

Historical analysis of land use change and Geodesign of rapid urbanization: Orlando, Florida, USA

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WHY GEODESIGN



Computer-aided approach



Spatial exploration & thinking



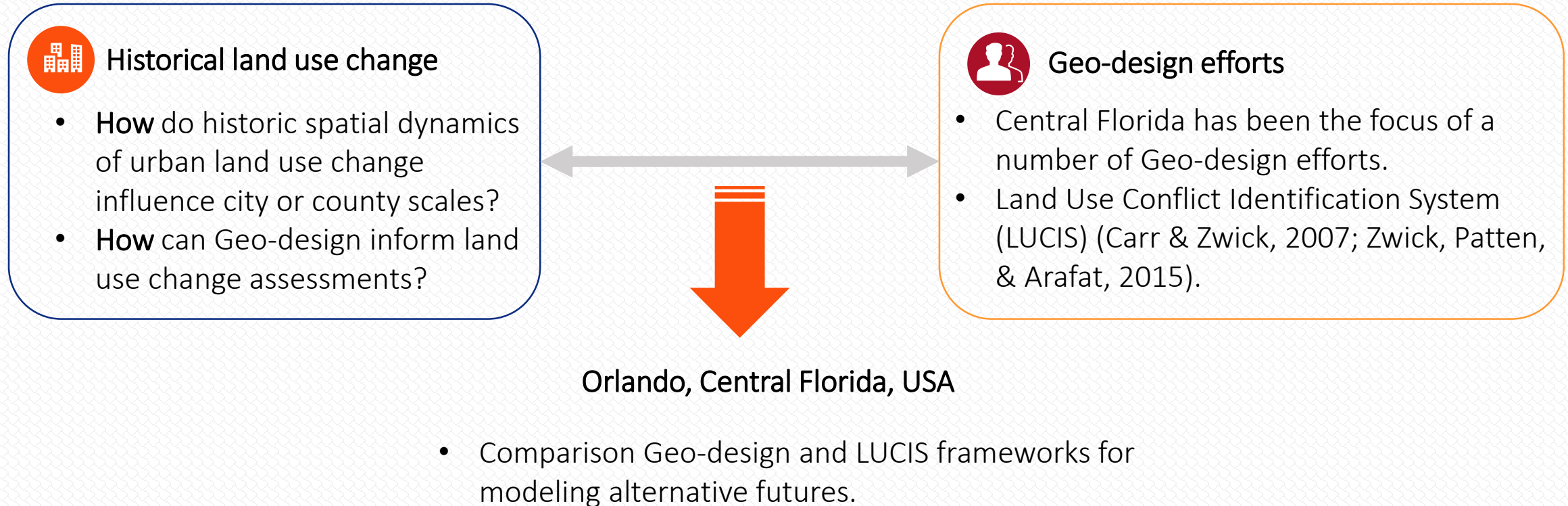
Over time and across scales



Future alternatives and scenarios

IDEAS ON GEODESIGN

Review and iterate the LUCIS model application



MULTIPLE PRESSURE

In Orlando, Central Florida

- Continued booming population rate
- Younger age structure among the whole nation
- Shrinking lakes in south east areas, Irma hurricane 2017

Figure 1. Population growth.

