, economic modeling, and geographic information systems to address economic and employment issues in a proactive manner by anticipating a region's economic potential.

The unmet demand for creative industries raises an issue about density and development patterns. Although the skyline across the region is changing, most jurisdictions enforce regulations that encourage low density office/commercial development. This study allocated employment centers according to the assumption that new employment centers are single story. In counties like Orange, Lake, and Seminole higher density development with greater floor area ratios will present additional opportunities to accommodate future creative employment. The creative thrive in environments where there is a dense flow of knowledge and increased densities would provide a mechanism to build creative capital.

Universal Applicability

The expansion of urban areas due to increased population growth is blurring jurisdictional boundaries thus creating urban corridors. In terms of housing and urban services this growth has become problematic. With respect to economic potential, additional growth creates an opportunity for increased economic efficiency, which could be an inducement to serve greater populations. Cities are looking to provide the amenities that will attract those individuals and companies in turn maximizing the local and regional economy.

This study can be adapted to any region, city or neighborhood to evaluate whether they have the potential to become a creative industry. The results from this study do not signify a plan but instead is an illustration of potential development patterns and should be used to identify the driving forces behind the preference of creative industries. Before any region welcomes new

industries, they must understand that growth cannot occur independently of other societal factors. Without the help of the larger region and identification of values that encourage populations that will stimulate and contribute to the economy, growth will occur slowly if at all. Several key dynamics must be in place for the most talented to not only locate to a region but to start companies and attract other companies to locate in the region as well. This model proves that it is possible to spatially measure a system of qualitative indicators and determine the potential regional economic growth in East Central Florida.

Economic Implications

This model is an endogenous growth model. That is, we believe that the influence of the goals we have included within the suitability analysis are indicative of future spatial development patterns of high-tech and innovative industries, which will drive regional economic growth. For example, if you consider existing transportation infrastructure, no new improvements to roads were considered, but transportation plays a significant role in where people live and work. If rail or some other type of more efficient more sustainable system of mass transit was included as a transit option, the employment base of the region would expand exponentially. Rail would allow valuable land to be used for alternative uses (i.e. conservation areas) aside from parking facilities. Although we didn't have an indicator which evaluated transportation, the larger idea of more compact connected urban form was represented in the People's Choice Map. To compete in a larger economy, the East Central Florida region must harness their complementary **and** competitive advantage to compete across the nation and around the globe.

ACKNOWLEDGMENTS

First, I would like to thank my parents for teaching me that with faith I can move mountains. Secondly, I would like to acknowledge and thank my committee members: Paul Zwick and Margaret "Peggy" Carr of the University of Florida and Phil Laurien of the East Central Florida Regional Planning Council. Each has provided an unquantifiable amount of advice, motivation and encouragement during the past two years. In addition, I would like to thank Samer Bitar and Claudia Paskauskas of the East Central Florida Regional Planning Council; Ella Littles, Evelyn Cairns, and Nelda Schneider of the University of Florida Urban and Regional Planning Department; Mosi Harrington and Ava Kuo of Housing Initiative Partnership; and Alexis Thomas and the entire GeoPlan staff. I thank them for their technical assistance, administrative help, and patience while I completed this study. Finally, I thank my family, close friends, and my fellow students for their kind words and encouragement. Their kindness was not overlooked.

This study and paper have become more than a series of pages and words that acknowledge that I learned a thing or two about planning during the past two years. I hope it signals a new phase of my life where I push myself to explore topics and take chances that require a little faith to get through. The poet Patrick Overton said, "When you have come to the edge of all light that you know and are about to drop off into the darkness of the unknown, Faith is knowing one of two things will happen: there will be something solid to stand on or you will be taught to fly." Having completed this thesis, I can now fly.

---

[i] The PLAC3S method was used by Renaissance Planning Group in Orlando Florida to create the Centers Scenario. The methods used to create this scenario will not be discussed in this paper.

[ii] A Gross Regional Product (GRP) is defined as "a measure of total income in a given area. The GRP includes employee compensation, property income, and proprietary income plus indirect business taxes. The GRP is equal to

total value added and is the local or regional equivalent of the national measure of economic growth, the Gross Domestic" Product (Southern Forest Resource Assessment, 2001).

