DID SCHOOL CONCURRENCY AFFECT THE LOCATION OF RESIDENTIAL DEVELOPMENT?: AN ANALYSIS OF SCHOOL CONCURRENCY IN ALACHUA COUNTY, FLORIDA

By

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To my incredible parents, Jim and Beth Holimon, and to my remarkable siblings, Beth Ellen, Paul, and Jimmy Holimon

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LIST OF ABBREVIATIONS

AP	Advanced Placement
CPA	Community Planning Act
DCA	Department of Community Affairs
DOE	Department of Education
DRI	Development of Regional Impact
FCAT	Florida Comprehensive Assessment Test
GIS	Geographic Information System
GMA	Growth Management Act
LOS	Level of Service
OLS	Ordinary Least Squares
PFSE	Public School Facilities Element
SB-360	Senate Bill 360
SBAC	School Board of Alachua County
SCP	State Comprehensive Plan
SCSA	School Concurrency Service Area
SPSS	Statistics Package for Social Sciences
USB	Urban Service Boundary

Abstract of Thesis Presented to the Graduate School
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In Florida, the school concurrency requirement was only a required element in local comprehensive plans for six years. Senate Bill 360 in 2005 was seen by the development and construction industry as a burden to residential development because of the required Public Schools Facility Element. The highly contested issue of planning for public schools and who is supposed to pay for public schools was a victory for smart growth advocates. This paper seeks to address the realized effects, if the legislation forced development to occur in a pattern, of this piece of Florida's Growth Management Act on the residential development location patterns in Alachua County, Florida.

In this research, multiple statistical tests run on different variables to test the significance of their relationship with single family residential development in Alachua County, Florida. Correlation tests were run on the level of service standards, the actual year built, and total number of parcels built per year, as well as number of units built in 2007, the school building type, and the school grade in 2007. A linear regression analysis was also run to determine if the level of service standards, actual year built,

and the mean just value of parcels were significant predictors of the number of units built in a year. Once these analyses were done, an ordinary least squares regression model was produced to determine if a spatial relationship existed between the number of units built and a parcel’s just value, actual year built of a parcel, and the level of service standard of the concurrency service area.

The model results lacked consistency between the three school levels, but the regression analyses at the high school level indicated a relationship existed between the number of units built and the LOS standard. School concurrency data for Alachua County was only available for the 2007-2008 school year, which was around the time that the economic recession began; Alachua County experienced a sharp decline in residential construction, which influenced the data model. The results of the study show that many more factors influence the rate of residential construction.

CHAPTER 1
INTRODUCTION

Florida's Residential Growth and Schools

After Florida became a state in 1845, there were only 528,542 persons living in Florida in 1900, but by 1960 the population had increased to almost 5 million (Forstall, 1995). Florida's population continued to increase by roughly 3 million persons per decade. A favorable climate, cheap land, and low taxes brought people and businesses to Florida in large quantities. Settlement occurred mostly along the coast and has slowly moved inward. Cheap land made it extremely profitable for out-of-state developers to buy large tracts of land to develop into single family residential subdivisions. Out-of-state developers quickly platted the land, sold it off, and left the state; these actions caused new cities to be formed overnight and to pay for the construction of roads, water, and sewage of the city. Florida was originally a haven for retirees and vacationers, so the construction of schools for new communities often trailed behind other public amenities.

Historically, Florida has been a low tax, low service state, which has forced Florida's student performance to lag behind other students in the United States. Budget shortfalls for education spending and rapid rates of population growth have contributed to the poor, overcrowded educational system in Florida. The levels of high growth seen throughout Florida's history increased the demand for public services. Counties and cities are responsible for providing public services, such as roads, water, sewage, and schools. Funding for these services comes from a variety of sources like sales taxes, property taxes, impact fees, and the state budget. While there are these revenue sources available, Florida is one of seven states in the US that does not have an income tax. With limited funds to provide services, Florida’s communities have suffered tremendously by not having adequate public services that could provide more vibrant, livable cities.

The public school system is often an indicator of how well a community is fairing. Schools that perform well are often indicators of a well-performing community. Real estate agents advertise school zones as a key selling point when selling a home; well-performing schools have the ability to draw new residents to the community. Property values and the subsequent property taxes are indicators of the performance of a school. The money that is generated from property taxes adds to the budget of a school district, and a higher budget allows for better facilities, highly qualified teachers, and more resources. Better educational opportunities often lead to higher qualities of life, and in turn create a cyclical effect for future generations.

Florida law requires that the school system be “a uniform system of free public schools,” and that the facilities and educational programs fit the needs of the students. The equality of a system has been found to be at a county-wide level because the needs of local populations vary greatly among and within districts in Florida. The uniformity of a school system can be anything from a district’s desegregation policies to educational opportunities available at schools. The location within a well-performing school attendance zone is seen as a desirable amenity for families, and this desirability often highlights the undesirable qualities of other school zones

Within a county, residential development occurs in pockets of growth. There can be varying levels of residential densities, and areas that have higher residential densities will require more schools to support the population. Unequal growth contributes to inequalities within the school system. There will be spatial, physical, and social inequalities to resolve due to the patterns of residential growth. In order to make education equal and accessible to all residents, counties are required to bus students to schools when the student lives farther from the school than two miles. Student attendance also alters how many students are bussed to each school because school facilities have limited capacities. Due to limited capacities at schools, students are forced to attend schools outside of a normal distance from their home because schools closer to them are at capacity. This in turn increases the levels of busing and causes greater transportation costs. Other costs, such as social disparities, are incurred as a result of capacity restrictions and spatial distribution of schools.

In 2011, school funding was cut by over $1 billion at the state level, which left local districts struggling to meet requirements and provide a good quality education. Governor Rick Scott recently announced that his budget for 2012 would focus on schools and add $1 billion into the educational system. The economic recession hit school funding relatively hard because of the decline in property values. The decreased funding at the local level will only further exacerbate problems that will result in decreased levels of educational achievement. A recent report ranked Florida's overall educational system as 11^{th} in the nation, which is down six spots from last year's rank (Matus, 2012). The rankings, based on 2009 data, put Florida's finance rank as 39^{th}, falling from 31st, and the academic rank feel from 6^{th} to 12^{th} (Matus, 2012). The rankings are expected to fall in future years as data for recent years is included in the report. By improving state resources, communities will not only gain better learning environments for future generations, but infrastructure improvements can lead to better economic development and a better quality of life for communities (Lambert & Huh, 2004). It is paramount that schools remain at the focus of state and local officials.

A Closer Look: Alachua County as a Microcosm

Alachua County is located in North Central Florida. The largest urban area in the county is the city of Gainesville, which is home to the University of Florida. The University of Florida and the Shands hospital offer a steady source of employment for many residents in the region. As the university and associated industries have expanded over the years, more employment opportunities have caused Gainesville and Alachua County's population to grow. In the early 2000s, Florida's residential construction rates were at an unprecedented height, and consequently, schools were being built to fit the needs of the growing population. In Alachua County, 145 to 155 single-family home permits were issued per month during 2004 and 2005 (Curry, 2011). During the economic boom of the early 2000s, residential construction and the siting of new public schools did not usually happen congruently. New residential units were built with very little analysis on the capacity of the schools that units were zoned for. Just a short time after signing an interlocal agreement to insure that the Alachua County School Board and Alachua County Commission would work together on the siting of future schools, the school board announced plans to buy land for a new high school (Byerly, 2006). This announcement in 2006 took local officials by surprise as there was no public input, no analysis had been done on the need for a new high school in that specific area, and the formal process to acquire the land had not been followed. The school board had been caught up in the momentum of the economy during the period of growth, and while planning for future growth is always advisable, planning with a thorough analysis will better serve residents over a longer period of time.

The Alachua County Public Schools have been consistently performing above state averages in recent years on the Florida Comprehensive Assessment Test (FCAT) (School Board of Alachua County, 2009). In 2006, the Alachua County Public School district was rated an ‘A’ grade district by the state based on FCAT scores, and there were 19 schools that received an ‘A’ rating in the district (SBAC, 2006). Not only were students outperforming their peers on the FCAT in 2006, but Alachua County was also “ranked first in the Florida in the percentage of high school students passing the rigorous Advanced Placement (AP) test” between 2005 and 2007 (SBAC, 2007). In 2009, the district was named “one of 14 ‘academically high-performing’ school districts in the state by the Florida Department of Education” (SBAC, 2009). These top performances clearly show that education is a strong element in the community and also that the quality of education in Alachua County is extremely high compared to most other school districts in Florida.

Alachua County has a reputation for being pro-growth management and maintaining adequate public services for its residences. School concurrency is no exception, and although it is no longer a required element of local governments’ comprehensive plans, Alachua County and the School Board of Alachua County have recognized that it has benefitted planning for residential growth and the impacts on the school system. In order to determine if school concurrency has any negative effects on residential growth, the research revealed in this document addresses the following questions: did the level of service of a school concurrency service area affect the location of new residential units in Alachua County? Is there a relationship between school ratings and the number of new residential units? Is there a relationship between school ratings and the level of service of school concurrency service areas?

Organization

The work will be presented in six chapters. Chapter 2 describes how Florida chose an innovative approach to deal with growth and the timing of public infrastructure, specifically public schools. Chapter 3 includes a narrative of the study area and its characteristics and the methodology used in the analyses. Chapter 4 details the results from the statistical analyses and GIS analyses. Chapter 5 discusses the conclusions that can be drawn from the results. Chapter 6 discusses the implications on planning policy and questions that have arisen during the research.

CHAPTER 2
RELATIVE LITERATURE REVIEW

School Concurrency

Developing property in Florida before the 1970s was a simple process that required very little review by the local planning department, for either residential or commercial use. Developers did not have to go through land use consistency or site plan reviews, and they did not have to deal with zoning, platting, or environmental permits (Powell, 2001). At that time, concurrency, the term used to describe the process of ensuring adequate public facilities that were to be built concurrent with development, was an unheard of process. Florida was in the midst of an unprecedented phase of population growth that left local planners and legislatures baffled as to how to maintain public facilities for the influx of new residents and how to plan for future populations. Prior to the 1970s, out of state developers were platting large tracts of land for residential development and then leaving local governments to handle the enormous task of building the supporting infrastructure. In response, the Florida Legislature effected the Growth Management Act, an effort to provide communities with legal ways to balance growth, plan for public facilities, and protect important environmental resources. Public facility concurrency was designed as a tool for local governments to ensure the availability of adequate public facilities for current and projected populations. Public facilities are an integral part of the health, safety, and general welfare of all communities, and should be used to improve and preserve the social, economic, environmental, and physical health of communities.

Due to the recent changes to Chapter 163, Part II of the Florida Statute, many questions have arisen regarding how to manage Florida's overcrowded classrooms.

School concurrency was a planning tool intended to ensure that new developments would not cause any strains on public facilities. The Community Planning Act (Chapter 2011-139), signed into law in 2011, gives local governments the option to implement school concurrency in cooperation with local schools boards, whereas it previously required local governments to have a strategic plan in place. Without a statewide school concurrency requirement, local governments that choose not to employ the optional public school facilities element within their comprehensive plan will be allowed to approve new developments without needing to verify that adequate space in the public schools exists. These changes empower school boards to address fluctuating populations and the voter approved classroom size amendment, Chapter 2003-391 of the Florida Statute, without input from the local planning departments. Florida's population boom has slowed down considerably due to the most recent economic recession that began in late 2007, but this does not mean that there will be a decrease in the demand for public schools. With the recent release of new population counts in the 2010 Census, Florida's policymakers and planners will be better able to evaluate the current and future demands on the public school system and the growth that Florida will experience in the coming decades. These numbers help in estimating the school enrollment projections. School enrollment projections facilitate school districts in determining where to allocate their funding; without proper projection techniques and intergovernmental agency cooperation, taxpayer money will be wasted, children will be placed in overcrowded classrooms, and facilities will be underutilized by functioning at under capacity. The public schools facility element (PFSE) was a legislative obligation that was intended to incentivize local government agencies to work together with the school district in planning for the future of the community. Constant legislative changes to the state's groundbreaking growth management planning process have severely hindered the law from performing as it was originally intended. Because of these changes, it is increasingly difficult to assess and therefore recommend policy regarding the actual impacts of growth management legislation on land use patterns, public facility improvements, and long-term planning decisions made in Florida.

While local governments should be capable of determining their own public school infrastructure needs without having to be told do so by the state, the public school system is often in conflict with local planning agencies and both need encouragement to work together. Public schools can cause a multi-faceted array of complex issues. If an area is experiencing growth and their schools are overcrowded, then this area rightly deserves more classrooms; however, with more classrooms or a new school brings higher growth rates. School location is essential to real estate market principles. Schools are one of the most important aspects of communities as they "help to define a community's quality of life, influence development decisions, and are a factor in where people choose to live" (Florida Department of Community Affairs, 2007, p.7). Future land use planning and the availability of public facilities directly impacts land values and the rate of development in a community, so it is in the best interest of local governments and the state to ensure that facilities exist, or are planned, for communities or growth will be hindered (Ben-Zadok, 2005).