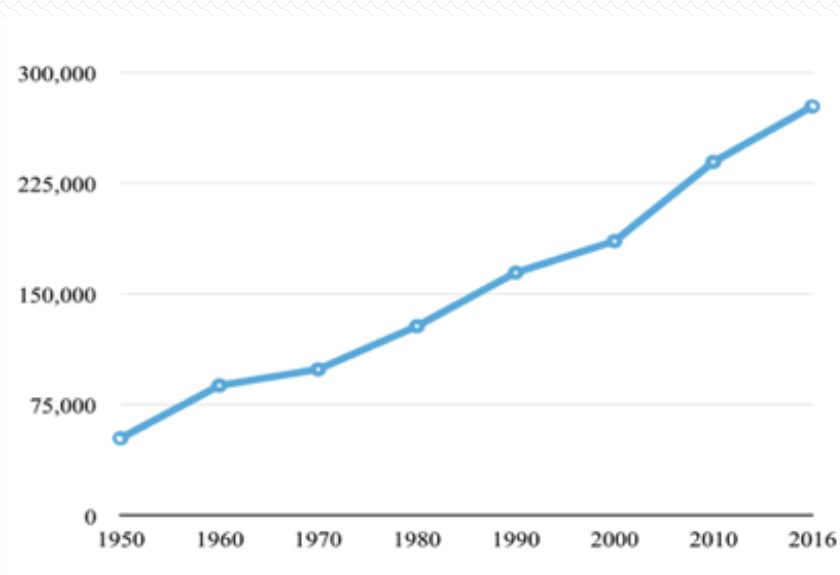
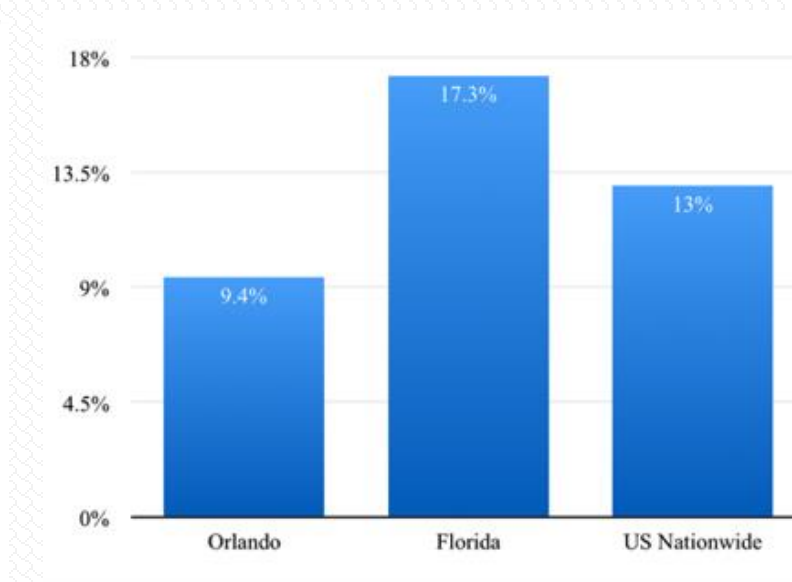


Figure 2. Percent of People Over 65 of 2010.



300%

Historical population growth:
1970-2011.