[iii] The seven environmental jewels are seven areas identified by The Florida Natural Areas Inventory as sensitive lands that have significant regional, national, and in some cases, global ecological and economic value. The seven locations are St. Johns Mosaic/Econlockhatchee River, the Indian River Lagoon, the Kissimmee Prairie, the Volusia Conservation Corridor, the Green Swamp, the Wekiva-Ocala Greenway, and the Lake Wales Ridge.

[iv] The U.S. Census Bureau defines a metropolitan statistical area as "a geographic entity…based on the concept of a core area with a large population nucleus, plus adjacent communities having a high degree of economic and social integration with that core. Qualification of an MSA requires the presence of a city with 50,000 or more inhabitants, or the presence of an urbanized area and a total population of at least 100,000 (75,000 in New England) (Davidson and Dolnick, 2004, p. 269).

[v] The 2005 population is referenced because the analysis performed in this paper uses 2005 as the temporal baseline.

[vi] The term "surface" is used interchangeably with "raster".

[vii] AHP is the non-generic form of pairwise comparison. AHP was developed by T. L. Saaty in 1980 at the University of Pennsylvania's Wharton School of Business and is a systematic method that compares a list of objectives or alternatives (Virginia Tech University, 2006)

[viii] The surfaces and models for determining the suitability of the agriculture and conservation stakeholders used in my study are a product of the work done by Dr. Paul Zwick and Margaret Carr for the East Central Florida Regional Growth Vision.

[ix] The original human capital theory was rooted in work done by British economists Sir William Petty and Adam Smith during the 17th and 18th centuries. During the early 20th century their work was further developed by American economists Gary Becker and Theodore Schultz. The neoclassical view explains that the "expenditure on training and education is costly, and should be considered an investment since it is undertaken with a view to increasing personal incomes" (Economy Professor, 2007).

[x] ArcGIS is a family of software products produced by ESRI that form a complete GIS (Geographic Information System) most often used by planners, developers and researchers (maps-gps-info.com, 2007)

[xi] ModelBuilder is an application within ArcGIS in which you create, edit, and manage models (ESRI 2006). Input data and geoprocessing tools can be strung together, with the output of one tool serving as the input for another, and the whole model can be run as a single operation with the click of a button. With the ability to place GIS data and geoprocessing tools in a visual program, the GIS analyst can create complex programs without having to learn a programming language (Carr and Zwick, 2007a, p. 26).

[xii] A cell is the smallest unit of information in raster data, usually square in shape (Wade and Sommer, 2006, p. 27). For this project each cell represents an area of 31 square meters, which is equivalent to a quarter acre.

[xiii] Earlier discussion indicated that the suitability values assigned by Carr and Zwick range between 1 and 9, with 9 as the highest suitability. In this study, the suitability surface for Urban Goal 5 resulted in a high value of 8.625. Therefore, when examining areas within Urban Goal 5 that are most suitable for Creative Environments, we consider those areas greater than 8. If our suitability surface had values equal to 9, then we would only seek to separate out those cells with values of 9.

[xiv] Employment figures and projections for 2005 and 2050 were developed using the REMI (Regional Economic Models, Inc.) software package. This software generates realistic year-by-year estimates of the total regional effects of any specific policy initiative (REMI, 2007)

[xv] The Region Group function Selects and groups cells that are contiguous and have the same value.

[xvi] The "Number of neighbors to use" indicator provides two neighbor sizes that can be used for analysis, eight or four. By selecting four, connectivity will be defined between cells of the same value that are directly to the right or left or above or below each other. Diagonal cells are not considered. Conversely, by selecting eight, connectivity between cells of the same value that are to the right or left, above or below, or diagonal to each other will be defined (ESRI, 2006).

[xvii] NAICS (North American Industry Classification System) codes succeed the Standard Industrial Classification (SIC) system and is used to classify business establishments (Bureau of Labor Statistics, 2007b)

[xviii] In this analysis sector level NAICS code were used.

[xix] Institute of Transportation Engineers. 1998. *Trip Generation: Trip Generation Rates, Plots, and Equations*. 6th Ed. Washington, D.C.: Institute of Transportation Engineers.