These planning practices beg the question of which came first: residential development or school placement. As new schools are built, residential development increases in the area around schools, but schools are not built until the school board sees that capacity at other schools have been reached. In Hillsborough County, real time tracking of residential development permitting has enabled school districts to be more involved in the community planning process, which means that the school district is more in tune with what areas will be impacted by development (Suarez, 2011). Active planning from both local governments and school boards facilitates the rate at which growth can occur because increased levels of communication between government agencies ensures a greater depth of knowledge and data. When encouraging economic development in cities, planners should encourage better uses of public facilities like schools, which will contribute to the overall attractiveness of a community. School districts that communicate well, and often, with planning departments in their county will have an advantage over other counties in maintaining adequate public facilities that operate at proper capacity levels.

This research seeks to address the effects that legislative policy had on the location of residential construction within Alachua County. The growth management legislation was created largely as a preemptive policy to reduce residential sprawl and protect Florida's environmental resources, but it lacked force, or clear direction, on how to deter development from occurring in this pattern. Residential location choice is often affected by the school performance, which creates of cyclical pattern of higher property values and higher performing schools or lower property values and lower performing schools. The improvement of neighborhood schools can increase the economic vitality of a community, not just the educational achievement of students (Lambert & Huh, 2004). It is an assumption by developers, parents, and others that neighborhood characteristics directly affect the learning environment and the overall performance of a school. It should be noted that there is a lack of literature on the relationship between level of service standards and residential property values. The relative literature that needs to be addressed will cover the evolution of the growth management legislation,how it came to handle school facilities, and what the current legislation exists regarding school facility planning and community planning in Florida.

A Brief History of Growth Management in Florida: the 1970s to early 2000s

The early beginnings of smart growth principles in Florida can be traced back to the early 1970s with the passage of the State Comprehensive Planning Act and state regulation of developments of regional impact (DRIs) and areas of critical state concern, which include the Green Swamp, the City of Apalachicola, the Florida Keys, the City of Key West, and the Big Cypress Area. The Local Government Comprehensive Planning Act was passed in 1975 and required local governments to submit comprehensive plans by 1979, but did not give the state planning agency the power to reject inconsistent plans or enforce state requirements (Chapin, Connerly, & Higgins, 2007). In 1985, the state legislature passed the State Comprehensive Plan (SCP) and the Growth Management Act (GMA). The implementation of these two innovative planning policies was overseen by the Florida Department of Community Affairs (DCA), the state planning agency. The DCA was charged with reviewing all local comprehensive plans to check for consistency against both state and regional plans. Local governments were required to adopt concurrency requirements to provide public facilities. The concurrency requirement applied to six public facilities or amenities: potable water, sanitary sewers, solid waste, drainage, parks, and roads. During this era of growth management legislation, the vital requirement designed to ensure local government compliancy was the interlocal agreement requirement. The intergovernmental agreements were to provide for coordination and consistency among adjoining local governments, counties, and regional planning councils.

Local governments, both counties and municipalities, were required to make their comprehensive plans consistent with the rules found in rule 9J-5 of the Florida Administrative Code. Rule 9J-5, passed in 1986, outlined the criteria for review of local comprehensive plans and spelled out the minimum requirements for local governments. The powers of consistency gave the state the right to oversee that all local plans fit into the regional schema cohesively. Consistency provided a means to guide local land use regulations, infrastructure, and budgeting for capital expenditures (Chapin et al., 2007). The concurrency requirement was also slightly reinforced in 1986. A major impediment to the implementation of the concurrency element was that most communities could not afford to keep up with the rate of growth on their own, and local governments did not want to repel development by forcing developers to pay the costs. Evidence of the inability to support high levels of growth was found when an Environmental Land Management Study Committee reported that “39% said infrastructure was operating below adopted LOS standards and 28% said state roads were the most inadequate” (Chapin et al., 2007, p.35). While concurrency was argued as the toughest legislative element to implement, the DCA did not intend to cause growth to stop; rather, the intention was to “protect human welfare, maintain quality of life, and preserve ecosystems” (Ben-Zadok, E., 2001, p.846).

In 1995, the legislature added the optional public school facilities element by establishing requirements of school concurrency. If made part of the comprehensive plan, local governments were to establish, in coordination with the school district, the level of service standards, financial feasibility, and the location of new schools. While interlocal government cooperation was encouraged in setting the LOS standards, only schools board had the legal authority to set the standards that were to be implemented in local comprehensive plans' capital improvements elements (Weaver, 2001). Legal ambiguities made the implementation of the optional PSFE a difficult task to undertake. Although it was optional, the fastest growing counties implemented light versions of the public schools facility element.

A new state study on the Growth Management system was commissioned by then Governor Jeb Bush in 2000. The findings were the beginnings of what the legislature would adopt five years later. Meanwhile, the interlocal agreements that were required in 2002 emphasized organization of land use planning and public school facility planning. Greater intergovernmental coordination, specifically among planning for school facilities and water, were adopted by the Legislature in 2005 as part of Senate Bill 360. The interlocal agreement "requires consensus on level of service standards, concurrency service areas, maximum utilization of capacity, annual adoption of public schools capital facilities program, options for proportionate-share mitigation, and implementation procedures" (Florida DCA, 2005).

Senate Bill 360

Before 2005, not much was done in regards to school concurrency and many local governments and school boards were afraid of the difficulties that it would cause. Public schools were left off of the originally required public facilities concurrency element because they have always been a highly contentious issue, due to high operating costs and lack of political will to support higher taxes for these social facilities. Public schools have always been one of Florida's largest expenses, and the costs of "planning, construction, and maintenance of new schools are among the largest in the education budgets of state and local governments, especially in fast growing areas" (Chapin et al., 2007, p.32). Broward County attempted to make use of the optional public school facilities element in their comprehensive plan, but this element of their plan was found to be not in compliance with the state minimum regulations and was subsequently removed from their comprehensive plan. Palm Beach County was the only county that successfully attempted the school concurrency optional element. Urban counties began to recognize the needs of school districts and the growing problem that school overcrowding was becoming.

The Growth Management Study commission report published in 2001 had a few recommendations for greater integration of schools into community planning. The commission recommended that the state regulations concerning school siting be changed so that "smaller schools in urban cores targeted for revitalization" could be built, site acreage requirements eliminated, a financial feasible school portion to the capital improvements portion of local comprehensive plans included, and adequate capacity for new residential development confirmed (Growth Management Study Commission, 2001, p. 32). These recommendations were further developed and incorporated into Senate Bill 360 (SB-360).

In July 2005, SB-360 was signed into law and required all districts, except those with waivers and exemptions, to be in compliance with the requirements by December 1, 2008 (Florida DCA, 2005). SB-360 became part of the growth management legislation of the Florida Statute at the height of the development boom in Florida, and in many cities, schools were struggling to keep up with the rate of growth from the surge of new residential developments. The intention of requiring the school concurrency element in local comprehensive plans was to ensure planning for adequate public facilities, and the public school facility element was only to be applied to residential development. Local governments were not allowed to approve residential development if adequate facilities were not going to be in be available or under construction within three years from the final site plan approval or subdivision platting. The developer also had the option to fulfill the school concurrency obligation through the proportionate fair share system. The Legislature also included the proportionate fair share system to ease the burdens placed on the development industry. This option allowed developers to pay a fee, their portion of transportation and school concurrency costs, but this did not guarantee that the local government would be able to raise the rest of the money for needed infrastructure (Chapin et al., 2007). All of the pieces of the PFSE, including the intergovernmental coordination agreement, proportionate share mitigation plan, and capital improvements plan, were to be found throughout municipalities' comprehensive plans that were to go through the DCA review process to check for consistency at the local, regional, and state levels.

The bill required that the financial feasibility of the capital improvements element section of local comprehensive plans be defined. The capital improvements element was intended as a budgetary guide for local governments to plan for future populations. By necessitating financial feasibility of the capital improvements plan, the Legislature aimed to make the local governments and school boards work closely and carefully in projecting growth and planning for growth impacts. SB-360 also required the adoption of a new level of service standards for public schools. The level of service (LOS) standards can be defined as the "'capacity per unit of demand', in this case meaning the number of pupils to be served and not the schools' performance based on some qualitative measurement" (Powell & Gazica, 2005, p. 45). LOS standards were left up to local governments to determine based upon data and analysis, and they were to be applied on a countywide service area for the first five years (Powell & Gazica, 2005). LOS standards varied by school type (elementary, middle, and high school levels), but had to be applicable to schools of the same type (Florida DCA, 2007). School boards and local governments were to apply LOS standards to the district at first, but within the first five years of adopting concurrency, the standards had to be applied on a less than district wide level, which could be adopted concurrency service areas or school attendance zones. A major issue that arose when schools were required to reduce the service areas on a less than district wide basis was the potential inequalities in education. Also, requiring less than district wide service areas could force districts to redraw school zones, an often lengthy, contentious and expensive process, on an annual basis, which would then force counties to adjust the LOS standards yearly.

The interlocal agreement of the PSFE required all local governments to agree on the above criteria and be consistent with each other's comprehensive plans. The intention of the PSFE was to make local governments to work together on planning for the impact of residential development on school facilities to ensure that there will be adequate school capacity for the 5-year planning period. By requiring coordination of local governments in regards to school planning, the involved parties were made aware of land-use decisions and future residential developments that impacted student populations, which in turn allowed the involved parties to discuss the impacts that these decisions would have on the vision of the community (Florida Department of Education, 2005). While the coordination of local governments and the school board was a daunting task, the involved parties should have been able to make use of the expertise of everyone involved for decisions regarding population projections, school siting, land use decisions, and financial feasibility planning (Gibson, 2006).

Not all local governments were required to fulfill the school concurrency obligation if they fit the exemption rule or qualified for a waiver. The district wide waivers were granted if the capacity rate for all schools in a district did not exceed 100% and the 5-year projected student growth rate was less than 10% (Florida DOE, 2008). If only one school exceeded capacity, districts were still eligible for waivers if other conditions were met (Florida DOE, 2008). The timespan of the waivers were two years and were to be jointly completed by the county and school board (Florida DOE, 2008). For local governments located in counties that were not eligible for waivers, there was an exemption option made available. Only those local governments that were approving residential developments that were fewer than 50 units or developments that were creating less than 25 students over the five-year planning period qualified for an exemption from the interlocal agreement (Trevarthen & Friedman, 2005). Municipalities that did not have any public schools within their boundaries or did not annex land that permitted residential uses that affected school attendance during the preceding five years qualified for an exemption (Florida DOE, 2008). Local governments that agreed upon a visioning plan and urban service boundary (USB) lines were not subjected to the typical DCA comprehensive plan review process (Trevarthen & Friedman, 2005). The interlocal agreement exemptions were intended to alleviate restrictions on rural counties, so that growth would occur unhindered in these communities. However, the exemptions were a contributor to the encouragement of urban sprawl that was a major glitch in the growth management system and directly conflicted with smart growth principles that the system was built upon.

Exemptions and waivers were written by legislators so that local governments were given flexibility to plan for future growth creatively. The laws recognized that the policies could not be uniformly implemented because of different physical, social, and economic climates across the state. However, throughout the evolution of the growth management system, exemptions became so common that they almost became the rule. The constituents that fought for high levels of flexibility were usually won by large land developers that were seeking a relaxation of land development rules so that their current projects would pass regulations. This practice of goal and regulation crafting and land development diluted and demoralized the entire premise that the GMA was based upon.

SB-360's lack of a policy for the redevelopment of existing facilities contributed to the deterioration of urban schools and, consequently, to urban sprawl. The policy did little to encourage compact development and to provide for planning for schools that were experiencing a decline in population. Increasing levels of suburbanization created a demand for schools outside of downtown areas and school districts were forced to focus revenues on building new schools instead of allocating money for the upkeep and revitalization of existing facilities.

Class Size Amendment

Now that municipalities are no longer required to directly and actively plan for schools through concurrency, it is anticipated that the class size amendment will be what keeps residential development in check. The unfunded class size amendment was approved by voters in 2002. The timing of this amendment had a particularly interesting effect on the school concurrency because the optional school concurrency element was also enacted in 2002. Of the few counties and school boards that chose to implement the element, many faced lawsuits from developers because of improper implementation techniques. As the schools began the process of reducing class sizes, it seemed that the attention shifted away from concurrency, and there were no lawsuits after school concurrency became a required element in 2005.

The voter approved amendment applied to core classes (math, science, social studies, and language arts) and capped class sizes depending on the grade. For prekindergarten to grade 3, the cap was placed at 18 students, for grades 4 to 8, the class sizes were capped at 22 students, and for high school, class sizes were capped at 25 students (Florida DOE, 2011a). Schools were given 8 years to meet the requirements and were given phased requirements to help bring class sizes down. During the 2003-2006 school years, the requirements were only applied to the district level, but schools were required to reduce the number of students per classroom by at least two students per year (Florida DOE, 2011a). For the 2006-2010 school years, compliance was to be met at the school level, and for the 2010-2011 school year, compliance was to be at the classroom level.

Schools that do not meet the class size reduction goals face fines. School districts that are struggling to meet demands of growing student populations are now being forced to pay fines on top of making more classroom space. For the 2011-2012 school year, the Miami-Dade County school district is facing fines of up to $10 million and the

Pasco County school district is facing a $4.9 million fine for not meeting the requirements (Alexander, Greggis, & Swirko 2011). While intended to incentivize schools boards to meet the requirements, these fines are further burdening an already overburdened system. Oftentimes, schools do not know how many students they will have for the school year until the first day of school due to families moving in, out, and within the district. Instead of the fines, the schools that meet the requirements should be given monetary rewards or another form of positive reinforcement.

