

Florida Trends and Conditions 2000- 2001

Trends in Transportation and Ecosystems



Summary Points

- Florida supports a diverse and unique combination of ecosystems and has more species than any other state east of the Mississippi.
- At the same time, 516 species in Florida are listed as endangered or threatened and Florida is home to 4 of the 10 most endangered species in the US.
- The different ecosystems found in Florida are of great importance not only for the beauty and the meaning of life itself but because they support the life of Floridians and they are the key for sustained growth.
- The most notable effect of transportation on ecosystems is habitat fragmentation.
- The greatest effects of transportation on ecosystems are observed in areas of rapidly growing population such as South Florida, where there is an increasing conflict between the build and natural environment.
- The main problem is that in order to maintain the current diversity of plant and animal life found in Florida, our systems of conservation areas must be capable of supporting thousands of species on only a fraction of the original land base.

Ecosystems and Transportation

Florida is blessed with a wide display of unique habitats and wildlife which, to date, are not threatened or endangered. As habitat continues to diminish, the importance of these habitats and the species dependent on them will increase. Unfortunately, with continuing development in Florida, wildlife continues to decrease. As this occurs, the wildlife habitat that was once abundant will become critical.



Manatees

Source:www.arttoday.com

Florida supports a great diversity of native plants and animal life that includes about 3,500 species of vascular plants, 900 species of non-marine vertebrate animals, and many thousands of species of invertebrate animals. Florida's marine systems also count with an enormous variety of plants, mammals, fishes, and invertebrates.¹

The different ecosystems found in Florida are of great importance not only for the beauty and the meaning of life itself but because they support the life of Floridians and they are the key for sustained growth. Some of the characteristics of Florida's diversity are shown in Table 1.

Table 1: Some of Florida's more unique historical features at the community/ecosystem scale.

Natural System Feature	Dimension
Coastline	1,900 km (greater than all other states except Alaska)
Saltmarshes	180,000 ha
Longleaf pine forests	More than 1/5 of the state
Freshwater Wetlands	More than 1/2 of the state
Lakes	7,800 lakes
Rivers	1,700 rivers
Springs	300 springs

Many taxa (species and subspecies) are endemic (present distributions occur entirely within the political boundaries of Florida) or nearly endemic (ranges extend only slightly beyond Florida's borders) (Table 2). Most of this endemism occurs in the Central Lake Wales Ridge, the Everglades and Florida Keys, and the Appalachian River area.

Table 2.: Endemism in Florida's natural systems.

Taxa	Endemic		Nearly Endemic	
	Species	Subspecies	Species	Subspecies
Vascular Plants	235	NA	40	NA
Freshwater Fish	4	3	4	0
Amphibians	1	5	3	1
Reptiles	6	31	2	4
Birds	0	7	0	2
Mammals	2	56	1	2
Terrestrial and Freshwater Invertebrates	410	0	0	0
Plant Communities	13 (of 70)		NA	



Florida Waterway

Source: FAU Joint Center

In addition to habitat loss, another problem is derived from the fragmentation of our remaining patches of natural habitat. Habitat fragmentation refers to the tendency for remaining patches of habitat to become reduced in size and increasingly isolated from one another. This creates problems since some species range widely and require large tracts of habitat to survive. One example of this is the Florida panther, which has a broad habitat preference and at one time ranged throughout Florida. Although

the panther preys on a number of species, it depends on the deer population within its hunting range for its reproductive success. The panther is one of the endangered species in Florida and the number of panthers is not likely to exceed twenty based on available habitat.²



Blue Heron

Source: FAU Joint Center

Highway construction, runoff quality, mitigation activities, and maintenance may be subject to review under the Endangered Species Act if the receiving waters are considered “critical habitats.” The Endangered Species Act applies directly to activities affecting water resources designated as “critical habitat” areas, and may include receiving waters from highway or urban runoff.

The National Wild and Scenic Rivers Act

The purpose of this Act is limited to the protection of “certain selected rivers of the Nation, which, with their immediate environments possess outstandingly remarkable qualities.”⁴ It essentially provides for a mechanism to determine if a river can meet certain eligibility requirements for protection as a wild and/or scenic river, and protects designated rivers from activities which may adversely impact those values.⁵



Florida Waterway

Source: FAU Joint Center

Legislation

Endangered Species Act

In 1973, the United States government passed the Endangered Species Act. This was the first major law to protect animals threatened with extinction, and the only one that really has authority to stop any project that jeopardizes the habitat of endangered species. This Act seeks to conserve endangered and threatened species through requiring Federal agencies to ensure that their actions “do not jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modifications of the critical habitat of such species.”³



Alligator

Source FAU, J. Vos

The Department of Agriculture administers and designates rivers in the national forests,⁶ even though the Act’s framers intended for most private land’s rivers to enter the Wild and Scenic River System through the state designation and management provisions.⁷

The National Environmental Policy Act

The National Environmental Policy Act (NEPA) was designed to create a vehicle for considering environmental amenities consistent with other national needs, such as economic development, in a systematic manner.⁸



Canal Along Central Florida Road
Source: FAU Joint Center

NEPA establishes judicially enforceable obligations, which require all federal agencies to identify the environmental impacts of their planned activities. Under the Act, federal agencies are required to determine whether a proposed action constitutes a “major Federal action which will significantly affect” the quality of the human environment.⁹ The organization has to conduct a preliminary investigation of the potential environmental effects and report it in an environmental assessment (EA), or a environmental impact statement (EIS), in order to determine if further investigation is required.

ISTEA and TEA-21

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) includes measures and policies requiring or encouraging an approach to transportation development which integrates considerations for management of both the natural and constructed environments. ISTEA, through measures in the Transportation Improvement Program, encourages Metropolitan Planning Organizations, local, and state transportation agencies to involve the public and other resource management and development concerns in long-range transportation planning. It also requires that transportation agencies consider the likely effects of transportation policy decisions on land use and development, and the consistency of transportation plans and programs with the provisions of all applicable short- and long-term land use and development plans. In a sense, these provisions incorporate an ecosystem approach into highway planning, resource development, and land use by moving land use decisions to the front end of the transportation planning process. This should encourage better decision-making processes and long range planning for both transportation and land use development compatible with sustainable ecosystem productivity and integrity.