[xx] A bedroom community is classic residential suburbs. The offer little in the way of employment but plenty of housing (Title Company of the Rockies, 2007).

[xxi] This percentage reflects the most recent full academic year data available, which was from 2005-2006 (Office of Institutional Research - University of Central Florida, 2007).
[xxii] This percentage reflects the most recent data available, which was from academic year 2005-2006 (Office of Institutional Research – Florida Institute of Technology, 2007).
[xxiii] This percentage reflects the most recent data available, which was from academic year 2005-2006 (Office of Institutional Research – Bethune Cookman College).
[xxiv] The statistics used in this discussion reflect calculations based on the total patents issued by county from 1990 to 1999. The calculations are expressed in per capita figures per 1,000 population.
[xxv] Statistics were not yet available by county after 1999. Recent detailed statistics were available by MSA, which is considered too large of an area to determine real patterns (U.S. Department of Commerce, 2000).
[xxvi] Sufficient evidence could not be found that supported the statistical correlation between concentrations of immigrants and the suitability of an area for creativity.
[xxvii] This statistic excludes Bethune Cookman University. Bethune Cookman is a HBCU (Historically Black College and University) so enrollment for students of Black/African-American ethnicity are typically higher than those of other races/ethnicities.
[xxviii] The floor area ratio ("FAR") is the relationship of the floor area to the lot area computed by dividing the floor area by the lot area (Davidson and Dolnick, 2004, p. 190). It is important to note that each jurisdiction has different guidelines for calculating floor area ratio.
[xxix] The location quotient is used to determine whether a county's local demand for service sector employment is being met.
[xxx] Typically, the highest suitability value is classified as those cells with a suitability value of 9. In this case, the final suitability surface had a high value of 8.25; therefore all areas classified as greater than 8 were classified as most suitable for creative environments.

LIST OF REFERENCES

America2050. (2007). America 2050 Prospectus. Retrieved April 20, 2007, from www.america2050.org.

Anas, A. (1987). Modeling in urban and regional economics. New York: Harwood Academic Publishers.

Audretsch, D. B. and M. P. Feldman. (1996). R&D Spillovers and the Geography of Innovation and Production. *American Economic Review*, 86: 630-640.

Barkley, D.L., & Henry, M. S. (2001). *Advantages and disadvantages of targeting industry clusters.* Clemson, South Carolina: Clemson University Public Service Activities.

Barnett, Jonathan. (2005). *PennDesign VII Central Florida: Our region in the year 2050*. City Planning 702 Urban Design Studio.

Borchert, J. R. (1992). *Megalopolis: Washington to Boston*. New Jersey: Rutgers University Press.

Bitar, S. (2007). [Employment statistics from the Regional Economic Models, Inc. (REMI) software]. Unpublished raw data.

Bolen, R. (2002). GIS: Essential technology for urban growth management: Portland, Oregon Metropolitan Area. Presented at the RLIS @ Ten Symposium, Sponsored by Lincoln Institute of Land Policy, March 14, 2002.

Breschi, B, & Lissoni, F. (2001). *Localised knowledge spillovers vs. innovative milieux: Knowledge "tacitness" reconsidered*. Papers in Regional Science 80 (3), 255–273

Borchert, J. (1992). *Megalopolis: Washington, D.C., to Boston*. New Brunswick, N.J.: Rutgers University Press.

Bureau of Economic and Business Research (BEBR). (2006). Florida Population Studies (Detailed Bulletins 145). Gainesville, Florida: University of Florida.

Bureau of Labor and Statistics (BLS). (2007a). *Location quotient*. Retrieved March 18, 2007, from http://www.bls.gov/data.

Bureau of Labor and Statistics (BLS). (2007b). *Glossary*. Retrieved April 9, 2007, from http://www.bls.gov/bls/glossary.htm.

Carr, M. (2006). [Moderate population projections from 2030 to 2050]. Unpublished raw data.

Carr, M., & Zwick, P. (2005). Using GIS suitability analysis to identify potential future land use conflicts in North Central Florida. *Journal of Conservation Planning* (1): 89-105.