Community Planning Act

After over twenty years of changes in the growth management legislation, the state legislature and their lobbyists, consisting of large-scale land development companies, pushed the new era of legislation into focus. The main concern regarding the old legislation were that the GMA hindered economic development through a series of over-reaching, over-lapping regulations that had a set of overly prescriptive measures that did not apply to all communities (Buzzett, 2011). In June 2011, the Community Planning Act (CPA) was enacted by the Legislature. The CPA was a reorganization of the Growth Management Act from a top-down planning approach to letting cities be cities. As of 2011, there is no longer a state requirement for concurrency of transportation, schools, and parks and recreational facilities, but the concurrency requirement for wastewater, solid waste, drainage, and potable water facilities is still in place. Concurrency of transportation, schools, and parks and recreational facilities is an optional element that local governments can choose to enforce. For school concurrency, the local governments are encouraged to employ this planning tool on a district-wide basis so that the implementation and evaluation will be cover the full district, rather than just school attendance zones. By having all municipalities within a county implement the concurrency requirement, it will allow the service areas and schools within the district to be evaluated evenly and to ensure that the schools are of an equal quality. It is not a requirement that all municipalities within a school district adopt school concurrency requirements, and it will not impede the implementation of concurrency for those municipalities that choose to impose the requirement. Even if concurrency is not met, local governments will still be able to allow the development to occur if all of the following conditions are met (Florida Department of Economic Opportunity, 2011):

1. The development is consistent with the future land use designation and other pertinent portions of the comprehensive plan for the specific property as determined by the local government.
2. The capital improvements element and the school board's educational facilities plan provide for facilities adequate to serve the development, and the element has not been implemented or the project includes a plan that shows that the needed facilities can be reasonably provided.
3. The local government has provided the means to assess the landowner a proportionate share of the cost of providing the facilities necessary to serve the development.

By allowing development to occur even though concurrency has not been met, this gives local governments the opportunity to maintain control over the capacity of schools while also still allowing growth to happen. Flexibility in planning, along with cautious maintenance of LOS of public facilities, should not have adverse effects on economic development, but rather it should help strengthen local economies.

Funding for Concurrency and School Facility Funding

Most often, no matter what strategic goals a local government envisions the achievements are limited to what the budget will allow. Florida has historically been a low tax, low service state, and with the sharp increase in population over the past few decades, a serious strain has been placed on the state's infrastructure. In a 2006 study, Florida was ranked "35th in overall tax burden and 44th in taxes as a percent of personal income" (Chapin et al., 2007, p.59). Florida is one of seven states that does not have an income tax, and in 1992, a cap was placed on property tax increases for homesteaded properties to 3% or the rate of increase in the Consumer Price Index, whichever is lower (Chapin et al., 2007). One third of state revenue is generated from sales and use taxes, but this means that the state is depending on a revenue source that fluctuates depending on the strength of the economy at that moment in time. When the State Comprehensive Plan Committee was evaluating the feasibility of implementation of the growth management laws, they found that the infrastructure needs throughout the state totaled almost $53 billion, which did not even include public education facility needs (Chapin et al., 2007). The goal of smart growth was to "[direct] state fiscal resources toward areas where new developments would be adequately served," but the reality was that development was being pushed outwards to areas that were under-capacity (Nicholas & Steiner, 2000, p.13). The cost of development in outwardly sprawling areas was much more expensive than the intended goals of compact development.

The Legislature continues to pass new laws and requirements for local governments to adhere to, but do not provide additional funding to comply with the rules and regulations. Local governments have been repeatedly told that they must provide adequate facilities throughout their community and to prove the financial feasibility of providing these services. If a local government is unable to provide adequate facilities for the projected population, then the local government is forced to restrict the growth of new development. Alternatively, the failure to fund public facility needs and requiring adequate capacity for services forced developers to look for areas that could support new growth, which challenged the state's anti-sprawl policies (Pelham, 2001). The imposition of the concurrency law was passed on to counties and municipalities along with tax cuts and limitations on sources of revenue. Funding for local communities has been severely restricted by the Legislature with seemingly little regard for the implications this has on communities. Legislation has left infrastructure to be a local problem, but the local governments are left with very few options to raise revenue to fund infrastructure improvements.

Most school districts use a variety of funding sources to pay for new school buildings. Relying on impact fees as a source of funding for local infrastructure became common practice in Florida's local governments in the 1990s. Impact fees are a one-time fee paid by developers to offset the projected costs of public infrastructure that will be impacted by the new development. In 1991, 125 of 459 local governments used impact fees to generate revenue. As of 2005, "30 counties, 38 municipalities, 24 school districts and 22 independent special districts" used impact fees specifically to raise funds for schools (Cahill, Gauthier, Boles, Foltz, Lauer, Smith, & Nicholas, 2006, p.7). However, impact fees are an unreliable source of funding for schools when there is no new construction occurring.

A major criticism of the school concurrency requirement is that local governments were forced to keep up with growth, but were not given any new sources of funding or tools to raise new funds. In the 2005 Legislative updates, the state allocated $1.5 billion for new infrastructure, but the majority of this allocation was to go towards state roads

(Chapin et al., 2007). Fundamentally, the state's failure to provide adequate funding for infrastructure to keep up with the rapidly growing population and outward expansion of cities has been a key reason in the failure of local governments to sustain the strains placed on the growth management system. If adequate funding existed for the new roads, schools, and other public facilities, then ground conditions would be arguably different and growth management laws may have been more successful in allowing the state to grow intelligently.

During the 2005 legislative session, over $100 million in additional funding was allocated specifically for use by the public school system to deal with growth. The Classroom for Kids program provided $83.4 million for schools, and the High Growth District Capital Outlay Assistance Grant program provided $30 million (Florida DCA, 2009a). After the 2008-2009 budget, these two sources of funding were no longer made available. In order to facilitate the creation of the interlocal agreements and public school facilities element, the DCA awarded grants worth $25,000 to local governments. Over half of the school districts took advantage of this funding (Florida DCA, 2010). A major piece of the 2005 school concurrency legislation was the provision for $113.4 million for school construction during the 2005-2006 fiscal year and $75 million every year after that (Florida DCA, 2005). This new funding for schools was a result of a particularly strong economy at the time of passage.

As a part of SB-360, the concept of proportionate share mitigation was extended to allow local governments to require developers to pay their fair share of impact on the school infrastructure. The proportionate share mitigation process was to occur when there was no available capacity at the time of the development approval, whereas impact fees applied to all residential development no matter what the capacity levels were (Cahill et al., 2006). Developers are required to enter into an agreement with the school board. The developer is not limited to donating money to meet the LOS standards. For example, Alachua County currently allows developers to donate, construct, or fund school facilities, or the creation of mitigation banking, as well as creating charter schools to support the development (Alachua County, 2011). Alachua County requires that the developer's mitigation strategy make a contribution to the permanent capacity of the school system, which means that the use of portable classrooms is not acceptable (Alachua County, 2011).

In order to meet the requirements for the class size amendment, the Legislature appropriated over $20 billion towards operational expenses and facilities funding. The following table (Table 2-1) from the Florida DOE (2011a) details the levels of funding for operational expenses and facilities funding that were appropriated since the enactment of the class size amendment.

Table 2-1. Funding for Operational Expenses and Facilities by School Year

School Year	Operating Funds	Facilities Funds	Total Funds
2003-2004	$ 468,198,634	$ 600,000,000	$ 1,068,198,634
2004-2005	$ 972,191,216	$ 100,000,000	$ 1,072,191,216
2005-2006	$ 1,507,199,696	$ 83,400,000	$ 1,590,599,696
2006-2007	$ 2,108,529,344	$1,100,000,000	$ 3,208,529,344
2007-2008	$ 2,640,719,730	$ 650,000,000	$ 3,290,719,730
2008-2009	$ 2,729,491,033	$ 0	$ 2,729,491,033
2009-2010	$ 2,845,578,849	$ 0	$ 2,845,578,849
2010-2011	$ 2,913,825,383	$ 0	$ 2,913,825,383
2011-2012	$ 2,927,464,879	$ 0	$ 2,927,464,879
Total to Date	$19,113,198,764	$2,533,400,000	$21,646,598,764

The chart demonstrates the various political and economic conditions in the state throughout the years of implementation. The large increase in facilities funding in the

2006-2007 year can be attributed to the sudden increase in population growth, the housing boom, an increase in the tax base, and the Legislatures recognition that the state's public school infrastructure was not able to meet the level of demand. The housing bubble burst and funding for facilities was cut in half the following school year. Then, facility funding was nonexistent when the economic recession became a long-term problem. In addition to state funding, local funding for school budgets has also significantly decreased due to declining property values. School facility funding will be continue to be a problem for Florida as the student population increases and the aging infrastructure becomes burdensome.

The fundamental question that can be raised in the concurrency debate and what continues to drive the debate is what party is responsible for providing public schools and other infrastructure. These facilities are being used by the general public, so the general public should be providing funding for the infrastructure. While it is the local governments' constitutional responsibility to provide these facilities, residents of this state balk at the idea of paying higher taxes and still continue to demand more services as their communities begin to grow. During the current economic recession, local governments are scrambling to make their budgets work without raising taxes. In 2010, six municipalities in other states across the country filed for Chapter 9 bankruptcy protection and long list of other cities have narrowly avoided this option (Kim, 2011). The recession has hit cities particularly hard while they try to lure new business and jumpstart the local economy while having less funding to provide for the new infrastructure that accompanies growth. Enforcing concurrency requirements without providing the mechanism for funding the infrastructure will force cities to pass the problem on to the developer or prevent the development altogether.

The state unfairly forced local governments to meet these requirements and to face penalties for not complying with concurrency, yet they did not provide additional funding to meet the needs of the communities. While the concurrency requirements have not stifled the creativity of local planners throughout Florida, the ability to fund the creative projects and encourage growth and economic development has been severely limited by lack of funding to practice good planning principles. The fiscal theory of requiring a capital improvements plan to show the financial feasibility of providing adequate public facilities is not supported by the fiscal reality of the needs of a community and the needs to improve existing public facilities. Were school districts able to provide adequate public school facilities without curtailing development? This research examines the impacts, if any, that school capacities and level of service standards had on new single family residential construction in Alachua County in 2007 through 2010.

CHAPTER 3
METHODOLOGY

Methodology Overview

School choice and the quality of a school have strong influences on the residential location choices of families. School districts are frequently evaluating and analyzing population distributions, building new schools for growing populations, and monitoring school attendance to account for varying growth rates within the district. A study conducted by Bayoh, Irwin, and Haab (2006) found that one of the strongest indicators in residential household choice was school quality and other local public goods. This research aims to evaluate the effectiveness of school concurrency, its impact on the learning environment, and its impact on residential construction in recent years. More specifically, did the actual utilization, the number of full-time enrolled students divided by the capacity of a facility, of a school facility affect the location of new residential units in Alachua County? Is there a relationship between school ratings and the number of new residential units? Is there a relationship between school ratings and the actual utilization of a school facility?

This research was conducted through a Geographic Information System (GIS) analysis and regression analysis of Alachua County public schools to show the relationship between single family residential homes that were built in the selected study years and the corresponding capacities in schools. After a regression analysis was conducted on selected variables, the variables were tested in a GIS to see if there was a spatial relationship. It was anticipated that there would be an inverse relationship between the number of residential units built and the actual utilization of facilities in school concurrency service areas; in other words, a higher the number of units built in a year would indicate that the actual utilization percentage would be lower because there was more space for students in the concurrency service area. It was hypothesized that there would be a negative correlation between the school grade and the capacity of a school because smaller class sizes would improve a student's performance. It was an assumption that schools operating at capacity would have smaller class sizes than those that are over capacity, and it was also assumed that smaller class sizes would give students more individualized attention from teachers. More individualized attention can contribute to a better learning environment, and thus students would perform better on standardized tests and have higher graduation rates.

By planning to operate at capacity or lower, schools are better able to meet the requirements of the school class size amendment. Local policy makers will be able to use this research to better determine where to encourage residential development and redevelopment to reach density goals while still planning for adequate space in public schools. Local policy makers will be able to concentrate efforts of residential development in certain areas while still achieving the goals outlined in the PSFE of the comprehensive plan.

Study Area

The selected study area for this research is Alachua County, Florida. Alachua County is located in North Central Florida. Alachua County was selected as the study area because it is a medium sized county, both in land area and population, compared to other counties in Florida. It is a data rich county compared to the more rural counties in Florida. The Community Planning Act of 2011 no longer requires the PFSE, but Alachua County has elected to retain this optional element in their comprehensive plan. The original PSFE interlocal agreement was signed in 2006. The School Board of

Alachua County (SBAC), Alachua County, and 10 municipalities signed the agreement. The municipal governments in Alachua County are Alachua, Archer, Gainesville, Hawthorne, High Springs, Lacrosse, McIntosh, Micanopy, Newberry, and Waldo. Alachua County is 620,486 acres and the largest city is Gainesville.