TEA-21 builds upon the planning provisions of ISTEA to assure that environmental considerations are part of the decision making process. Although it increases funding for the Congestion Mitigation and Air Quality Improvement as well as the Transportation Enhancements Programs, TEA-21 does not include specific provisions for ecosystem protection and ecosystem management but does call for environmental streamlining and better integration of transportation and community planning.¹⁰

Trends

The Florida Natural Areas Inventory lists 33 of the state's 70 systems, which is 47%, as globally rare to critically imperiled and 54 (77%) as state rare or critically imperiled.¹¹ It is of great importance to mention that the utmost declines in Florida's natural systems have occurred within this century.¹² A description of changes in Florida's natural systems is shown in Table 3.

Table 3: Extent of temporal changes in some of Florida's communities/ecosystems¹.

Community/Ecosystem	Description of Change
Seagrass meadows in Tampa Bay	81% reduction from the 1800s
Mangroves in Tampa Bay	7% reduction from 1950 to 1980
Salt marshes in Brevard County	95% were converted to mosquito control impoundments
Salt and freshwater marshes	60% reduction from 1936 to 1987
Everglades system	65% converted into a water control system
Coastal Strand	50% reduction from 1936 to 1987
Pine Rocklands	95% reduction from 1936 to 1987
Tropical Hammocks	50% reduction from 1936 to 1987
Central ridge scrub	82% reduction from 1936 to 1987
All forests	38% reduction from 1936 to 1987
All forests	35% are now in short rotation, pine plantations
Longleaf pine forests	87% reduction from 1936 to 1987

According to the Florida Assessment of Coastal trends report, forty-four percent of all Florida's vertebrates are known or suspected to be declining in number or distribution. Genetic diversity has also been reduced in species with remainder populations as the panther. When human induced changes occur, the species that are least adaptable to change are extirpated first. If conditions continue to get worse, fewer and fewer species can be sustained until all that remains are the very adaptable, generalist species, such as raccoons, gulls, and cockroaches.¹³

Introduction of exotic species is also observed in Florida. This leads to a very low, homogeneous diversity of life in Florida, and it means that some generalist species that did not originally live in the area may move into niches formerly occupied by extirpated species.



Bear Crossing Sign

Source: FAU Joint Center

The Everglades: A Special Case

Although ecosystems fragmentation is a problem that affects the whole state of Florida, the Everglades are of special consideration due to its uniqueness and influences over the fastest growing segment of Florida, which is South Florida. The wildlife habitat value of the Everglades wetland system as a whole is extremely important. It serves as a permanent refuge for a great diversity of wildlife including numerous endangered species.¹⁴



Florida Everglades

Source: FAU Joint Center

The Everglades and South Florida ecosystem in general are uniquely dependent on the area's distinctive water flow pattern.¹⁵

When people began to disrupt this pattern, the health of the ecosystem began to deteriorate.¹⁶ The wetlands of South Florida were regarded as being inhospitable and without intrinsic value. In the early 1900's, draining the wetlands was considered to be essential for commerce and safety. Drainage projects were accelerated by the result of hurricanes in the 1920's. Nowadays, much of South Florida's wetlands are intensively managed, with more than 1,400 mi of primary canals and more than 100 water control structures.¹⁷ The effects of the drainage and development of the region include a variety of environmental problems such as loss of soil, nutrient enrichment, contamination by pesticides, mercury buildup in the biota, fragmentation of landscape, loss of wetlands and wetland functions, widespread invasion by exotic species, increased algal blooming in coastal waters, seagrass die off, and declines in fishing resources.¹⁸

Endnotes

- ¹ Florida Conservation Foundation, 1993. Guide to Florida Environmental Issues and Information. Florida Conservation Foundation, Winter Park, Florida, page 29.
- ² Belden, R.C. 1982. *Florida Panther Recovery Plan Implementation*. 1982 Progress Report. Florida Game and Freshwater Fish Commission, Gainesville, Florida.
- ³ 16 U.S.C. -1536
- ⁴ 16 U.S.C -1271-1287
- ⁵ R.A Corbitt, 1990. *Standard Handbook of Environmental Engineering*. MacGraw Hill, Inc. New York, NY, p. 628.
- ⁶ *Ibid.*
- ⁷ B. Doppelt, M.Scurlock, C. Frissell, and J. Karr, 1993. *Urban Highway Storm Drainage Model*. Federal Highway Administration. FHWA-RD 83/041-047, Camp Dresser and McKee, Inc., Annandale, VA.
- ⁸ R.A Corbitt, 1990. *Standard Handbook of Environmental Engineering*. MacGraw Hill, Inc. New York, NY, p. 628.
- ⁹ Doppelt, M.Scurlock, C. Frissell, and J. Karr, 1993. *Urban Highway Storm Drainage Model*. Federal Highway Administration. FHWA-RD 83/041-047, Camp Dresser and McKee, Inc., Annandale, VA.
- ¹⁰ U.S. Department of Transportation, 1999. *Listening to America*, Report on the U.S. Department of Transportation's Outreach on Implementation of the Transportation Equity Act for the 21st Century (TEA-21)
- ¹¹ Florida Natural Areas Inventory.
- ¹² Schaefer, J., 2000. *Florida Natural Systems: Diverse and Valuable Resources*.
- ¹³ Bush, Mark, 2000. *Ecology of a Changing Planet*. 2nd ed. Prentice Hall, New Jersey.
- ¹⁴ *Ibid.*
- ¹⁵ World Resources Institute, 2000. *World Resources 2000-2001* .
- ¹⁶ *Ibid*
- ¹⁷ *South-Florida, A region Under Stress*
- ¹⁸ *Ibid.*

Florida Trends and Conditions 2000- 2001

Trends in Transportation and Land Use



Summary Points

- Florida experienced its most intensive growth between 1960 and 1990, which coincides with the development of the Florida Limited Access Highway network funded by the 1956 Federal-Aid Highway Act.
- During this time, nearly 150,000 acres of Florida farmland were developed each year.
- Water, as a feature and resource, has been a major factor in the development of the land use/transportation relationship in the state by driving the tourism-dependent economy as well as providing a means for local and international transportation.
- Until recently, urban growth and intensity of development have been highest in coastal areas. This has been closely related to accessibility of the state's highway corridors, proximity to waterfront, and growth management policies directed at promoting or containing growth within boundaries.
- Although population and density continue to be greater in coastal areas, growth is no longer confined to coastal counties.
- In addition, encroachment of the coastal areas, protected water sources, and other related natural features, such as wetlands, are limiting urban growth and development in areas where development has traditionally taken place.
- Growth is moving to the rural areas where land is relatively cheap and growth management policies are less stringent, thus promoting sprawl development.
- Finally, in non-coastal regions of Florida, other economic generators—universities (Gainesville), man-made tourist attractions (Orlando), and governmental hubs (Tallahassee)—have generated major transportation infrastructure investments (major highways and airports) attracting new development.

