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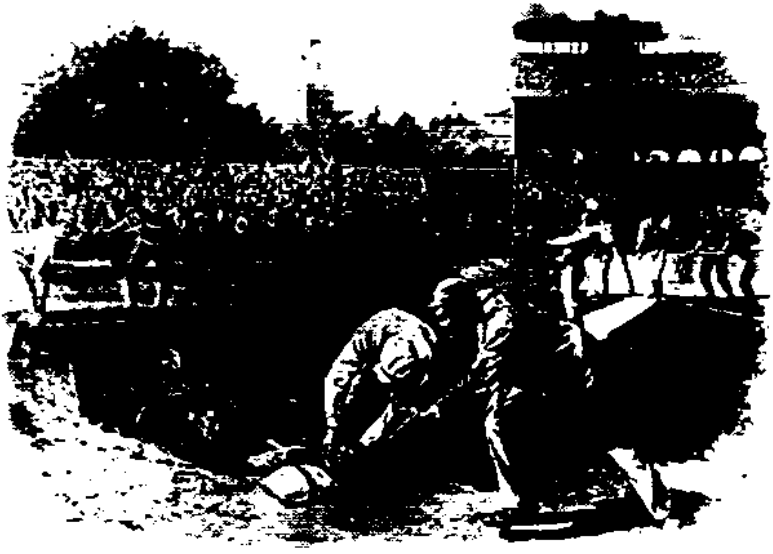

"Slide, Kelly, Slide!"

Contents

From the Editor

The *Florida Geographer* is the official publication of the Florida Society of Geographer and is distributed free to members of the society. It is a statewide journal, with coverage of geographical topics largely relating to the state. Manuscripts generally deal with some social science or physical geographical aspect of Florida or include Florida as an important component of a larger study, although exceptions can be made.

Manuscripts are solicited from all who feel they have research worthy of dissemination. For matters of style, see articles in the present issue. Authors should not be dissuaded from submitting articles for review because of format considerations.

Authors should submit the final copy of the paper on an IBM compatible diskette (3.5") in high-density format. Word Perfect or Word files are preferred: If not, please save files in ASCII (DOS text file) format.

This issue of the journal was prepared using Pagemaker 6.5 for Windows. Graphics were prepared using Freehand 9.0.

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The 2001 issue of the *Florida Geographer* contains seven articles. Of these articles five were written by geographers. This year's issue contains an article on the relationship between Florida's agriculture and its climate variability. The authors, eight in number, form a committee appointed by the governor to study this important issue. All are from Florida universities, but none are geographers. I was delighted that the committee chose to submit their findings for possible publication in the *Florida Geographer* since their conclusions should be of interest to a number of our readers. The other article not written by a geographer is that related to mortality trends during tropical cyclones. The authors were a graduate student in meteorology and a climatologist. It might be added that this is the first article I have published whose primary focus was not Florida, thus initiating a policy which was formalized several years ago.

As in previous years, the Florida Geographic Alliance, through its past Director, Ed Fernald and now through its present one, Laurie Molina, has covered the majority of the publication costs of the journal as well as its distribution. Acknowledgements are also due to Peter Krafft of the Florida State University's Florida Resources and Environmental Analysis Center, who for the past six years has drawn the maps, and Jim Anderson, the Director of the Florida Resources and Environmental Analysis Center, who during the same period, has done the page layout. This issue, as the previous ones, was edited by Betsy Purdum. However, the editor accepts responsibility for all errors and omissions.

Once again I appeal to members of the Florida Geographic Alliance to submit articles, teaching units, and any other material that you believe would aid others in the instruction of geography in grades K-12. When I assumed the editorship of the journal I particularly wanted to publish good student papers and materials submitted by teachers that were related to instruction. A number of student papers have been published, but relatively few on the teaching of geography.

Morton D. Winsberg
Editor, *The Florida Geographer*

Major League Baseball's Spring Training in Florida, 1901-2001

Jonathan I. Leib

"There are alligators out there." Babe Ruth explaining why he would not go back into the outfield to shag fly balls after walking off the field during the first day of New York Yankees' 1925 spring training in St. Petersburg (quoted in McCarthy 1996, p. 153).

On March 22, 1888, over one thousand spectators watched at a baseball field located on the outskirts of Jacksonville as the National League's Washington Capitals and New York Giants played Florida's first spring training baseball game (McCarthy 1996). In 2001, 20 of Major League Baseball's 30 teams participated in Florida's annual baseball rite of renewal, spending six weeks in late February and March training for the upcoming baseball season at 19 spring training sites across the state.[1] Along with providing a warm weather base of operations for professional baseball players to prepare for the upcoming season, Florida spring training has long provided pictures of sunshine and palm trees to northern residents locked in the icy grip of winter's cold and snow. These pictures have also provided free advertising for Florida's mild winters to potential northern tourists and migrants. Along with pretty pictures, spring training provides tangible benefits to the communities across the state that host teams. In 2001, attendance at spring training games in Florida was over 1.5 million fans, with the Florida Sports Foundation (2001) reporting that spring training provided a positive economic impact to the state of nearly $500 million dollars.

In the 101 seasons between 1901 and 2001, Florida has been the core area of spring training baseball. Despite being only a minor factor in spring trainings until the 1920s, 57% of the nearly 2,000 individual team spring trainings over the past 101 years (16-30 teams per year multiplied by 101 seasons) have been held in the

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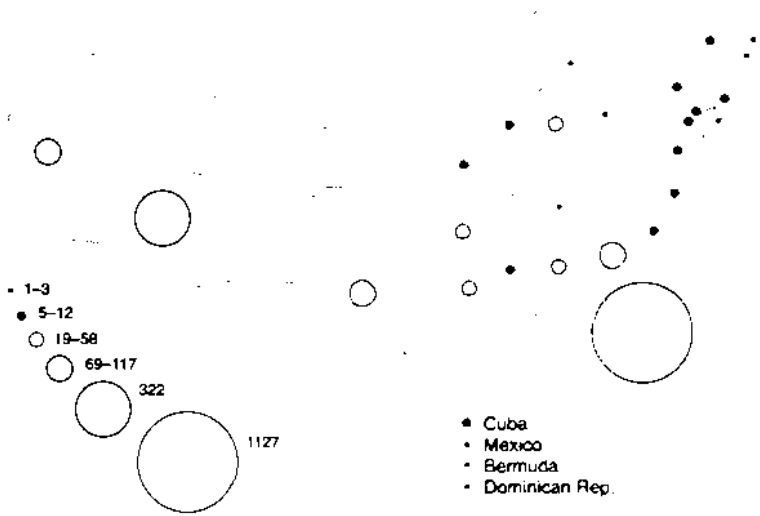
Sunshine State. The over 1,100 Florida spring trainings are more than double that of the next two states (Arizona and California) combined (Figure 1). Since World War II, Florida has been the dominant state for spring training, with 70% being held in the state since 1946.

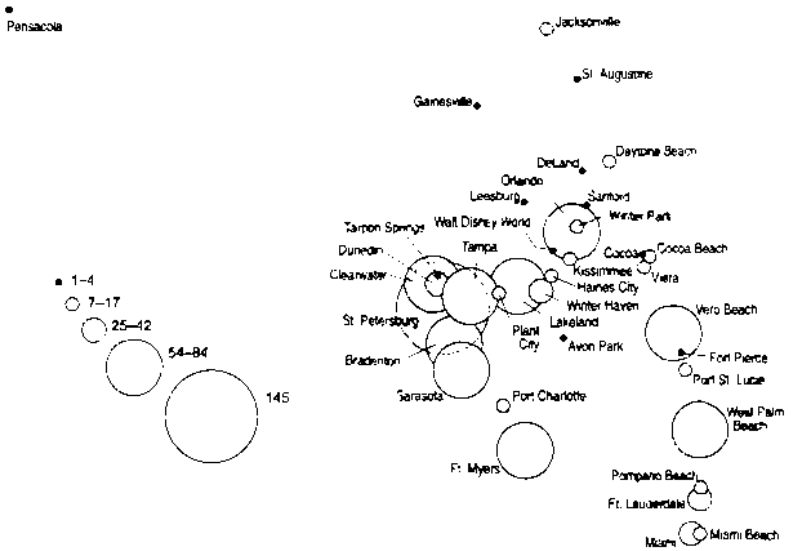
Figure 1
Number of Spring Trainings, 1901–2001



While Florida's spring trainings have been held from Pensacola to Miami Beach, the Tampa Bay area emerged in the 1920s as the state's spring training core area. St. Petersburg ranks first as a spring training site, having hosted 145 spring trainings or 13% of the state's total (St. Petersburg hosted two teams for spring training for most years between the 1920s and 1980s). Along with spring trainings held in Tampa, Clearwater, Sarasota, Bradenton, Dunedin, Plant City, and Tarpon Springs, the Tampa Bay region has hosted 44% of Florida's spring trainings over the past century. Adding to this group the spring trainings held in Fort Myers and Port Charlotte, the Florida Gulf Coast region has hosted a majority (51%) of the state's spring trainings. The state's southeast coast,

from Cocoa Beach to Miami Beach, has hosted 26%, while Central Florida has hosted 19%. North Florida, which was an important center for spring training activity in the early 20th century, has hosted approximately 3% of the state's spring trainings (Figure 2).

Figure 2
Number of Spring Trainings in Florida, 1901–2001



This article traces the historical evolution and shifting spatial patterns of Florida as a destination for baseball's spring training. After discussing the limitations of the data, this article looks at Florida's emergence and dominance as a spring training center over four time periods: 1901-1912, when Florida was a minor center for spring training; 1913-1942, when Florida became the core spring training area; 1943-1960, when major league baseball and Florida's spring training centers were faced with integration and challenges to Jim Crow segregation; and 1961-2001, when

major league baseball expanded into a nationwide sport and Florida communities faced challenges from emerging spring training centers in Arizona.

Limitations of the Data

Before tracing the historical geography of spring training in Florida, we must first address some limitations of the data on the locations of baseball's spring training sites. While baseball's first professional club, the Cincinnati Red Stockings, was organized in 1869, baseball historians are uncertain as to when the first professional baseball team traveled to the southern United States during the late winter to prepare for the upcoming season. Friedman (1999) notes that while in the late 1800s many northern teams traveled south during the winter, it is difficult to differentiate to what degree these trips were taken to train for the upcoming season from "barnstorming," in which teams would travel from town to town to take on local teams to make extra money before the start of their professional seasons. Given the confusing and incomplete histories of late 19th century spring training, the *Official Encyclopedia of Major League Baseball* (Thorn, Palmer, Gershman, and Pietrusza 1999; Thorn, Palmer and Gershman 2001) lists spring training sites for each team starting with the beginning of the modern baseball era in 1901 (that year marked the birth of the American League, joining the National League which started in 1876).

As a result, this essay examines only 20th century major league baseball spring training sites. A second limitation is that for the first half of the 20th century, Major League Baseball was only one of two entities playing high-caliber professional baseball in the United States. From 1920 to the 1950s, a series of African American professional baseball leagues (e.g., Negro National League, Eastern Colored League, Southern Negro League, Negro American League) played in parallel to the segregated (until 1947) Major Leagues (Peterson 1970). Some "Negro League" teams conducted spring training in the South (for example, in the 1930s the Pittsburgh Crawfords trained in Hot Springs, Arkansas and New Orleans (Bankes 1991), however their sites are not listed in this study for two reasons. First, no known database exists listing all the Negro League teams spring training locations. Second, Negro League teams spring training were much shorter, if they were held at all (Tygiel 1997), than those of the Major Leagues (Chadwick 1992)

suggests that Negro teams' spring training lasted about one week). One reason was that, while many Major League baseball players used the longer spring training period to get into playing shape, many Negro League baseball players played considerably more games during "baseball season" in the US than did their white counterparts, and continued to play during the winter months in Latin American baseball hotbeds (such as Cuba, the Dominican Republic, Mexico and Venezuela) where they were paid better, and did not face the obstacles of segregation and racism that were found in the United States (Bankes 1991, Chadwick 1992, Tygiel 1997).

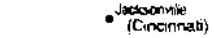
Spring Training in Florida: 1901-1912

While spring training first came to Florida in 1888, the early 20th century demonstrates that it was not inevitable that Florida would become baseball's spring training core region. Most teams did travel south for spring training in the early 20th century. Of the 192 opportunities to host spring training from 1901 to 1912 (16 teams multiplied by 12 seasons), 154 (80%) were held in the eleven states of the South (in addition, 8 were held in California). However, Florida was a minor base of operation for spring training, hosting only six (3%) during this time period. Cities across Georgia hosted the most spring trainings (23%), followed by Texas and Arkansas. Late 19th and early 20th century southern resort cities were popular spring training locations during the time period, with Hot Springs, Arkansas being the main spring training center of the period. Hot Springs hosted 25 spring trainings, including five teams in 1910 alone (Boston Red Sox, Brooklyn, Chicago Cubs, Cincinnati and Pittsburgh). Jacksonville was the site of all six of Florida's spring trainings during this time period, with no more than one team training there in any one season (Figure 3).

Spring Training in Florida: 1913-1942

In the 1920s and 1930s, Florida moved from a peripheral region for spring training baseball to being the main center of activity. In the 20 seasons between 1923 and 1942, 56% of spring trainings nationwide were held in the state. In terms of spatial patterns, the major change occurred as spring training baseball shifted further south in Florida to the Tampa Bay region especially and to a lesser extent to central Florida and the state's southeastern coast.

Figure 3
Spring Training in Florida



1905

Northern Florida retained a minor spring training presence until the early 1920s and then sporadically into the 1930s. The region hosted one to three spring training teams each year between 1913 and 1922 (in Jacksonville, Pensacola, Saint Augustine, Daytona Beach and Gainesville) and then for several seasons in the 1930s.

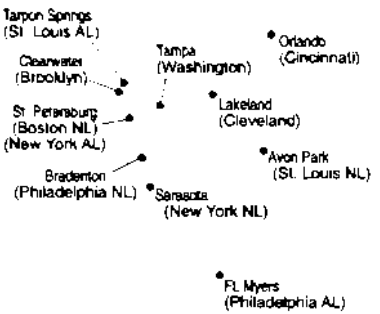
The major shift in Florida spring training locations began in 1913 when the Chicago Cubs transferred their spring training operations from New Orleans to Tampa. While the Cubs only stayed in Tampa for four seasons, moving to California in 1917, the Cubs started the Tampa Bay region's long-standing dominance in spring training. Ironically, the Cubs' four seasons in Tampa would be the only seasons during the 20th century that they would train in Florida. Across Tampa Bay, St. Petersburg hosted its first spring training team in 1914 when the St. Louis Browns moved their operations from Waco, Texas. The first spring training game held in St. Petersburg that year between the Cubs and Browns drew a crowd of 4,000, some of whom came by boat and special trains, with the day declared a city holiday with businesses and schools closed (Zinsser 1989; McCarthy 1996). While the Browns returned to Texas after only one season in St. Petersburg, the Philadelphia Phillies took their place in 1915.

The rise of the Tampa Bay region as spring training's core area occurred in the mid 1920s. In 1923, four teams trained in the area: the Washington Senators in Tampa, Boston Braves in St. Petersburg, St. Louis Cardinals in Bradenton, and the Brooklyn Dodgers in Clearwater. By 1925, seven teams trained in the area (two teams trained in St. Petersburg as the Boston Braves were joined by the

New York Yankees, the Browns established a spring training base in Tarpon Springs, while the New York Giants trained in Sarasota). In addition, the Philadelphia Athletics set up operations farther south along the Gulf Coast in Fort Myers. Thus, by the mid-1920s, half of major league baseball's 16 teams were training along Florida's Gulf Coast (Figure 4).

Figure 4
Spring Training in Florida

1927



While there would be movement among some teams from one city to another, from 1923 to 1942 anywhere between four and seven teams trained each year in the Tampa Bay area, with Fort Myers also hosting a team through much of this period. During this twenty year span, the Tampa Bay region became the core area for spring training, with one-third of all of baseball's spring trainings held in the region. Adding the fourteen years spring training was held in Fort Myers during this period, the southern Florida Gulf Coast hosted 38% of all spring trainings.

To a lesser extent, other parts of the state also became spring training centers. Central Florida hosted its first spring training in 1922 when the Philadelphia Phillies shifted operations from Gainesville to Leesburg. Between 1923 and 1942, one to four cities in central Florida hosted spring training teams each season, including Leesburg, Orlando, Lakeland, Winter Haven, Avon Park, Winter Park, Deland and Sanford. During this twenty-year period, 16% of spring trainings were held in central Florida.

Southeastern Florida was a minor base of spring training operations between 1913 and 1942. For only five seasons did two teams train in this part of the state, while no teams trained there in 14 seasons. Miami hosted the first team in the region in 1916, but between 1921 and 1927, no teams trained in southeastern Florida at the same time as the Tampa Bay region blossomed as a spring training center. Between 1923 and 1942, only 5% of spring

trainings were held in the area, with Miami, Miami Beach and West Palm Beach being the only cities to host spring training.

The person who receives the most credit for turning the Tampa Bay region specifically and Florida in general into a spring training center is St. Petersburg's Al Lang (Zissner 1988, McCarthy 1996, Friedman 1999). Lang moved to St. Petersburg from Pittsburgh in the early 1910s, and then started enticing major league baseball teams to come to the area for spring training (Lang would be twice elected mayor of St. Petersburg in the late 1910s). In 1914, Lang brought the St. Louis Browns to St. Petersburg, though they stayed only one year following a dispute over who would pay the team's expenses.

Lang continued working to bring spring training to St. Petersburg in the 1920s. In 1920, Lang orchestrated the building of a new ballpark in St. Petersburg, and brought the Boston Braves to the city in 1922 (McCarthy 1996). In 1925, he lured the New York Yankees to St. Petersburg. With Babe Ruth as the main attraction, ticket sales to Yankees spring training games soared, with 270,000 fans watching Ruth and the Yankees during the 1928 pre-season (Friedman 1999). Lang also encouraged other teams to move close by so that by the mid-1920s the Tampa-St. Petersburg area was baseball's premier spring training center (Zissner 1988).

While some teams stayed in one city for a decade or more, others moved frequently. For example, while the Yankees trained in St. Petersburg from 1925 to 1942, their New York City cross-river rivals, the Giants, trained in nine different cities during that time period (Sarasota; Miami; Miami Beach; Winter Haven; Augusta, Georgia; San Antonio, Texas; Los Angeles; Baton Rouge, Louisiana; and Havana, Cuba).