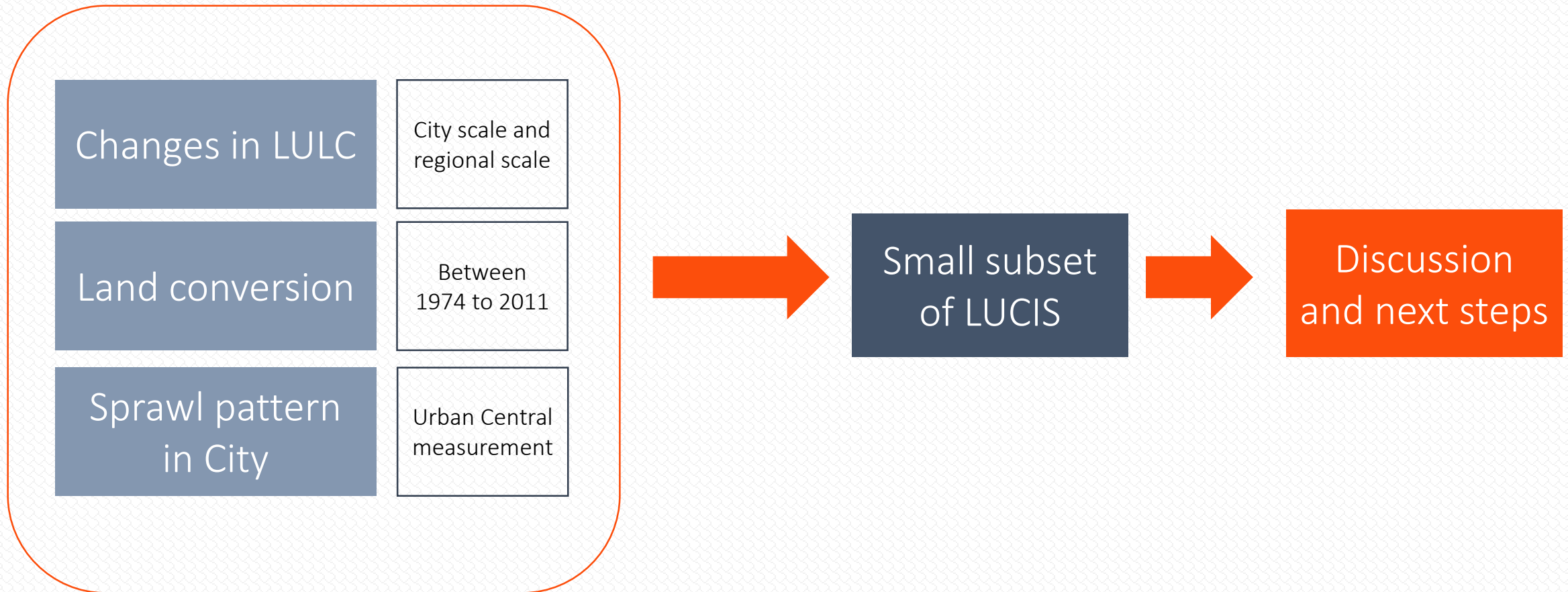
2.8%

Historical population annually
growth rate

Source: US Census Bureau, 1950-2010 Census of Population Source: American FactFinder, General Demographic Characteristics.

STUDY METHOD

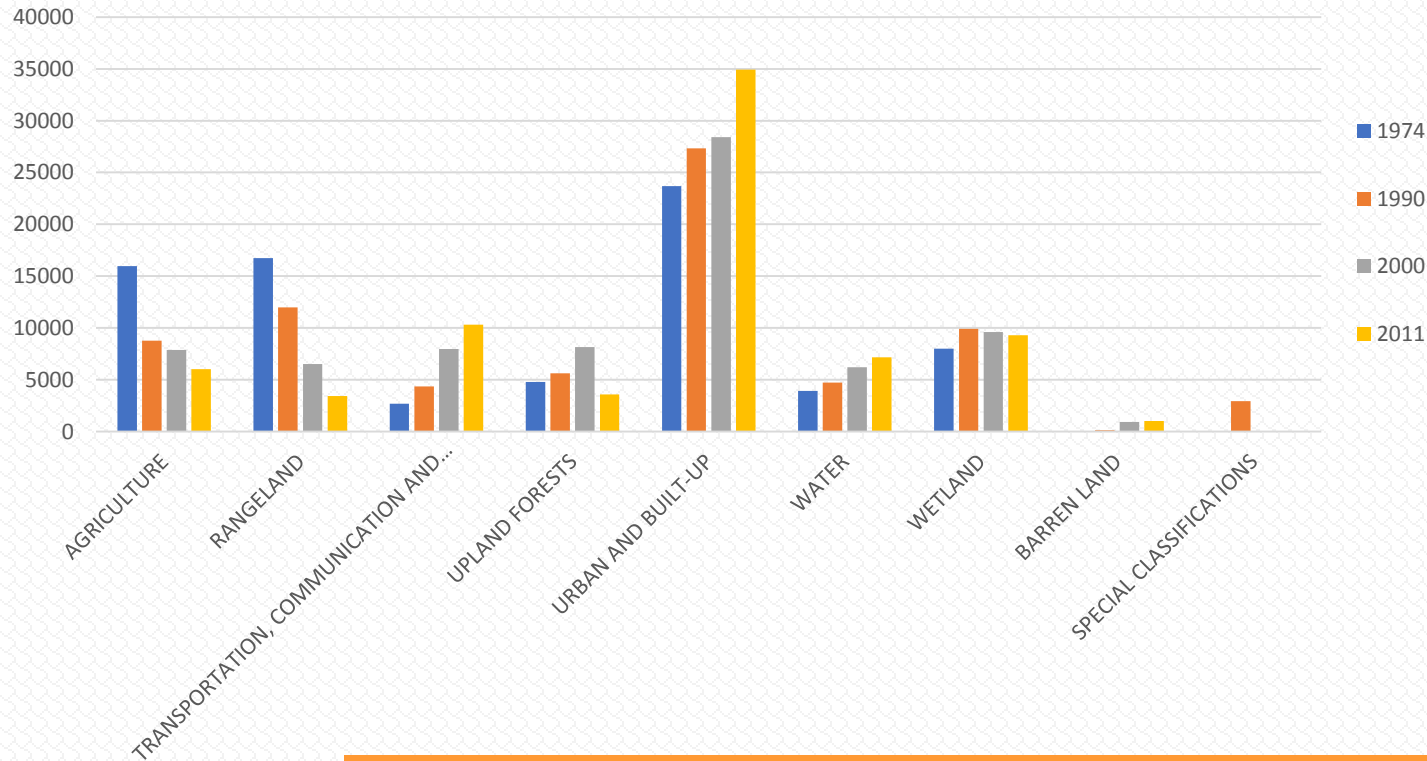
Orlando historical analysis of land use change