Historical Perspective

Historically, water has played a major role in the state's land use and transportation infrastructure development. Port cities were indicators of where to place road and railroad infrastructure, as port cities were the first signs of urbanization within the state.



South Florida Suburban Residential Development

Source: FAU Joint Center

Yet in more recent history, the construction of roads has joined the mixture of development factors as a result of the interconnectivity of water, land use, and transportation in Florida.

With the establishment of the 1916 Bankhead Act, the state was ordered to establish an intercity road network of state highways.¹ By 1938, state and federal funds had built 9,000 miles of roads. Early major highways included US 1, 19, 27, and 98.



Highway Interchange

Source: FAU Joint Center

To promote the movement of goods and interconnectivity of states, in 1956, the Federal Highway Act was passed marking the beginning of a national high-speed limited access interstate highway system. As a result, construction of Interstates 4, 10, 75, 95 and the Florida Turnpike began. By the early 1960's sections had already been completed significantly adding capacity to the existing road network.

¹ Anonymous. Florida's Transportation History.
<http://www.dot.state.fl.us/historicdotphotos/default.htm>

Where is Growth Taking Place?

Today, Florida's urban landscape is characterized by pearl-necklace development strung along the extensive coastline where much of the land is occupied by hotels, shops, attractions, homes, and transportation infrastructure. Highway US 1 and the Florida East Coast (FEC) and Seaboard Coastline (CSX) railroads thread the eastern strand of communities. Additionally, Interstate 95 and the Florida Turnpike provide greater mobility throughout the eastern, central, and southeastern parts of the state. Highways US 41 and US 19, north of Tampa, connect the western strand of communities. With the construction of Interstate 75, capacity was added from Broward County in the southeast, across the state, and up to Ocala. Tourist development in the Panhandle can be found along US 98. Airports are found throughout and seaports are located at all major coastal cities.



Beachfront development

Source: FAU Joint Center

The degree of density and intensity of development in certain places of Florida results from several factors, such as geography (particularly beachfront), policies, demographics, economy (mainly tourism), and infrastructure investment. Settlement patterns in the state indicate that urban growth and intensity of development have been highest in coastal areas with highway access, with the exception of Orlando where manmade amenities may have played a larger role than proximity to the beach. Highways have also expanded development away from the coast. In the south, intense linear development can be found along transportation corridors expanding west where many cities are growing on the urban fringes of larger ones. In central parts of the state, new residential and industrial developments are springing up near highway interchanges and access ramps where transportation accessibility is highest.

Agriculture and timber in Florida are still important contributors to the state's economy and the nation. However, the conversion of land from rural to urban uses is outpacing the state's population growth. The demand is highest for agricultural land closest to urban areas. Here sprawling residential developments occur at low densities with poorly connected roadway networks that significantly decrease access to work, schools, and shopping opportunities.² At the same time, longer utility and roadway corridors increase the cost of providing services.

² Ewing, Reid, (Winter 1994). *Characteristics, Causes, and Effects of*

Transitioning of Florida's Land

Between 1960 and 1990, Florida's heaviest growth period, the rural population in southeast Florida virtually disappeared and the region's character became distinctly urban. By 1980, the areas east of the Everglades dike in Broward and Dade counties had become 99 percent urban. As parts of south Florida face build-out within the next decade, development has already begun encroaching on the dike. Meanwhile, development is beginning to move to the central and northern portions of the state where there are fewer constraints and land is cheaper.



Area near agriculture cleared for development

Source: FAU Joint Center

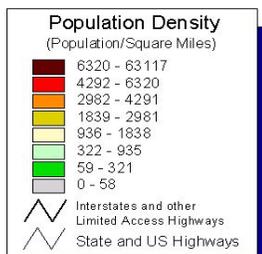
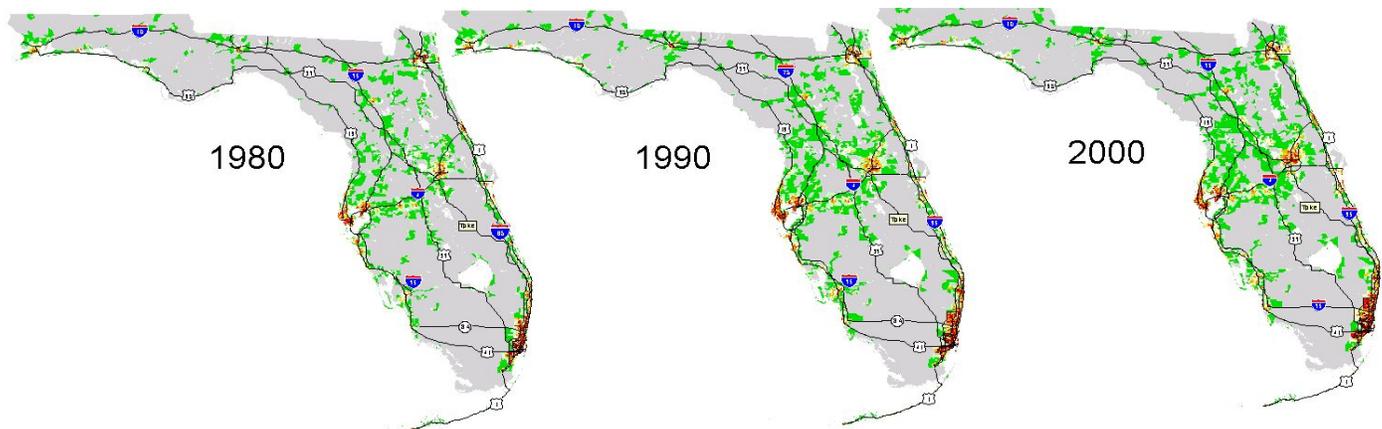
Recent changes are most visible around the cities of Gainesville and Ocala, and along I-4 between Orlando and Tampa, where there is pressure to convert rural and agricultural land for residential and industrial purposes to meet the urban growth demand of these regions.³

Business development and relocation also plays an important part in the expansion of urban growth and transition of land throughout the state, in the Lake Mary/Heathrow corridor along I-4 and areas along the I-95 corridor, for example. Tourism continues to play an important role development in the western panhandle where forested land is making room for vacation communities.