As is the case today, cities in the 1920s and 1930s offered economic inducements to entice teams to train in their cities. The St. Louis Cardinals provide one example. In 1923, the Cardinals became Bradenton's first spring training tenant, leaving Texas after Bradenton's Spring Training committee "agreed to sell two thousand dollars worth of tickets" to Cardinals' exhibition games (Zissner 1988, 25). The Cardinals spent only two years in Bradenton, moving on to Stockton, California in 1925 and San Antonio, Texas in 1926. However, the city of Avon Park was able to lure the Cardinals back to Florida for the 1927, 1928, and 1929 seasons after the city "guaranteed" Cardinal ownership fifteen thousand dollars per year to hold spring training in their city (Stockton 1961, 227). Officials in Avon Park struggled to make

their 1928 and 1929 payments, and in 1930 the Cardinals moved back to Bradenton, where they would remain through 1936 (Zissner 1988). In 1937, the Cardinals moved their spring training operations to Daytona Beach in exchange for a payment of five thousand dollars (Friedman 1999). However, their stay in Daytona Beach lasted only one season, and in 1938 the Cardinals moved back across the state to St. Petersburg, which, except for three years during World War II, would be their spring training home for the next sixty years.

Thus cities competed with each other, offering cash inducements and other amenities to attract teams. This is not to suggest that places in Florida did not gain from the arrangement. Through their investments in stadiums and teams, Florida communities in the 1920s were able to buy themselves publicity in northern baseball cities at a time when baseball's popularity was soaring, and also at the time of the Florida land boom and as the state's popularity as a tourist destination was increasing (see Rogers 1996). In addition, there were more tangible benefits. McCarthy (1996) notes that the Yankees agreement in the early 1930s to house their players and entourage in St. Petersburg's Don Ce Sar Hotel reportedly saved the resort from "financial ruin" during the Depression.

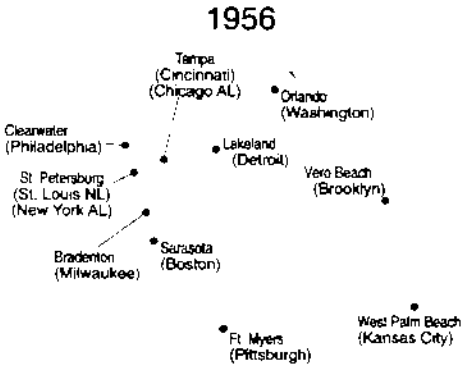
Spring Training in Florida: 1943-1960

World War II travel restrictions kept major league baseball teams close to home for spring training in 1943, 1944, and 1945. So, Chicago's Cubs and White Sox trained in French Lick, Indiana; the Washington Senators trained in College Park, Maryland; while the New York Giants trained in Lakewood, New Jersey.

After a three-year hiatus, spring training returned to Florida in 1946. Between 1946 and 1960, spring training locations would stabilize, as many teams retained semi-permanent spring training sites. In 1946, the Philadelphia Phillies moved their spring training to Clearwater, where it has remained since. The Detroit Tigers returned to Lakeland, still their spring training home. The Washington Senators returned to Orlando, their spring training base through 1990. In fact, the Senators spring training location was more stable than the franchise itself, which retained their Orlando spring training base even after the franchise moved to Minnesota before the start of the 1961 season.

In the fifteen seasons after World War II (1946-1960), Florida solidified its hold as the nation's premier spring training region (Figure 5). Seventy percent of baseball's spring trainings during this time period were held in Florida (including 13 of baseball's 16 teams in 1955). Within the state, the Tampa Bay region retained its hold as the core area for spring training, as 56% of all Florida's spring trainings and 39% of all of baseball's spring trainings during the time period were held in Tampa, St. Petersburg, Clearwater, Bradenton and Sarasota (including the six spring trainings in Fort Myers, the Florida Gulf Coast hosted 59% of Florida's and 41% of all spring trainings).

Figure 5
Spring Training in Florida



Southeast Florida grew as a spring training site during the time period, though not rivaling that of the Tampa-St. Petersburg area, as 22% of Florida's and 15% of all spring trainings from 1946 to 1960 were held in Miami, Miami Beach, Fort Lauderdale, West Palm Beach, and Vero Beach. Central Florida continued as a minor spring training region, with Lakeland and Orlando serving as hosts for 18% of Florida's and 13% of baseball's spring trainings.

The stabilization of spring training sites hides the time period's biggest challenge to spring training in Florida (and to Major League Baseball itself): racial integration. In 1945, Brooklyn Dodgers' General Manager Branch Rickey signed Negro League player Jackie Robinson. Robinson played the 1946 season for Brooklyn's top minor league farm team in Montreal, and in 1947 he became the first African American in the 20th century to play in the Major Leagues. Cleveland Indians' owner Bill Veeck followed in 1947 by signing Larry Doby, who became the first African American to play in the American League. With the majority of

baseball teams training in Florida, many parts of which were still under the control of Jim Crow (Jones 1996, Mohl and Mormino 1996), integration brought challenges to Florida's spring training.[2]

With the signing of Robinson, the Brooklyn Dodgers first attempt to break baseball's color barrier on the field occurred in March 1946 at their spring training camp in Daytona Beach, a city governed by Jim Crow segregation. Speculation in both the white and black northern press questioned whether Robinson could survive spring training in Florida. As a writer for the *Brooklyn Eagle* wondered the day after the official announcement of Robinson's signing in October 1945,

> Probably the first headache will come next spring . . . in Daytona Beach, Fla. and anyone who has traveled that far South can't help but wonder just how things will be arranged. Fundamental things such as where he will sleep and where he will eat. Not to mention what traveling accommodations they'll let him have in deepest Dixie (quoted in Tygiel 1997, 99).

While Jackie Robinson had experienced segregation in the military during World War II, for he and his wife Rachel, both raised in California, their spring training experience would provide painful lessons on living under the rules of Jim Crow. Just getting to Daytona Beach for the beginning of spring training proved to be an ordeal, as their airplane trip from California to Florida turned into a nightmare once they reached the South. Bumped off their connecting flight in New Orleans, the Robinson's would not be served at the airport's restaurants and found only a dilapidated black hotel to wait for the next available flight. Once they left New Orleans, their plane stopped at Pensacola, where the Robinson's were ordered off the plane so two white passengers could board in their place. They bused to Jacksonville, forced to sit in the inferior, crowded, and nauseating Jim Crow section at the back of the bus. Rachel Robinson described the cramped black waiting room at the Jacksonville bus terminal, where they waited for their ride to Daytona Beach, as a "wretched hell hole" (quoted in Tygiel 1997, 100). Upon their delayed arrival in Daytona Beach, Jackie Robinson noted, "Well I finally made it, but I never want another trip like that one" (quoted in Tygiel 1997, 101).

Both the Dodgers and their top minor league farm team, the Montreal Royals to whom Robinson was assigned, trained in Daytona Beach in 1946. Because of local Jim Crow laws, the

Robinson's were not allowed to stay in the team's hotel, and the Dodgers had to find the Robinson's separate accommodations in the black section of the city. However, Daytona Beach officials *did* allow Robinson to play on the field against white baseball players. Other north Florida cities were not as accommodating. Enforcing bans on the mixing of the races on its playing fields, public officials in Jacksonville and Deland canceled scheduled Royals' spring training games rather than allow Robinson and the Dodgers' other black signee, John Wright, from sharing the field with white players. In Sanford, the Chief of Police came on to the field during the middle of a Royals' spring training game and ordered Montreal's manager to expel Robinson and Wright from the stadium or the game would be shut down (Tygiel 1997).

While Daytona Beach officials lobbied the Dodgers to sign a long term contract to keep the team's spring training in the city, Branch Rickey decided otherwise in light of the problems faced, and in 1947 the Dodgers shifted their spring training base out of the South (Tygiel 1997). Despite incurring much higher costs, the Dodgers avoided segregation in Florida by holding their 1947 spring training in Havana, Cuba, while playing their pre-season games in Cuba and Panama (though, ironically, to avoid potential confrontations with white players, the Dodgers had the four black players on their 1947 spring training roster stay at a separate hotel from the rest of the squad in Havana, living and eating in much poorer conditions than their white teammates (Tygiel 1997). Robinson made the major league team in 1947 and became a star in his first season.

After their sojourn to the Caribbean, Branch Rickey moved the Dodgers' spring training back to Florida. However, in doing so, he wanted to avoid the Jim Crow headaches the team faced earlier. Rickey solved the problems of training an integrated team in Florida by leasing a decommissioned naval base in Vero Beach in 1948 and turning it into the Dodgers' spring training complex. "Dodgertown," as it became known, was a city within a city. Controlled and operated by the team, Dodgertown became a "haven of tolerance," insulated from Vero Beach's segregation, a place where "black and white players could room together, eat together, and train together without interference from outside authorities" (Tygiel 1997, 316-317). To allow black players to avoid Vero Beach's Jim Crow system, team officials at Dodgertown showed movies, built a nine-hole golf course for the players, and had an airstrip that could provide transportation in and out of the

facility (Tygiel 1997).

While the Dodgers went to great lengths to provide a shield for its black players from Jim Crow in Florida, other teams in the late 1940s and 1950s avoided the problem altogether by holding spring training outside of Florida and the South. In 1953, five of the seven major league teams with African American players on their rosters held spring training in either Arizona or California (Tygiel 1997, Friedman 1999). The Cleveland Indians, the first American League team to break baseball's color barrier, was one of these teams. The Indians trained in Lakeland in the mid 1920s, Fort Myers in the early 1940s, and Clearwater in 1946, before moving spring training operations in 1947 to Tucson, Arizona, where they would be based for the next 45 years. The Indians and New York Giants, who moved from Miami to Phoenix the same year, became the first teams to train in Arizona since 1929.

Cleveland Indians' owner Bill Veeck was the motivating force behind the team's move west. Veeck had bought the team in 1946, and his decision to move the Indians' spring training out of Florida was based on his experience in the early 1940s as owner of the minor league Milwaukee Brewers team. The Brewers had held their spring training in segregated Ocala. Veeck decided to watch a Brewers' spring training game with black fans in the segregated Jim Crow section of Ocala's ballpark. While Veeck was chatting with the fans, the local sheriff tried to remove him. When he refused to leave, Ocala's mayor came and ordered him out of the black section of the stands for violating a city ordinance. Veeck refused again, and told the mayor that if he were removed, he would immediately pull the Brewers out of Ocala, cancel the team's six-week booking at the Ocala Hotel, and seek national publicity explaining why the team left town in the middle of spring training. Local officials backed off, and Veeck sat in the black section of the ballpark every day for the remainder of spring training (Veeck 2001, 177-178). At that point, Veeck vowed not to return to Florida for spring training until conditions had changed.

The Indians first spring training in Arizona in 1947 was uneventful. In July 1947, Veeck signed Negro Leaguer Larry Doby, who became the second black player in the major leagues. When the Indians returned to Tucson in 1948, management at the Santa Rita Hotel, their base of operations, informed Veeck that Doby could not stay there. The Indians acquiesced. Doby stayed with a local family, but Veeck told the hotel that if all of the team's players, regardless of race, were not allowed to stay in the hotel in

future years the team was moving to another facility (Veeck 2001, 178; Tygiel 1997, 235).

Although some teams training in Arizona faced segregated housing for their players into the early 1950s, most Florida spring training sites remained segregated throughout the decade. While most cities around the state had relented and allowed black and white ballplayers to play on the same field together (in fact, many cities lobbied to have the Dodgers play exhibition games in their ballparks given that Jackie Robinson was a major attendance draw, especially among African American fans), players remained segregated in their housing and eating facilities (Davis 1992, Tygiel 1997). As well, spectators at spring training games were segregated into white and black seating areas. The fan segregation was also true for black and white ballplayers who would sometimes watch spring training games from the stands. For example, in 1955, the Pittsburgh Pirates, training for the first time in Fort Myers and holding only their third Florida spring training since 1918, encountered this problem. As Tygiel (1997, 315) notes, "local officials ordered blacks on the Pirates who did not suit up for the first exhibition game [of the season] to sit in the colored section." Thereafter, the Pirates instructed all players to appear in uniform even if they were not scheduled to play." The Cincinnati Reds encountered a similar situation at their spring training ballpark in Tampa.

In the early 1960s, Florida's spring training facilities finally became fully integrated. In January 1961, the St. Petersburg chapter of the NAACP launched a public campaign to end segregated facilities at spring training sites. St. Petersburg provided a logical site to launch the campaign as it was the leading center for spring training, it was the spring training home of the New York Yankees and St. Louis Cardinals, and it was a fully segregated city into the late 1950s (Davis 1992). Black players on the Yankees and Cardinals, as well as other teams in the state, called for the desegregation of spring training hotels and other facilities. The Yankees requested in February 1961 that their hotel in St. Petersburg, the Sereno, desegregate immediately and allow its black players to room there. The Soreno declined (as did the Vinoy Park Hotel where the white Cardinal players stayed), and the Yankees moved their spring training the following year to Fort Lauderdale, where their hotel allowed all Yankee players, black and white, to stay (though Davis [1992] and McCarthy [1996] suggest that for Yankee ownership, the move the Fort Lauderdale was not based solely for

this reason).

The first major breakdown of segregated spring training facilities in 1961 came as the result of actions by Bill Veeck, who had bought the Chicago White Sox two years earlier and who in the late 1940s had moved his Cleveland Indians to Arizona to avoid Jim Crow. Responding to the NAACP's call for an end to segregated spring training facilities, Veeck canceled his team's reservations at Miami's McAllister Hotel for an upcoming series of spring training games after the hotel informed him that they would not allow the White Sox's black players to stay there. Veeck then asked a nearby hotel, the Biscayne Terrace, to allow all of his players to stay there, and they agreed (Davis 1992).

Veeck's actions were followed by other teams. In March 1961, the Milwaukee Braves eliminated Jim Crow segregation at their spring training ballpark in Bradenton, "abolishing segregated seating requirements and removing discriminatory signs at washrooms, ticket windows, and gates." Other Florida spring training stadiums followed the Braves' lead (Davis 1992, 161).

For the 1962 season, baseball officials and local politicians worked behind the scenes to secure integrated accommodations for most teams training in Florida. In St. Petersburg, arrangements were made for the Cardinals and the expansion New York Mets to stay at hotels other than the Vinoy Park and Soreno (Davis 1992).

While most team's hotels became integrated for the start of spring training in 1962, two exceptions, the Philadelphia Phillies in Clearwater and the Minnesota Twins in Orlando, stand out. In Clearwater, the Phillies' hotel, the Jack Tar Harrison, refused to house the team's black players. In response, black community leaders in Philadelphia announced they would picket the team's regular season home games in Philadelphia that year. Under pressure, the Phillies moved its players to a hotel across Tampa Bay. The Jack Tar Harrison's management changed its policy two weeks later, and the Phillies resumed their affiliation with the hotel (Davis 1992).

The last team to stay in a segregated hotel, the Minnesota Twins in Orlando, agreed to move their spring training operations to an integrated hotel in 1964. As was the case in Philadelphia, the Minnesota chapter of the Congress of Racial Equality (CORE) vowed in early 1964 to picket the Twins' regular season home games in Bloomington, Minnesota if the team did not move into an integrated spring training hotel. Acceding to the planned protest, the Twins agreed in March to move into an integrated hotel (Davis

1992). Thus, sixteen seasons after Jackie Robinson had integrated organized baseball and the Dodgers' started to challenge Jim Crow on the baseball fields of Florida, the state's spring training had finally become fully integrated.

Spring Training in Florida: 1961-2001

The 1950s and early 1960s saw the beginnings of two related trends in baseball franchise locations. While in the first half of the Twentieth Century major league baseball was only played in the northeastern and midwestern U.S., the 1950s saw the major leagues spreading into a truly "national" pastime, as the majors saw their first franchise shifts since 1903. The boundaries of baseball stretched greatly with two of New York City's three teams, the Dodgers and Giants, moving to Los Angeles and San Francisco after the 1957 season, thus becoming the majors' first teams west of Missouri. The mid-1960s move of the Milwaukee Braves (who had moved from Boston in the early 1950s) to Atlanta gave major league baseball its first franchise in the southeastern U.S.

The movement of franchises occurred at approximately the same time as Major League Baseball greatly expanded its number of teams. In 1961, for the first time in sixty years, baseball expanded beyond sixteen teams, adding eight teams during the decade. While some of these teams reinforced baseball's northeast-midwest core by replacing franchises that had moved away (such as new teams in New York, Washington and Kansas City), other teams further expanded baseball's national reach (e.g., Houston, San Diego, Seattle, and a second Los Angeles area team) and continental reach (e.g., Montreal). With the beginning of the 1998 season, major league baseball had thirty franchises, almost double the number in 1960, and had teams spread throughout the United States and into Canada, a far different geography than in the early 1950s.

Paradoxically, the expansion and spread of baseball franchises provided both an opportunity and a threat to Florida as baseball's spring training core. With more franchises, more cities in Florida could become spring training centers. At the same time, the spread of baseball teams meant that, unlike in previous periods, various teams were now closer to other potential warm weather spring training sites (i.e., Arizona) than they were to Florida. Also, the development of jet airline service made sites in Arizona "closer" to teams in the northeast and midwest than ever before.

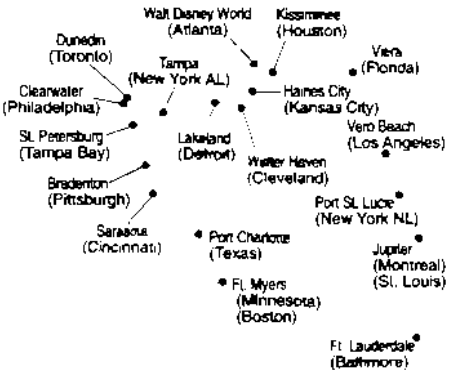
The map of spring training sites also shifted in the 1950s, as Arizona replaced California as the primary challenger to Florida's domination. In the 1930s and 1940s, California was the second leading spring training site, hosting four teams in most years. However, in the early 1950s, spring training in California ended as the leaders of the Pacific Coast League, a top minor league with the majority of its franchises in California, effectively kicked out Major League Baseball teams from spring training sites in the state (Friedman 1998, 571). At the time, the Pacific Coast League was mounting a challenge to the American and National Leagues as a third major league. The result was that Arizona replaced California as the center for western spring training.

