



Almost daily on the evening news stories about water shortages, decreased food production, and increased development flash across the television screen. As the newscaster verbally paints a picture of circumstances around the world, often you can hear in his voice an inflection that asks “How did we get here?” The most ominous areas suffer from a lack of water, burgeoning populations, and mismanagement of natural resources. Yet many of these visible problems occur because of bad policy decisions and overall political negligence. So is there a solution? Developing alternative future land use scenarios is a proactive approach to land management, resource management, and political and economic responsibility.

With the help of technical tools such as geographic information systems (GIS), regions across the United States are using scenario modeling to paint a picture of future development patterns. The UF's GeoPlan Center has developed a two-step process for creating alternative land use scenarios.

- The first step employs the Land Use Conflict Identification Strategy (LUCIS)
- In the second step, planners and designers use the product of LUCIS and a carefully crafted set of assumptions to allocate projected future population.

The methodology illustrates the impact of population increase and paves the way for developing more sustainable patterns of land use.

#### Determining Population Projections

The population projections used in future land use scenarios are derived using data from the Bureau of Economic and Business Research (BEBR) at the University of Florida. BEBR generates population projections for each county in three ranges: low, medium and high. Similar to the work of the US Census, these projections are based on combinations of assumptions about birth rates, death rates, immigration, and emigration. BEBR's projections exist in five year increments up to 2030. BEBR's middle population projection was used in the following way. The average annual population change between 2000 and 2030 was calculated. For each five year increment following 2030, projected population was calculated by adding five times the average annual population increase to each preceding projected population. For example, the BEBR middle range 2030 population for Alachua County was 320,506. The average annual change population increase between 2000 and 2030 was calculated to be 3,418. Therefore the 2035 Alachua County population was projected to be:

$$(5 \text{ [years]} \times 3,418 \text{ [avg. annual increase]}) + 320,506 = 337,596$$

## What is LUCIS?

The Land-Use Conflict Identification Strategy, aka LUCIS, is a goal-driven GIS model that produces a spatial representation of probable patterns of future land use divided into the following categories:

- Existing conservation lands
- Existing urban lands
- Existing agricultural lands to remain \*\*
- Areas preferred for future conservation land use
- Areas preferred for future urban land use
- Areas of probable future conflict between agricultural and conservation land uses
- Areas of probable future conflict between agricultural and urban land uses
- Areas of probably future conflict between conservation and urban land uses
- Areas of probable future conflict among agricultural, conservation and urban land

LUCIS could be run using any raster-based GIS software, but it has been developed using ESRI's ModelBuilder. The results of a LUCIS model in and of themselves are interesting and very useful, as they suggest what lands are highly appropriate for future development, what lands should be set aside for conservation, and what lands should be set aside for agricultural production of all sorts. But the real power of LUCIS comes from the application of its results to develop alternative land-use futures.

## The origin of LUCIS

LUCIS was developed over a period of ten years in a graduate design studio at the University of Florida for students from the departments of landscape architecture and urban and regional planning. It evolved as we struggled with ways to use traditional land-use suitability analysis as a basis for projecting future land-use alternatives. Its conceptual basis was derived from the work of Eugene P. Odum, one of the 20th century's foremost ecologists (See table 2.1). In this classic article "Strategy of Ecosystem Development" (1969, 268) Odum proposes four general land-use types in a simplified model "so that growth-type, steady-state, and intermediate-type ecosystems can be linked with urban and industrial areas for mutual benefit." In Odum's Compartment Model, all areas of the landscape were classified into one of four types: (1) productive areas, "where succession is continually retarded by human controls to maintain high levels of productivity"; (2) protective, "or natural areas, where succession is allowed or encouraged to proceed into the mature, and thus stable, if not highly productive stages"; (3) compromise areas, "where some combination of the first two stages exists"; and (4) urban/industrial, "or biologically non-vital areas."

Odum wrote that by dividing land use into these categories, and "by increasing and decreasing the size and capacity of each compartment through computer simulation, it would be possible to determine objectively the limits that must eventually be imposed on each compartment in order to maintain regional and global balances in the exchange of vital energy and materials." He called it a "systems-analysis procedure," and noted that it provided "at least one approach to the solution of the basic

dilemma posed by the question ‘How do we determine when we are getting too much of a good thing?’” (268).