Changes in Florida's Population Density

State of Florida:

Highways and Population Density



FAU/FAU
JOINT CENTER
for Environmental & Urban Problems

FAU Center for
Visual Planning
Technology



Source: US Census Bureau, 1980-1990.
Claritas, 2000 Population Estimates.

Sprawl, Environmental and Urban Issues.

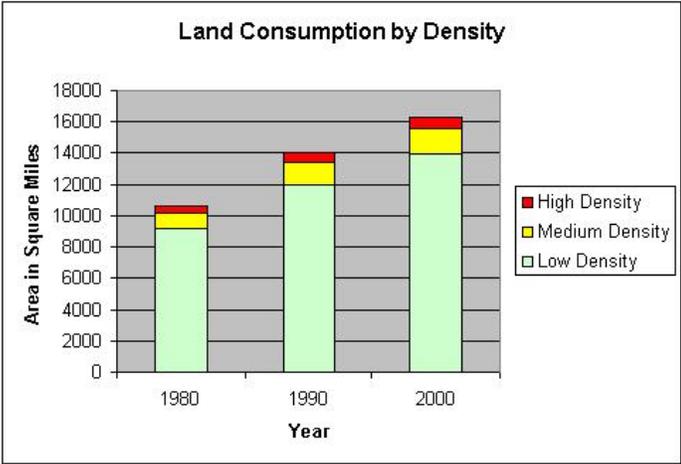
³ Barnett, C. and Klass, M.E. (December 2000) *Managing Growth 10 Steps Toward a More Livable Florida*. Florida Trend.

Transportation and Land Use Planning

As Florida's population continues to grow, innovative ways must be developed to deal with population growth, sprawl, congestion and mobility issues. These issues must be addressed in the planning stages of transportation and land use.



Traffic on I-95 Source: FAU Joint Center



Over the past twenty years, low density urban development in Florida has consumed land faster than any other density category, while the percentage of high density development has remained relatively unchanged (figure above). Density is a local policy decision used to deal with growth. Fast growing metropolitan areas, like Orlando, are allowing higher densities. Neighboring communities, however, unused to such growth, allow only low-density development, eventually at the expense of increased roadway congestion and overburdened services.



Infill Development Area Source: FAU Joint Center

Moderate to high-density thresholds are needed to establish transit and alleviate the need for more roads and cars. As development costs increase, future trends will shift emphasis from greenfield development to redevelopment and the infilling of properties overlooked in the past. Accessibility to existing transportation hubs, underutilized infrastructure, and local amenities will play a major role in the economic resurgence of neglected older neighborhoods.

Although transportation has always been a component of state and local land use comprehensive plans in Florida, serious emphasis has not been placed on the development of transportation systems or alternative modes of transportation that address urban form and community design. Today, transportation planners cannot view transportation services in an isolated manner just, as land use planners cannot afford to let the market drive development. There is a reciprocal pattern that must be addressed when drafting land use and transportation plans.

New transportation programs are opportunities to reverse old policies and support the revitalization of long-neglected infrastructure, maintenance, transit, walking, and bicycling. In recent years two state committees, the Growth Management Commission and the Transportation and Land Use Study Committee, have gathered to develop recommendations on how the state laws and agencies can work more effectively to address these issues. In addition, FDOT's 2020 Florida Transportation Plan has also addressed the issues of urban form and community design.



Florida Atlantic University Joint Center for Environmental and Urban Problems

Please cite report as: FAU Joint Center for Environmental and Urban Problems. (2001) *Florida Trends and Conditions, 2000-2001 in Transportation and Land Use Trend-Project Summary*. Florida Atlantic University: Ft. Lauderdale, Florida, www.jc.fau.edu

Florida Trends and Conditions 2000- 2001

Florida Land Use and Transportation Planning Issues



Summary Points

- In 1999, the Florida Transportation and Land Use Study Committee (TLUSC), concluded that, *"the optimized, segregated and specialized approach to planning, although presumed internally consistent, is not concerned with achieving a predetermined vision or community objective and often has not created communities where people are comfortable and proud to live."*¹
- The lack of correlation between different levels of land use and transportation planning is affecting the potential to coordinate decisions. While several levels of government are involved in transportation decisions, with the exception of the review of developments of regional impact (DRI), the authority to make land use decisions belongs solely to local governments.
- Urban sprawl, composed of low-density residential developments on the urban fringe, is a product of existing development and transportation regulations and a burden for local governments, who provide services and infrastructure.
- Changes in land use and transportation planning will be needed for local governments to counter urban sprawl and promote more sustainable forms of development such as infill development, redevelopment, and traditional neighborhood design.
- Despite a coordinated state planning system, it still lacks the provisions needed to achieve mutually supportive land use and transportation plans and decisions, particularly those needed to support alternatives to driving alone.
- Regional strategies and organizations are needed to solve regional mobility problems and help maintain a strong state and regional economy.
- Under Florida's Growth Management Act, roadway concurrency is one of the most influential regulatory requirements in shaping the urban form in Florida. Unfortunately, it has had an unintended consequence: some of the conditions imposed for urban growth also promote urban sprawl.
- In addition to roadway concurrency and permitting low density, most current local regulatory requirements for setbacks, stormwater management, parking, and landscaping, cumulatively consume large portions of land and promote greater separation of land uses.

Transportation and Land Use Planning

Historically, transportation planning has done little to evaluate how construction of additional infrastructure was impacting urban form. Transportation plans primarily used roads to meet the demand created by land uses.¹ Meanwhile, land use planning was viewed as a separate entity altogether since land use is strictly a matter of local jurisdiction. Combined, transportation plans and land development regulations have produced sprawling low-density residential and commercial areas that rely almost exclusively on cars and roads to move people around.



Separated Land Uses

Source: FAU Joint Center

Florida has tried to reign in its intense development with growth management strategies. Land use and transportation planning are both components of three levels of growth management planning: state, regional, and local. A variety of government agencies are directly and indirectly involved in producing local land use and transportation plans at each of these levels. However, at the local level, coordination between transportation and land use planning has yet to fulfill its full potential.