Despite challenges from Arizona, between 1961 and 2001 Florida maintained its position as the preeminent center for spring training. During the 41 season span, 70% of spring trainings were held in Florida, with Arizona hosting the remaining 30%.[3] Florida hosted a high of 80% from 1966 to 1968 (16 of 20 teams), and a low of 67% (20 of 30 teams) between 1998 and 2001. This latter figure will drop over the next several years as two current Florida spring training teams (Texas and Kansas City) have agreed to move their spring training operations to Arizona.

Throughout this period, the Tampa Bay area specifically and the Florida Gulf Coast in general maintained their positions as premier centers for spring training. The Tampa Bay area hosted six or seven teams during the time period, and the entire Gulf Coast region anywhere from seven to ten (including teams in St. Petersburg, Tampa, Clearwater, Dunedin, Plant City, Bradenton, Sarasota, Port Charlotte, and Fort Myers). Both southeastern and central Florida increased their number of spring training teams as well. In the late 1960s, early 1970s, and again in the early 1980s, seven teams trained along the southeastern coast (two teams in West Palm Beach, and one each in Cocoa Beach, Fort Lauderdale, Miami, Pompano Beach and Vero Beach), while in the late 1980s, and again in the late 1990s, five teams trained in central Florida (Haines City, Kissimmee, Lakeland, and Winter Haven, in addition to Orlando in the late 1980s and at Walt Disney World in the late 1990s). These patterns are apparent in the map of 2001 Florida spring training sites (Figure 6). Over the forty one season period from 1961 to 2001, 37% of Florida's spring trainings were held in the Tampa Bay area (with 46% occurring along the Florida Gulf Coast), 34% were held along the southeast coast, and 20% in Central Florida.

Figure 6
Spring Training in Florida

2001



Between the mid 1960s and the mid 1980s, spring training sites in Florida became very stable, with few teams switching locations during this period. Of Florida's sixteen spring training teams in 1966, fourteen held spring training in the same city in 1984. However, the mid 1980s saw the beginning of a period of upheaval in Florida spring training locations that continues to the present. The late 1970s and 1980s was a period in which Major League Baseball underwent renewed interest in the U.S., leading to increases in attendance. Increases in interest and attendance were also exhibited at spring training sites (Friedman 1999). With Florida cities competing for national exposure and associated revenue accruing from hosting a spring training team, cities across the central and southern part of the state started a fierce bidding war. The result, in the mid to late 1980s and 1990s, was that Florida cities and counties spent increasing amounts of money to lure teams to their newly built facilities, with teams looking to increase their revenue streams.

For example, in 1985, the Houston Astros were lured from Cocoa Beach to Kissimmee with a new $5.5 million spring training facility, while two years later Charlotte County built a $5.6 million complex in Port Charlotte to bring the Texas Rangers from Pompano Beach. The cost of new facilities increased dramatically as demonstrated by efforts in Fort Myers in the early 1990s to bring in spring training teams after the city lost the Kansas City Royals to the Haines City area in 1988. In 1991, Lee County built a $15 million complex to bring the Minnesota Twins to Fort Myers from Orlando, while the city of Fort Myers spent $25 million to lure the Boston Red Sox from Winter Haven in 1993. The building of new facilities and stealing of teams continued among Florida cities into the mid and late 1990s. In 1994, Hillsborough County Commis-

sioners approved the building of a $17 million spring training facility for the New York Yankees (the Yankees moved to Tampa from Ft. Lauderdale in 1996)(McCarthy 1996). Even the Disney Corporation, whose Walt Disney World dominates Florida's lucrative tourism industry and has over the past thirty years been the economic engine driving central Florida's growth (Winsberg 1992), joined the spring training movement, enticing the Atlanta Braves to move from West Palm Beach to its new Wide World of Sports entertainment complex in 1998 (Friedman 1999).

Cities and counties make the argument that spending public funds to build spring training complexes makes economic sense because of the $20-$25 million yearly economic impact that each team brings its home community (e.g., ESPN 2001, Florida Sports Council 2001). Academics studying the economic impact of professional sports on local communities (e.g., Rosentraub 1999) urge that such figures be used cautiously because professional sports advocates often wildly exaggerate the impact of pro sports on their home communities. Such charges of exaggeration have been leveled against spring training economic impact studies as well (ESPN 2001).

Whatever the economic gains that come with spring training, Florida cities have demonstrated that there are costs involved as well. The cost of maintaining Plant City's spring training facility, which hosted the Cincinnati Reds from 1987 to 1997, reached $400,000 per year (about 1% of the city's budget) by the end of the Reds tenure; while by 1997, West Palm Beach was spending approximately $1 million in annual upkeep costs of its spring training facility (ESPN 2001). Homestead suffered the worst economic loss of any Florida city trying to lure a team for spring training. In 1991, Homestead spent $22 million to build a spring training facility to entice the Cleveland Indians from their long time spring training base in Arizona. However, Hurricane Andrew significantly damaged the facility, with repairs costing an additional $8 million. Indians' management rethought their impending move to Homestead, and relocated to Winter Haven instead, leaving Homestead without a spring training tenant (McCarthy 1996).

The building of facilities and chasing of teams continues in Florida. West Palm Beach, which in 1998 lost its two spring training tenants, the Atlanta Braves and Montreal Expos, is considering building a $35 million complex in an attempt to entice the Baltimore Orioles from Fort Lauderdale and the New York Mets from

Port St. Lucie. The irony is that the Mets moved to Port St. Lucie in 1988, after being lured there from St. Petersburg with a new facility built by St. Lucie County. However, St. Lucie County officials are fighting the potential loss of the Mets by trying to sign them to a new lease agreement, or, if they should fail, targeting the Cleveland Indians to move to Port St. Lucie from Winter Haven (ESPN 2001). Thus cities across central and south Florida continue to engage in ever increasingly expensive franchise chasing.

At the same time that cities in Florida are trying to steal teams from each other, cities in Arizona are also involved in similar spring training franchise chasing and, as well, are attempting to steal teams from cities in Florida. The cost of spring training facilities in Arizona increased greatly in 1994, when the Phoenix suburb of Peoria built a $32 million complex to bring the Seattle Mariners and San Diego Padres from Tempe and Yuma respectively. In 1998, Tucson built a new complex for the expansion Arizona Diamondbacks and to lure the Chicago White Sox across the country from Sarasota, their spring training home since 1960 (Friedman 1999). The raiding of Florida spring training teams will continue in either 2002 or 2003, as two Florida teams (the Royals and Rangers) have agreed to move into a new $45 million complex in Paradise, Arizona (the Rangers abandoning their fifteen year old facility in Port Charlotte) (Friedman 2001). In addition, in recent years officials in the Las Vegas area and in southern Texas have discussed building spring training facilities and bringing from four to six teams to these areas (including some from Florida) (e.g., Hilderbrand 1996, Carp 1997, Kantowski 2000). While the Las Vegas and Texas proposals have yet to be realized, these examples suggest that Florida's future dominance of spring training is not assured.

Conclusion

This article has detailed Florida's long-standing dominance of Major League Baseball's spring training. Since the 1920s, the core area of Florida's (and the country's) spring training activity has been found in the Tampa-St. Petersburg region. However, underlying this seeming stability have been periods of instability, both in terms of the locations of teams and the local contexts in which they have trained. While Johnson (1983) correctly notes that of the four long-established professional sports leagues in North America (Major League Baseball, National Football League, National

Basketball Association, and National Hockey League), only baseball franchises have displayed "locational stability" with relatively few franchises moving from place to place, their spring training operations have gone through periods of both locational stability and instability. In many ways, the spring training pattern of teams shifting their operations from city to city on a more frequent basis is more similar to that of franchises in minor league baseball than of the major leagues (Leib 1989, Leib 1990).

Major League Baseball's spring training operations in Florida during the 1940s, 1950s and 1960s also demonstrates that baseball (and Florida) were not immune to the local and national contexts in which they were situated. Baseball's efforts at racial integration and desegregation in some cases led and in some cases lagged behind the rest of the country. While today, the Civil Rights Movement of the 1950s and 1960s is most associated with "Deep South" states such as Mississippi, Alabama, Georgia, and the Carolinas, the response in Florida's spring training communities to baseball's integration attempts demonstrates that struggles were necessary throughout Florida to achieve civil rights for African Americans in the Sunshine State as well (see Rabby 1999).[4]

Baseball's spring training will likely remain an institution in Florida into the near future. However, challenges from other parts of the country suggest that it is too soon to tell whether Florida will be the dominant spring training region for the next hundred years as it has been for the past hundred years.

Notes

[1]The Montreal Expos and St. Louis Cardinals share spring training facilities in Jupiter.
[2]Tygiel (1997, 33) suggests that issues of Jim Crow laws in Florida spring training cities was one of the excuses given by some in baseball for not admitting black players in the years before Major League Baseball integrated.
[3]Between 1961 and 1992, the Los Angeles (then California, and now Anaheim) Angels split their spring training each year between Mesa, Arizona and Palm Springs, California. Since 1993, the Angels have held spring training exclusively in Arizona.
[4]Though Major League Baseball officials, owners, players, and spectators, of course, were not themselves always willing participants in the effort to integrate the sport (see Tygiel 1997).

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Trends in U.S. Tropical Cyclone Mortality During the Past Century

Anthony Arguez and James B. Elsner[1]

Hazard mitigation specialists in the United States, and particularly in Florida, are deeply concerned with hurricanes. Storm surge, heavy rainfall, and high winds combine to make them perilous events. Despite technological advances in monitoring and prediction, hurricanes retain their potential to cause severe damage and numerous deaths. Hurricane Mitch, which devastated Honduras and Guatemala in 1998 is a reminder that hurricanes can quickly kill thousands of people. Population and demographic shifts toward the coasts will make the problem worse.

The United States' coastal population is growing faster than the total population. Damage data from past storms support the notion that the United States is becoming increasingly vulnerable to hurricanes (Pielke and Landsea 1998). The five costliest U. S. hurricanes have occurred since 1965 (Elsner and Kara 1999). The average number of deaths from hurricanes has, however, decreased markedly over the past century (Simpson and Riehl 1981). This is due, in part, to technological advances (satellite and aircraft surveillance, numerical weather prediction models, etc.) and to effective communication of their destruction potential (Pielke and Pielke 1997). For example, efficient communication and transportation infrastructure allow effective warning and evacuation of coastal residents well in advance of the storm (Riebsame et al. 1986).

However, because the distribution of annual deaths is skewed, the mean annual death toll can be misleading. In fact, there is the intuitive notion that with more people in harm's way, there is an increasing threat of casualties. Here, instead of the *mean* we use the *median* value to ascertain the typical number of deaths per year. In addition we demonstrate that, similar to damage costs, the median

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number of deaths per hurricane has been larger during the second half of the century than during the first half.

Data and Method

Data used in this study are obtained from Hebert et al. (1996). They consist of estimated annual number of deaths in the mainland United States from North Atlantic tropical cyclones that reached land over the period 1900 through 1995 (see Table 1). The North Atlantic includes the Caribbean Sea and Gulf of Mexico. A tropical cyclone is a generic term referring to a disturbance or storm of tropical or subtropical origin. For the purpose of this study we use only the count of direct deaths from tropical cyclones (see also Fitzpatrick 1999). Direct deaths are those that occur from high winds, storm surge, or flooding accompanying the storm. Indirect deaths, including stress-related heart attacks or traffic accidents on rain-soaked highways, are not included. Historically, whenever there is a large loss of life from a tropical cyclone, the main cause of death is drowning, not wind or wind-blown objects or structural failure (Rappaport and Fernández-Partagás 1995). Inland flooding remains a significant threat to lives during a tropical cyclone landfall even after the storm's surface circulation diminishes. In fact, of the tropical cyclones affecting the United States since 1970, inland loss of life is relatively large (Rappaport et al. 1999).

To uncover trends in the data, the 96-year period is broken into six consecutive 16-year sub-periods: 1900–15, 1916–31, 1932–47, 1948–63, 1964–79, and 1980–95. The length of each sub-period is a compromise between smoothing and a reliable number of data points. Shorter sub-periods produce more points at the expense of less smoothing. Choosing a shorter or longer sub-period does not meaningfully change the results.

The mean annual number of deaths is tabulated for each sub-period, as well as the standard deviation and the coefficient of variation. Additionally, we determined the median annual mortality over each sub-period. A k -statistic is calculated as the number of years in which there are at least k deaths for different values of k . Note that earlier years may have had a greater accounting problem than the more recent years. With regards to the actual number of fatalities, this could influence the present results.

Mortality data on a per storm basis over the period 1966–95 are obtained from the seasonal tropical cyclone summaries published

Table 1
Tropical Cyclone Deaths

Year	Deaths	Year	Deaths	Year	Deaths
1900	8000	1932	0	1964	49
1901	10	1933	63	1965	75
1902	0	1934	17	1966	54
1903	15	1935	414	1967	18
1904	5	1936	9	1968	9
1905	0	1937	0	1969	256
1906	298	1938	600	1970	11
1907	0	1939	3	1971	8
1908	0	1940	51	1972	122
1909	406	1941	10	1973	5
1910	30	1942	8	1974	1
1911	17	1943	16	1975	21
1912	1	1944	64	1976	9
1913	5	1945	7	1977	0
1914	0	1946	0	1978	36
1915	550	1947	53	1979	22
1916	107	1948	3	1980	2
1917	5	1949	4	1981	0
1918	34	1950	19	1982	0
1919	287	1951	0	1983	22
1920	2	1952	3	1984	4
1921	6	1953	2	1985	30
1922	0	1954	193	1986	9
1923	0	1955	218	1987	0
1924	2	1956	19	1988	6
1925	6	1957	400	1989	56
1926	269	1958	2	1990	13
1927	0	1959	24	1991	16
1928	1836	1960	65	1992	24
1929	3	1961	46	1993	4
1930	0	1962	3	1994	38
1931	0	1963	10	1995	29

Values are estimated annual deaths (direct) from tropical cyclones in the United States 1900–95. Data are from Hebert et al. (1996). The horizontal line divides the data into the six equal duration sub-periods used in the analysis.

routinely by the American Meteorological Society in the Monthly Weather Review for the purpose of determining the percentage of U. S. tropical-cyclone deaths from storms of hurricane intensity or greater. These are used to justify our calculation of the typical number of deaths per hurricane, which is obtained by multiplying the median number of deaths by 16 years and dividing by the hurricane frequency. State population data from the U. S. Bureau of the Census are used to calculate the population increases in coastal counties along the hurricane coast.

Results

The average annual death toll from tropical cyclones in the United States has decreased over the 20th century (Table 2). The average annual death count dropped from 584 in the first sub-period to 16 in the last sub-period. The standard deviation fell from 1985 to 16. The coefficient of variation, defined as the ratio of the standard deviation to the mean, decreased from 340% in the earliest sub-period to 103% in the most recent sub-period. This analysis suggests a decreasing problem with regard to hurricane-related deaths in the United States. In other words, despite substantial increases in population during the century, the annual number of tropical cyclone-related deaths is declining.

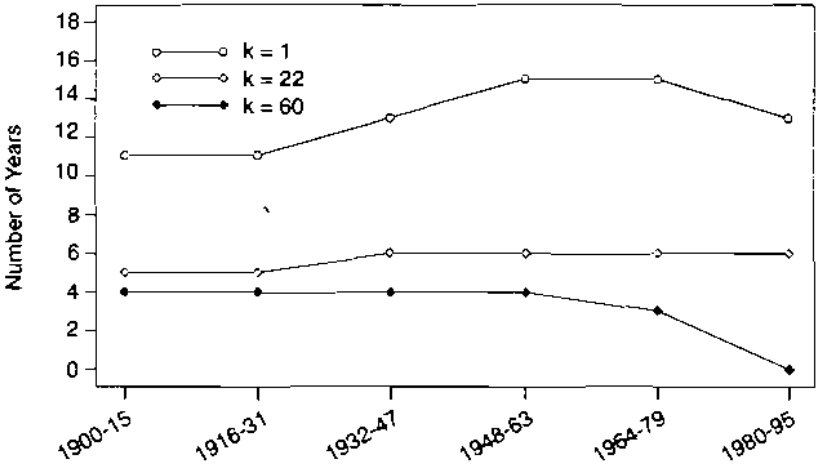
The above analysis is somewhat misleading as it fails to consider the full range of mortality data. For instance, Figure 1 shows

Table 2
Annual U.S. Hurricane Mortality Statistics

Sub-period	Mean	S.D.	C.V.(%)	Median	U.S. hurricane	Median deaths/ hurricane
1900-15	583.6	1985.1	340	7.5	26	4.6
1916-31	159.8	456.8	286	4.0	24	2.7
1932-47	82.2	170.8	208	13.0	34	6.1
1948-63	63.2	112.2	177	14.5	28	8.3
1964-79	43.5	65.3	150	19.5	23	13.6
1980-95	15.8	16.2	103	11.0	21	8.4

Values include mean, standard deviation, coefficient of variation, median, number of U.S. hurricanes, and the median number of deaths per hurricane.

Figure 1
Number of Years with at Least k Deaths

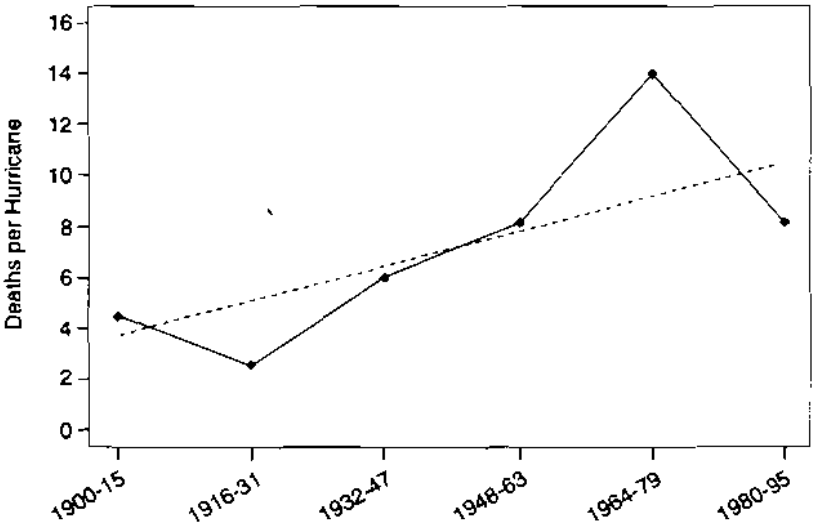


Trends in U.S. tropical cyclone deaths. Each point represents the number of years in the sub-period in which there were at least **k** direct tropical cyclone fatalities. Note that the general trend are different for different values of **k**.

the frequency of years in each sub-period with at least k tropical-cyclone related deaths. The overall trends on these curves are different for different values of k . The frequency of years with at least one hurricane fatality has increased since the first half of the century. However, the number of years with a large annual death toll has decreased. At about k=22 , the six sub-periods yield similar values indicating no change over the century. That is, all six sub-periods have approximately six years with more than 21 deaths.