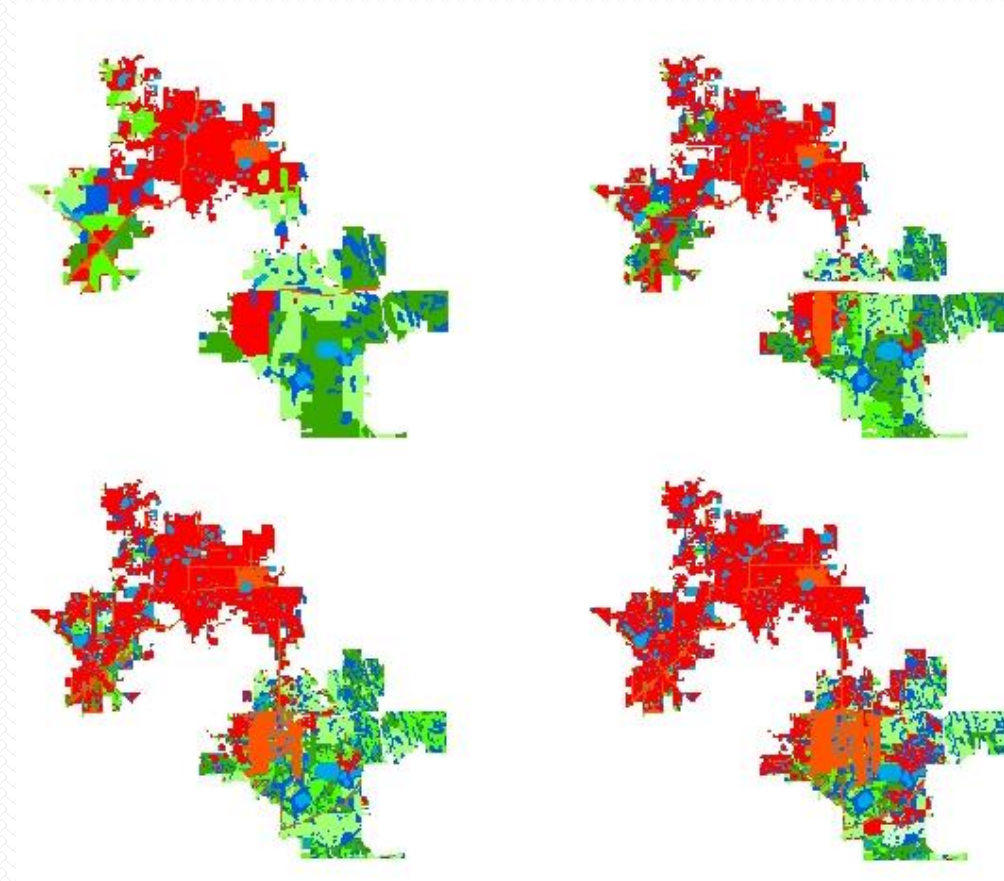
STUDY RESULTS

1. City vs. Region

Orlando City Land Use Change 1974-2011



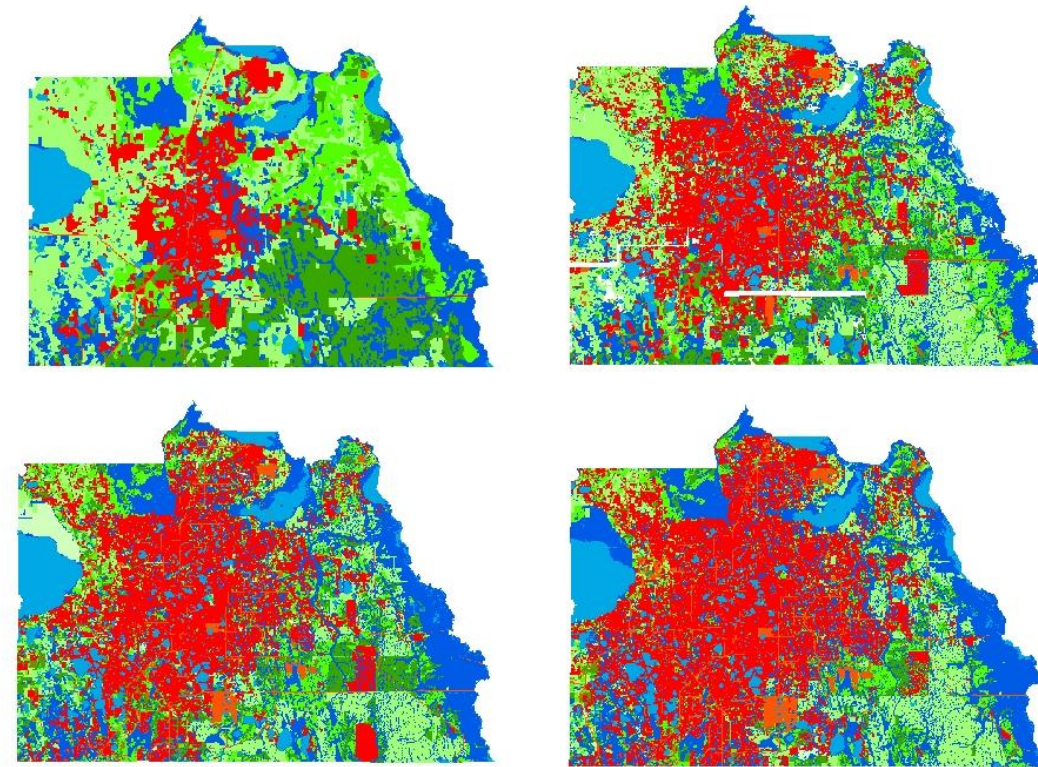
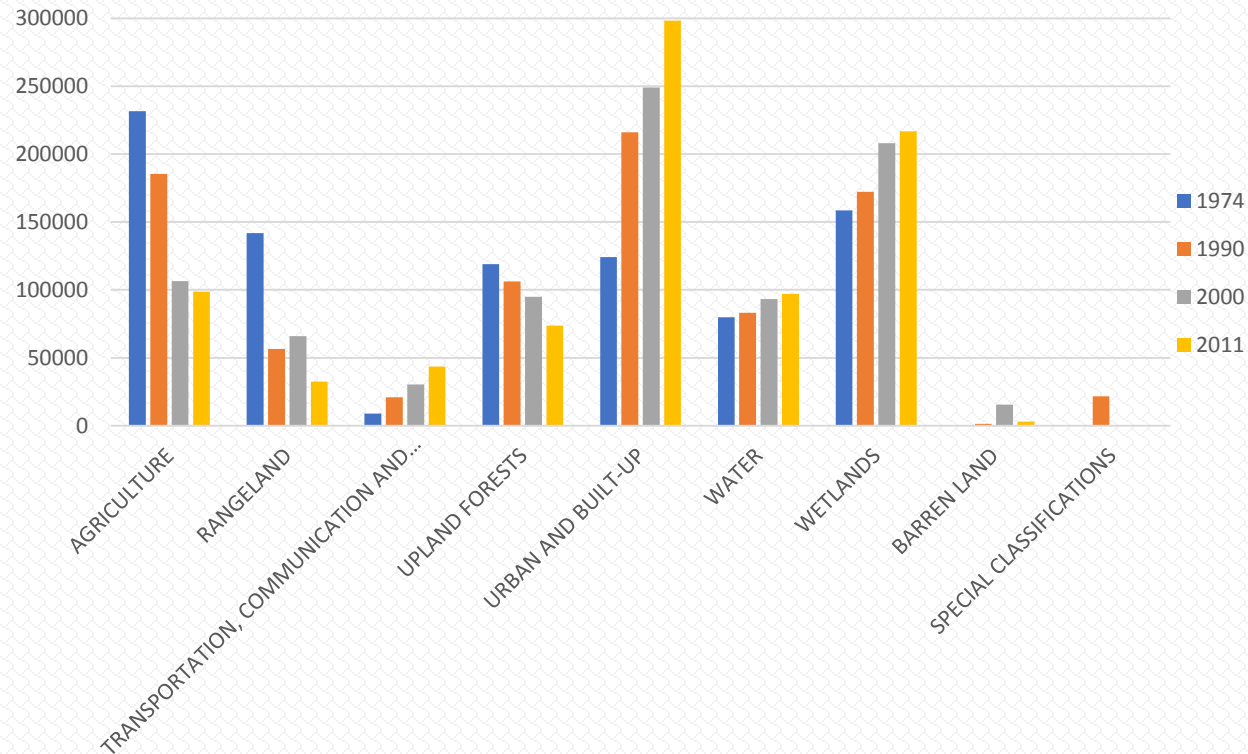
- **Agriculture** unevenly lost, i.e. 45%, 10%, and 24% respectively.
- **Rangeland** decreased 28%, 46% to 47% in each period.
- **Transportation** increased nearly tripled.
- **Urban and built-up** land increased 47.4%.