The population of Alachua County in 2000 was 217,955 and in 2010 the population was 247,336, which was a 13.5% increase (U.S. Census Bureau, 2011). Florida's growth rate between 2000 and 2010 was 17.6% with a population increase of nearly three million people. In Alachua County, 17.9% of the population is under 18 years, which is close to Florida's 21.3% of the population under 18 years (U.S. Census Bureau, 2011). In Alachua County's PFSE Data and Analysis document (2008), the school age population, defined as ages five to seventeen, totaled 13.5% of the population in 2006, which was lower than the Florida's 16.9%, and the school age population was forecasted to increase slightly by 2020 and decline in 2030. In the 2010 decennial census, there was a reported 112,766 housing units and 38.3% were multi-unit structures. This can be attributed to the market accommodating a high population of college students in the area. The median household income in Alachua County, $38,597, is over $6,000 less than Florida's overall median household income at $44,755 (U.S. Census Bureau, 2011).

As school enrollments increase, new schools are needed and boundaries are adjusted to accommodate the new populations as equally as possible while trying to minimize transportation costs. Alachua County recently changed school attendance zones to accommodate a new elementary school that is to be opening for the 2012-2013 school year. Along with attendance zone changes, the capacities and population distribution at the schools where students will be transferred from were monitored and adjusted (Alexander et al., 2012). In Alachua County, schools that are above 90% are "considered crowded and not eligible for students to attend as part of school choice" (Alexander et. al, p. 1, 2012). This process often takes weeks to accomplish due to numerous public meetings to gather input from parents' concerns about the new zones. By opening the new school, capacity levels will be alleviated in the Northwest Gainesville area. As evidenced by the growth of the population, it is important that school districts and local governments maintain communications about future residential growth.

Datasets

School location data was obtained from the Alachua County government. School capacity information and school grades were obtained from the School Board of Alachua County. All other geographic data used in the analysis was downloaded from the Florida Geographic Data Library (FGDL). The datasets were very similar, but still required some manipulation in order to be aggregated or joined to the SCSA. Separate tests were run for the three school levels: elementary, middle and high school. Three separate tests required three copies of the parcel data, but spatially joined to the different SCSA levels.

In Alachua County, there are twenty-four public elementary schools, seven public middle schools, and seven public high schools. Schools grades for twenty-two elementary schools, nine middle schools, and eight high schools were available. The study will examine the traditional public schools in Alachua County and will not incorporate charter, magnet, specialized, or private schools. Only traditional public schools were utilized in the model because the other school types can be graded differently, are open to public enrollment but privately funded, or are privately funded and not included in concurrency calculations. Grades for schools were available from the 2001-2002 school year through 2010-2011 school year. When a school was classified as a combined school, the grade for the year was given to both school levels; for example, Hawthorne Community School serves grades 6-12 and receives one grade for both high school and middle school, but for concurrency purposes, the middle school and high school capacities are separate. In Florida, school grades are awarded letter grades; for example, the highest grade a school can receive is an A, and the lowest is an F. The grades were recoded as numbers so that all of the data was at the ratio level of measurement. The following table (Table 3-1) shows the new codes for school grades.

Table 3-1. New Codes for School Grades

School letter grade	Numerical grade
A	5
B	4
C	3
D	2
F	1

A field defined as building type was added to the schools databases. The school building type was classified as either campus style or neighborhood style. If identified as a campus style building, the attribute was given a value of 1; if the building was identified as a neighborhood school, then the attribute was given a value of 2. The value for the neighborhood school was 2 because it was assumed as more desirable for parents to be located near and would have less negative impacts than larger, campus style schools. Neighborhood elementary schools were not adjacent to another school facility and were located on a parcel smaller than 35,000 acres. Neighborhood middle schools were not adjacent to another school facility and were located on a parcel smaller than 60,000 acres. Neighborhood high schools were not adjacent to another school facility and were on a parcel smaller than 60,000 acres. Aerial images of the schools used in this study were used to identify if there was an adjacent school facility.

Alachua County maintains the school concurrency analysis on a less than district wide basis. School concurrency boundaries were obtained from the Alachua County Department of Growth Management. The less than district wide school concurrency service areas (SCSA) are larger than the school zones for each level and were generally based on community boundaries and geographic features like roadways (Alachua County, 2008). According to Policy 2.3.3 of the PSFE in the Alachua County Comprehensive Plan (Alachua County, p.394, 2011):

> SCSAs shall be established to maximize available school capacity and make efficient use of new and existing public schools in accordance with the LOS standards, taking into account minimization of transportation costs, limitations on maximum student travel times, the effect of court approved desegregation plans, and recognition of the capacity commitments resulting from the development approvals by the local governments within Alachua County.
>
> SCSA boundaries shall consider the relationship of school facilities to the communities they serve including reserve area designations and extra-territorial areas established under the “Alachua County Boundary Adjustment Act” and the effect of changing development trends.

The capacity levels were obtained for ten elementary school concurrency service areas, nine middle school concurrency service areas, and six high school concurrency service areas. Capacity levels for the concurrency service areas were for the 2007-2008 school year and projections for the 2010-2011 school year. When the PFSE data and analysis were created, the district served 26,235 students and had the capacity for 30,315 (Alachua County, 2008). In 2007-2008, the high school permanent program capacity was 8,617, and the actual enrollment for that school year was 8,488, which was a 98.5% utilization rate (Alachua County, 2008). The middle school permanent program capacity for 2007-2008 was 7,465, and the actual enrollment for that year was 5,573, which was a 74.7% utilization rate (Alachua County, 2008). The permanent program capacity for elementary schools in the 2007-2008 school year was 13,310, and the actual enrollment was 11,750, which was a 88.3% utilization rate (Alachua County, 2008). After careful examination of the available school grades and the corresponding SCSA, school records were removed if the school was classified as a “special” school, which could be graded differently or not even given a grade. For the 2007-2008 school year, the adjusted total capacity for elementary schools was 12,735, the adjusted enrollment was 11,551, and the adjusted LOS standard was 90.7%. For the 2007-2008 school year, the adjusted total capacity for middle schools was 7,465, the adjusted enrollment number was 5,573, and the adjusted LOS standard was 74.7%. For the 2007-2008 school year, the adjusted total capacity for high schools was 8,917, the adjusted enrollment was 8,728, and the adjusted LOS standard was 97.9%. The schools that were used in the study are listed in the following tables (Tables 3-2, 3-3, and 3-4).

Table 3-2. Elementary Schools Used in the Study

School Concurrency Service Area	School Name
Alachua CSA	Alachua Elementary School
Alachua CSA	Irby Elementary School
Archer CSA	Archer Community School
East Gainesville CSA	Duval Elementary School
East Gainesville CSA	Lake Forest Elementary School
East Gainesville CSA	Metcalfe Elementary School
East Gainesville CSA	Rawlings Elementary School
East Gainesville CSA	Williams Elementary School
Hawthorne CSA	Shell Elementary School
High Springs CSA	High Springs Community School

Table 3-2. Continued

School Concurrency Service Area	School Name
Newberry CSA	Newberry Elementary School
Northwest Gainesville CSA	Foster Elementary School
Northwest Gainesville CSA	Glen Springs Elementary School
Northwest Gainesville CSA	Norton Elementary School
Northwest Gainesville CSA	Talbot Elementary School
South Gainesville CSA	Finley Elementary School
South Gainesville CSA	Idylwild Elementary School
South Gainesville CSA	Littlewood Elementary School
South Gainesville CSA	Terwilliger Elementary School
Waldo CSA	Waldo Community School
West Urban CSA	Chiles Elementary School
West Urban CSA	Hidden Oak Elementary School
West Urban CSA	Wiles Elementary School

Table 3-3. Middle Schools Used in the Study

School Concurrency Service Area	School Name
Bishop CSA	Bishop Middle School
Fort Clarke CSA	Fort Clarke Middle School
Hawthorne CSA	Hawthorne Middle School
High Springs CSA	High Springs Middle School
Kanapaha CSA	Kanapaha Middle School
Lincoln CSA	Lincoln Middle School
Mebane CSA	Mebane Middle School
Oakview CSA	Oakview Middle School
Westwood CSA	Westwood Middle School

Table 3-4. High Schools Used in the Study

School Concurrency Service Area	School Name
Buchholz CSA	Buchholz High School
Eastside CSA	Eastside High School
Eastside CSA	Loften High School
Gainesville CSA	Gainesville High School
Hawthorne CSA	Hawthorne High School
Newberry CSA	Desoto High School
Newberry CSA	Newberry High School
Santa Fe CSA	Santa Fe High School

The following graphics (Figures 3-1, 3-2, and 3-3) show the SCSAs and the location and number of schools within the SCSA.

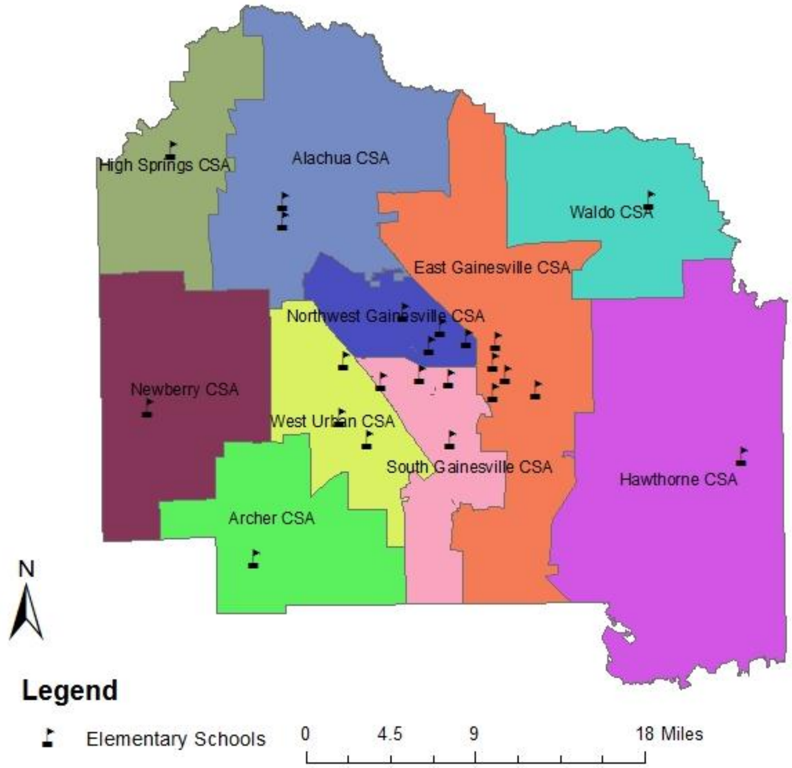

Figure 3-1. Elementary School SCSAs and Location of Elementary Schools

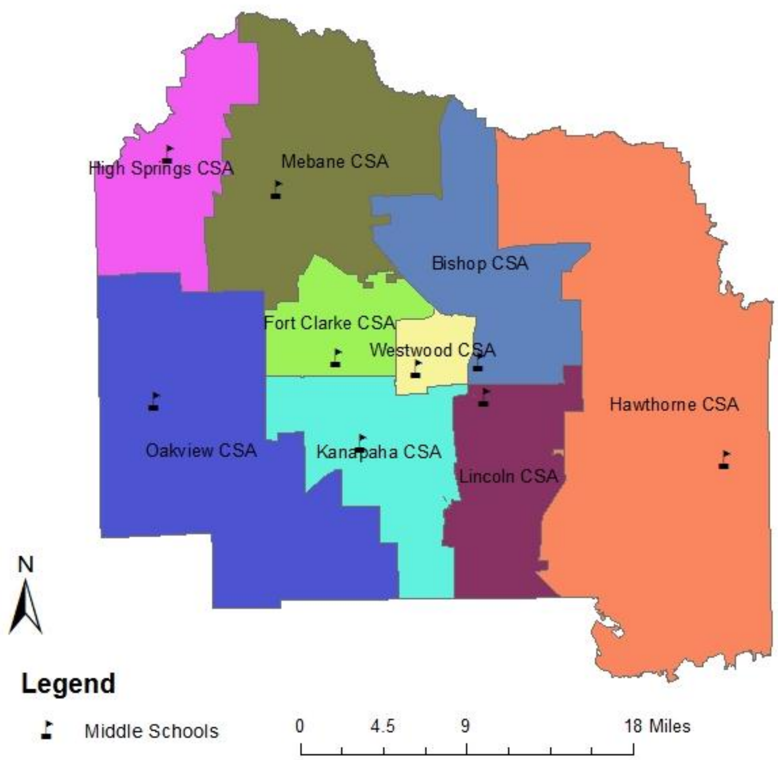

Figure 3-2. Middle School SCSAs and Location of Middle Schools

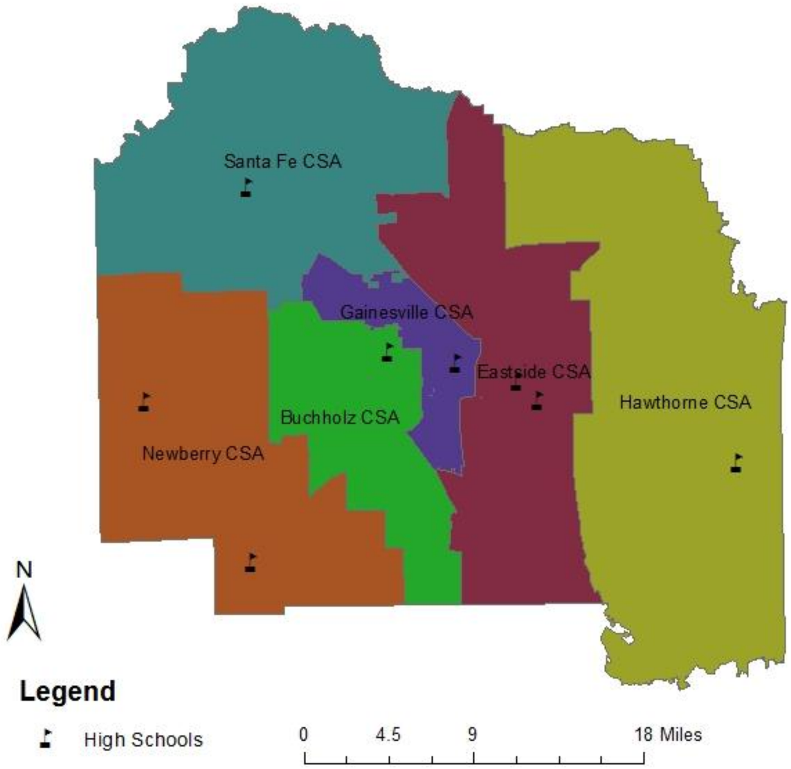

Figure 3-3. High School SCSAs and Location of High Schools

Variables

Factors that will be analyzed center around a school's capacity and the SCSA level of service standard, which was defined in Alachua County's PFSE data & analysis as the actual utilization. The number of housing units built per year during a period of four years was used to identify if there was a linear relationship between the actual utilization of facilities in SCSAs and the number of residential units built in a year. The years that were included in the study were 2007, 2008, 2009, and 2010. The just value of a parcel, school grade, the school building type, and the number of housing units built per year were used to find a correlation between school ratings and the location of new residential units. The just value of a parcel is defined as the "present cash value, use, location, quantity or size, cost, replacement value of improvements, condition, income from property, and net proceeds if the property is sold" (Florida Geographic Data