Carr, M., & Zwick, P. (2007a). *Smart Land-Use Analysis: The LUCIS Model*. Redlands, California: ESRI Press.

Carr, M., & Zwick, P. (2007b). An application of LUCIS (Land Use Conflict Identification Strategy) in South Central Florida: An example of GIS for land use planning & design. *LAA 6656 & URP 6341 Class Slides*. University of Florida

Cartwright, S. D., & Wilbur, V. R. (2005). *ULI Community Catalyst Report: Translating a regional vision into action*. Washington, D.C.: Urban Land Institute.

Ceh, B. (2001, April 9). Regional innovation potential in the United States: Evidence of spatial transformation. Papers in Regional Science, 80, 297-316.

Central Florida Regional Growth Vision: Lessons learned from regional visioning processes. (2006, September). *Florida Department of Transportation (FDOT)*.

Davidson, M. & Dolnick, F. (2004). *A planner's dictionary*. Chicago, IL: Planning Advisory Service.

Deal, B., Pallathucheril, V. G., Sun, Z., Terstriep, J., & Hartel, W. (2005). *LEAM Technical Document: Overview of the LEAM Approach*. University of Illinois at Urbana-Champaign.

Dowall, D. E. (1999, January). Globalization, structural change and urban land management. *Land Lines*. Retrieved November 10, 2006, from http://www.lincolninst.edu/pubs/PubDetail.aspx?pubid=378.

Economy Professor. (2007). *Human Capital Theory*. Retrieved March 5, 2007, from http://www.economyprofessor.com/economictheories/human-capital-theory.php.

Enterprise Florida. (2007). *County Profiles*. Retrieved April 20, 2007, from http://www.eflorida.com/countyprofiles/CountyProfiles.asp?level1=3&level2=127&level3=335&region=.

Envision Utah. (2004). *A history of Envision Utah*. Retrieved April 23, 2007, from http://www.envisionutah.org/plans.phtml?type=research.

ESRI. (2006). Understanding reclassification. Retrieved December 4, 2006, from http://webhelp.esri.com/arcgisdesktop/9.2/index.cfm?TopicName=Understanding_reclassification.

Federal Highway Administration. (2005a). *GIS tools for transportation and community planning*. Retrieved November 11, 2006, from http://www.fhwa.dot.gov/tcsp/case7.html

Federal Highway Administration. (2005b). *Case study: Charlottesville, Virginia: Jefferson Area Eastern Planning Initiative*. Retrieved April 20, 2007, from http://www.fhwa.dot.gov/tcsp/cvadeflt.html.

Feldman, M. & Florida, R. (1994). The geographic sources of innovation: Technological infrastructure and product innovation in the United States. *Annals of the Association of American Geographers*, 84: 210-229.

Fishkind and Associates. (2005). *Supporting and strengthening our local economy: Figures for 2003*. Retrieved April 23, 2007, from http://www.portcanaveral.org/general/economics.php.

Fishman, R. (2000). The death and life of American Regional Planning. In B. Katz (Ed.), *Reflections on regionalism* (pp. 107-123). Washington, D.C.: Brookings Institution Press.

Florida, R. (2002). *The rise of the creative class*. Nee York: Basic Books.

Florida, R. (2006, July). Richard Florida: The New Megalopolis. *Newsweek International*. Retrieved November 8, 2006, from http://msnbc.msn.com/id/13528839/site/newsweek.

Florida, R., & Gates, G. (2002). Technology and tolerance: Diversity and high tech growth. *The Brookings Review*, 20, 32-35.

Florida State University Department of Urban and Regional Planning. (2006). *Planning Methods III: Forecasting, location quotient technique*. Retrieved March 15, 2007, from http://garnet.acns.fsu.edu/~tchapin/urp5261/topics/econbase/lq.htm.

Frey, W. H. (2001). *Melting Pot Suburbs: A Census 2000 study of suburban diversity*. The Brookings Institution Center on Urban & Metropolitan Policy: Washington, DC.

Friedman, T. (2000). *The Lexus and the olive tree*. New York: Anchor Books.

GIS Tools for Transportation and Community Planning. (2005). *Federal Highway Administration (FHWA)*. Retrieved August 26, 2006, from http://www.fhwa.dot.gov/tcsp/case7.html.