The mean and median are widely used measures of central tendency. In general, sample means vary less than medians except in the case of a skewed distribution caused by extreme values. Figure 2 suggests a highly skewed distribution of annual tropical-cyclone deaths for which the median better reflects the central tendency. As an illustration, the mean and median annual death toll over the 96-year period is 158 and 10, respectively. If 1900—the year in which an estimated 8000 people died in the Galveston hurricane—is eliminated from the analysis, the mean (over the period 1901–95) drops to 75, whereas the median remains at 10.

Figure 2
Typical Mortality per US Hurricane



Mortality per hurricane during each sub-period. Values are obtained by multiplying the median by 16 (number of years in the sub-period) and dividing by the number of hurricanes. The dashed line represents a linear regression of the data points.

Table 2 lists the median number of deaths during each sub-period. Here we observe a general increase over the century. Thus, while the annual mean number of deaths has fallen dramatically, the median number has risen. The result is striking when considering that there were fewer hurricane landfalls over the past several decades. Most tropical cyclone-related deaths occur with hurricanes. Mortality data on a per storm basis over the period 1966–95 indicate that 85% of U. S. tropical cyclone deaths were due to hurricanes, although, as mentioned, a substantial portion of these deaths occurred inland from flooding after the storm weakening. The relatively more frequent catastrophic events earlier in the century would likely make this percentage even higher over the entire century. On the other hand, the bias related to counting deaths from inland flooding during earlier years is not considered.

Table 2 also lists the number of U. S. hurricanes in each sub-period. A U. S. hurricane is defined as a tropical cyclone with winds of hurricane strength at the point of landfall (all or part of

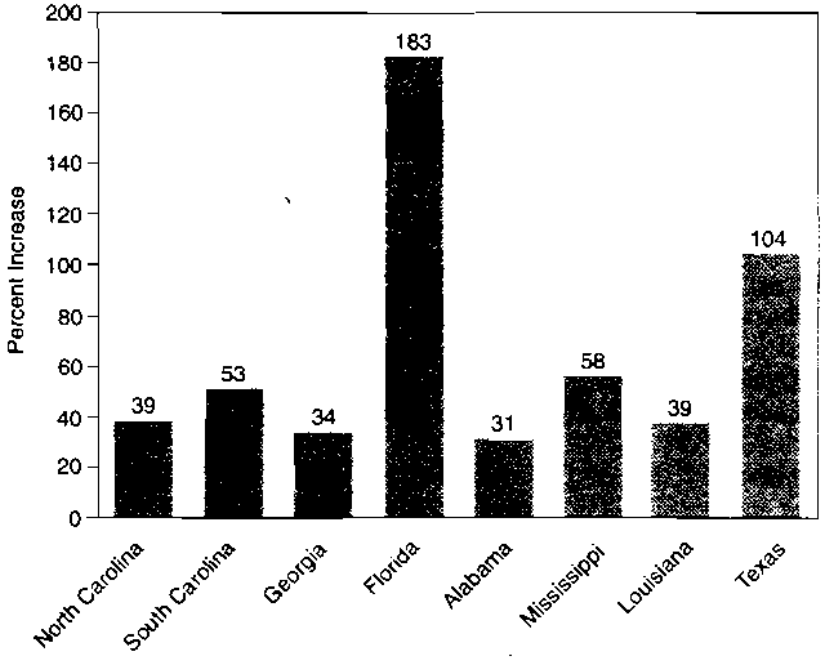
the eye-wall over land). A hurricane land falling more than once is counted as a single U. S. hurricane. Note the relative abundance of U. S. hurricanes during the 1930s and 1940s compared to the frequency during the latter third of the century. Multiplying the median number of deaths by the number of years in each sub-period and dividing by the number of U. S. hurricanes gives the typical mortality per hurricane (last column of Table 2). Although tropical cyclones of lesser intensity cause deaths, hurricanes have accounted for a significant portion of all casualties since 1966. The mortality per hurricane in the United States, which takes into account the median death toll and hurricane frequency, is shown in Figure 2 for each sub-period. As anticipated we see an increase over the period of record. In fact, a linear regression gives an R-squared value of 0.58 with a p-value on the slope coefficient of 0.079.

Discussion

Tropical cyclones in the United States have killed on the order of 15,000 citizens during the past century. Approximately half of these occurred during the 1900 Galveston catastrophe. After this tragedy there are sixteen years in the record with more than 100 deaths from tropical cyclones giving an average of one catastrophic year every six years. Yet, the last time the annual tropical cyclone death toll surpassed the century mark was back in 1972 with hurricane Agnes. Historically, largest losses are due to drowning from hurricane-generated storm surge. The decrease in storm-surge deaths during the latter part of the 20th century is attributable to a cooperative relationship between the National Weather Service/Tropical Prediction Center (National Hurricane Center), emergency management community, U. S. Army Corps of Engineers, and the media (Sheets 1990, Rappaport et al. 1999). However, the increasingly rare catastrophic event makes a trend analysis based on averages suspect. It is our view that the median value is a better metric of the typical annual death toll and that by this measure, an increase in deaths per hurricane has occurred during the 20th century.

The increase in mortality per hurricane is likely related to population increases along the hurricane coast. Figure 3 shows the coastal population increases between 1960 and 1994 for North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas. Although hurricanes and other tropical

Figure 3
Coastal Population Increase, 1960–94



Coastal population changes over the period 1960-94 expressed as a percentage increase. Values are from the U.S. Bureau of the Census for coastal counties as defined by the National Oceanic and Atmospheric Administration.

cyclones occasionally make landfall between Virginia and Maine, 85% of U. S. hurricanes between 1900 and 1995 made landfall along the coastline from Texas to North Carolina (Elsner and Kara 1999). Between 1960 and 1994, the U.S. population increased by 45%, with the population in the eight aforementioned most hurricane-prone states increasing by 80%. More troubling however is that coastal population in these states rose 103% during this time period. While advanced warnings (in particular, warnings of high winds and surge at the coast) have reduced the occurrence of a massive loss of life from a single event, the increased coastal population of the United States is raising the anticipated loss per hurricane. The problem is acute in densely populated areas where the evacuation clearance times are substantially longer than the storm warning time.

Acknowledgments

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Florida's Agriculture and Climatic Variability: Reducing Vulnerability

David Letson, James W. Hansen, Peter E. Hildebrand, James W. Jones, James J. O'Brien, Guillermo P. Podestá, Frederick S. Royce and David F. Zierden

A remarkable scientific breakthrough has important financial implications for Florida's agriculture. Meteorologists can now forecast El Niño and its opposite, La Niña, months in advance by monitoring the Pacific Ocean west of Peru. The tropical Pacific atmospheric-oceanic phenomenon known as ENSO (El Niño-Southern Oscillation) is a variation between normal conditions and two extreme states associated with warm or cold sea surface temperatures in the eastern tropical Pacific. ENSO has profound effects on global atmospheric circulation, resulting in regional shifts of temperature and precipitation on a seasonal to inter-annual time scale (Trenberth 1997). In Florida the most recent El Niño event two years ago created property losses of $500 million and spawned tornadoes that led to more than 100 deaths (Changnon 2000).

Agricultural use of climate information, such as forecasts, has dramatically increased in the last 20 years (Changnon 1999; Stern and Easterling 1999). The emergence of useful climate forecasts means farmers can now know months in advance if a drought or

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excessive seasonal rain is anticipated. Although uncertainty about daily weather remains, knowing which climatic patterns are likely allows decision makers to reduce risks associated with such patterns.[1] Climate forecasts have already proved useful to Florida's forestry managers, who now know that low rainfall in typical La Niña winters increases fire risks the following spring and summer, especially in southern Florida. From 1981-98, La Niña years averaged 500,000 acres burned in Florida, compared to 200,000 acres for neutral years (Jones, Shriver and O'Brien 1999).

The potential value of ENSO forecasting to agriculture is estimated to be $100 million annually to southeastern U.S. farmers (Adams et al. 1995) and $200 million nationally (Solow et al. 1998).[2] Not all damages are avoidable, nor can all potential gains be secured, since forecasts are imperfect and dissemination may be impeded by technical, financial, and cultural barriers (Stern and Easterling 1999; Glantz 1996; Feldman 1989). Surveys of ENSO forecast value for agriculture include Johnson and Holt (1997), Mjelde et al. (1998), Weiher (1999) and Richard Katz' internet site (www.esig.ucar.edu/HP_rick/agriculture.html).

In this paper we discuss what climate variability and ENSO are and why they are important for Florida's agriculture. We also discuss which regions, commodities, and production technologies are most vulnerable. We then make the case for climate forecasting as an emerging technical improvement that enables producers to avoid some of the potential damages associated with climatic variability and also to take advantage of some profitable opportunities. As is true of other technical improvements for agriculture, there is no guarantee that researchers will provide the climate forecast products farmers want most nor that farmers will understand how best to use climate forecasts. Nor will climate forecasts necessarily improve economic performance immediately, but only in the longer term. A successful forecasting process will require not only that researchers produce accurate[3] forecasts and that farmers incorporate them into their decisions, but also that the forecast producers and users communicate with one another.

What is climatic variability?

The relationship between sea surface temperatures in the equatorial Pacific and agricultural productivity in the southeastern U.S. is just one facet of the new understanding of climate variability that has emerged over the past 20 years. We give ENSO

particular emphasis because in many parts of the world it is the largest source of climate variability on seasonal to inter-annual scales. In the winter of 1982-1983, one of the strongest El Niño events measured this century developed undetected in the waters of the tropical Pacific. California and the Gulf Coast were battered by strong winter storms, while other parts of the country were drier and warmer than normal. The event opened the eyes of the nation as well as the scientific community to the potential climate impacts caused by fluctuations in sea surface temperatures of the equatorial Pacific Ocean. Year-to-year variability of climate influences many aspects of our daily lives, with impacts ranging from our comfort level when we work or travel to disasters such as hurricanes and floods, and can also influence the productivity and safety of our work. The agriculture and forestry industries are particularly vulnerable to variations in climate.[4] With a heightened awareness of El Niño- and La Niña-driven climate patterns, these sectors have expressed the need for more detailed information on which to base their decisions.

Recorded as far back as the 1500's, unusually warm water appeared periodically off the coast of Peru. This often occurred around Christmas, thus the phenomenon was called El Niño for the Christ child. Satellite measurements and moored buoys now show that the warm waters of an El Niño extend along the equator well out into the equatorial Pacific. Normally, trade winds blow from east to west, piling up warm water around Indonesia and Australia. During an El Niño, the trade winds die down and the warm water moves back towards the South American coast, resulting in sea surface temperatures that are much warmer than normal. In a La Niña, stronger than normal trade winds bring up cooler water from the ocean's depths, causing the sea surface to be colder than normal. Although El Niño and La Niña tend to return every 2 to 7 years, sea surface temperatures in the tropical Pacific are neutral, or near normal, a majority of the time. In fact, neutral years outnumber El Niño or La Niña years by over 2 to 1. Table 1 lists ENSO events of the previous century.[5]

The jet stream is a fast moving ribbon of air that circles the globe several miles above the ground. The jet stream is responsible for steering storms and fronts, driving the day-to-day weather we experience. In an El Niño winter, the warm surface waters of the Pacific provide heat and moisture that strengthens the jet stream, pulls it further south and keeps it flowing west to east across the southern United States. The new position guides winter storms

Table 1
Warm and Cold JMA ENSO Years between 1900 and 1999

ENSO Phase	Years
Warm (22)	1902, 1904, 1905, 1911, 1913, 1918, 1925, 1929, 1930, 1940, 1951, 1957, 1963, 1965, 1969, 1972, 1976, 1982, 1986, 1987, 1991, 1997
Cold (25)	1903, 1906, 1908, 1909, 1910, 1916, 1922, 1924, 1938, 1942, 1944, 1949, 1954, 1955, 1956, 1964, 1967, 1970, 1971, 1973, 1974, 1975, 1988, 1998, 1999

Note: Years not listed are neutral.

into California and along the Gulf Coast. These storms provide abundant rainfall and cooler temperatures for Florida and the deep South. In La Niña winters, a weaker jet stream strays to the north and meanders across the country. Fronts and storms do not make it down to Florida as often, and the winters are warmer and dryer than normal. For more details on climate variability and ENSO, the interested reader can see the NOAA/Office of Global Programs web site at http://www.ogp.noaa.gov/enso/.

How does ENSO affect Florida's temperature and precipitation?

One way to appreciate how ENSO influences climate in Florida is to examine how temperature and rainfall patterns differ during a Niño or Niña event. Figures 1 and 2 show how the relative frequencies of precipitation, daily minimum temperature and daily maximum temperature vary according to ENSO phase. As examples, we chose three locations (Tamiami, Ocala, and Madison) somewhat arbitrarily, but we have placed the same information for 80 weather stations statewide online at http://fawn.ifas.ufl.edu/enso.html. The climate data shown in these figures are from the U.S. Cooperative Station Network, and were archived and quality controlled by the National Climatic Data Center. We have used only observations from 1948 through 1999, since data quality and missing values were a concern for earlier observations. For each station, monthly averages of temperature and precipitation were computed for Niño, Niña, and neutral years. When plotted, these relative frequencies of precipitation, daily minimum temperature

and daily maximum temperature show the areas of Florida most affected by ENSO.

Precipitation. In the absence of irrigation, inadequate water availability is the most important factor limiting crop production. Excess water also can affect crops adversely by damaging root systems, leaching plant nutrients, favoring development of some diseases, and sometimes delaying field operations. The critical period for rainfall deficit is from March to May in most of the state. The deficit is likely to be more severe in April in northern Florida, and in March in southern Florida during La Niña years. Rainfall deficit is generally less (equivalently, surplus is greater) in El Niño years from January to March.

One of the most striking impacts is the increase in average winter (November to March) rainfall during El Niño years, and the decrease in La Niña years (Figure 1). This graph shows likely conditions at the Tamiami and Ocala weather stations during El

Figure 1
Precipitation in Niño and Niña Years

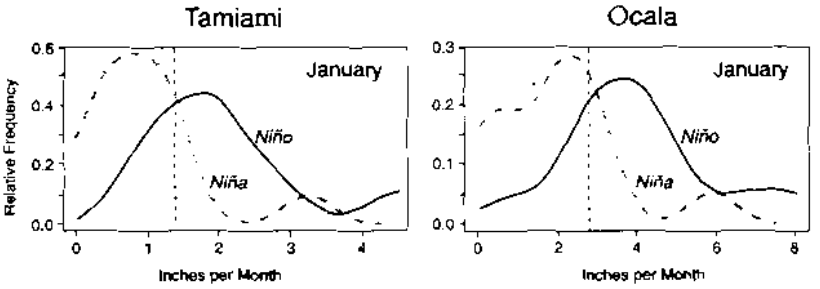
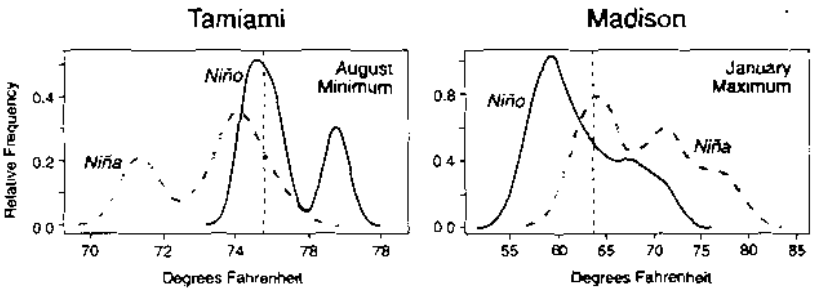


Figure 2
Daily Temperatures in Niño and Niña Years



Niño (solid line) and La Niña (dashed line) years. The more likely rainfall amounts are indicated by high values on the graph. Less likely conditions are represented by lower values. The relative frequencies of daily rainfall in January allow comparisons of conditions expected in El Niño and La Niña years, with the average in neutral years (dotted vertical line). Florida is particularly vulnerable to variations in seasonal rainfall, with an excess of over 30% of the normal total across much of the state during an El Niño winter. La Niña has the opposite effect, with deficits of 10% to 30% lasting from fall through winter and spring. The monthly deviation from normal due to either El Niño or La Niña conditions exceeds 30% in all of Florida, and 50% in the southern peninsula during some part of the year. The excess winter rainfall in El Niño years adversely affects yields of winter-harvested vegetables.

Temperature. Crops and animals are affected adversely when temperatures are either too hot or too cold. Different crops have different optimal temperatures. Because mammals regulate their body temperature, they tend to have wider optimal temperature ranges than crops, but experience heat stress at temperatures lower than many crops. Temperature also influences the rates of biological processes, and therefore the timing of flowering and harvest. Temperatures above or below critical target values also influence energy costs associated with heating or cooling. Changes in average daily maximum or minimum temperatures associated with El Niño or La Niña conditions are much smaller than the differences between seasons. However, departures from normal are significant in Florida, especially during winter months.

Figure 2 shows likely temperature conditions at the Tamiami and Madison weather stations during El Niño and La Niña years. The more likely minimum or maximum temperatures are indicated by high values on the graph. Less likely conditions are represented by lower values. The relative frequencies of temperatures allow comparisons of conditions expected in El Niño and La Niña years, with the average in neutral years (dotted vertical line). Florida and its Gulf Coast neighbors can expect to see average temperatures 2°F to 3°F below normal during El Niño years. La Niña has the opposite effect, with temperatures 2°F to 4°F above normal during winter months. La Niña's effect on temperature is more pronounced in northern Florida, and in Alabama and Mississippi. In the winter and spring months (December to April), average daily maximum temperatures are higher than normal in La Niña years, and lower than normal in El Niño years through

Florida. The effect of La Niña on winter temperatures increases as we move north within the state. The effects of El Niño and La Niña on winter average daily minimum temperatures is not as strong. In southern Florida, however, average daily minimum temperatures from June to August tend to be lower than normal in La Niña years. Lower nighttime temperatures may benefit growth and yield of some crops. However, in South Florida few commercial crops are grown in the summer.