Today, transportation planners cannot afford to continue to view transportation services in an isolated manner, just as land use planners cannot afford to let the market alone direct where land development will occur. The reciprocal association must be recognized when drafting land use and transportation plans.

Levels of Transportation Planning

In addition to being components of state, regional, and local planning, land use and transportation are also linked at the federal level through transportation acts that affect decisions directly and indirectly through regulations and funding.

Federal Level

Federal transportation laws have been enacted every five to six years to provide authority for new federal programs or to modify existing programs. The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 was the first federal transportation act that required transportation to include land use planning in transportation projects. Until then, highway construction was almost exclusively the focus of federal funding. More recently, the Transportation Efficiency Act (TEA-21) has continued many ISTEA initiatives. TEA-21 focuses more on integrating alternative modes of travel and requires comprehensive transportation planning at all levels of government.

State level

Early growth management initiatives established the importance of planning at the state level. Major state departments currently involved in transportation and land use planning include the Florida Department of Transportation, the Department of Community Affairs, and the Department of Environmental Protection. The Florida Transportation Plan (FTP) covers a 20-year period and sets long- and short-range transportation goals and objectives based on federal and state objectives. By state law, this plan must be consistent with the State Comprehensive Plan's goals and policies, and any other statutory mandates and authorizations. This plan recognizes the demand for better coordination between transportation and land use decisions.

Regional Level Transportation Planning

The problems of growth and development are not confined within specific boundaries while the effect of local policies transcends political boundaries. Regional issues in Florida are the concern of several agencies.

- MPOs — Metropolitan Planning Organizations (MPOs) are regional organizations whose membership includes local elected officials and state and local transportation, environmental, and planning agencies. Their primary focus is to develop transportation plans and improvement programs for their metropolitan areas.
- RPCs – Regional Planning Councils are similar to MPOs in that they also provide technical assistance to local governments on land use and transportation issues. They are responsible for preparing a Strategic Regional Policy Plan (SRPP) to guide local comprehensive plan policies and coordinating intergovernmental cooperation between local governments.
- FDOT Districts – They focus on the transportation infrastructure and service demands of their districts. They are responsible for providing operational assistance to the transit authorities, public and private airports, and seaports.

- Regional Transit Organizations – Several major metropolitan areas also have regional transit organizations, e.g. Tri-Rail in Miami-Dade, Broward and Palm Beach counties. Although, their responsibilities vary in scope, they coordinate regional commuter transportation services.

Towards Corridor Management

In 1995, state and local planning law was amended to promote an expanded local role in corridor management. Instead of designating corridors for preservation in the state's Florida Transportation Plan, corridors would be designated in local comprehensive plans. Emphasis moved from corridor preservation to corridor "management". Preservation denotes the limiting of development completely, while management refers to providing compatible development along the designated corridors. Essentially corridor management involves right-of-way preservation, advance acquisition, and access management techniques.

Local Level Transportation Planning

At the local level, several government documents regulate transportation and transportation plans. Each county and municipality has a local comprehensive plan that contains the policies and goals for mandated elements including land use and transportation. The transportation element of each plan also contains maps that rank local roads and transit service, airports, and seaports, where applicable. In addition, local governments use their zoning, subdivision, and building codes to establish design and building standards and requirements for parking and roadway improvements.

Land Use Planning

Florida's rapid growth during the 1960s and 1970s led to the enactment of landmark growth management legislation adopted afterwards. The Growth Management Act requires three levels of planning: state, regional, and local.

State Level Land Use Planning

The State Comprehensive Plan guides all transportation and land use planning within the state. It sets the goals and policies regarding environmental protection, meeting the needs of a growing population, and maintaining a strong economy. The land use element of the state plan directs development to take place in areas that have the resources, fiscal abilities, and service capacity to accommodate growth "in an environmentally acceptable manner." By law, the Department of Community

Affairs (DCA) is the land planning agency that plays a supervisory role in the administration of and enforcing the state's growth management policy.

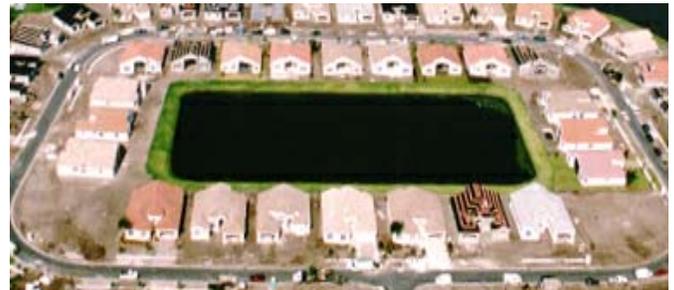
Regional Land Use Planning

Regional Policy Plans

The regional policy plan provides the blueprint for local comprehensive plans and plan review. It is composed of goals and policies based on an assessment of the region's resources and needs. However, it does not contain a land use plan or a transportation plan per se.

Water Management

Increased development has heightened the need to address the issues of water management. State and local laws require developments to mitigate the impact of stormwater runoff from impervious surfaces (e.g., roads, sidewalks, and parking lots) by following best management practices. Developers use a variety of techniques to maintain runoff on site including ponds, lakes and swales. These water features serve as an amenity that adds value to the development, but they also separate land uses and development, causing the roadway network to be longer and more complex.



Subdivision on Canal

Source: South Florida Water Management District

Local Land Use Planning

In Florida, local land use planning is accomplished through the local comprehensive plan and the local zoning codes. Among a handful of states, Florida requires that the local land development regulations (i.e., zoning and site planning tools) be consistent with local, regional, and state policies. The state also enables local governments to fund and plan redevelopment through a variety of legal tools.

The Local Comprehensive Plan (LCP)

The LCP contains policies and plans that guide the planning elements required in Rule 9J-5, including land uses and urban design. The LCP includes a Future Land Use Map (FLUM) and a Future Trafficways Plan. The FLUM serves as a document to guide decisions regarding future land use changes.

The Zoning Code and Map

The zoning code regulates the type and location of land uses and their intensity. The map that accompanies the code indicates the zoning designation for each property. Several elements in the land development regulations affect how land use and transportation physically interact.