Library, 2010). Finally, an analysis was conducted to see if there was a linear relationship between school ratings and the actual utilization of facilities in a concurrency service area.

Originally, the study was designed to evaluate only the development of single family homes during the chosen time period. It was developed accordingly because a majority of multi-family housing in Alachua County cater to the college aged population that do not often have children; however, the population projections are planned for the entire community, which does sometimes include families living in multi-family housing units. The study was then changed to include housing units that were categorized as condominia to account for the families that do live in multi-family units, but not including multi-family apartment buildings built within the selected time period. When selecting the single family residential and condominia parcels, there were no condominium units built between 2007-2010 according to the Alachua County parcel data. The study therefore only examined the impacts of single family homes built during 2007-2010 on the Alachua County public school system.

Study Design

In order to determine the total number of units built per year, summary statistics were created using the summary statistics tool in ArcGIS. The frequency of units built and the mean just value were summarized for each CSA by actual year built. The summary statistics were used for analysis in SPSS.

In order to work with the parcel data, the parcels were selected for the study and had the following criteria: single family residential and the actual built year later than 2007. The selected polygon parcels were then exported to a new feature class, and this feature class was converted to point features for easier visualization. The parcel points were spatially joined to the SCSAs. School points were also spatially joined the SCSAs so that the tables could be joined together through the table join function. This process was repeated so that three sets of parcel points existed for each school level.

The first level of analysis that was conducted used statistical methods in the Statistical Package for Social Sciences (SPSS). In order to determine the relationship and strength between the SCSAs' LOS standards, the actual year built, and the total number of units built for the year, a bivariate correlation test was run in SPSS to obtain Pearson's Product-Moment Correlation, also known as Pearson's correlation coefficient. Pearson's correlation coefficient is a measure of the strength and direction of the relationship between ratio level variables (Zwick, 2010). The equation for the Pearson's Product Moment Correlation is shown below (Figure 3-4). It is expected that there will be a positive relationship between the LOS standards and the number of units built for the year and a negative relationship between the actual year built and the total number of units built for the year.

$$r = \sum (x_i - \bar{x})(y_i - \bar{y}) / (n-1) s_x s_y$$

Figure 3-4. Pearson's Product Moment Correlation (Zwick, 2010)

The range of values of the coefficient is between -1 and +1, with values being close to the ends showing the strongest correlations and the values near 0 showing no correlation (Table 3-5). Pearson's correlation coefficient was obtained via the Bivariate Correlation tool in SPSS. A correlation coefficient was obtained for each school level.

Table 3-5. The Interpretation of r Values (Zwick, 2010)

r Value	Strength and Direction of Relationship
1.0 to 0.5	Strong positive relationship
0.5 to 0.3	Moderate positive relationship
0.3 to 0.1	Weak positive relationship
0.1 to -0.1	No relationship
-0.1 to -0.3	Weak negative relationship
-0.3 to -0.5	Moderate negative relationship
-0.5 to -1.0	Strong negative relationship

Another bivariate correlation test using Pearson's correlation coefficient was obtained to determine the strength and relationship between the number of units built in 2007, the LOS standard for the 2007-2008 school year, the school building type, and the school grade in 2007. It was expected that a positive relationship would exist between the number of units built and the school grade, and that a negative relationship would exist between the LOS standard and the school grade. No relationship was expected between the number of units built and the school building type. It was expected that the LOS standard and the number of units built would have a positive relationship, and a positive relationship would exist between the school building type and the school grade. A positive relationship between the LOS standard and the school building type was also expected. A linear regression analysis was run in SPSS to determine if the LOS, actual year built, and the mean just value were predictors of the number of units built for a given year. The linear regression determined if the dependent variable, which was the frequency of units built, could be predicted by the independent variables, which were LOS, actual year built, and means just value. The equation for a straight line is shown in the following graphic (Figure 3-5).

The equation for a straight line is:

$$Y = m(X) + b$$

m = slope of the line
b = line intercept

Figure 3-5. Equation for a Straight Line (Zwick, 2010)

For the GIS analysis, the summary statistic tables were joined to the single family parcel data based on the CSA name. The tables containing the LOS standards were joined to the joined parcel and summary statistic table. An ordinary least squares (OLS) regression model was created to model the number of units built and their relationship to parcels' just value, parcels' actual year built, and the LOS standards of the CSAs in 2007-2008. OLS is a regression technique that will produce a regression equation that models the relationship between the dependent variable and the independent variables (ESRI, 2009). OLS is the strongest and most common of regression techniques, and the equation that is produced in the tool is shown in the following figure (Figure 3-6).

The regression model for a straight line is:

$$Y = B_0 + B_1(X) + \varepsilon$$

B_1 = slope of the line
B_0 = line intercept
£ = residual term

Figure 3-6. Regression Model for a Straight Line (Zwick, 2010)

After the OLS tool was run, the Spatial Autocorrelation (Moran's I) tool was used to determine if the residuals of the OLS were clustered. Spatial autocorrelation occurs when the over residuals are spatially clustered and separated from the spatially clustered under residuals (ESRI, 2009). The residuals in this model were expected to be clustered because the parcel data had been aggregated to the SCSAs. In the tool, the default settings were used, except row standardization was used because of potential biases due to the aggregation schema.

CHAPTER 4
RESULTS

Correlation of Variables

The results from the first bivariate correlation using Pearson's correlation coefficient are shown in Appendix A (Figures A-1, A-2, and A-3). The bivariate correlation tested the relationship between the actual year built, the number of the units built per year, and the LOS standard for the 2007-2008 school year. It was hypothesized that there would be a positive realtionship between the LOS standards and the number of units built for the year and a negative realtionship between the actual year built and the total number of units built for the year. None of the results for the elementary and middle school levels showed a significant relationship between the actual year built and the LOS standard or the number of residential units built per year and the LOS standard. The high school level analysis showed a signficant positive correlation, with a correlation coefficient of 0.5, between the nubmer of residential units built per year and the LOS standard, which shows that a greater number of units built was associated with a higher LOS standard. There was a moderately negative correlation, -0.381, between the number of units built per year and the actual year built at the elementary school level, which suggest that there were more residential units built in the earlier years of the study. There was a strong negative correlation,-0.508, between the number of units built per year and the actual year built at the middle school level. There was a statisitically signifcant strong negative correlation, -0.560, between the number of units built per year and the actual year built at the high school level. The negative relationship between the number of units built per year and the actual year built reflects the economic recession and sharp decline in residential contruction rates.

The results from the second bivariate correlation using Pearson's correlation coefficient are shown in Appendix A (Figures A-4, A-5, and A-6). None of the variables tested at all three levels showed a significant correlation to the other variables at the 95% confidence interval for a two-tailed test. It was expected that positive relationships would exist between the number of units built and the school grade, between the LOS standard and the number of units built, between the LOS standard and the school building type, and between the school building type and the school grade. It was also expected that a negative relationship would exist between the LOS standard and the school grade and no relationship between the number of units built and the school building type.

Linear Regression Results

The next test statistical test that was run was the linear regression analysis. The dependent variable was the number of units built per year, and the independent variables were the actual year built, the mean just value of parcels, the school grade, and the LOS standard. An R value of 0.515 in the linear regression model at the elementary school level showed a strong positive relationship between the variables. The coefficients portion of the results showed that the actual year built and the LOS standards were significant predictors of the dependent variable at the 95% confidence level. The linear regression at the middle school level had a strong positive relationship between the variables. In the coefficients portion of the results for the middle school level regression analysis, the variables that were significantly statistic at the 95% confidence interval were the actual year built and the mean just value. The linear regression at the high school level had a strong positive correlation between the variables. The coefficient results showed that the actual year built, mean just value, and

LOS standard were all statistically significant predictors of the dependent variable. The results from the linear regression models are shown in Appendix A (Figures A-7, A-8, and A-9).

OLS Model Reliability

In order to conduct the OLS test, summary tables of the single family parcels were created. Each SCSA school level was summarized based on the name of the SCSA and the actual year built. The following tables (Tables 4-1, 4-2, and 4-3) show the summarized results.

Table 4-1. Summarized Parcel Data for Elementary School Concurrency Service Areas

School Concurrency Service Area	Actual Year Built	Number of Units Built	Mean Just Value
Alachua CSA	2007	121	$169,847.11
Archer CSA	2007	31	$219,364.52
East Gainesville CSA	2007	107	$149,388.79
Hawthorne CSA	2007	19	$204,326.32
High Springs CSA	2007	70	$188,570.00
Newberry CSA	2007	105	$210,460.95
Northwest Gainesville CSA	2007	83	$219,669.88
South Gainesville CSA	2007	29	$233,617.24
Waldo CSA	2007	12	$287,875.00
West Urban CSA	2007	426	$280,294.60
Alachua CSA	2008	66	$189,410.61
Archer CSA	2008	27	$243,140.74
East Gainesville CSA	2008	46	$151,665.22
Hawthorne CSA	2008	14	$166,392.86
High Springs CSA	2008	31	$173,809.68
Newberry CSA	2008	65	$215,218.46
Northwest Gainesville CSA	2008	59	$223,476.27
South Gainesville CSA	2008	17	$264,041.18
Waldo CSA	2008	4	$397,425.00
West Urban CSA	2008	223	$301,839.91
Alachua CSA	2009	51	$173,017.65
East Gainesville CSA	2009	46	$142,543.48
Hawthorne CSA	2009	11	$156,472.73
High Springs CSA	2009	23	$191,121.74

Table 4-1. Continued

School Concurrency Service Area	Actual Year Built	Number of Units Built	Mean Just Value
Newberry CSA	2009	49	$180,973.47
Northwest Gainesville CSA	2009	44	$200,047.73
South Gainesville CSA	2009	14	$234,435.71
Waldo CSA	2009	5	$272,780.00
West Urban CSA	2009	159	$258,865.41
Hawthorne CSA	2010	1	$282,400.00
Newberry CSA	2010	1	$20,000.00
South Gainesville CSA	2010	1	$198,500.00
West Urban CSA	2010	1	$172,100.00

As seen above, 2007 had the highest frequencies of single family units built during the four years.Construction of new residential units tapered off as the years passed. The fastest growing SCSA in Alachua County was consistently the West Urban CSA, with the largest number of residential units built per year in 2007, 2008, and 2009. The East Gainesville had the lowest mean just value in 2007-2009. The Waldo and West Urban CSAs had some of the highest mean just values during 2007-2010.