Florida is a large and diverse state, climatically speaking, and ENSO is only one of many important influences upon our climate. One reflection of this complexity is that the climatic characteristics of principal agricultural interest tend to vary by region. In northern Florida and the Panhandle, for example, late hurricanes, the timing of frosts, and drought are most important, while in central Florida it is the occurrence of frosts and water allocations, and in southern Florida it is flooding and hurricanes (Hildebrand et al. 1999). While ENSO is by no means the only influence on our climate, its predictability is an opportunity that may benefit farmers throughout the state.

Who is vulnerable?

Climate variability and climate forecasting matter in a very practical sense to Florida farmers, although for some clearly more so than for others. Florida's agriculture is notable for both its economic importance and its diversity. Florida was the nation's ninth ranked state in 1998 in total farm sales of ($6.7 billion dollars). State farmers led the nation in the production of twenty major commodities, including citrus, ranked second in vegetables and horticulture, making it fourth in the nation in total crop sales (Florida Department of Agriculture and Consumer Services 1999). The magnitude and variety of agricultural production in Florida raise questions of which commodities and regions are most influenced by ENSO. An important conclusion of our statewide interviews with county extension agents was that the diversity of Florida's agriculture will place strong demands on a climate information system, making it essential to identify priority commodities and regions for technical assistance (Hildebrand 1999).

To properly gauge who is most affected, we must assess *vulnerability*, which is an aggregate measure of human welfare that integrates environmental, social, and economic exposure to climatic fluctuations (Bohle et al. 1994; Pulwarty and Riebsame

1997). The question of who is at risk depends critically upon location, as the previous sections show, but also upon the commodities produced and the production technology used. The most vulnerable producers and regions are those most exposed to climatic perturbations, whose production is most affected and least able to cope with climatic impacts, and who have more limited endowments for recovery (Bohle et al. 1994). To identify those most vulnerable, we have examined various measures of agricultural productivity (e.g., yields, crop value) and production technology for evidence of an ENSO influence.

To identify cropping enterprises in Florida vulnerable to ENSO, we analyzed the influence of ENSO phases on historical yields of annual field crops (maize, soybean, peanut), sugarcane, vegetables (potatoes, eggplant, strawberry, celery, pepper, tomatoes, snap bean, and sweet corn) and citrus (oranges, limes, grapefruit, temples, tangelos and tangerines). We found that several of Florida's high-valued crops are influenced by ENSO. These effects include decreased winter yields of tomato (77% of long-term average for neutral years), bell pepper (77%), sweet corn (83%) and snap beans (83%) in Niño years; increased prices of bell pepper and snap bean (each by 31%) in Niño years; increased sugarcane yields (107% of long-term average) following Niña events; and increased yields of grapefruit (109%) and tangerines (116%) but decreased lime yields (86%) in the harvest following Niño events (Hansen et al. 1998, 1999b). We attribute the yield responses to increased (decreased) rainfall, and reduced (increased) daily maximum temperatures and solar radiation in El Niño (La Niña), principally in winters but in spring and summer also.

Parallel research for the four-state region of Alabama, Florida, Georgia and South Carolina, found that ENSO has a significant influence on corn and tobacco yields, areas of soybean and cotton harvested, and total values of corn, soybean, peanut, and tobacco. In these four states, there is almost $500 million difference in the annual value of these four crops due to ENSO (Hansen et al. 1999a). A subsequent analysis that added the states of Mississippi, Louisiana, Tennessee, and North Carolina found that yields of cotton, tobacco, corn, tomato, hay, sugarcane, wheat, soybean, peanut, and rice all responded significantly to ENSO phase (Hansen et al. 2001). Thus, although ENSO-related weather variability explained a significant portion of yield variability of a broad range of crops in Florida and neighboring states, the direc-

tion, magnitude and timing of the effect depended on the particular crop.

Vulnerability also depends on the type of agriculture. Because it can reduce or eliminate water stress and is also observable, irrigation capacity is a particularly useful indicator of production technology that is less vulnerable to climate variability. Irrigation also correlates with crop type, geography, farm size and other factors (e.g., low income or cash flow) often cited as components of vulnerability. Our data sources for irrigation are the most recent and comprehensive available, the 1997 Census of Agriculture and the 1998 Farm and Ranch Irrigation Survey, which report those farmers who irrigated any of their land during the year (USDA/NASS 1999a, 1999b). Because these sources report whether a given farmer did irrigate rather than whether that farmer has the capability to do so should the need arise, the numbers we report are likely to slightly under-represent true irrigation capacity.

Although Florida has a humid climate, irrigation is widespread in crop production. According to the 1998 Farm and Ranch Irrigation Survey, Florida irrigated 1.862 million acres in 1997, or 3.4% of the U.S. total, which is the most of any state east of the Mississippi River and the tenth highest in the U.S. Of Florida's 34,799 farms, 12,673 had irrigation on some of the 4.567 million acres they managed. Florida's irrigated acreage represented just over half (51%) of its total cropland of 3.64 million acres.

Irrigation capacity is also an indication of wealth, which is often cited by economists (e.g., Hardaker et al. 1997) as what enables some producers to withstand income fluctuations better than others. Wealthier producers tend to have larger farms with more advanced production technologies and may also have greater access to risk hedging opportunities. The high correlation of irrigation capability with farm size is consistent with economists' depiction of wealth as risk bearing capital. According to the 1997 Census of Agriculture, some 1,112,860 irrigated acres, or 60% of Florida's total, was controlled by the 369 farms (3% of the total) having at least 2000 acres. The 708 farms (5.6%) having at least 1000 acres controlled 1,339,603 irrigated acres (72%).

Annual sales are another index of producer wealth, and farmers who irrigate have a disproportionately large share of sales. According to the 1997 Census of Agriculture, the average market value of agricultural products sold per farm in Florida is higher for farms having irrigated land ($382,683) than for either non-irrigated farms ($52,192) or for all farms ($149,586). The same is

true for the average value of crops sold: irrigated ($405,620), non-irrigated ($48,354), and all farms ($284,876). However, non-irrigated farms also had lower expenses: non-irrigated ($43,326), irrigated ($267,638) and all farms ($126,043). On average, irrigated farms also have more valuable machinery and equipment ($67,767) than do non-irrigated farms ($25,156).

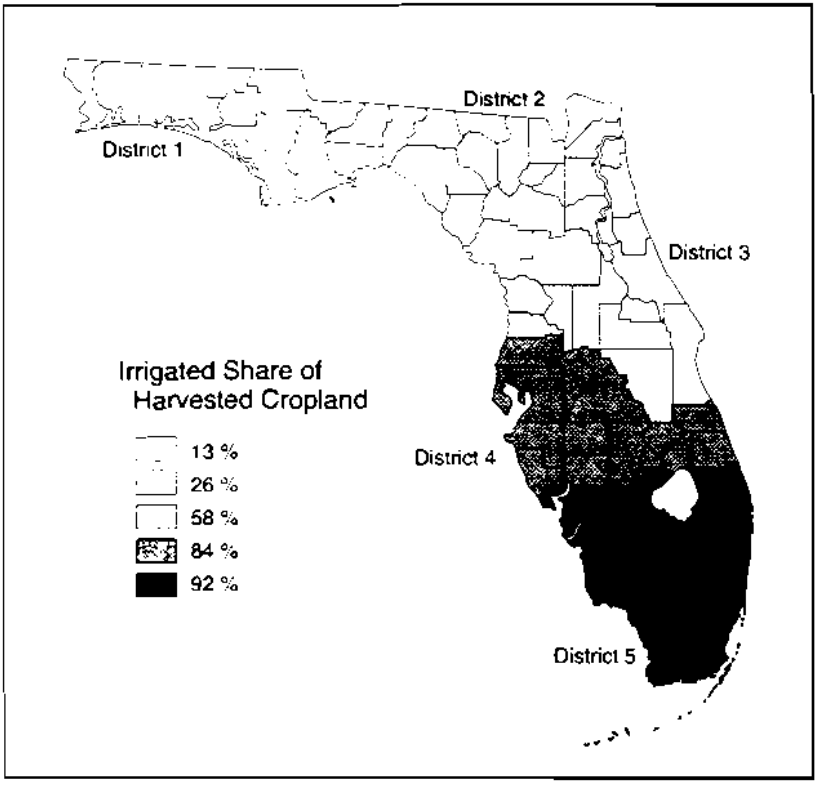
Not surprisingly, irrigation produces higher crop yields. Table 2 compares the irrigated versus non-irrigated yields for several crops that are grown under both irrigated and rainfed conditions in Florida. In each case, irrigation makes a substantial difference in crop yields. Since irrigation is generally only part of a package of improved management, not all the improvement in yields can be attributed to it. Nonetheless, irrigation plays a critical role (Paxton and Lavergne 1989). Since irrigation raises average yields by improving the driest conditions, it also tends to reduce yield variability, an important source of income risk. Notably the crops in Table 2 are grown in the northern and panhandle regions of the state, while crops cultivated only under irrigated conditions (e.g., vegetables, citrus, sugarcane, horticulture) are grown in the central and southern regions of the state. Figure 3 maps the proportion of harvested cropland that is irrigated, according to the 1997 Census of Agriculture, using the University of Florida/ Institute of Food and Agricultural Science's Extension District boundaries for regions of comparison. The higher irrigated shares of harvested cropland in the central and southern portions of the state indicate less ENSO vulnerability and suggest that the problems that do exist there stem from too much precipitation rather than too little.

Table 2
Harvested Crops and Irrigation

Crop	Irrigated Share (% area)	Irrigated Yield (per acre)	Rainfed Yield
Corn (bushels)	21	111.4	69.9
Soybeans (bushels)	6	35.6	24.4
Peanuts (lbs)	20	3226.2	2626.5
Cotton (bales)	7	698	415
Tobacco (lbs)	81	2424.9	2051.1

Sources: 1997 Census of Agriculture and 1998 Farm and Ranch Irrigation Survey.

Figure 3
Irrigation Capacity by IFAS Extension District



Finally, policy and technical changes can make farming more vulnerable to climate variability. Florida's winter fresh tomato growers and distributors, and the competition they face from Mexico, are a case in point. Florida and Mexico are historic rivals for the U.S. winter tomato market, but Mexico has improved its market share for at least three reasons. First, Mexican adoption of extended shelf life varieties and drip irrigation technology in recent years has lowered their input costs and raised yields, while Florida's yield trend has remained flat and its input costs are rising (Love and Lucier 1996). Second, the devaluation of the Mexican peso, which lost over half its value relative to the US dollar in 1995, increased the volume of Mexican tomato exports to the US by 70 percent during the 1995/96 season. Because the Mexican

tomato export price may not rise in response to a peso devaluation for several months, such devaluations have the temporary effect of an export subsidy proportional to the magnitude of the devaluation (Douglas 1997). Third, the North American Free Trade Agreement, which took effect in 1994, has reduced tariffs on imported tomatoes and will eliminate them by 2003. As a result of competitive pressures stemming from changes in trade policy and recent trends in yields and input costs, Florida's winter tomato producers and distributors are vulnerable to a wide range of risks, including climate variability.

Our assessment of vulnerability suggests a potential for farmers throughout the state to modify practices based on forecasted ENSO phase. Previously, our interviews with extension agents informed us that livestock producers, too, are highly interested in climate forecasts, since pasture establishment, hay purchases, and animal sales decisions could be informed by climate forecasts so as to reduce producer risks (Hildebrand 1999, 2000). Unfortunately, the widespread physical impact of ENSO in Florida does not imply that all producers have the same capacity or flexibility to adjust their decisions in light of a climate forecast. For example, perennial crops such as citrus and forestry have fewer mitigatory actions available, as compared to annual row crops. While citrus growers did alter their replanting patterns and varietal mix following the severe freezes in central Florida in the 1980s, this was a response to a longer scale of climate change rather than to seasonal or inter-annual climatic variability (Miller 1991). Our goal of reducing vulnerability to climate fluctuations requires a look at potential responses to climate forecasts.

How can farmers respond?

Translating even an accurate climate forecast into a successful response for farmers is a complicated task. Consider the following example, reported to us at a meeting with 175 peanut farmers in Marianna, Florida, in March 1999. In 1998 some peanut farmers in northern Florida and southern Georgia, aware that it was an El Niño year, delayed planting due to excessive spring rains. Those who did so avoided the catastrophic losses due to heat and drought stress that would later be experienced by those who did plant early. However, yields varied spatially due, in part, to the timing of regional precipitation associated with a hurricane. Yields were quite good in southern Georgia, but generally poor in Florida.

This experience highlights the timing of weather events and the importance of climate influences perhaps not related to ENSO, and suggests the need for a small geographic focus when applying climate forecasts to crop production.

The question of an appropriate response is partly one of what researchers can recommend farmers should do after a given climate forecast. Some management variables worth considering as possible responses to a forecast are the crop mix and cultivars selected for a given year, the amounts of fertilizers and pesticides used, and the planting dates. Cold protection, land drainage and irrigation scheduling are other possibilities. According to one recent climate forecast evaluation for Tifton, Georgia, adjusting crop mix in small to medium field crop farms could increase profits by 4–6 $/ha; and varying planting date, variety, plant population and nitrogen fertilizer applications has potential benefits of 5–30 $/ha (Royce et al. 1998). An important advantage agriculture has, relative to other economic sectors, is the availability of crop models that allow exploration of the outcomes of numerous alternative decisions, which would be impossible to do with traditional field experiments or statistical analyses of historical data.

However, as the peanut example above suggests, the issue of forecast usefulness or value extends beyond forecast skill and the availability of forecast responses. Producers' decisions whether to use climate forecasts are complex and do not occur in isolation from their other decisions. Pulwarty and Redmond (1997) argue that forecast "interpretation" involves ongoing evaluation of the physical conditions being forecast, in the context of other decisions and information that potential users must consider throughout the year.

Climate forecasters do offer a valuable technology to Florida's farmers: the predictability of climate and yield variability associated with ENSO suggests a potential to tailor agricultural production decisions to either mitigate the negative impacts of adverse conditions or to take advantage of favorable conditions. For climate forecasts to appeal to farmers, however, they (1) must address climatic variables of interest at (2) a sufficient level of spatial resolution. They (3) also must arrive prior to decision making, and (4) should come from a trusted information source. So, to facilitate use by fruit and vegetable growers, for example, forecast providers might enlist a cooperative association such as the Florida Fruit and Vegetable Association, to aid forecast struc-

ture, timing and delivery. Also, working with more specialized cooperatives for both producers (e.g., the Florida Tomato Grower Exchange) and distributors (e.g., the Florida Tomato Exchange) might help target climate information toward the different needs of these groups. Finally, forecast providers might consult important input suppliers, such as seed distributors or the South Florida Water Management District, to determine if the recommended mitigatory responses are in fact feasible. The usefulness of a climate forecast will depend in part upon the capability of users to process that information so that it can match their needs (Stern and Easterling 1999).

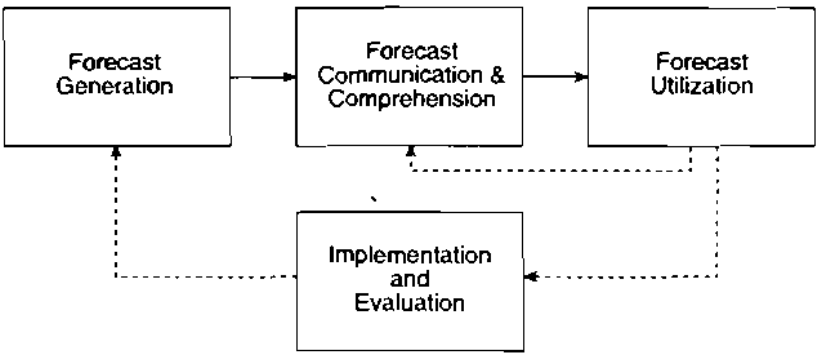
The bottom line is that, to reduce vulnerability, climate forecasts must be used to modify decisions. The skill of a forecast, the feasibility of a response, and the effectiveness of communication each make an essential contribution to forecast value.

Building a better climate forecasting process: the Florida Consortium

Translating imperfect ENSO-related climate forecasts into information useful for improved decision making is a complex issue that goes well beyond simply producing better climate forecasts. Vulnerability of Florida's agriculture and economy to climate fluctuations and weather extremes prompted formation in 1996 of a consortium of Florida universities (Florida State, Florida and Miami) to capitalize on the potential predictability of climate impacts associated with ENSO (www.coaps.fsu.edu/lib/Florida_Consortium/). The goal of our research in the Southeast US is to reduce economic risks and improve social and economic well being by facilitating the routine and effective use of climate forecasts for agricultural decision making.

The Florida Consortium has designed an operational system for the dissemination of agriculturally relevant climate information in Florida. The conceptual framework for this forecasting system (Figure 4) includes four parallel activities associated with (a) the generation of climate information, (b) the communication and comprehension of such information, (c) the use of the information, and (d) implementation and evaluation. As Sarewitz et al. (2000) note, good decisions are more likely to occur when all components of a forecast system function well. In our work in the southeastern US, we have explored extensively the functions of each of these components and how they fit together. The implementation and

Figure 4
Integrated Components of a Forecasting System



Adapted from: Sarewitz, Pielke and Byerly 2000. Prediction. *Island Press. Page 376*

evaluation portion of the system, in particular, is the result of a close collaboration between the Consortium and the Florida agricultural extension system.

Our attempts to build a climate forecasting system in Florida would be naïve and likely counter-productive if we did not recognize and, indeed, take advantage of the agro-technological infrastructure already in place. We have striven to instill among ourselves the notion that the only way to perform work on applications of climate information is through multi-disciplinary, multi-institutional collaboration and active involvement of decision makers from the start. The Florida agricultural extension system has emerged as our major partner, providing the conduit for information flow from our research effort to end users, and helps guide and prioritize our research efforts. Through this partner, we are able to greatly amplify the impact of our research and ensure sustained delivery and use of climate information and decision aids in the future. Our close cooperation with the Florida agricultural extension system is allowing us to evolve from a purely research-oriented project to a proto-operational effort, and has three motivations. First, the experience of the extension system in facilitating other types of agro-technological transfer may help us understand how to achieve the dissemination of climate information effectively. Second, the extension system provides a readily available infrastructure for the delivery of information and for the

evaluation of its effectiveness. Third, the existing relationship of trust that extension already enjoys with farmers will enable the iterative bridging process between forecast producers and users.