- **Uses permitted**--The zoning code lists the types of land uses and activities allowed in each zoning district.
- **Bulk requirements, lot size, and setbacks**-- Building height and width, mass, and floor height are bulk requirements. Typical suburban development limits building heights and requires larger lot size and setbacks, which directly affect the density and intensity of land use.
- **Parking requirements**--Many local zoning ordinances maintain parking space provisions that are based on older, larger vehicle types.
- **Density**--Densities are notoriously low in Florida. Problems with low densities became apparent with increases in the cost of financing infrastructure and services
- **Landscaping**--Code requirements are geared towards saving energy by providing shade and pervious areas to replenish the water table. However, landscaping requirements also help to separate land uses. Where compact development is desired, landscaping is provided in public open spaces in combination with street trees.

Roadway Concurrency and Urban Form

Florida's Concurrency Management System was meant to be a financial planning tool to ensure that adequate public services and infrastructure would be in place "concurrent" with the impacts of new development.² In an attempt to reverse the effects of transportation concurrency requirements that discourage development in already existing urban areas, Florida implemented Transportation Concurrency Exception Areas (TCEAs). A TCEA is defined as a specific geographic area where transportation concurrency requirements apply on an areawide basis and can be relaxed so that additional development, such as infill, is possible.

Federal, State, Regional, and Local Land Use/Transportation Initiatives

Several fairly recent initiatives have dealt with the relationship between land use and transportation and are worth noting. These are:

- The Environmental Lands Management Commissions (ELMS I, II, & III) all led to significant growth management legislation, including the planning consistency requirement.
- The 1995 Governor's Commission for a Sustainable South Florida and the Eastward Ho! Initiative.
- The 1999 state Transportation and Land Use Study Committee.

- The 1999 Urban Infill and Redevelopment Act.
- The I-4 Initiative

Trends in Transportation and Land Use Planning

- A move towards the implementation of regional initiatives and solutions.
- The continued deficiencies in communications between MPOs will lead to continued difficulties in managing major transportation corridors in the state.
- The continued accumulation of negative impacts from developments that individually do not trigger the DRI process and whose impacts are not reviewed from a regional perspective.
- A continued focus on infill and redevelopment techniques and issues, including the need to revise local land development regulations and the creation of attractive incentives to achieve desired forms of development.

Conclusions and Recommendations

Different state and regional initiatives have emphasized the need for coordinating land use and transportation decisions. Despite the state's growth management legislation and consistency requirements, provisions for regional planning and coordination of these issues are still lacking.

Although FDOT is not in the business of making land use decisions, it could help local communities and regional authorities to understand that there is a reciprocal relationship between transportation and land use that needs to be addressed through multiple planning levels, changes in the planning process, and innovations in land use planning and urban design.

Endnotes

¹ So, F. and Getzels, J., eds.(1988) *The Practice of Local Government Planning in Transportation Planning* 2nd ed.International City/County Management Association (ICMA): Washington, DC.

² Arline, T and 1000 Friends of Florida. (1998) *Florida's Growth Management Experience*.

Florida Trends and Conditions 2000- 2001

Trends in Transportation and Water Quality



Summary Points

- Water is one of Florida's most critical resources and its most vulnerable one.
- Florida's economy depends on the availability of clean fresh water for the \$7 billion fishing and \$32 billion tourism industries and the \$20 billion agricultural sector.
- Transportation has a negative impact on water quality because of the generation of polluted run-off from roads and other transportation facilities.
- In addition, roads act as corridors for the movement of polluted run-off from other sources such as yards and agricultural fields.
- The most common contaminants in highway runoff are heavy metals, inorganic salts, aromatic hydrocarbons, and suspended solids.
- Highway construction also contributes to water quality problems because of erosion of topsoil during storms.
- Water quality problems are evident around the densely populated, major urban centers, including: Jacksonville, Orlando, Tampa, Pensacola, Cape Canaveral, and the southeastern Florida coast.

The Importance of Water in Florida

Although around 70 percent of Earth's surface is covered with water, fresh water is a scarce resource. Over 97 percent of all the earth's surface water is salt water and most of the remaining 2.4 percent fresh water is locked up in glaciers, ice caps and snowfields (See Table 1).

Table 1: Distribution of Water¹

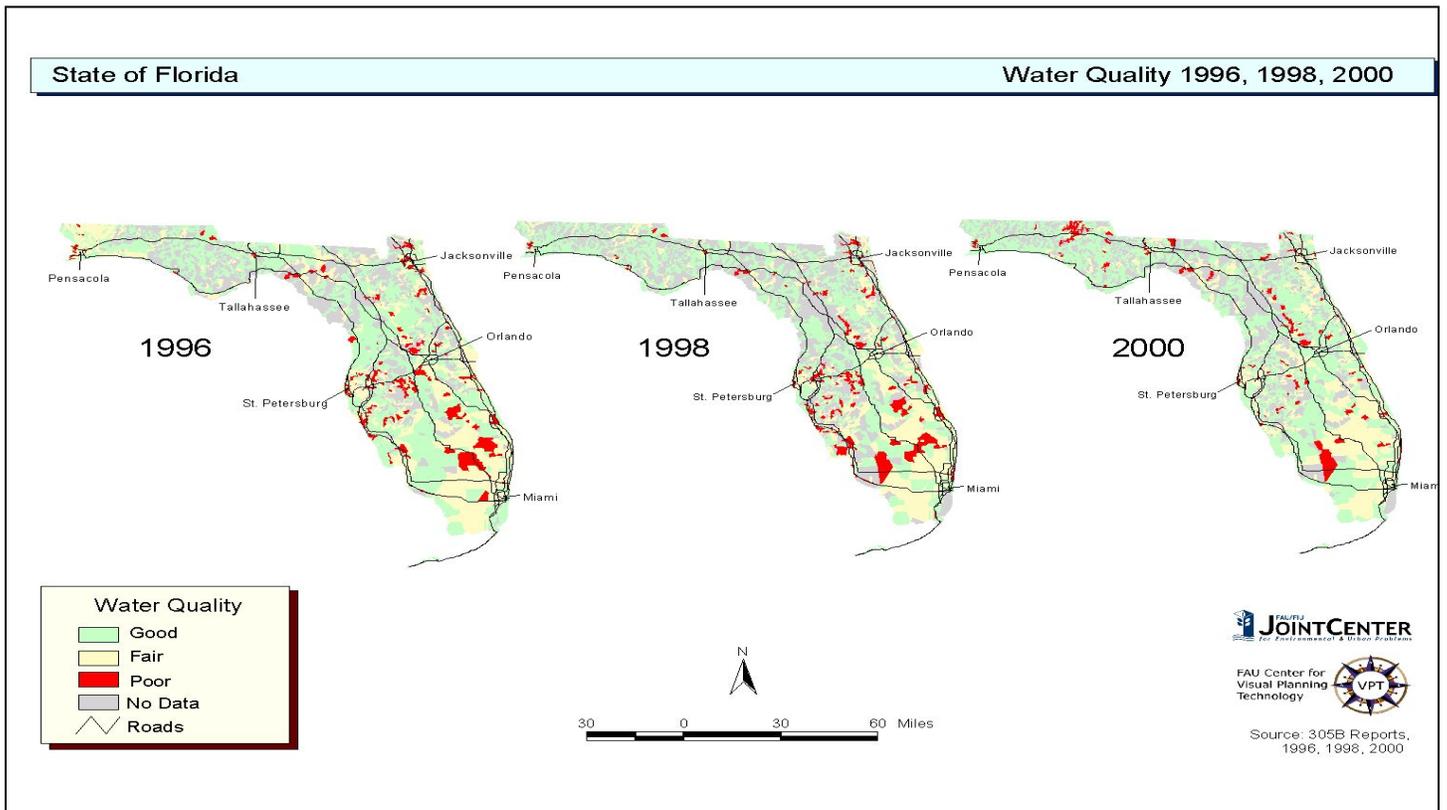
Source	Percentage	Average Staying Time
Oceans	97.6	3,000-30,000 years
Ice and snow	2	1-16,000 years
Groundwater	.3	Days to thousands of years
All lakes	.016	1-1000 years
Soil moisture	.005	2 weeks to a year
Plants and animals	.005	1 week
Atmosphere	.001	8-10 days
Rivers and streams	.0001	10-30 days