Table 2.1 The LUCIS approach is based on the work of Eugene P. Odum, presented in “Strategy of Ecosystem Development,” 1969.

<b>Odum's Compartment Model Land-Use Classifications</b>	<b>LUCIS's Land-Use Classifications</b>
<b>Productive</b>	<b>Agriculture - Lands that produce food, fuel, and fiber</b>
<b>Protective Compromise</b>	<b>Conservation - Environmentally significant lands</b>
<b>Urban/Industrial</b>	<b>Urban - Lands that support relatively intense human activity like residential, commercial and industrial uses</b>

Odum’s Compartment Model was the basis for the LUCIS land classification scheme (Table 2.1). Three, rather than four categories were used for two primary reasons. First, comparison among three categories rather than four tends to maximize the contrast among the categories, and second, the three categories relate well to the patterns and purpose of public and private land ownership.

The five steps of LUCIS

The LUCIS model requires that three stakeholder groups, each representing one of the land-use classifications of Table 2.1, serve as advocates for their respective classification. Each group rates all lands in a defined study area for their relative suitability to support their land-use classification. The three results are compared to identify areas of potential conflict. More specifically, this is accomplished through five steps:

1. Define goals and objectives that become the criteria for determining suitability
2. Inventory data resources potentially relevant to each goal and objective
3. Analyze data to determine relative suitability for each goal
4. Combine the relative suitabilities of each goal to determine preference
5. Compare the ranges of land-use preference to determine likely areas of future land-use conflict

\*\* Existing agricultural lands include some lands not under active agricultural use. There are, in fact, wetlands and other tracts of relatively pristine land included in this category. Since they have no permanent protective status, it would be inappropriate to classify them as conservation lands so they remain in the agricultural lands classification and they are highly vulnerable to change. Future conservation lands and future urban lands are carved out of existing agricultural lands.

## LUCIS Projects

State of Florida

1000 Friends of Florida

- Trend Scenario

Central Florida

myregion.org, ECFRPC, DCA

- Trend Scenario
- 3 Alternative Scenarios

Southwest Florida

Southwest Florida Regional Stewardship Alliance, DCA

- Trend Scenario
- 8 Alternative Scenarios

## Contact Us

For additional information concerning previous or current GeoPlan scenario modeling projects contact either Paul Zwick or Peggy Carr using the information below.

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## Book

Smart Land Use Analysis: The LUCIS Model (ESRI Press)

## Publications & News

Paving the Way toward Crowded Future

RisMedia.com (press release)

Put another way, Florida's population will equal the nearly 36 million now living in California, but they'll have just a third of the land to live on. ...

Study: Fla. population to double in 50 years

Gainesville Sun, FL - Dec 7, 2006

By Karen Voyles. A half century from now, the Sunshine State will likely have twice as many residents, or about 36 million. That ...

Leadership and Long-Term Planning Are Needed to Protect Florida's ...

Wakulla.com, FL - Dec 7, 2006

PRESS RELEASE: On December 6, 2006, 1000 Friends of Florida released two studies that define the growth management challenges facing Florida, a state whose ...

Environmental Group Predicts Massive Population Growth

All Headline News - Dec 7, 2006

Tallahassee, FL (AHN) - An environmental group released two studies Wednesday that said Florida's population could double to 36 million by the time today's ...

Population may double in 50 years

Sarasota Herald-Tribune, FL - Dec 7, 2006

By DALE WHITE. If current development trends continue unabated through 2060, Florida's population will double, most of its wildlife ...

Study: Fla. population to double in 50 years

Gainesville Sun, FL - Dec 7, 2006

By Karen Voyles. A half century from now, the Sunshine State will likely have twice as many residents, or about 36 million. That ...

Paving the way toward a very crowded future

Orlando Sentinel, FL - Dec 7, 2006

Put another way, Florida's population will equal the nearly 36 million now living in California, but they'll have just a third of the land to live on. ...

Study warns of looming urbanization of counties

Naples Daily News, FL - Dec 7, 2006

By Jeremy Cox (Contact). The growth explosion in Lee and Collier counties threatens to eat every acre of land that hasn't been ...

Study says state's growth in need of long-term plan

Daytona Beach News-Journal, FL - Dec 7, 2006

By JIM SAUNDERS. More than 940,000 people living in Volusia County. Nearly 275,000 more in Flagler County. And Central Florida becoming one big urban area. ...