Table 4-2. Summarized Parcel Data for Middle School Concurrency Service Areas

School Concurrency Service Area	Actual Year Built	Number of Units Built	Mean Just Value
Bishop CSA	2007	65	$148,233.85
Fort Clarke CSA	2007	210	$250,283.33
Hawthorne CSA	2007	31	$236,667.74
High Springs CSA	2007	70	$188,570.00
Kanapaha CSA	2007	290	$292,346.55
Lincoln CSA	2007	45	$152,295.56
Mebane CSA	2007	121	$169,847.11
Oakview CSA	2007	136	$212,490.44
Westwood CSA	2007	35	$187,688.57
Bishop CSA	2008	28	$142,303.57
Fort Clarke CSA	2008	134	$292,004.48
Hawthorne CSA	2008	18	$217,733.33
High Springs CSA	2008	31	$173,809.68

Table 4-2. Continued

School Concurrency Service Area	Actual Year Built	Number of Units Built	Mean Just Value
Kanapaha CSA	2008	138	$295,190.58
Lincoln CSA	2008	19	$162,842.11
Mebane CSA	2008	66	$189,410.61
Oakview CSA	2008	92	$223,413.04
Westwood CSA	2008	26	$192,973.08
Bishop CSA	2009	28	$139,446.43
Fort Clarke CSA	2009	89	$230,355.06
Hawthorne CSA	2009	16	$192,818.75
High Springs CSA	2009	23	$191,121.74
Kanapaha CSA	2009	114	$262,506.14
Lincoln CSA	2009	20	$162,120.00
Mebane CSA	2009	51	$173,017.65
Oakview CSA	2009	65	$200,995.38
Westwood CSA	2009	12	$185,550.00
Hawthorne CSA	2010	1	$282,400.00
Kanapaha CSA	2010	2	$185,300.00
Oakview CSA	2010	1	$20,000.00

The highest number of units built was in 2007. The Fort Clarke, Kanapaha, Mebane, and Oakview SCSAs had the highest number of single family residential units built throughout the time period in the study. The Kanapaha CSA and Fort Clarke CSA had some of the highest mean just values during the four years. The Bishop and Lincoln SCSAs had consistently lower mean just values.

Table 4-3. Summarized Parcel Data for High School Concurrency Service Areas

School Concurrency Service Area	Actual Year Built	Number of Units Built	Mean Just Value
Buchholz CSA	2007	440	$280,661.14
Eastside CSA	2007	110	$149,895.45
Gainesville CSA	2007	95	$214,928.42
Hawthorne CSA	2007	31	$236,667.74
Newberry CSA	2007	136	$212,490.44
Santa Fe CSA	2007	191	$176,708.90
Buchholz CSA	2008	232	$300,628.88
Eastside CSA	2008	47	$150,606.38
Gainesville CSA	2008	66	$229,337.88

Table 4-3. Continued

School Concurrency Service Area	Actual Year Built	Number of Units Built	Mean Just Value
Hawthorne CSA	2008	18	$217,733.33
Newberry CSA	2008	92	$223,413.04
Santa Fe CSA	2008	97	$184,424.74
Buchholz CSA	2009	166	$259,241.57
Eastside CSA	2009	48	$148,893.75
Gainesville CSA	2009	49	$196,322.45
Hawthorne CSA	2009	16	$192,818.75
Newberry CSA	2009	65	$200,995.38
Santa Fe CSA	2009	74	$178,644.59
Buchholz CSA	2010	1	$172,100.00
Gainesville CSA	2010	1	$198,500.00
Hawthorne CSA	2010	1	$282,400.00
Newberry CSA	2010	1	$20,000.00

In Table 4-3, the Buchholz SCSA consistently had the highest number of residential units built per year. The highest amount of residential growth was seen in 2007. The mean just value for parcels was generally the highest in the Buchholz and Hawthorne SCSAs. The Eastside SCSA had consistently lower mean just values during 2007-2010.

Elementary School Level Model

Below is a discussion of the OLS regression results at the elementary level that are worthy of note. The OLS regression showed some interesting results at the elementary school level. The coefficient and diagnostic output tables are in Table 4-4 and Table 4-5, respectively. The overall model performance had an adjusted r-squared value of 0.2019, which is a weak significance. None of the variance inflation factors (VIF) were greater than 7.5, which showed that there was no redundancy among the variables. Because the Koenker (BP) showed a statistically significant result, the Joint Wald statistic was examined to determine the overall model significance, which was statistically significant. The Koenker (BP) statistic showed that the regression model had a statistically significant non-stationarity, but that only the just value of a parcel and the LOS standard were statistically significant explanatory variables. The Jarque-Bera (JB) statistic showed that the residuals were not normally distributed. Because the residuals were not normally distributed according to the JB statistic, a test for spatial autocorrelation (Moran's I) was run and a p-value of 0.0000, which confirms that the residuals were not normally distributed. The residuals were clustered based on the SCSA to which the parcels were spatially joined. The clustering of residuals was expected because of the aggregation methods used in tying the parcel data to the SCSAs. Of the three variables used in the OLS regression, the just value of a parcel and LOS standard showed statistical significance.

Table 4-4. Elementary OLS Regression Coefficient Table

Variable	Coefficient	StdError	t Statistic	Probability	Robust StdError	Robust r	Robust Prob
Intercept	9777.9502	8477.6862	1.1534	0.2489	8477.74500	1.1534	0.2489
Just Value	0.0003	0.0000	11.0061	0.0000	0.0000	10.2311	0.0000
Actual Year Built	-4.9893	4.2222	-1.1817	0.2375	4.2223	-1.1816	0.2375
LOS	420.0384	23.7366	17.6958	0.0000	20.7617	20.2314	0.0000

Table 4-5. Elementary OLS Regression Diagnostic Table

Diagnostic Name	Diagnostic Value	Definition
AIC	25433.8532	Akaike's Information Criterion: A relative measure of performance used to compare models; the smaller AIC indicates the superior model.
R2	0.2031	R-Squared, Coefficient of Determination: The proportion of variation in the dependent variable that is explained by the model.
AdjR2	0.2019	Adjusted R-Squared: R-Squared adjusted for model complexity (number of variables) as it relates to the data.
F-Stat	167.6451	Joint F-Statistic Value: Used to assess overall model significance.
F-Prob	0.0000	Joint F-Statistic Probability (p-value): The probability that none of the explanatory variables have an effect on the dependent variable.
Wald	721.1114	Wald Statistic: Used to assess overall robust model significance.
Wald-Prob	0.0000	Wald Statistic Probability (p-value): The computed probability, using robust standard errors, that none of the explanatory variables have an effect on the dependent variable.
K(BP)	1017.6041	Koenker's studentized Breusch-Pagan Statistic: Used to test the reliability of standard error values when heteroskedasticity (non-constant variance) is present.
K(BP)-Prob	0.0000	Koenker (BP) Statistic Probability (p-value): The probability that heteroskedasticity (non-constant variance) has not made standard errors unreliable.
JB	165.9745	Jarque-Bera Statistic: Used to determine whether the residuals deviate from a normal distribution.
JB-Prob	0.0000	Jarque-Bera Probability (p-value): The probability that the residuals are normally distributed.
Sigma2	22583.4891	Sigma-Squared: OLS estimate of the variance of the error term.

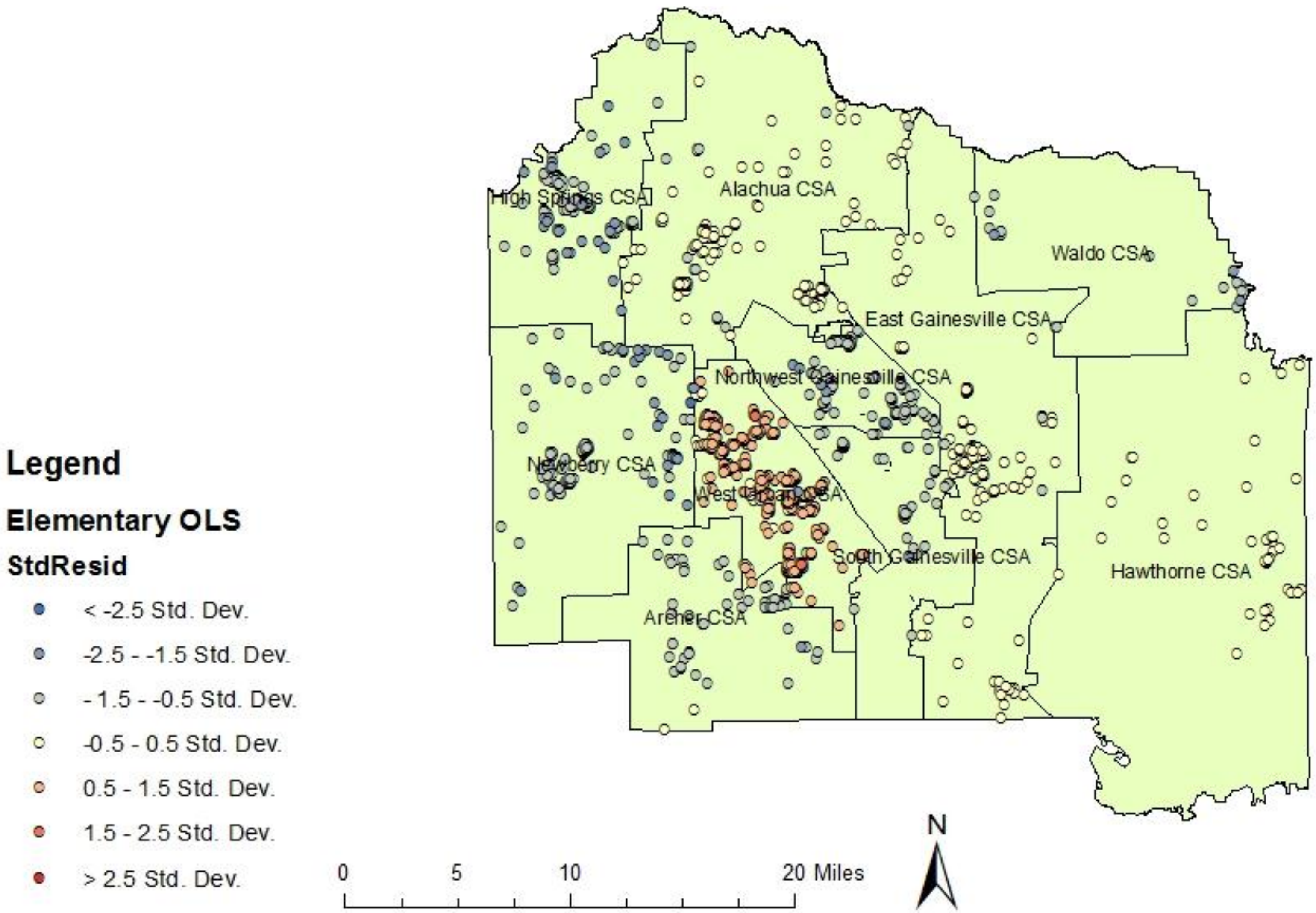

Figure 4-1. Map of Elementary School OLS Standard Residuals

Middle School Level Model

The OLS regression showed similar results at the middle school level. The coefficient and diagnostic output tables are in Table 4-6 and Table 4-7, respectively. The overall model performance had an adjusted r-squared value of 0.2615, which is a weak relationship. The variance inflation factors (VIF) were not greater than 7.5, which showed no redundancy among the variables. Because the Koenker (BP) showed a statistically significant result, the Joint Wald statistic was examined to determine the overall model significance, which was statistically significant. The Koenker (BP) statistic showed that the regression model had a statistically significant non-stationarity, but that only the just value of a parcel and the LOS standard were again the only statistically significant explanatory variables. The Jarque-Bera statistic showed that the residuals were not normally distributed. Because the residuals were not normally distributed according to the Jarque-Bera statistic, a test for spatial autocorrelation (Moran's I) was run and a p-value of 0.0000, which confirmed that the residuals of the middle school level OLS regression model were not normally distributed. The clustering of residuals was again expected due to the aggregation methods. In this analysis, the just value and LOS standard were again statistically significant predictors of the number of units built.

Table 4-6. Middle School Level OLS Regression Coefficient Table

Variable	Coefficient	StdError	t Statistic	Probability	Robust StdError	Robust t	Robust Prob
Intercept	1015.4200	4424.2017	0.2295	0.8185	4487.5675	0.2262	0.8210
Just Value	0.0001	0.0000	10.5631	0.0000	0.0000	9.4179	0.0000
Actual Year Built	-0.5171	2.2035	-0.2347	0.8144	2.2350	-0.2314	0.8171
LOS	226.6014	10.8081	20.9659	0.0000	4.8849	46.3873	0.0000

Table 4-7. Middle School Level OLS Regression Diagnostic Table

Diagnostic Name	Diagnostic Value	Definition
AIC	21314.3613	Akaike's Information Criterion: A relative measure of performance used to compare models; the smaller AIC indicates the superior model.
R2	0.2627	R-Squared, Coefficient of Determination: The proportion of variation in the dependent variable that is explained by the model.
AdjR2	0.2615	Adjusted R-Squared: R-Squared adjusted for model complexity (number of variables) as it relates to the data.
F-Stat	219.5785	Joint F-Statistic Value: Used to assess overall model significance.
F-Prob	0.0000	Joint F-Statistic Probability (p-value): The probability that none of the explanatory variables have an effect on the dependent variable.
Wald	2632.2425	Wald Statistic: Used to assess overall robust model significance.
Wald-Prob	0.0000	Wald Statistic Probability (p-value): The computed probability, using robust standard errors, that none of the explanatory variables have an effect on the dependent variable.
K(BP)	25.7574	Koenker's studentized Breusch-Pagan Statistic: Used to test the reliability of standard error values when heteroskedasticity (non-constant variance) is present.
K(BP)-Prob	0.0000	Koenker (BP) Statistic Probability (p-value): The probability that heteroskedasticity (non-constant variance) has not made standard errors unreliable.
JB	55.8612	Jarque-Bera Statistic: Used to determine whether the residuals deviate from a normal distribution.
JB-Prob	0.0000	Jarque-Bera Probability (p-value): The probability that the residuals are normally distributed.
Sigma2	5782.4925	Sigma-Squared: OLS estimate of the variance of the error term.