According to the 2000 Water Quality Assessment Report, Florida has 51,858 miles of streams and rivers, more than 7,700 lakes with a total surface area of 3,258 square miles, and 4,298 square miles of estuaries.² In addition, the far northwest and southeast receive more than sixty inches of rainfall per year, while the Keys receive about forty inches annually. The resulting rainwater represents a valuable component of water resources to be recovered and reused³. However, the variability of this rainfall due to location and climatic conditions can create local water shortages.

Water Quality in Florida

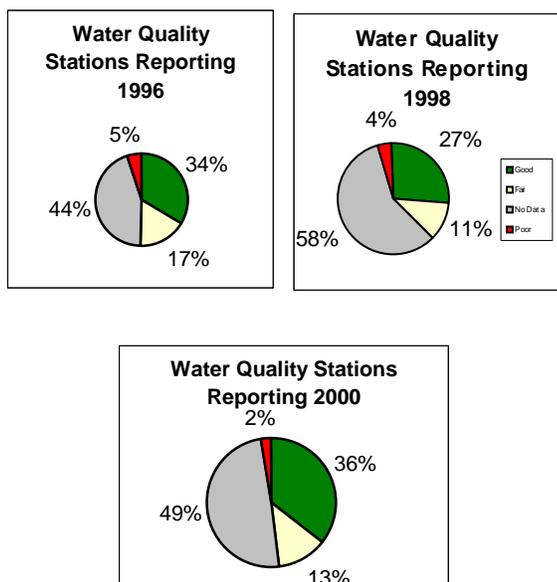
Florida's Water Quality Assessment Reports give an assessment of overall water quality based on a large number of criteria which fall into four general categories: 1) the trophic state, 2) biological data, 3) exceedances of standards for conventional pollutants, and 4) exceedances of metal standards. Based on the criteria and assessment methods, less than 5 percent of the water bodies in Florida have *poor* water quality, while about one third is qualified as having *good* water quality for years 1996, 1998, and 2000 (Figures 1 and 2). Typically, the water quality in the sparsely populated northwest and west-central sections of the

Figure 1: Water quality 1996, 1998, 2000



state is better than in other areas. Poor water quality not associated with a large population is also found in basins with intense agricultural and industrial use⁴. It is important to realize that for all three years there was no data available for

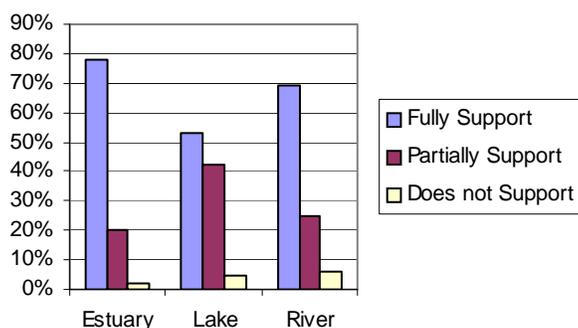
Figure 2: Percentage of water bodies that were included in the 1996, 1998 and 2000 water quality determination



about half of the water bodies. Besides the lack of data, the methodology for calculating water quality is far from perfect.

Another way of reporting water quality is by designated use. Figure 3 shows that most of Florida's water bodies meet their designated use and most of the water bodies that do not meet their designated use are located in the highly urbanized sections of central and southern Florida.

Figure 3: Support of Designated Use by Florida's Water Bodies⁵



Threats to Water Quality

According to FDEP, the major surface water problems in Florida fall into five general categories⁶:

1. Urban storm water. A source of many different pollutants from nutrients to toxics, storm water can impair all water body types, mainly in the urban centers.

2. Agricultural runoff. With nutrients, sediments (increased turbidity), biochemical oxygen demand, bacteria, and pesticides, agricultural runoff mainly infects lakes, slowly moving rivers and canals, and sometimes receiving estuaries, primarily in Central and Southern Florida

3. Domestic wastewater. Municipal wastewater treatment plants, package plants, septic tanks, and runoff from land application sites have dealt with domestic wastewater that contains nutrients, pathogens and even toxics. They remain a major problem in some rural areas.

4. Industrial wastewater. Major industrial wastewater sources in Florida include phosphate mines, fertilizer manufactures, and pulp and paper mills. Industrial discharges contribute about 10 percent to the total miles of impaired waters.