MULTIPLE PRESSURE

1. City vs. Region

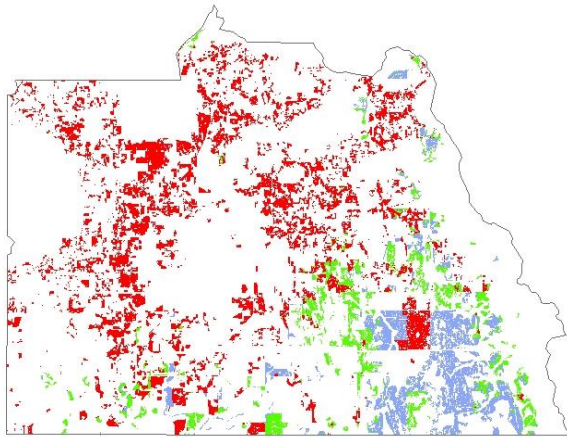
Orange and Seminole County Land Use Change 1974-2011



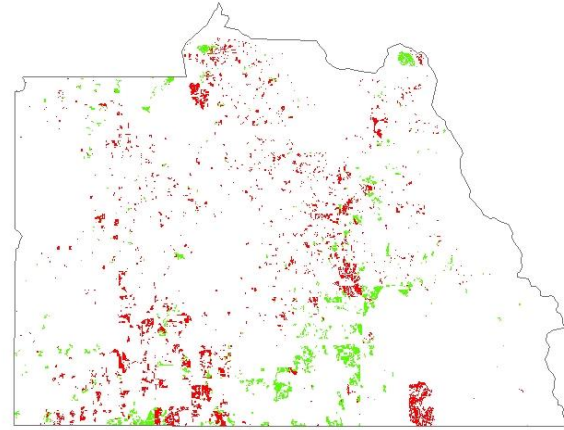
- **Agriculture** and **rangeland**, with descending rates of 57.5% and 77.1%.
- **Transportation** increased at a slightly higher rate than that observed for the city boundaries.
- **Urban and built-up** areas increased by 140% between 1974 and 2011, more than double the original area in 1974.

STUDY RESULTS

2. Land Conversion



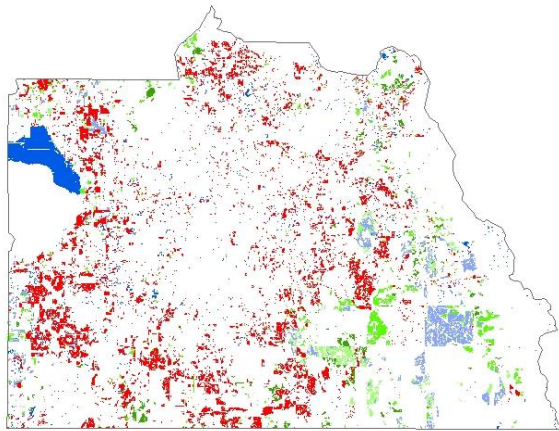
1974 to 1990



1990 to 2000

Legend

- AGRICULTURE TO URBAN BUILT-UP
- BARREN LAND TO WETLANDS
- RANGELAND TO AGRICULTURE
- RANGELAND TO UPLAND FOREST
- RANGELAND TO URBAN BUILT-UP
- UPLAND FOREST TO AGRICULTURE
- UPLAND FOREST TO RANGELAND
- UPLAND FOREST TO URBAN BUILT-UP
- WATER TO WETLANDS
- WETLANDS TO URBAN BUILT-UP
- Boundary