How Shall We Grow? Creating a shared vision for Central Florida, Mid-Project Report. (2006, September). *myregion.org*.

Institute of Transportation Engineers. (1988). *Employment center parking facilities*, Committee 6F-24 Informational Report. Washington, D.C.: Institute of Transportation Engineers.

Jacobs, J. (1961). *The death and life of great American cities*. New York: Random House.

JAXPORT. (2007). Seaports-Services-Rail and Road Connections. Retrieved April 23, 2007, from http://www.jaxport.com/sea/sea_rail.cfm.

Katz, B. (2005, March 9). This land is our land: A call to arms for state and federal policy reform [Presentation]. *Funders' Network for smart growth and livable communities – Albuquerque, New Mexico*.

Katz, B. (2004). *A progressive agenda for metropolitan America. Policy Report*. Retrieved November 10, 2006, from http://www.brookings.edu/urban/pubs/KatzGreenBook.pdf.

Kitsner, S. (2001, May). *Seattle reboots its future*. Fast Company, p. 44.

Knaap, G., Bolen, R., & Seltzer, E. (2003). *Metro's Regional Land Information System: The virtual key to Portland's growth management success*. Lincoln Institute of Land Policy Working Paper.

Knaap, G., & Song, Y. (2004). *The fruits of growth management in the Sunshine State: An examination of urban form in Orange County, Florida*. Prepared for presentation at the Critical Issues Symposium on Evaluating Growth Management in Florida: January, 2005.

Kochar, R. (2006). *Growth in the foreign-born workforce and employment of the native born*. Pew Hispanic Center: Washington, DC.

Latimer, S. (2006). *URP 6270 Class Notes*. University of Florida.

Laurien, P. (2007). Myregion.org presents: How Shall We Grow? Central Florida's Four Futures. *Slides used for Media Week January 2007*. East Central Florida Regional Planning Council

Lockheed Martin awarded patent for a three-axis flap control system. (2003). *Space War*. Retrieved April 11, 2007, from http://www.spacewar.com/reports/Lockheed_Martin_Awarded_Patent_for_a_ThreeAxis_Flap_Control_System.html.

Maps-gps-info.com (2007). *Maps GPS glossary*. Retrieved March 16, 2007, from http://www.maps-gps-info.com/maps-gps-glossary.html.

McHarg, I. L. (1969). *Design with nature*. New Jersey: Doubleday/Natural History Press.

Merriam-Webster, Incorporated. (2004). *The Merriam-Webster Dictionary*. Springfield, Massachusetts: Merriam-Webster.

Metro (2007a). *Land Use Planning: 2040 Growth Concept*. Retrieved April 20, 2007, from http://www.metro-region.org/article.cfm?articleid=231.

Metro (2007b). *Land Use planning: urban growth boundary*. Retrieved April 20, 2007, from http://www.metro-region.org/article.cfm?articleID=277.

Morrill, R. (2006, May). Classic Map Revisted: The growth of megalopolis. *The Professional Geographer*, Vol. 58, No. 2, 155-160.

myregion.org (2006, September). *How shall we grow? Creating a shared vision for Central Florida: Mid project report*. Orlando, Florida: myregion.org

Nowlan, D. M. (1997). *Jane Jacobs among the economists*. Retrieved April 2, 2007, from http://www.chass.utoronto.ca/~nowlan/papers/jacobs.pdf.

Office of Institutional Research, Florida Institute of Technology. (2007) *Graduation Summary Report 2005-2006*. Retrieved March 15, 2007, from http://www.fit.edu/oir/reportviewer.php?pageid=gradsum.

Office of Institutional Research, Bethune Cookman University. (2007). *Total undergraduate degrees conferred 2001-02 – 2005-06*. Daytona Beach, Florida: Office of Institutional Research.

Office of Institutional Research, University of Central Florida. (2007) *Degrees conferred AY 2006-2007*. Retrieved March 15, 2007, from http://www.iroffice.ucf.edu/degrees/0607degrees/0607contents.html.

Regional Economic Models, Inc. (2007). *Policy Insight*. Retrieved March 16, 2007, from http://www.remi.com/software/software.shtml.