5. Hydrologic modifications. This category includes damming running waters; channeling slowly moving waters; or dredging, draining, and filling wetlands for flood control, agriculture, drinking water supplies, and urban development. These modifications also bring water quality problems.

Besides these pollution related problems, Florida's water supply is threatened by the increasing water use of Florida's burgeoning population. It is also important to note that most Floridians live in coastal areas where less fresh water is available.

Transportation and Water Quality

The effects of transportation on water quality can be categorized according to the source of pollution (Table 2). The most common contaminants in highway runoff are heavy metals, inorganic salts, aromatic hydrocarbons, and suspended solids that accumulate on the road as a result of regular highway operation and maintenance activities. Non-transportation related activities also generate pollutants such as fertilizers, pesticides, and atmospheric deposition.

Table 2: Facilities, Devices, Combination, and Construction (Adapted from EPA)⁷

Type	Constituent	Source
Facilities	Iron	Steel highway structures such as bridges and guardrails.
	Nickel	Asphalt Paving.
Devices	Particulates	Vehicles, atmospheric deposition.
	Lead	Leaded gasoline from auto exhaust.
	Zinc	Motor oil and grease.
	Iron	Auto body rust.
	Copper	Metal plating, bearing and brushing wear, moving engine parts, and brake lining wear.
	Chromium	Metal plating and brake lining wear.
	Nickel	Diesel fuel and gasoline, oil.
	Manganese Sulphates	Moving engine parts. Fuel.
Combination	Particulates	Pavement wear.
	Zinc	Tire wear.
	Cadmium	Tire wear.
	Nickel	Asphalt paving.
Construction	Particulates	Maintenance activities
	Copper	Fungicides and insecticides.
	Cadmium	Insecticide application.

Studies in Florida have determined that the first one-inch of runoff generally carries 90 percent of pollution from a storm⁸ (Figure 4). The quantity of runoff generated depends on the frequency, intensity, and duration of precipitation in an area. The water quality characteristics of runoff are affected by local air quality (because of deposition of air pollutants onto roads) and, to some extent, the level of traffic activity.

Figure 4: First Flush

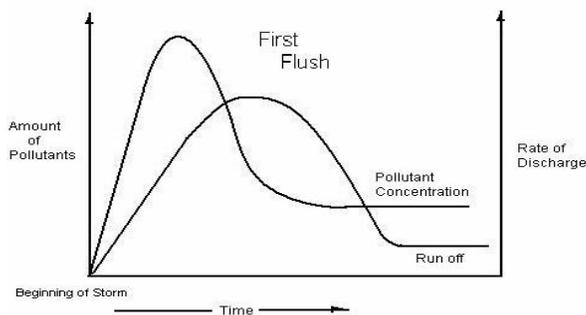


Table 3: Pollutant Concentration and Average Daily Travel⁹

Pollutant	Urban (ADT>30,000)	Rural (ADT<30,000)
Total Suspended solids	142	41
Volatile Suspended solids	39	12
Total Organic Carbon	25	8
Chemical Oxygen Demand	114	49
Nitrate+Nitrite	0.76	0.57
Total Kjeldahl Nitrogen	1.83	0.87
Phosphorus (as PO4)	0.40	0.16
Total Copper (Cu)	0.054	0.022
Total Lead (Pb)	0.40	0.080
Total Zinc (Zn)	0.329	0.080

Runoff from roads is affected by both the amount and type of infrastructure (paved or unpaved surfaces), and by the amount of travel. In the case of paved roads, pavement and structures may cover soils and destroy vegetation that would otherwise slow and absorb runoff before it reaches receiving bodies of water.¹⁰ According to the Federal Highway Administration (FHWA), the nature and extent of pollutant accumulation is affected by the following variables.¹¹

- Traffic characteristics (volume, speed, braking).
- Climate conditions (intensity and form of precipitation, wind, temperature).
- Maintenance policies (sweeping, mowing, repair, herbicides).
- Surrounding land use (residential, commercial, industrial, rural).
- Percent pervious and impervious areas.
- Age and condition of vehicles.
- Anti-litter laws and regulations covering vehicle emissions.
- Use of special additives in vehicle operation.
- Vegetation types on the highway right-of-way.
- Accidental spills.

Important environmental impacts of highway construction result from erosion of topsoil during storms. The most important constituents of storm water runoff from the construction corridor are suspended solids. Other solid related parameters such as turbidity and iron are also important.¹² Runoff from construction sites can also cause sedimentation, and other changes disrupting aquatic habitats. Construction of roads can also reduce water storage and spring flow, threatening species during droughts.¹³ Highway construction has also been cited as an activity that contributes to wetlands destruction and loss of mangroves,

seagrass, marshes, and swamps.¹⁴ However, highway maintenance has a low potential for significant water quality impacts.

¹⁴ *Ibid.*

Endnotes

- ¹ Master, Gilbert M, (1991), *Introduction to Environmental Engineering and Science*. Prentice Hall, Upper Saddle River, New Jersey.
- ² Hand, Joe, Jana Col and Linda Lord, (1996), *South Florida District Water Quality 305(b)*, Bureau of Surface Water Management, Florida Department of Environmental Protection, Tallahassee, Florida.
- ³ Florida Department of Environmental Regulation, (1988), *Stormwater Management: A Guide for Floridians*. Florida Department of Environmental Regulation: Tallahassee, Florida.
- ⁴ *Ibid.*
- ⁵ *Ibid.*
- ⁶ *Ibid.*
- ⁷ U.S EPA, (1996), *Indicators of Transportation*, Office of Policy Planning and Evaluation, EPA, U.S.
- ⁸ Florida Department of Environmental Regulation, (1988), *The Florida Development Manual: A Guide to Sound Land and Water Management*, Stormwater/Nonpoint Source Management Section, Tallahassee, Florida.
- ⁹ *Ibid.*
- ¹⁰ Florida Department of Environmental Regulation, (1988), *Stormwater Management: A Guide for Floridians*. Florida Department of Environmental Regulation: Tallahassee, Florida.
- ¹¹ Gupta, M.K, and Agnew, R.W. and Kobringer, N.P., (1981) *Constituents of Highway Runoff*. Federal Highway Administration, Milwaukee, WI.
- ¹² U.S EPA, (1996), *Indicators of Transportation*, Office of Policy Planning and Evaluation, EPA, U.S.
- ¹³ *Ibid.*