If improved agricultural decision making is our goal, then climate forecasting may best be thought of as a social process rather than simply as a meteorological product that farmers will use and use correctly. Because climate forecasts will always be imperfect and difficult to evaluate, policy officials should focus on reducing producers' vulnerability to climate fluctuations. That means, in part, a goal of improving long term measures of income loss or gain without giving undue emphasis to potentially misleading short term variations. To reduce vulnerability to climatic variability within a forecasting system, the researchers, extension system, trade groups, producers, and other forecast users all will play critical roles. Because the benefits of reducing exposure to climatic variability are likely to be unevenly distributed, research and extension efforts must be carefully targeted to the specific subpopulations and locations that are most vulnerable.

Notes

[1]To make clear the distinction between weather and climate, consider the example of a hard freeze in Central Florida that lasts for 2-3 days, which is a weather event. In contrast, one's heating bill may be smaller due to a warmer winter, which is a climatic pattern.

[2]Global climate change could alter the frequency and severity of ENSO events. One recent paper suggests that extreme ENSO events may become more frequent with a global warming (Timmermann et. al 1999). The economic consequences from a strong Niño for U.S. agriculture are a loss of $1.5 to $1.7 billion and a $2.2 to $6.5 billion loss for a strong Niña (Adams et al. 1999).

[3]What constitutes a "good" forecast process is a subject of spirited debate, of which technical accuracy is a part. Multiple measures are needed to evaluate the technical, communication, and use dimensions of forecasts. Physical scientists have evaluated forecasts according to technical criteria, such as skill scores and critical success indices, while social scientists have studied the forecast communication process. Another way to evaluate a forecast is to consider whether it had value to decision makers (Pielke 2000).

[4]The high variability of agricultural income is one reflection of

agriculture's vulnerability to climate fluctuations. Consider the statewide average over the period 1960-1999. According to the U.S. Department of Agriculture, National Agricultural Statistics Service, the average income expressed as a return to capital was 9.24%, which comports fairly well with the rule of thumb that we try to earn 10% on our investments. However, the variability of this return, expressed as a standard deviation, was 6.53, or 71% of the average return. That degree of variability does much to explain the agricultural community's interest in climate forecasts.

[5]We define ENSO phase in terms of the Japanese Meteorological Agency's sea surface temperature anomaly index (JMA SSTA), which selects well the known ENSO events. Several alternative ENSO phase definitions exist and are based on either atmospheric pressure patterns or on sea surface temperature anomalies in the tropical Pacific Ocean (Trenberth 1997). Our definition (Table 2) is a 5-month running mean of spatially averaged SST anomalies over the tropical Pacific: 4ES-4EN, 150EW-90EW. If the running mean exceeds 0.5EC for 6 consecutive months (including OND), we categorize the ENSO year of July to the following June as warm (El Niño). If the running means are less than or equal to -0.5EC over that time span, we classify the year as cold (La Niña or El Viejo). For all other possible index values, we define the year as neutral. JMA SSTA index values for each month of the 1868-1999 period are available via ftp. (www.coaps.fsu.edu/pub/JMA_SST_Index/).

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Protecting Environmentally Sensitive Land from Mistakes of the Past: A South Florida Example

Hubert B. Stroud and Nancy B. Payton

Land speculation, frequently accompanied by premature subdivision, is an age-old practice. It became a particularly significant problem throughout the United States during the 1950s and 1960s when thousands of installment (interstate) land sales operations subdivided millions of acres of prime real estate. Developers of these subdivisions, in their attempts to rapidly convert raw land into potential homesites, made poor site selection decisions and ignored many environmental constraints as they superimposed extensive road networks across large tracts of land. As a result, numerous problems have been created including wasteful and environmentally unsound land use practices, scattered development, inefficient and unequal distribution of basic services, and an overtaxing of the resource capabilities in some locations.

Even though many of these land development projects may have conformed to the local development regulations in existence at their inception, their layout and design are inadequate by today's standards and are now obsolete or antiquated. Land was subdivided to take advantage of the perceived demand for single-family homesites on individual lots. Many subdividers, with little or no planning or environmental impact assessment, superimposed a rigid gridiron network of roads (and canals in some locations) across extensive acreages. Master planning, environmental constraints, and the overall suitability of a site for development were largely ignored. Lack of foresight on the part of the developer has created significant land use problems in numerous locations including the wetlands of Florida, the mountains of Colorado, and arid environments in Arizona, New Mexico, and California (Stroud 1995).

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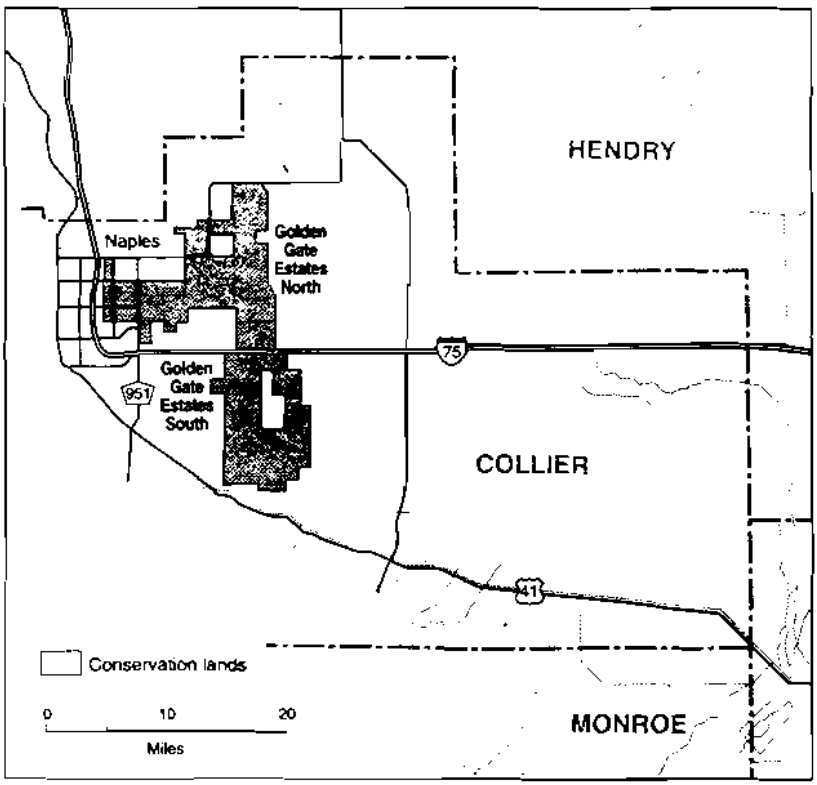
Multiple ownership subdivisions are a real challenge for those trying to find solutions to some of the numerous and vexing problems that they have created. After a development has been subdivided and sold to thousands of individual owners, correcting mistakes or changing land use patterns *becomes* extremely difficult. The challenge is to find solutions that will correct a problem without infringing upon the property rights of individual land owners. Several options for resolving platted lands problems are available and include plat vacation, lot merger, transfer of development rights, special assessments, tax delinquent lot purchase, community redevelopment, and lot acquisition or buy-out plans (for example, Elliott, 1997 and Stroud and Spikowski 1999). For a variety of reasons, but often because of financial or legal constraints, these options have not been widely used. One notable exception is the land acquisition and hydrologic restoration plan that is currently underway for the southern portion of Golden Gate Estates, one of Florida's earliest and largest land development schemes.

Golden Gate Estates, advertised by the developers as the world's largest subdivision, sprawls across more than 100,000 acres of sensitive wetland in central Collier County (Figure 1). A rigid network of 813 miles of roads and 183 miles of canals was superimposed over the entire site during the late 1950s and early 1960s. By 1965, 90% of the land had been platted into 1.25, 2.5, and 5 acre parcels for residential and commercial use.

The portion of the subdivision located north of I-75, now called North Golden Gate Estates (NGGE), is the fastest growing area in Collier County. Its current permanent population is nearly 30,000. Problems associated with rapid growth are compounded by nearly 22,000 platted lots in NGGE that are located east of the Urban Designed Area. If all of these parcels become owner-occupied (built-on), the total population for NGGE would be 100,000 (Mosca 2000).

The area south of I-75, known as South Golden Gate Estates (SGGE), remains virtually uninhabited. It is this largely undeveloped portion of Golden Gate Estates that has been designated by the state for acquisition and restoration. This study examines (1) the significance of this acquisition and restoration effort, (2) the most feasible alternative for meeting restoration objectives, and (3) the most important lessons learned from this attempt to correct land development mistakes of the past.

Figure 1
North Golden Gate Estates (NGGE) and South Golden Gate Estates (SGGE) in Collier County, Florida



Source: Data provided by the South Florida Water Management District and United States Army Corps of Engineers. Cartographic assistance provided by Brad Nunley, National Wildlife Federation.

Since the restoration of SGGE is a work in progress, detailed, up-to-date publications on the subject are limited. Some of the most useful information has been obtained from personal interviews with local officials; those persons directly involved in the day-to-day operation/administration of the buyout and restoration plan. Other important sources of information include a limited number of journal articles, newspaper articles, several reports from governmental agencies, and a few monographs and book-length manuscripts on the subject. One of the most useful publications is the "Hydrologic Restoration of Southern Golden

Gate Estates Conceptual Plan," which provides detailed information concerning the physical setting of the study area, examines problems created by development of sensitive environments, and considers alternatives for the hydrologic restoration of SGGE (Abbott and Nath 1996). Another informative publication is a journal article entitled "Facilitating a Multiparcel Land Acquisition Project in the Western Big Cypress Region of Collier County, Florida, USA" that highlights the history of speculative land sales activity in Florida, provides some detail concerning the land sales tactics used by the original developer of Golden Gate Estates, and gives a step by step account of the important role The Conservancy, Inc. (TCI) played in expediting the land acquisition process (Ramsey and Addison 1996). Useful information is also provided in a monograph entitled "Picayune Strand State Forest" prepared by the Florida Department of Agriculture and Consumer Services, Division of Forestry. The focus of this publication is a consideration of a forest resource management plan for Picayune Strand State Forest, which covers much of the area that is now South Golden Gate Estates (Division of Forestry 1996). Decisions concerning land management are crucial and will ultimately determine how much public access is allowed within this extremely environmentally sensitive location.

Current Issues

The humid subtropical climate of Southwest Florida produces an average annual rainfall of 53 inches with 80 percent of the precipitation occurring during the wet season (May through October). The topography of the region is characterized by low relief and poorly defined drainage patterns. Elevations range from 2 feet above sea level in the southern portion of SGGE to as much as 24 feet along the northern boundary near I-75. This flat landscape is ideal for sheet flow and standing water, both of which were prevalent prior to development when the area consisted of cypress strands and wet prairies (Abbott and Nath 1996). Surface water filtered slowly through this wetland as sheet flow. This gradual flow and mixing of fresh and salt water are essential to the natural processes that occur in estuarine systems, particularly coastal mangrove forests. These conditions make SGGE a crucial location for water storage and aquifer recharge. Subdivision activities that include a dense network of roads and canals disrupted the natural flow and greatly increased the concentration of

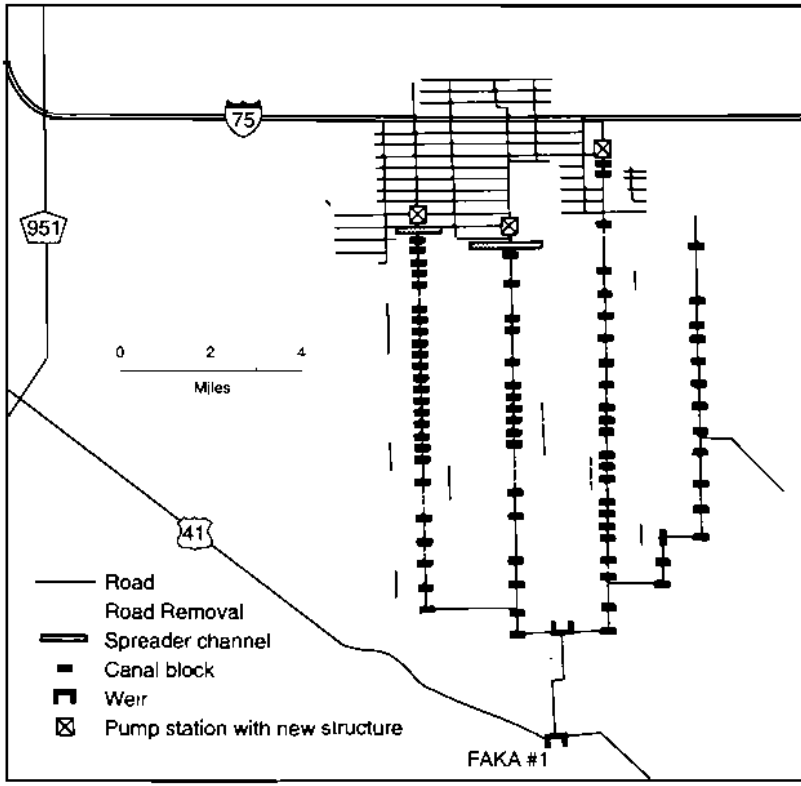
freshwater flowing into mangrove estuaries (Gore 1990).

Ironically, Southwest Florida, a region noted for its abundance of fresh and salt water, may not have an adequate natural water supply to sustain the rapid rates of population growth that have been occurring, and will have to resort to expensive desalinated water. Population growth, sprawling patterns of development, and agricultural encroachment into wetland environments are occurring at the expense of natural ecosystems that are currently shrinking or being disturbed at an alarming rate (Edwards and Staats 1999). Natural ecosystem maintenance is crucial if drinking water resources are to be protected. This is why the plan to restore SGGE, located less than ten miles from Collier County's urban area, to its natural hydrologic condition is so important. Not only will the restoration provide recreation land, it will also reduce the flow of fresh water to the Ten Thousand Islands estuarine environment and greatly improve the recharge of vital groundwater supplies. Ultimately, the restoration will contribute to the formation of a continuous public conservation area that extends across South Florida from the Gulf Coast to approximately 10 miles from the Atlantic Ocean. More specifically, a restored SGGE will serve as a western buffer for the Fakahatchee Strand and provide a continuous corridor between the Florida Panther National Wildlife Refuge and fragile coastal ecosystems to the south and west (Figure 2). Such a corridor will help protect the Everglades ecosystem from the encroachment of residential, commercial, and industrial development.

SGGE is faced with an unusual water quality situation since in places freshwater is actually invading salt water areas and causing ecological damage. Although the natural flow of water has been disrupted by roads and canals, both the physical and chemical conditions of surface and ground water within SGGE continue to meet the acceptable state water quality standards (or conditions). Surface water supplies are suitable for recreation, fishing, and wildlife and ground water supplies are within Florida Department of Environmental Protection (FDEP) drinking water standards for potable supply (Abbott and Nath 1996). However, a problem has arisen from the routing of waters by canals into Faka Union Bay and the Ten Thousand Islands, *creating* abnormally low salinity levels throughout the year. As a result, too much fresh water serves as a pollutant for delicate estuarine environments (Tears 1999).

Discharge from the Faka Union Canal varies seasonally causing tremendous fluctuations in salinity levels and an enormous shock

Figure 2
Importance of Location of South Golden Gate Estates



The successful restoration of SGGE will provide a link (continuous corridor) among several public preserves, parks, and refuges in southwest Florida.

Source: Data provided by the South Florida Water Management District. Cartographic assistance provided by Brad Nunley, National Wildlife Federation.

to aquatic biota of Faka Union Bay. Of greatest significance is the rapid decline in the salinity during periods of excessive freshwater outflow. This has drastically reduced fish plankton communities in Faka Union Bay, followed by a reduction of some types of fish and also a considerable drop in shellfish harvest levels. The rapid influx of fresh water has also drastically reduced the seagrass meadows, formally an important habitat type in the Bay (Abbott and Nath 1996).

The hydrologic restoration plan that is currently under consideration will replace the concentrated shock load discharges to estuarine environments with a more naturally distributed sheet flow. A gradual flow (discharge) should do much to alleviate problems associated with salinity stresses.

Flooding has become an ever-increasing problem in Collier County. Problems are intensified by subdivisions that were carved *from its* wetlands, which makeup 75% of the county's land cover. The problem is aggravated by residential sprawl as low-density suburban development continues to encroach into low-lying areas. A major concern is the impact of hydrologic restoration of SGGE on the drainage within the rapidly developing North Golden Gate Estates. In part because of this concern, continued maintenance and even enhancement of the existing flood control system has been incorporated into the hydrologic restoration plan for SGGE.

The greatest concerns stem from plans to plug the canals and redirect the fresh water naturally across the SGGE's property. Those residents living in NGGE are concerned that a drastic reduction in the current rate of flow will intensify flooding problems *in* their neighborhoods. Plans are already in place, that, if properly implemented, will alleviate this concern. Protection will be provided to NGGE by the installation of a series of pumps to help move excess water into SGGE where it will be allowed to flow slowly across the land surface and/or seep into the soil and recharge groundwater supplies.

Another significant on-site problem is the invasion of exotic plants such as melaleuca and Brazilian Pepper. These fast growing plants are invading the native ecosystem and destroying critical wildlife habitat. Invasive exotic plants plus the altered hydrology result in a significant change in the plant and animal community structure. An important part of the SGGE restoration plan is the elimination of invasive exotics while at the same time converting the hydrology of the area to its pre-development condition (Durwatcher 1999). The use of controlled burns over the entire area and redistribution of surface water along three major flowways are the keys to SGGE's successful restoration.

Since SGGE covers a relatively large area and is made up of several extremely delicate ecosystems, natural ecosystem management is crucial. Land managers (forest rangers, for example) should take a holistic approach when making decisions about restoration. Hydrologic restoration should have an even greater impact than reorganizing the flow of fresh water. Plant and

animal communities and the mix of salt and fresh water along the coast are intricately and delicately linked to the flow of fresh water at the surface and to ground water as well.