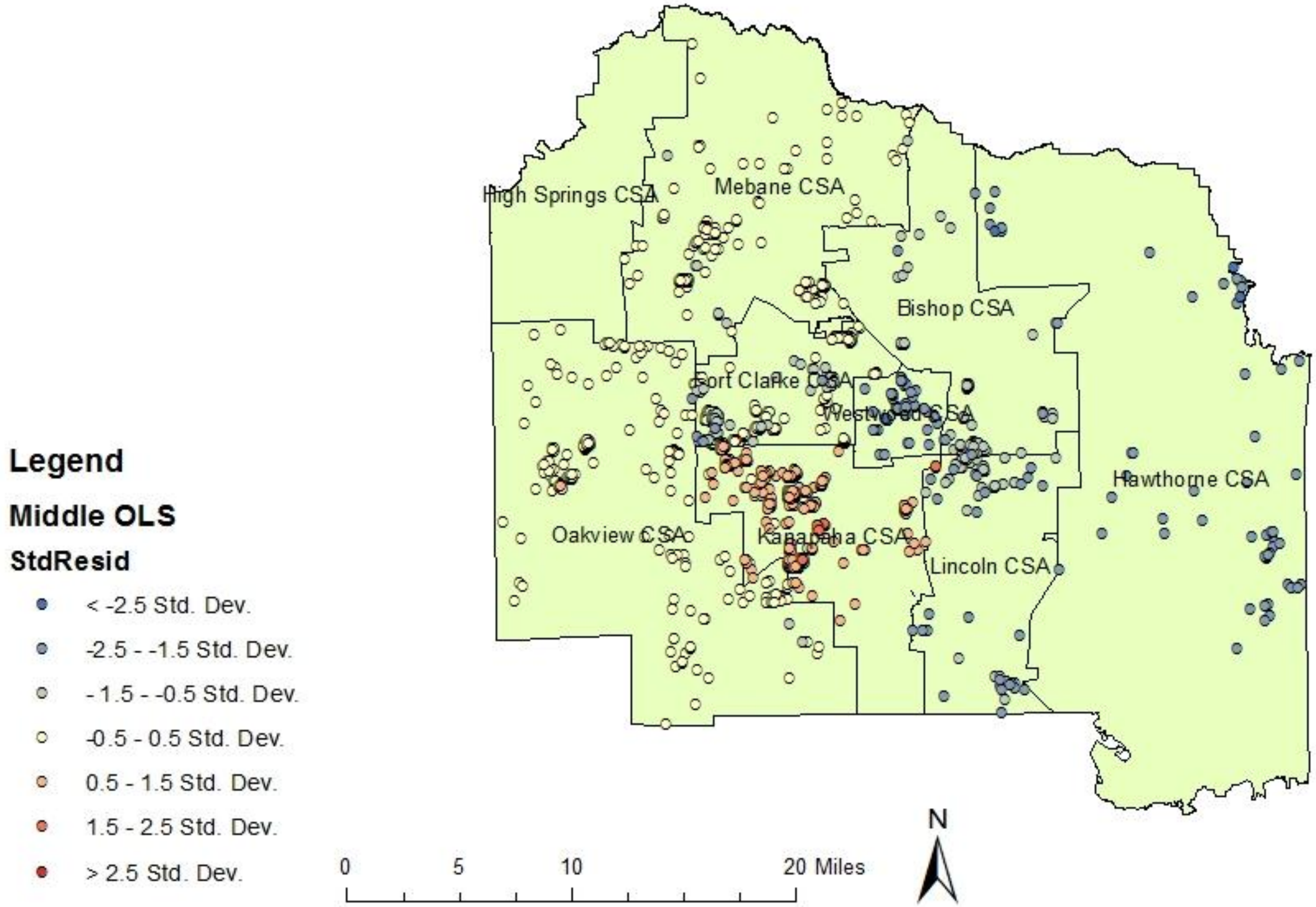

Figure 4-2. Map of Middle School OLS Standard Residuals

High School Level Model

The OLS regression showed slightly different results at the high school level. The coefficient and diagnostic output tables are in Table 4-8 and Table 4-9, respectively. The overall model performance had an adjusted r-squared value of 0.4479, which is a moderately strong relationship. The variance inflation factors (VIF) were not greater than 7.5, which showed no redundancy among the variables. Because the Koenker (BP) showed a statistically significant result, the Joint Wald statistic was examined to determine the overall model significance, which was statistically significant. The Koenker (BP) statistic showed that the regression model had a statistically significant non-stationarity, but that only the just value of a parcel and the LOS standard were again the only statistically significant explanatory variables. The Jarque-Bera statistic showed that the residuals were not normally distributed. Because the residuals were not normally distributed according to the Jarque-Bera statistic, a test for spatial autocorrelation (Moran's I) was run and a p-value of 0.0000, which confirmed that the residuals of the middle school level OLS regression model were not normally distributed. The clustering of residuals was expected due to the spatial join and aggregation methods. In this third analysis, the just value of a parcel and the LOS standard were again significant predictors, and it was not expected that the actual year built would show no significance in all three levels of analysis.

Table 4-8. High School Level OLS Regression Coefficient Table

Variable	Coefficient	StdError	t Statistic	Probability	Robust StdError	Robust r	Robust Prob
Intercept	2696.2608	6483.1202	0.4159	0.6776	6512.7590	0.4140	0.6789
Just Value	0.0002	0.0000	13.0582	0.0000	0.0000	11.7543	0.0000
Actual Year Built	-1.6012	3.2286	-0.4959	0.6199	3.2433	-0.4937	0.6216
LOS	7.0674	0.1953	36.1902	0.0000	0.1915	36.8999	0.0000

Table 4-9. High School Level OLS Regression Diagnostic Table

Diagnostic Name	Diagnostic Value	Definition
AIC	24370.6500	Akaike's Information Criterion: A relative measure of performance used to compare models; the smaller AIC indicates the superior model.
R2	0.4487	R-Squared, Coefficient of Determination: The proportion of variation in the dependent variable that is explained by the model.
AdjR2	0.4479	Adjusted R-Squared: R-Squared adjusted for model complexity (number of variables) as it relates to the data.
F-Stat	535.3282	Joint F-Statistic Value: Used to assess overall model significance.
F-Prob	0.0000	Joint F-Statistic Probability (p-value): The probability that none of the explanatory variables have an effect on the dependent variable.
Wald	1949.0704	Wald Statistic: Used to assess overall robust model significance.
Wald-Prob	0.0000	Wald Statistic Probability (p-value): The computed probability, using robust standard errors, that none of the explanatory variables have an effect on the dependent variable.
K(BP)	624.5017	Koenker's studentized Breusch-Pagan Statistic: Used to test the reliability of standard error values when heteroskedasticity (non-constant variance) is present.
K(BP)-Prob	0.0000	Koenker (BP) Statistic Probability (p-value): The probability that heteroskedasticity (non-constant variance) has not made standard errors unreliable.
JB	180.5138	Jarque-Bera Statistic: Used to determine whether the residuals deviate from a normal distribution.
JB-Prob	0.0000	Jarque-Bera Probability (p-value): The probability that the residuals are normally distributed.
Sigma2	13189.6569	Sigma-Squared: OLS estimate of the variance of the error term.

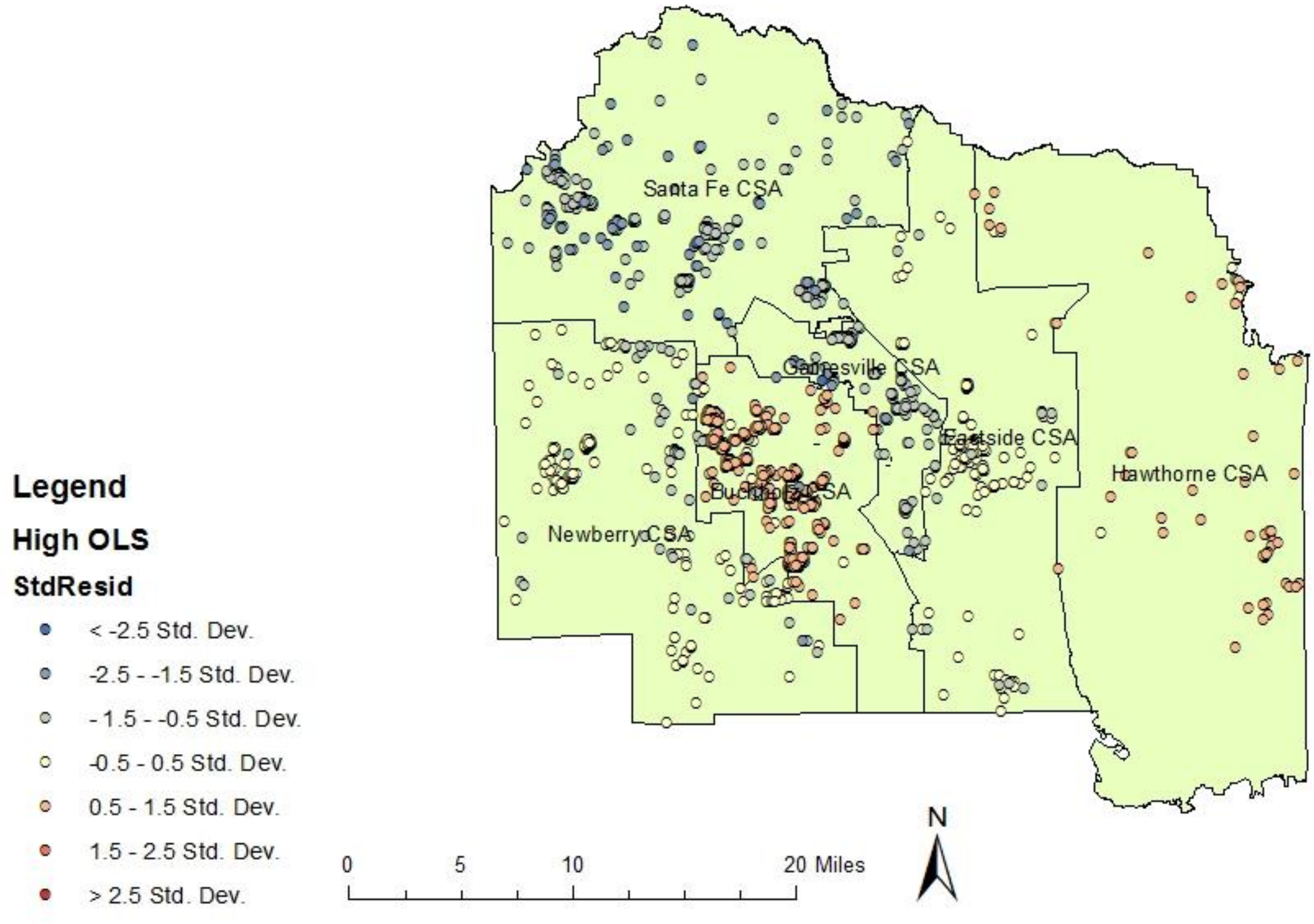

Figure 4-3. Map of High School OLS Standard Residuals

CHAPTER 5
DISCUSSION

Elementary School Level Results

The inverse relationship between the frequency of units built and the actual year built was expected because the frequency had been aggregated based on the year the structure was built. While the correlation between frequency of units built and the LOS standard was not significant at the 95% confidence interval, it was significant at the 90% confidence interval and it was not expected that there would be a positive relationship between the two variables. In the second correlation analysis, the frequency of units built and the LOS standard variables were the closest to showing a significant relationship with a p-value of 0.052 with a moderately positive coefficient. The different p-values between this test and the previous can be attributed to the different datasets that were used for the two tests; the first dataset was only at the SCSA level, but the second test used data at the school level with aggregated data joined to the dataset based on SCSA name. In the linear regression model, the negative coefficient of the actual year built variable was expected because it reflected the decrease in number of units built per year as the economic recession progressed. The LOS standard coefficient was positive, which would indicate that the higher LOS would increase the number of units built per year. The OLS regression model showed that the independent variables were significant in predicting the frequency of units built, but the clustering of residuals affected the significance of the model. The study was designed to test the significance of the LOS standards of SCSAs, and the spatial distribution of the variables was tied to the SCSA in which the parcel was located. The coefficients that were significant in the OLS regression, just value and LOS, were different than the linear regression, which could be attributed to the use of just value per parcel rather than the previously used mean just value.

Middle School Level Results

The middle school level test results were somewhat closely aligned to the researcher's expectations because middle schools had the lowest LOS standards and were less likely to be reaching capacity. The second correlation study showed no significance, which again can be attributed to the lower LOS standard and fewer SCSAs than at the elementary school level. The linear regression at the middle school level also showed a negative relationship between the number of units built and the actual year built. The mean just value significance as a predictor of was surprising because the elementary school level linear regression did not show that the mean just value had a statistical significance. It was surprising that the middle school level OLS regression showed similar results to the elementary school level OLS regression. After reviewing the results, it was hypothesized that the low level of service could have altered the results of the analysis. The overabundance of space available for students at the middle school level could provide overflow space for students at other grade levels.