2000 to 2011

LULC conversion	1974-1990 (area in ha)	1990-2000 (area in ha)	2000-2011 (area in ha)
Agriculture to Built-up	22395	8309	8524
Upland forest to Built-up	11566	6939	9247
Rangeland to Built-up	6155	4229	5942
Wetland to Built-up	5407	3163	2485

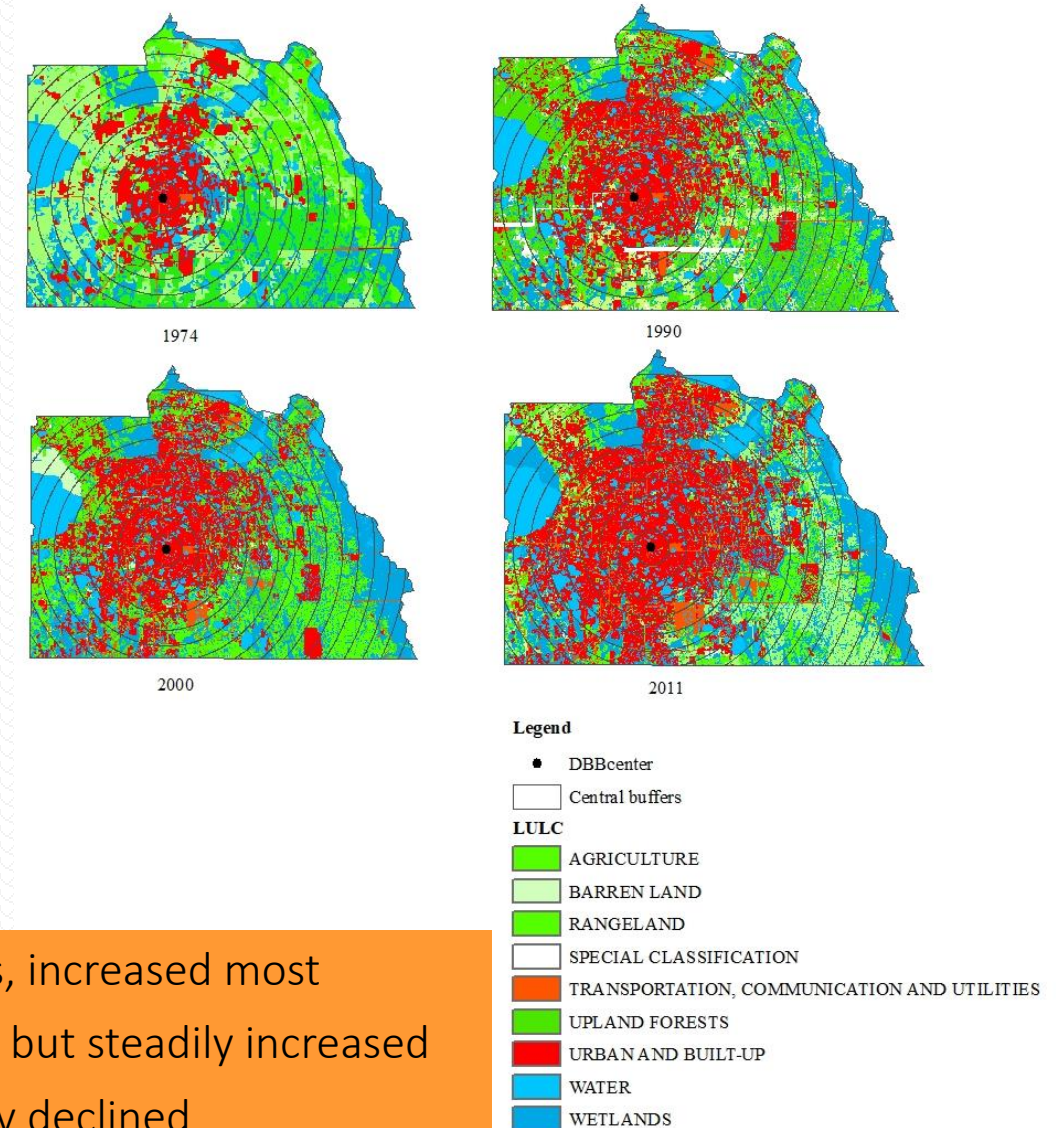
- Agricultural dominated most in periods
- Upland forest converted more recently