Renaissance Planning Group. (2007). *Community element model*. Retrieved April 20, 2007, from, http://www.citiesthatwork.com/imodels/CorPlanInfoSheet2.htm.

Scott, M. (2003). *Modeling, making inferences and making decisions: the role of sensitivity analysis*. Retrieved April 17, 2007, from http://www.rss.org.uk/main.asp?page=1142.

Slack, B. (2006). Transport Corridors of Canada. Retrieved April 23, 2007, from http://people.hofstra.edu/geotrans/eng/ch2en/appl2en/ch2a2en.html.

Smallbone, D., Bertotti, M., and Ekanem, I. (2005). Diversification in ethnic minority business: The case of Asians in London's creative industries. *Journal of Small Business and Enterprise Development*; 2005; 12, 1; ABI/INFORM Global pg 41.

Smart Growth America. (2006). *Glossary – American Farmland Trust*. Retrieved November 13, 2006 from http://www.farmland.org/farmingontheedge/about_glossary.htm.

Southern Resource Forest Assessment. (2001). *Draft glossary of terms*. Retrieved April 22, 2007, from http://www.srs.fs.usda.gov/sustain/data/authors/glossary.htm.

Tampa Port Authority. (2007). Tampa Port Authority. Retrieved April 23, 2007, from http://www.tampaport.com/index.asp.

Taube, F. A. (2006). Local clusters, ethnic networks and diversity in knowledge-based industries: evidence from the Indian IT industry. Retrieved April 5, 2007, from http://www.people.hbs.edu/dkendall/Consortium/Summaries/taube.pdf.

Teeple, Brian (2006, September/October). The Re-Emergence of regionalism in Florida. *Florida Planning*, pp. 1-2.

The EcoTipping Points Project (2007). USA-Portland, Oregon – A livable city. Retrieved April 20, 2007, from http://www.ecotippingpoints.org/indepth/usaportland.html.

The National Neighborhood Coalition's Neighborhoods, Regions and Smart Growth Project: Connecting Neighborhood and Region for Smarter Growth. (2000, April). *National Neighborhood Coalition*, pp. 1-17.

Title Company of the Rockies. (2007). *Real estate dictionary*. Retrieved March 16, 2007, from http://www.titlecorockies.com/dictionary_b.htm.

ULI - The Urban Land Institute (2005). *Building Florida's Future: State strategies for regional cooperation*. Washington, D.C.: The Urban Land Institute.

University of Central Florida. (2006). *Burnham Institute to build next to UCF College of Medicine*. Retrieved March 18, 2007, from http://www.med.ucf.edu/news_releases/2006/aug/082306.htm.

U.S. Census Bureau; 2005 American Community Survey; generated by Iris Patten; using American Factfinder; http://factfinder.census.gov/servlet/DatasetMainPageServlet?_program=ACS&_submenuId=&_lang=en&_ts=; (08 March 2007).

U.S. Census Bureau; Census 2000, Summary File 3 (SF 3); generated by Iris Patten; using American Factfinder; http://factfinder.census.gov/; (08 March 2007).

U.S. Department of Commerce. (2000). *United States Patent Grants by State, County, and Metropolitan Area Utility Patents, 1990-1999* (A Technology Assessment and Forecast Report). Washington, DC: U.S. Government Printing Office.

Virginia Tech University. (2006). *Analytical hierarchy process.* Retrieved March 18, 2007, from http://www.aoe.vt.edu/~cdhall/courses/aoe4065/AHPslides.pdf.

Wade, T. & Sommer, S. (2006). *A to Z GIS*. Redlands, California: ESRI Press.

Wang, L., Wu, H., Wang, F., & Hu, Y. (2004). *Economic globalization and a case study of the urban land use growth of Wuhan, PR China.* Retrieved November 8, 2006, from the International Society for Photogrammetry and Remote Sensing Web site http://www.isprs.org/istanbul2004/comm3/papers/334.pdf.

Author Information

Iris E. Patten
Title: Graduate Student/Research Assistant
Organization: University of Florida – GeoPlan Center
Address: 431 ARCH Building
Gainesville, Florida 32611

Telephone: (813) 205-5211
Email: ipatten@ufl.edu