The threatened and endangered species listed below provide an indication of how significant this region is to a wide variety of wildlife. Threatened or endangered species documented in SGGE include the Florida panther, Florida black bear, American alligator, eastern indigo snake, wood stork, southern bald eagle, West Indian manatee, red-cockaded woodpecker, American swallow-tailed kite, ghost orchid and numerous other plant species. In 1994, the Florida Fish and Wildlife Conservation Commission identified SGGE as a Strategic Habitat Conservation Area (SHCA). SHCAs are "lands essential to providing some of the state's rarest animals, plants, and natural communities with the land base necessary to sustain populations into the future" (Florida Game and Freshwater Fish Commission, now the Florida Fish and Wildlife Conservation Commission 1994). The South Florida Multi-Species Recovery Plan, released in 1999 by the U. S. Fish and Wildlife Service, reaffirmed the 1993 designation of SGGE by the Florida Panther Interagency Committee as *a* Priority 1 panther habitat. Priority 1 is defined as lands frequently used by the panther or as high quality native habitat suitable for panthers and should be preserved (Florida Panther Interagency Committee 1993). In addition, the Faka Union Canal has the second highest concentration of manatees on the west coast of Florida.

The Acquisition Plan

South Golden Gate Estates was added to the Conservation and Recreational Lands (CARL) acquisition list in 1984 as part of then Governor Bob Graham's Save Our Everglades plan. The CARL program was established in 1979 by the Florida legislature and is an expanded version of the 1972 Environmentally Endangered Lands (EEL) Program and includes resource conservation measures for other types of lands. In 1990, the legislature passed the Florida Preservation 2000 (P-2000) Act which renewed funding for CARL and other programs. Act P-2000 proposed raising nearly $3 billion over a 10-year period for the state's land acquisition programs. To receive funding, CARL projects must meet one of seven specific public purposes criteria. Public purposes include such things as protecting unique and irreplaceable lands that contain native flora and fauna that are unique or scarce within the

state; and conserving and protecting lands within areas that have been designated as areas of critical state concern (Florida Department of Environmental Protection 1998).

One of the first steps in the acquisition process within South Golden Gates Estate was to survey and appraise all *the* 22,000 lots that had been sold to approximately 17,000 owners. Lot appraisals ranged from $300 to $2000 an acre depending on location and elevation. Acquisition was slowed by angry lot owners who felt that the appraised value was far too low. Many of these disgruntled lot owners filed suit against the state in 1988. They demanded new appraisals, and an inadequate land acquisition staff resulted in a very slow acquisition process. Between 1985 to 1991, for example, the state purchased only 1,000 acres of SGGE real estate.

In 1991, The Conservancy, Inc. (The Conservancy of Southwest Florida), concerned over the slow pace of the acquisition process, implemented a volunteers and interns program to help process repurchase offers that were being made to SGGE landowners. Financial support for the Conservancy's acquisition assistance project was provided by the Harder Foundation. A larger staff and the computerization of the project greatly reduced the time required to contact lot owners and to finalize purchase agreements. With the Conservancy's assistance, 4,000 acres were purchased by the state in 1992 alone (Ramsey and Addison 1996).

A second group of 900 SGGE landowners that were also upset over low lot appraisals filed a civil complaint in 1992 that was similar to the 1988 suit. This brought the total number of landowners demanding new appraisals to 3,900. Even though the lawsuits drastically slowed acquisition efforts, the state continued to extend first time offers to lot owners; a process that was completed in 1993.

In April of 1996, the U. S. Congress provided the Secretary of the Interior $200 million from the Farm Bill for restoration activities in the Everglades ecosystem, including land acquisition and resource protection and maintenance. The very next month, Vice President Al Gore announced a grant of $20 million to the South Florida Water Management District to be used to acquire lands in South Florida. The Southern Florida Ecosystem Restoration Task Force ranked the SGGE acquisition fourth on a list of 33 prioritized projects that could be funded.

Between 1985 and 1997 the state purchased 22,000 acres from more than 7,600 lot owners. Thereafter the pace of acquisition

gained momentum. In 1997, SGGE moved up to the third ranking on the CARL acquisition list. In June of that same year, Vice President Al Gore announced a $25 million Farm Bill Grant to complete the state's buyout of SGGE. In August, 1997, Governor Lawton Chiles and the Cabinet unanimously approved a proposed settlement that called for new appraisals of some 7,500 acres in South Golden Gate Estates. Between 3,200 and 4,000 plaintiffs signed a settlement agreement whereby new appraisals would become binding purchase prices. This settlement was crucial to the completion of land purchases throughout SGGE. In 1999, Florida received an additional $13 million from the federal government to ensure complete acquisition by December 2002.

Successful acquisition of the whole property, however, was complicated by the activities of Avatar Properties, Inc., a land development company with substantial holdings in SGGE. Avatar continued to sell lots within the acquisition area, buyers paying three times the price of comparable lots in the area. The practice continued until an agreement was reached with the state in December of 1998 for the purchase of some 8,000 acres of land. Avatar Properties Inc. is a Coral Gables-based successor company to the corporation that carved SGGE out of pristine wetlands in the early 1950s. The Avatar deal and the settlement of the landowner lawsuits almost doubled the amount of land the state owned. By June 2000, the state had acquired more than 40,500 acres, 70 percent of the property that initially was proposed to be purchased (Hicks 2000).

SGGE's acquisition and restoration will provide a western buffer to the Everglades eco-system and is critical to the ecological integrity of the adjacent preserve areas. It is extremely important to recognize that the Everglades system lies beyond the boundary of Everglades National Park, and extends from the Kissimmee River Basin in the north, through Lake Okeechobee, to the Keys. The Big Cypress Basin, of which SGGE is an integral part, is the source of over half the water flowing into Everglades National Park. The restoration of South Golden Gate Estates (or Picayune Strand State Forest) to its natural state is a critical component of the $7.8 billion Comprehensive Everglades Restoration Plan.

Before water resources can be well protected, however, the acquisition process must be completed and the restoration process far advanced. The acquisition process has reached a crucial stage with much of the remaining acreage in the hands of "unwilling sellers." The state may have no alternative other than the use of

eminent domain to obtain the property. Indications are that the state will use this strategy after all other avenues have been exhausted.

The Restoration Plan

The hydrologic restoration plan has several important objectives. These include a wetland hydroperiod restoration that would return the area to pre-Golden Gate Estates conditions; surface water sheetflow restoration; replacement of concentrated shock load discharge to estuaries with more widely distributed sheetflow; improved water storage and aquifer recharge; enhanced surface water deliveries to the adjacent Fakahatchee Strand State Preserve; reduction of over-drainage of Fakahatchee Strand; reduction of over-drainage of the adjacent Florida Panther National Wildlife Refuge; and maintenance of existing flood protection for areas north of Interstate 75 (Abbott and Nath 1996). Hydrologic restoration alternatives were geared toward meeting the objectives stated above and based on the assumption that the entire area of SGGE will be under public ownership when the acquisition process is completed.

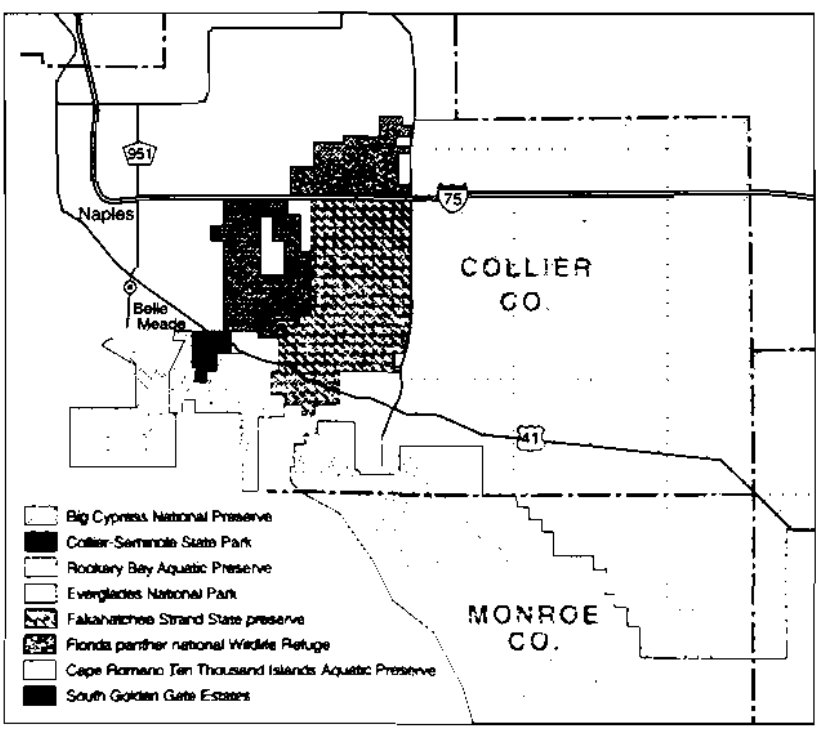
Several options are available to meet, at least in part, the restoration objectives of the project. Previous studies suggest the use of weir type water control structures on the canals to reduce overdrainage and to restore the overall hydrology of SGGE. More *than weirs* are needed to fully restore the wetland hydroperiods. Weir structures would increase water storage and aquifer recharge but would not eliminate the freshwater point load discharge into Faka Union Bay. Because of this shortcoming, five alternative measures were formulated to accomplish the stated objectives of the restoration project.

Alternative 1 is only a partial plan that utilizes diversion structures and a spreader channel to dissipate flows. This plan will not achieve the full range of objectives identified for the SGGE restoration project (Abbott and Nath 1996). Alternative 2 suggests removing all the roads and canals south of I-75. Such an option would be cost prohibitive and was not seriously considered as a feasible option by officials with the South Florida Water Management District (Nath 2000). Alternative 3 is designed with three different configurations (alternatives 3A, 3B, and 3C), all of which have some common key components. These common components are spreader channels, pump stations on each of the three major

north-south canals which contribute drainage from NGGE, removal or grading down of selected roads, canal plugs and roadside swale blocks, elimination of canal maintenance south of the spreader channel locations, and continuation of the groundwater level monitoring program (Abbott and Nath 1996).

Officials with the South Florida Water Management District prefer Alternative 3C and suggest that it is the best configuration to achieve the desired objectives of the proposed project. This decision is based on hydrologic-hydraulic and economic evaluations and assessment of the impacts of all the alternative restoration options. Alternative 3C includes the construction of three

Figure 3
South Florida Water Management District's Preferred Hydrologic Restoration Alternative for South Golden Gate Estates



Source: Adopted from *Hydrologic Restoration of South Golden Gate Estates Conceptual Plan*, Big Cypress Basin, South Florida Water Management District, Naples, Florida, 1996, p. 119.

pump stations, three spreader channels, 83 canal blocks and removal of 130 miles of roads (Figure 3). Canal maintenance south of the spreader channels would be discontinued. Additional recommendations included as part of this plan are: maintenance of a travel corridor for fire management by the Florida Division of Forestry (managers of Picayune Strand State Forest) and for recreational public access, collection of stream flow data of three canals at Interstate 75 on the north project boundary, continued groundwater monitoring programs, and development of a phased approach for project implementation. If this plan is implemented, it would reintroduce sheetflow across SGGE, re-establish three historical flowways, increase groundwater recharge and reduce the possibility of wildfires. Point flow discharge through the Faka Union Canal will be distributed across the SGGE and through improved culverts under U. S. 41 into the tidal coastal marshes (Abbott and Nath 1996).

The South Florida Water Management District has several additional recommendations that will become part of the overall restoration plan. These include accommodating the Florida Division of Forestry's needs for management of the area (for example, utilizing some of the existing roads combined with low water crossings to maintain a travel corridor through the project); collecting additional streamflow data by installing surface water monitoring stations on Miller, Faka Union, and Merritt Canals at the three major inflow points into SGGE at I-75; continuation and enhancement of the existing groundwater monitoring program that is to be a part of the overall restoration project; increasing water storage and conveyance capacity; restoration of wetlands; and phased implementation of the restoration plan.

Phased implementation of the restoration has several advantages. It would be financially and ecologically advantageous and could be designed to incorporate most of the major "elements" of the plan including pump stations, spreaders, plugs, and road removal all in manageable segments.

Conclusions

Several important lessons can be gleaned from the South Golden Gate Estates experience. It has shown just how difficult it is to reassemble parcels after the land has been subdivided and sold to thousands of individual owners. Planning after the fact is always difficult but in cases like this, problems are particularly

vexing. This is why a successful acquisition of this magnitude requires vision, leadership, and a long-term political and financial commitment (Outland 2001). Frequently, these problems are beyond the capabilities of local government in that they require a large sum of money and people with expertise in land acquisition techniques. In the case of SGGE, a joint effort *between* local, state, and federal governments was required. Funds were provided from state and federal sources and local officials worked in a cooperative effort to help resolve numerous problems including low property appraisals and uncooperative land owners. The acquisition effort is now in its 17th year and a significant portion of the property is yet to be *purchased*. Even though only approximately 4,000 of the original 17,000 plus lot owners have yet to settle with the state, these last purchases likely will be very time consuming and costly.

Political leaders in the state have shown a long-term commitment for land acquisition programs designed to protect sensitive lands. With regard to the Everglades, its restoration has become a national priority, and funding has the support of both major political parties on the national and state level.

An important concern in the acquisition process has centered around the state's willingness to take the final drastic step of using eminent domain to acquire the property that is needed to allow the restoration to go forward. That concern was alleviated, at least in part, by the January 2001 decision by the Florida Cabinet to approve the first in a series of legal procedures to buy the remaining parcels from owners who had, at least until now, refused to sell their property to the state. This important commitment by the Florida Cabinet will go a long way toward making the Everglades restoration a reality (Peltier 2001).

Even though the acquisition and hydrologic restoration is a difficult and time consuming process, its successful completion is very important to South Florida. This is particularly true since a regional watershed management plan for western Collier County has been undertaken to improve environmental conditions within the Big Cypress Basin. A restored SGGE is vital to the success of that undertaking.

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Florida's Jewish Elderly

Ira M. Sheskin

You shall rise before the aged and show deference to the old.
–Leviticus 19:32

Do not cast me off in old age;
When my strength fails me, do not forsake me!
--Psalms 71:9

Jewish tradition guides the American Jewish community in its attitude toward the elderly. But the attention paid by the Jewish community in Florida to its elderly[1] members is dictated as much by modern demographics as it is by ancient tradition.[2] While 17.6% of Florida's population are age 65 and over, about 55% of Florida's *Jewish* population are age 65 and over (Bureau of Economic and Business Research 1998).[3]

Almost 373,000 Jews age 65 and over live in the State, about 328,500 (87%) in one of the three South Florida Counties (Table 1). Broward and Palm Beach Counties, with about 125,000 and 150,000 Jewish elderly residents respectively, have the largest elderly Jewish communities, followed by Miami-Dade, with approximately 50,000 (Sheskin 1994b, 1996, 1997, 1999). Much smaller numbers live in Sarasota and Manatee Counties, Pinellas County (St. Petersburg /Clearwater), and the Orlando area (Sheskin 1993, 1994a, 2001a). About 25,000 live in the remainder of the state.

About half of Jewish elderly are age 75 and over, almost 90% who live in South Florida. The greatest number live in Broward, which has 77,000 Jewish elderly age 75 and over. Almost two-thirds of Jewish elderly in Broward are age 75 and over. About 34,000 Jewish elderly are age 85 and over. It also should be noted that while only about 5% of all Floridians are Jewish, their share of Florida's elderly is 13%.

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Table 1
Jewish Elderly Population in Florida

Community	Age 65 and Over	Age 75 and Over	Age 85 and Over
Miami-Dade County	51,000	24,000	7,000
Broward County	123,500	77,000	16,000
Palm Beach County	154,000	71,000	11,000
Total South Florida	**328,500**	**172,000**	**34,000**
Orlando[a]	2,800	900	100
Pinellas County	8,000	3,800	900
Sarasota-Manatee Counties	9,200	5,300	1,100
Other Counties[b]	25,000	12,000	2,000
Total Florida	**373,500**	**194,000**	**38,100**

[a] Orange, Seminole, Osceola, and Volusia Counties
[b] Estimates for named counties are based upon Jewish demographic studies by this author for local Jewish Federations Sheskin 1993, 1994a, 1994b, 1997, 1999, 2001a). Estimates for "Other Counties" are based upon interpolation.

This article has two purposes. First, while many issues that face elderly gentile Floridians also are faced by its Jewish elderly, social service providers, particularly those in areas of heavy Jewish concentration,[4] would be well served to be aware of some of the distinct characteristics of elderly Jews. Second, this article assesses the extent to which elderly Jews will become a "strain" on the State's public and private social service network. Demographic and geographic factors that contribute to increasing dependency among the Jewish elderly are first discussed, followed by a discussion of those factors that ameliorate this dependency. The evidence suggests that Jewish elderly will be much less of a burden on the social service network than other elderly groups.

Factors Contributing to Increasing the Dependency of Florida's Jewish Elderly

Imbalanced Age Distribution of the Jewish Community. Florida contains the most demographically imbalanced Jewish communities in the United States (Sheskin 2001b). About 15% of American

Jews are age 65 and over, compared to 66% in Palm Beach County, 63% in Sarasota-Manatee, 46% in Broward, 31% in Miami-Dade, and 28% in Pinellas (Sheskin 1992, 1994a, 1994b, 1997, 1999, 2001a). This demographic imbalance, created by an age-selective migration stream from the Northeast and Midwest to Florida, has a significant impact on the ability of the Jewish community to provide social services to its own members. That is, compared to other Jewish communities, most Florida Jewish communities have much higher "dependency" ratios. The dependency ratio refers to the ratio between those who are outside the normally productive age group compared to those who are within it. In the case of most of Florida's Jewish communities those in the unproductive age groups often greatly exceed those in the productive. This creates a situation where, at times, there may be a greater demand for Jewish charity than contributions.

"Home is elsewhere." Less than 1% of Florida's Jewish elderly were born in the state. The overwhelming majority in South Florida (75% in Broward County, for example) were born in the Northeast (Sheskin 1997). Although the percentage born in the Midwest is higher on Florida's West Coast, even here the majority were born in the Northeast. Add to this their relatively short period of residence in Florida it is not difficult to understand why so many never develop a deep attachment to their new community. As a group, Florida's Jewish elderly generally show a high level of philanthropic and civic activity (voter registration among Florida's elderly Jews is well over 95%) (Sheskin 2000). Unfortunately, particularly among Jewish "snowbirds" (those who spend less than eight months of each year in Florida), their philanthropy often is directed toward the northern communities they left. This reduces philanthropic dollars that might otherwise be available to social service agencies in Florida.

Geographic separation of the Jewish elderly from their adult children. One implication of this migration of elderly Jews from the North is that a large number of them are *now* living in different metropolitan areas than their children and grandchildren. In South Palm Beach County (Boca Raton and Delray Beach), for example, only 20% of the elderly have adult children living within a 90 minute drive (Sheskin 1996). Thus, many elderly Jews, while they may have long-time friends and relatives living in close proximity often lack adult children to assist them in times of medical, social, or other crises. This factor also contributes to many Jewish elderly leaving Florida upon the death of a spouse to live

closer to their children.