Florida's population may double by 2060

Tallahassee.com, FL - Dec 6, 2006

By Aaron Deslatte. Imagine a sea of pavement instead of grass spreading contiguously from Fort Myers to West Palm Beach. A landscape ...

Group fears a rural Florida swallowed by growth

Palm Beach Post, United States - Dec 6, 2006

By Jennifer Sorentroue. Rural land south of Lake Okeechobee will be gobbled up by homes and businesses, and sprawling strips of development ...

Growth out of control

The News-Press, FL - Dec 6, 2006

By Aaron Deslatte. TALLAHASSEE — Imagine a sea of pavement devoid of green space spreading from Fort Myers to West Palm Beach. ...

We're allowing too much growth, study says

Sun-Sentinel.com, FL - Dec 6, 2006

By Andy Reid. Waves of future development threaten to leave Florida choked in gridlock and covered from coast to coast by a sea of ...

Studies project a paved Florida

St. Petersburg Times, FL - Dec 6, 2006

By JAMES THORNER, Times Staff Writer. If you're used to living in Mayberry, you'd better brace yourself for something closer to Manhattan. ...

Studies show 'scary' future from Florida population growth

Tampa Bay's 10, FL - Dec 6, 2006

TALLAHASSEE, Fla. (AP) — Today an environmental group released a pair of studies on Florida's population. The group, 1,000Friends ...

State's projected population growth indicates grim, scary future ...

Orlando Sentinel, FL - Dec 6, 2006

By Andy Reid | sun-sentinel.com. Waves of future development threaten to leave Florida choked in gridlock and covered from coast ...

Studies show 'scary' future from Florida population growth

Gainesville Sun, FL - Dec 6, 2006

By BILL KACZOR. AP Writer. Imagine a Florida with twice as many people, double the congestion and another seven million acres of farms ...

Developed land in North Central Florida doubles in 50 years, study ...

Gainesville Sun, FL - Dec 6, 2006

By KAREN VOYLES. A pair of studies released Wednesday show that the amount of urbanized land in North Central Florida will double ...

Study: Florida's growth will eat up rural areas

Naples Daily News, FL - Dec 6, 2006

Southwest Florida's growth explosion will consume 1.1 million additional acres of open land by 2060, leading to a three-fold expansion of urban areas ...

Growth report to be released today

Tallahassee.com, FL - Dec 6, 2006

By Bruce Ritchie. Florida's population is expected to double by 2060, according to a report being issued today in Tallahassee. The ...

Study warns that Florida must curb growth or be overwhelmed by ...

Sun-Sentinel.com, FL - 22 hours ago

By Andy Reid. Waves of future development threaten to leave Florida choked in gridlock and covered from coast to coast by a sea of ...

Paving the way toward a very crowded future

Orlando Sentinel, FL - 22 hours ago

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Orlando Sentinel, FL - 22 hours ago

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News4Jax.com, FL - Dec 7, 2006

TALLAHASSEE, Fla. -- Imagine a Florida with twice as many people, double the congestion and another seven million acres of farms ...

Studies show 'frightening' future from Florida population growth

Orlando Sentinel, FL - Dec 7, 2006

Bill Kaczor | AP. TALLAHASSEE -- Imagine a Florida with twice as many people, double the congestion and another seven million acres ...

Studies Foresee a Crowded Florida

Lakeland Ledger, FL - Dec 7, 2006

By BILL KACZOR. AP. TALLAHASSEE - Imagine a Florida with twice as many people, double the congestion and another seven million acres ...

Florida's population may double by 2060

Tallahassee Democrat, FL - Dec 6, 2006

By Aaron Deslatte. Imagine a sea of pavement instead of grass spreading contiguously from Fort Myers to West Palm Beach. A landscape ...

Studies show 'frightening' future from Florida growth

Florida Times-Union, FL - Dec 6, 2006

By BILL KACZOR. AP Writer. TALLAHASSEE, Fla. - Imagine a Florida with twice as many people, double the congestion and another seven ...

Studies show 'frightening' future from Florida growth

Fort Worth Star Telegram, TX - Dec 6, 2006

AP. TALLAHASSEE, Fla. - Imagine a Florida with twice as many people, double the congestion and another seven million acres of farms ...

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