High School Level Results

The inverse relationship between the number of units built per year and the actual year built was expected and had been seen throughout the three school levels. The positive correlation between the number of residential units built per year and the LOS standard at the high school level showed that the greater the number of units built per year was highly correlated with an increased LOS standard. The second bivariate correlation test drew similar conclusions as the previous school levels discussed. All three independent variables showed statistical significance as independent variables, but the coefficient of the mean just value, 0.001, is so small that it has very little impact on the dependent variable. The LOS standard coefficient showed a positive relationship and the actual year built showed an inverse relationship, which was the most consistent result of the three linear regressions. The OLS regression at the high school level had the same significant variables as the other two school levels. The positive coefficient of the LOS again can be interpreted as the increase in LOS standard would result in an increase in the frequency of units built.

Although the actual year built variable was not significant in the three OLS regressions, the negative coefficient was expected. The actual year built results reflect the economic recession that has plagued Florida's construction industry for the past few years. The actual year built variable was chosen as an attempt to reflect the economic recession in the model. It was interesting to view the correlation results for the three school levels next to each other. The correlation became stronger at the high school level, which was the level with the fewest SCSAs. If capacity levels had been around the same value for each school level, then more solid conclusions could be drawn. The varying levels of capacity affected the results without any pattern. The inconsistency of results was not expected.

CHAPTER 6
CONCLUSIONS

While the model results lacked consistency between the school levels, the regression analyses at the high school level indicated a relationship existed between the number of units built and the LOS standard. This model does not prove that level of service standards had a direct impact on residential development, and it would be false to draw the conclusion that school concurrency requirements did not restrict growth or pushed development to be concentrated in specific geographic areas. The housing market has more control of its own destiny than it may realize and should not blame legislative oversight for hindering growth, but rather developers should welcome smart growth principles that encourage stronger communities in the long term.

It was hoped that this model could be used in other school districts to examine the impact that school concurrency had on residential construction. While the variables can still be used in other school districts, the differences between the concurrency service areas in Alachua County and other counties may vary greatly. Because the PFSE is no longer a required element of the comprehensive plan, counties that do choose to implement the PFSE are not required to maintain concurrency service areas on a less than countywide basis. Other counties may have much smaller concurrency service areas which are more closely tied to school zones, which are now more predictable and controlled because of the class size amendment.

Planning Policy

It is in the best interest of all local governments to continue to work together to ensure adequate space is available for all students. Funding for schools is at the county level, but the impacts of residential development are usually decided at the municipal level. If local governments abandon their interlocal agreements, then the fate of the school system will invariably be determined by the housing market and uncoordinated reactions to variations.in the market. Many school boards do not have the technical expertise, such as demographers or land planners, on hand that local planning agencies have (Stroud, 2000). Continued cooperation between local agencies is essential to the quality of the public school system.

Oftentimes, there are so many overlapping regulations that involve school planning that it leaves school boards very few options to plan for future growth in their districts. The confounding issue is how school districts can plan for future growth when school enrollment can be drastically variable on a yearly basis due to the various requirements that must be met at the federal, state, and local level while also accounting for the options available for students.

Rather than encourage developers to donate land or money to the school system, developers should be encouraged to bolster the charter school system, which has seen a significant growth in Florida over the past decade (Toothman, 2011). Charter schools are granted more flexibility to develop a better learning environment. Focusing efforts on charter schools would be beneficial for counties that do not have a large tax base to support the immediate need for new schools that is brought on by new growth. Rural counties in Florida, many of which have not amassed an appropriate amount of infrastructure to support growth, have the most to gain by enforcing school concurrency requirements and to encourage the development of charter schools because growth in rural counties was strong over the past decade and is expected to continue due to the overabundance of affordable housing (Reep, 2012). Charter schools could offer developers and local governments creative ways to improve and revitalize older, urban schools that have been long-forgotten in funding by the state.

Planners should use this research to further analyze and evaluate their PFSE to view the effects that the size of a SCSA can have on proposed residential development. After this research was completed, more questions arose about the effects that the size of an SCSA had on the analysis, as well as the varying LOS standards between and among the SCSAs. The SCSA and varying levels of LOS standards could force planners to encourage development to occur in less developed areas further contributing to urban sprawl and creating an unequal distribution of races and incomes that could contribute to an unequal public school system. Planners and school officials should carefully evaluate rates of growth throughout the entire county to identify clusters of land that are deemed by developers to be ripe for development. Lack of this foresight would lead to uneven development in and between SCSAs that already have existing inequalities of infrastructure needs and improvements. Public input, especially from the real estate and development professionals, when creating SCSA boundaries is essential to the school planning process. Planners and school officials should actively communicate and decide residential development factors together, rather than only being required to make recommendations to the each other using shared data and analysis.

As communities recover from the economic recession, it is important to remember that building a strong school system will help build strong, vibrant communities. Research has shown that a higher level of education will lead to a higher income

(Education Portal, 2012). A greater connection between society and education will help people gain access to better opportunities.

Study Limitations

Many limitations were found during this analysis, and most of the limitations could be attributed to the mismatch of time periods and aggregation methods. The clustering of residuals was a reflection of how the data had been aggregated and joined in the model. A Geographically Weighted Regression analysis was attempted after the OLS regression analyses; however, due to local multicollinearity, the model could not be tested. The lack of more localized, synchronized data significantly impacted the overall effectiveness of the model.

The parcel data that was used was collected in 2010, but the capacity data was from 2007. The school year for which grades were chosen from was 2007-2008. While the parcel just value and the actual year built could partially reflect the most recent economic recession, there could be more variables used that reinforce the effects that the recession had on the construction industry. The sharp decrease in building new residential units is related to the sudden flood of foreclosed homes in the market. Growth management was intended to be used to grow smartly, but because of the economic recession residential construction sharply decreased from the years before the study.

Another factor that may have impacted school capacity and LOS standards could be the class size amendment. The class size amendment forced schools to reexamine their capacity numbers on a school-by-school basis. By 2006, schools were required to operate at the mandatory class sizes by a grade level average, but local governments did not have to meet school concurrency requirements at a less than district wide basis until 2010.

Future research would be benefitted by the adding of new variables to the model. Demographic data was chosen not to be used in the study, but could be added to the model. Recommended demographics include free and reduced lunch status, English Language Learners status, and race and ethnicity. The most recent decennial census data and American Community Survey data could be spatially joined to the parcel data. Factors such as household size, household income, and median age of households influence various household decisions. A greater range in data that includes capacity data during periods of high growth would have been better for this analysis. Other research that could improve the model would be to change the location in the study to a school district that had consistent capacity levels throughout the school levels. If creating a model to be used in different school districts, it would be best to focus on high schools because the SCSAs are larger polygons and involve fewer complications than elementary schools.

APPENDIX
SPSS OUTPUT RESULTS

Correlations

		actyrblt	frequency	LOS
actyrblt	Pearson Correlation	1	-.381*	.014
	Sig. (2-tailed)		.026	.937
	N	34	34	34
frequency	Pearson Correlation	-.381*	1	.300
	Sig. (2-tailed)	.026		.084
	N	34	34	34
LOS	Pearson Correlation	.014	.300	1
	Sig. (2-tailed)	.937	.084	
	N	34	34	34

*. Correlation is significant at the 0.05 level (2-tailed).

Figure A-1. Elementary School Level: First Bivariate Correlation Results with Pearson's Correlation Coefficient

Correlations

		actyrblt	LOS	frequency
actyrblt	Pearson Correlation	1	-.072	-.508**
	Sig. (2-tailed)		.703	.004
	N	30	30	30
LOS	Pearson Correlation	-.072	1	.222
	Sig. (2-tailed)	.703		.238
	N	30	30	30
frequency	Pearson Correlation	-.508**	.222	1
	Sig. (2-tailed)	.004	.238	
	N	30	30	30

**. Correlation is significant at the 0.01 level (2-tailed).

Figure A-2. Middle School Level: First Bivariate Correlation Results with Pearson's Correlation Coefficient

Correlations

		frequency	actyrblt	los
frequency	Pearson Correlation	1	-.560**	.500*
	Sig. (2-tailed)		.007	.018
	N	22	22	22
actyrblt	Pearson Correlation	-.560**	1	-.065
	Sig. (2-tailed)	.007		.775
	N	22	22	22
los	Pearson Correlation	.500*	-.065	1
	Sig. (2-tailed)	.018	.775	
	N	22	22	22

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Figure A-3. High School Level: First Bivariate Correlation Results with Pearson's Correlation Coefficient

Correlations

		g07	bldg_type	LOS	unitsblt
g07	Pearson Correlation	1	.340	.117	.264
	Sig. (2-tailed)		.112	.594	.223
	N	23	23	23	23
bldg_type	Pearson Correlation	.340	1	.235	-.372
	Sig. (2-tailed)	.112		.281	.080
	N	23	23	23	23
LOS	Pearson Correlation	.117	.235	1	.409
	Sig. (2-tailed)	.594	.281		.052
	N	23	23	23	23
unitsblt	Pearson Correlation	.264	-.372	.409	1
	Sig. (2-tailed)	.223	.080	.052	
	N	23	23	23	23

Figure A-4. Elementary School Level: Second Bivariate Correlation Results with Pearson's Correlation Coefficient

Correlations

		g07	bldg_type	UNITSBLT	LOS
g07	Pearson Correlation	1	.354	.273	.280
	Sig. (2-tailed)		.351	.477	.466
	N	9	9	9	9
bldg_type	Pearson Correlation	.354	1	-.463	.182
	Sig. (2-tailed)	.351		.210	.639
	N	9	9	9	9
UNITSBLT	Pearson Correlation	.273	-.463	1	.261
	Sig. (2-tailed)	.477	.210		.498
	N	9	9	9	9
LOS	Pearson Correlation	.280	.182	.261	1
	Sig. (2-tailed)	.466	.639	.498	
	N	9	9	9	9

Figure A-5. Middle School Level: Second Bivariate Correlation Results with Pearson's Correlation Coefficient

Correlations

		bldg_type	g07	los	unitsblt
bldg_type	Pearson Correlation	1	.159	-.012	-.269
	Sig. (2-tailed)		.707	.978	.520
	N	8	8	8	8
g07	Pearson Correlation	.159	1	.199	.414
	Sig. (2-tailed)	.707		.637	.307
	N	8	8	8	8
los	Pearson Correlation	-.012	.199	1	.686
	Sig. (2-tailed)	.978	.637		.060
	N	8	8	8	8
unitsblt	Pearson Correlation	-.269	.414	.686	1
	Sig. (2-tailed)	.520	.307	.060	
	N	8	8	8	8

Figure A-6. High School Level: Second Bivariate Correlation Results with Pearson's Correlation Coefficient

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.515[a]	.265	.192	73.276

a. Predictors: (Constant), LOS, actyrblt, mean_jv

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	58213.417	3	19404.472	3.614	.024[b]
	Residual	161080.847	30	5369.362		
	Total	219294.265	33			

a. Dependent Variable: frequency

b. Predictors: (Constant), LOS, actyrblt, mean_jv

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	56304.287	25773.289		2.185	.037
	actyrblt	-28.088	12.829	-.350	-2.189	.036
	mean_jv	.000	.000	.169	1.046	.304
	LOS	131.101	63.041	.329	2.080	.046

a. Dependent Variable: frequency

Figure A-7. SPSS Output of Linear Regression Model for Elementary School Level

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.704[a]	.495	.437	49.701

a. Predictors: (Constant), mean_jv, actyrblt, LOS

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	62951.142	3	20983.714	8.495	.000[b]
	Residual	64225.558	26	2470.214		
	Total	127176.700	29			

a. Dependent Variable: frequency

b. Predictors: (Constant), mean_jv, actyrblt, LOS

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	54873.777	18967.301		2.893	.008
	actyrblt	-27.341	9.442	-.411	-2.896	.008
	LOS	-33.408	78.267	-.069	-.427	.673
	mean_jv	.001	.000	.527	3.227	.003

a. Dependent Variable: frequency

Figure A-8. SPSS Output of Linear Regression Model for Middle School Level

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.810[a]	.656	.599	63.934

a. Predictors: (Constant), los, mean_jv, actyrblt

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	140234.261	3	46744.754	11.436	.000[b]
	Residual	73576.330	18	4087.574		
	Total	213810.591	21			

a. Dependent Variable: frequency

b. Predictors: (Constant), los, mean_jv, actyrblt

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	79293.518	26702.939		2.969	.008
	mean_jv	.001	.000	.370	2.573	.019
	actyrblt	-39.615	13.286	-.429	-2.982	.008
	los	2.490	.700	.494	3.554	.002

a. Dependent Variable: frequency

Figure A-9. SPSS Output of Linear Regression Model for High School Level

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BIOGRAPHICAL SKETCH

Lara Holimon was born in 1987 in Lakeland, Florida. She is the daughter of Jim and Beth Holimon, and she has three siblings: Beth Ellen Holimon, Paul Holimon, and Jimmy Holimon. She attended the University of Florida, where she earned her Bachelor of Arts degree in geography and sociology in 2010. During her undergraduate career, she was on the university's crew team.

In August 2010, Lara began the urban and regional planning program at the University of Florida. She was a graduate research assistant at the GeoPlan Center at UF, and focused her research on U.S. Census data. Lara graduated with her Master of Arts in Urban and Regional Planning in May 2012. She hopes to continue working with GIS and planning, and to focus more on how GIS can be utilized by school officials.