STUDY RESULTS

3.Sprawl

Proportion of urban land from central measurement by year

Central radius (miles)	1974	1990	2000	2011
2	0.80	0.80	0.83	0.85
4	0.67	0.75	0.81	0.84
6	0.49	0.66	0.78	0.84
8	0.35	0.57	0.71	0.82
10	0.24	0.46	0.63	0.77
12	0.16	0.34	0.51	0.68
14	0.10	0.23	0.39	0.55
16	0.07	0.18	0.30	0.44
18	0.08	0.18	0.27	0.36

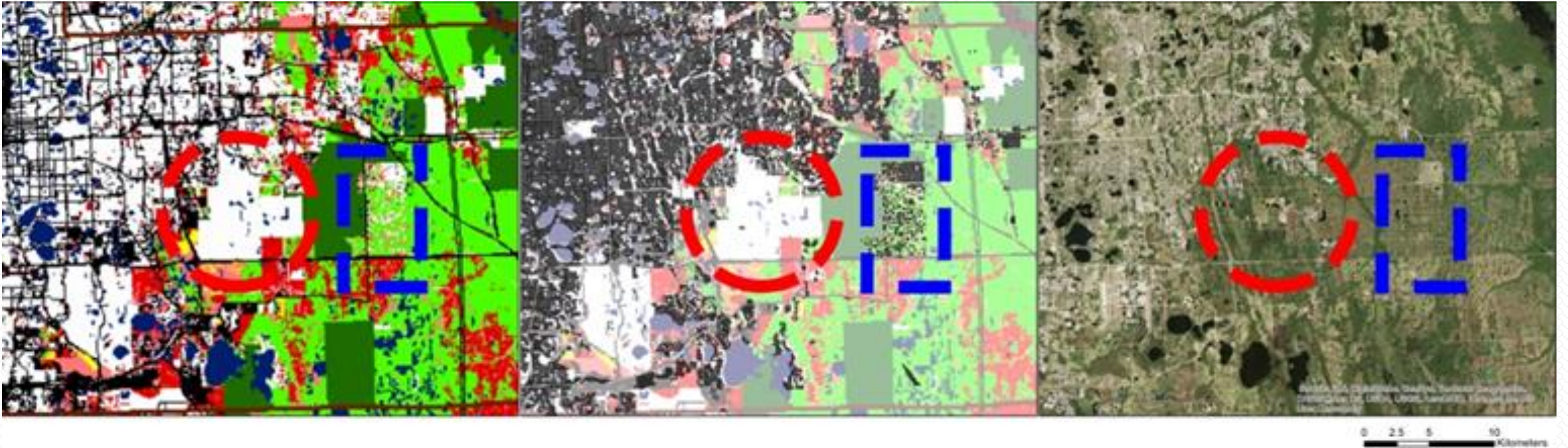


- > 4 and < 12-miles, increased most
- >12 miles, smaller but steadily increased
- > 18 miles, steadily declined

RESULTS SUMMARY

- 1). Over the last 40 years, city-wide and regional scale settlement expansion experienced similar growth trends.
- 2). Urban sprawl is more detectable at the regional scale than it is at the city scale.
- 3). Recent land conversion is particularly noticeable between 2000 and 2011.

DISCUSSION



a) the LUCIS model conflict surface b) the 2011 urbanized area overlaid (black) c) aerial photo from 2011.

An urban preferred area has not been developed adjacent to an area of development that was previously identified as conservation and conflicted in the 2005 study.

FUTURE STEPS

Future steps:

1. Expanded the scope of study in Central Florida: Orlando and Tampa regions.
2. Optimized alternatives for future development of land use.
3. Largely spread LUCIS model application and make it localized.



THANK YOU

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