The old are getting older. While the maxim "the old are getting older" is true for all American elderly, it is especially true for Jewish elderly. As they age they place an increasing burden on the state's health care system. Tens of thousands of Jewish elderly moved into Florida from the North during the 1970s. Most of these migrants were in their sixties. By the beginning of the 21st century many had reached into their eighties. For example, in South Palm Beach County, the number of Jews age 80 and over increased from 2,700 to 14,000 between 1986 and 1995 (Sheskin 1996). The implications for those involved in assisted living facilities, home health care, medicine, and mortuary services are clear. Another important implication of the aging of the Jewish retirees is that some have outlived their retirement savings. Jewish Family Services often are called upon for assistance when this occurs.

Equally important is the growth the number of the "oldest old." within the Jewish population. The share of this group (75 years of age and older) within the Jewish population of both Broward and Palm Beach counties has become so great that, as a result of their high mortality, the total Jewish population has begun to stabilize. Jews continue to migrate to these counties, however, the number arriving barely replace those who have died. In 1990, 275,000 Jews lived in Broward County while in 1997 the number had fallen to 269,000. Although approximately 8,000 Jews entered Broward County each year during the 1990s, they were replacing those who had been lost to mortality and outmigration. It is doubtful if we will witness significant increases in the overall number of Jewish elderly in Florida in the foreseeable future. Rather, the cohort of new retirees will now begin to replace the cohort who retired to Florida 20 years ago and is now suffering from significant mortality (Sheskin 1997).

It also should be noted that the communities in which these retirees have settled have become increasingly more aged. Imagine a condominium development that opened in 1975 and filled with people in their middle sixties. By 1995, those who had survived would be in their middle eighties. As they begin to die or enter managed care facilities the houses they leave become difficult to sell. For obvious reasons most retirees in their sixties do not wish to move into a housing development where a large share of its occupants are in their eighties

More single persons live alone. Another characteristic of a retirement community is the large share of its residents who live

alone. For example, the 1980 US Census enumerated 10,598 people in Century Village, near West Palm Beach (a housing development which traditionally has been more than 90% Jewish). They lived in 7,654 housing units, with an average household size of 1.4 persons per unit. Ten-years later, when the 1990 US Census was levied, the number of households remained virtually the same, but the number of inhabitants declined by about 2,200. In that year the average household had fallen to 1.1 people (Sheskin 1994c). In Broward County, 35% of the 133,000 Jewish households contain only one person, the highest percentage of single person households of any Jewish community in the nation. Of these single households, 71% contain elderly women (Sheskin 1997). In total, about 33% of Jewish elderly in Broward County live alone, as do 30% in Miami-Dade County, and about 18% in Palm Beach County (Sheskin 1994b, 1996, 1997, 1999).

Note as well that this drop in household size implies a significant imbalance in the male/female ratio, since life expectancy among women is higher than that for men. In Dade County, for example, 12,000 elderly women live alone, compared to only 3,000 elderly men. 20% of males age 75 and older are currently widowed, compared to 53% of females (Sheskin 1994b). This makes it difficult for elderly women to find male companionship. It also helps to explain why the majority of nursing home residents are female.

Clearly, the elderly who live alone are the most likely to require social services, medical care, and institutionalization. As the elderly live longer, we can anticipate that the share of those who live alone will increase. Most will be female. Life expectancy among U.S. females is now seven years longer than among males. Among Jewish elderly Floridians, females comprise the vast majority of nursing home patients.

Limiting physical and mental health. Declining physical and mental health[6] are serious problems within Florida's aged Jewish population. About 20%-25% of elderly Jewish households in Florida indicate that one or more household members has a limiting physical or mental condition; and about 10% of this group has a limiting condition that requires assistance on a daily basis. In Broward County, for example, 3%-5% of all elderly Jewish households have a person who needs help with one or more of the activities of daily living (dressing, getting around inside the home, bathing, taking care of one's appearance, using the bathroom, and eating). These high rates of limiting conditions, while well below that for the general US elderly population, in part might be related

to a selective migration from the North. The least hardy, those who no longer feel they can suffer another northern winter, might be the first to go south. This, in turn, could lead to them requiring more medical attention when they get to Florida than those who remained in the north. (Sheskin 1997).

Factors Ameliorating the Dependency Level of Florida's Jewish Elderly

Snow bird status. Florida's elderly Jewish population may be divided into three groups based upon the number of months spent in the state: full-year residents (8-12 months of the year in Florida), part-year residents or "snowbirds" (3-7 months), and "snowflakes" (less than 3 months). The snowflake population is not included in any of the statistics in this article, even though some evidence suggests that half of them own property within the state. About one-fourth of the elderly Jewish households in Palm Beach and Sarasota are snowbirds, as are 10%-15% in Miami-Dade County, Pinellas County, and Broward County (Sheskin 2000). While this group enjoys a much higher income and generally is in better health than elderly full-year residents, their ties to the local community are often more tenuous, a phenomenon earlier discussed.

Emotional attachment to other places implies less need for Florida assisted living facilities. Elderly Jews from the Northeast and Midwest, even after living years within Florida, when they go north to where they lived their productive lives, usually refer to the journey as "going home." This suggests a lack of identity with their Florida communities. For example, in 1995, $31 million was contributed by Jews in Palm Beach County to Jewish Federation chapters outside of Florida, while $28 million was donated to those within the state. Much lower percentages of the Jewish elderly respondents to surveys in Florida claim familiarity with their local Jewish social service agencies than do respondents to surveys completed in northern cities. Awareness of elderly programs offered by such agencies as Jewish Family Service is very low. The implication for assisted living facilities is that many Jewish elderly will choose (or their children will choose for them) to enter such facilities in the North and not in Florida.

A geographically clustered population. Particularly in South Florida and Sarasota, the elderly Jewish population is spatially highly concentrated. Most elderly Florida Jews live in planned

retirement communities in which they are the overwhelming majority. Even where they do not live in a planned community they commonly choose certain sections of the city in which they become concentrated. In Dade County, for example, 51% of the Jewish population claim to live in an area that is "all" or "almost all" Jewish; 76% claim to live in an area that is at least half Jewish (Sheskin 1982). In Broward and Palm Beach Counties, large numbers of Jews live in planned retirement communities such as Century Village, Hawaiian Gardens, King's Point, Palm Aire, and Wynmoor Village.[5]

An important factor that contributes to the success of these communities is that their original occupants invite friends and relatives down to visit them from their previous home. Many visitors are converted into permanent residents. In Sarasota, for example, half of the elderly households had close friends or relatives living in the area before they moved in (Sheskin 1992). Thus, informal social service networks, including "telephone reassurance services," "respite care," and "handyman services" develop among the residents. This support system lessens the need for government and religiously based social service programs. In those cases where such programs are needed, this pattern of elderly settlement simplifies the delivery of religious, social, cultural, and ethnic services to this population.

Despite a strong desire to live in communities in which they are the overwhelming majority, elderly Florida Jews have shown little enthusiasm for joining local synagogues. In fact, the share of South Florida elderly Jews who are members of local synagogues is among the lowest in the nation.[6] One reason for this low rate of membership is that when one lives in a mostly Jewish community, the need to join a Jewish institution to develop Jewish friendships diminishes. Jewish social and cultural activities are often offered in condominium clubhouses.

Developers, to attract Jews to their developments, often have used strategies such as stressing that they were "close to synagogues," even if many who purchase homes never join. The reverse also has been used. In Delray Beach (Palm Beach County), a housing development was originally called "Christian Conference Center" to indicate that it wanted to attract Christians and not Jews.

This strong desire for ethnic homogeneity among elderly Jews who have moved to Florida has other implications. Most Jews show a strong preference toward Jewish assisted living facilities,

even if their own personal level of religiosity is not strong. Although most Jewish assisted living facilities offer only kosher food, as well as religious services, most elderly secular Jews seem to prefer them to those that are non-sectarian. Whereas they might accept a Christmas tree in a shopping mall, they do not want to see one in the lobby of their "home." They might not keep kosher, but they would prefer only turkey on Thanksgiving, and not ham. A final outcome of Jewish residential concentration is that the civic efforts which were so much a part of many of their lives up north often are transformed into community politics once they settle in Florida.

Economic status. An important factor contributing to Florida's Jewish elderly putting less of a strain on the social service network of the counties in which they live than the average elderly American is their greater financial resources. For example, in Broward County, the median elderly Jewish household income is $36,500, compared to about $18,000 for all elderly households (Sheskin 1997). This differential is related to two factors. First, American Jews in general, because of extraordinarily high levels of education, have incomes in excess of other Americans. Second, the migration of elderly Jews to Florida has been selective. Northern elderly Jews with higher incomes and savings are more likely to migrate to Florida than those with more modest resources. This is especially true of the part-year Jewish elderly residents ("snowbirds") who have much higher incomes than their full-year counterparts. An important implication of this is that, while the demand for services among Florida's Jewish elderly is likely to increase significantly in the coming years, many will have the means to pay for a significant portion of these services and not have to resort to welfare or charity.

In Broward and Palm Beach Counties, about 90% of elderly Jewish households own their own home, as do about 80% in Pinellas, Sarasota, and Dade Counties (Sheskin 1992, 1994a, 1994b, 1995, 1997, 1999). In many cases, their owners have paid off the mortgage. For example, in Sarasota about 55% of Jewish elderly homeowners have no mortgage on their property (Sheskin 1992). In West Palm Beach, this figure is over 60% (Sheskin 1987). This would suggest that, if they had to move to an assisted living facility, they could sell their home to at least cover part of the cost.

There is considerable variation within retirement communities in the value of homes, especially when households are disaggregated into the young old (age 65-74) and the old old (age 75 and

Table 2
Housing Value of Jewish Elderly Households in Florida
Median (% Valued Under $50,000)

Community	Age 65-74	Age 75 and Over
Sarasota-Manatee Counties	$240,500 (2%)	$175,000 (2%)
Miami-Dade County	$99,000 (14%)	$66,000 (37%)
Palm Beach County	$135,000 (9%)	$86,000 (27%)
Orlando*	$87,000 (11%)	$77,000 (21%)
Pinellas County	$85,000 (16%)	$65,000 (35%)
Broward County	$74,000 (27%)	$57,000 (44%)

* Orange, Seminole, Osceola, and Volusia Counties
Source: See Table 1.

over) (Table 2). For those age 65-74, Sarasota-Manatee leads with a median house value of $240,500, compared to only $175,000 (27% less) for those age 75 and older. In Miami-Dade and Palm Beach counties the differences are 37% and 28% less, respectively. More importantly, in some counties many elderly Jews are living in homes valued less than $50,000. This is especially true of the old old in all counties except Sarasota. Many of the owners of these modest homes, if they have to move to an assisted living facility and must sell to make the move, will have to find other funds besides the sale of the home to meet their increased living expenses.

It is obvious from the value of homes owned by elderly Jews that not all are financially well off, although most have more resources than do the average Florida elderly. This is especially true of those living in Miami-Dade County where one-quarter of Jewish household's 75 years of age and older are living on incomes of $10,000 or less (Sheskin 1994b). Most of these older elderly Jews have been residents of the county for over 20 years. Many among them have largely exhausted their savings and must survive on modest retirement checks and social security. While there are elderly Jews throughout the state that find themselves in the same predicament, it is in Miami-Dade County where they are most numerous. It is here that Jewish welfare institutions must focus their attention, as well as those state agencies responsible for the welfare of the aged.

Conclusions

The following factors suggest that Florida's large elderly Jewish population will place some strain on the state's social service system:

Because Jewish communities in Florida have a very high percentage of elderly members, there are relatively few younger members of the community to whom one can appeal for funds to assist frail and vulnerable elderly residents.

Because many elderly are recent immigrants from the North, they maintain philanthropic connections with northern communities, reducing dollars that might otherwise be available to elderly service agencies in Florida.

Because many elderly are recent migrants from the North, they are geographically separated from their most "natural" support system, their adult children.

Jewish elderly, particularly because of higher incomes and consequent better medical care, are living longer. The "old old" population is increasing rapidly. Some are outliving their retirement "nest egg" and increasing numbers are single persons living alone. Persons age 80 and over who are living alone are most likely to tax the social service system.

Florida's climate has meant that the state has attracted many Jewish elderly who have some type of limiting health condition. Other factors may be seen to ameliorate the dependency level of Jewish elderly.

Many Jewish elderly are snowbirds, and much of this population is both relatively healthy and wealthy.

The emotional attachment that many elderly Jews feel to the North implies that they may well seek elderly institutional housing outside Florida.

Elderly Jews live in neighborhoods and housing developments with other elderly Jews in a geographically clustered fashion. Informal social service networks develop, lessening the need for public and private services. Such a geographic pattern also makes the provision of social services more efficient for both public and private providers.

Most importantly, a large share of Jewish elderly enjoy relatively high economic status and have a home to sell for capital if and when they need assisted living.

In sum, Jewish elderly form an important component of the elderly population of the state, particularly in a few coastal

counties in the southern part of the peninsula. While the demographic indicators above suggest that the social service needs of the elderly Jewish population are likely to increase, many, although not all, Jewish elderly will have the resources to pay for needed services. This is least true of those living in Miami-Dade County. Overall, however, it is clear that the Jewish elderly will tax Florida's social service system less than other elderly groups. Nonetheless, both public and private agencies (Jewish and non-Jewish) should heed the results discussed above and make certain that their "responses to an aging *Jewish* Florida" are demographically and geographically appropriate.

Notes

[1]This paper has been modified from an article that was originally published in *Responses to an Aging Florida* (Spring, 1999) pp. 18-21. *Responses*, edited by Stephen Golant, Department of Geography, University of Florida, is published by the Florida Council on Aging.
[2]Unless otherwise specified, the term elderly is defined as age 65 and over.
[3]Note as well that while 12.4% of the US population are age 65 and over, such is the case for 17.2% of American Jews.
[4]The US Census does not collect data on the Jewish population. Thus, this paper relies on a series of demographic studies completed by this author for the Jewish Federations in Florida. See the bibliography.
[5]63% of the elderly in Palm Beach County are Jewish, as are 45% in Broward, and 18% in Miami-Dade.
[6]Only about 40 percent of elderly in Palm Beach and Dade Counties and about one-quarter in Broward County report membership in a synagogue. Synagogue membership in most major Jewish communities runs 35%-70%.

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The Privatization and Localization of Welfare: How the Social Safety Net Serves Florida's Big Bend

Andy Walter, Janet E. Kodras, and Morton D. Winsberg

Introduction

The purpose of this article is to review how, in the context of welfare devolution and privatization, the social safety net in Florida's Big Bend serves the region's food insecure population. It does not examine with precision *how well* the safety net serves the welfare needs of the region, but rather provides an illustration of how a "private" and "local" system makes food and housing assistance available to those in need. The focus of attention will be upon two of the region's most important nonprofit, nongovernmental providers of emergency services, The Shelter, the largest homeless shelter in the Big Bend, and the America's Second Harvest of the Big Bend (ASHBB), the region's largest food bank. The Shelter provides meals as well as temporary shelter for the most indigent of the region's residents and the ASHBB offers food and other household items to agencies (including The Shelter) that provide welfare services to the poor. The first section will propose a conceptual framework that specifies the make-up of the social safety net and that scale at which it operates, followed in the second section by a review of the effects of recent state restructuring on social welfare provision and the debate surrounding those changes. Following a brief description of poverty in the Big Bend in the third section, the fourth and fifth sections illustrate two major actors within the safety net that serves that region of need. Finally, in the concluding section, the efficacy and suitability of the region's safety net is considered.

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The American safety net: Questions of architecture and scale

The concept of the "social safety net" represents the network of institutions through which social welfare services are provided, including actors and programs that operate at different scales (local, regional, national) within the spheres of the state, capital, and civil society. Figure 1 provides a framework that can be used to locate the various actors in the social safety net in the American political economy. *State* actors include agencies, departments, and programs working at different levels of the governmental hierarchy who serve the welfare needs of the poor and food insecure. They are the most substantial and systematically involved participants in the social safety net at all scales, and, moreover, often serve as "silent partners" by providing funding and policy support to commercial and nonprofit participants (Poppendieck 1998). Actors within the sphere of *capital*, such as family farmers and corporations involved in food production, processing, distribution, retailing and other non-food related activities, are also significant contributors to the social safety net. Commercial actors exist to serve the effective demand of markets and not the needs of the food insecure and homeless, and this is reflected in their reasons

Figure 1

	State	Capital	Civil Society
National			
State			
Regional/ Local			

for participating in the social safety net. As Poppendieck (1998) has observed, the institutionalization of the social safety net has "proven extraordinarily useful to business[es]" (p. 159), which receive tax benefits, avoid dumping fees, and use their association with a "good deed" as a marketing strategy. Actors from the sphere of *civil society* constitute the so-called voluntary sector and include religious and "faith-based" organizations, nonprofit institutions and charity organizations. While these "voluntary" participants in the social safety net are not motivated by the public- and profit-oriented mandates of state and commercial actors, they often work in close partnership with them (Wolpert 1993).

These actors form a safety net that exists as a *geographically and historically specific configuration of state, commercial, and voluntary programs, policies, and organizations with different motives that operate at and across distinct scales.* The historical development of the social safety net reflects an ongoing and contentious search for the most appropriate jurisdictional location of the safety net within the American political economy (i.e. in the public or private sphere and at what scale—state/local or national). In the late nineteenth century outdoor relief (public assistance in the form of cash and food) gave way to "scientific charity" as the view gained strength that private actors could play a more effective (i.e. morally disciplining) role in the provision of welfare services (Katz 1996). The establishment of the American welfare state in the 1930s re-positioned public institutions at the center of the national welfare system and precipitated a series of conflicts over the scale at which particular welfare services would be administered (Handler 1995). While the American safety net operated almost entirely at the scale of states and localities prior to the New Deal, the Roosevelt administration reconfigured the safety net to include national level agencies and programs, most notably Social Security. Twenty years on, the War on Poverty reinforced the keystone role of the national state in the social welfare system that would, in the vision of President Johnson, provide services through federally-funded but locally-based and public "community action" (Katz 1989). The most recent period in the development of the social safety net began during the recession of the early 1970s when "Welfare became the centerpiece of an explanation for economic stagnation and moral decay" (Katz 1989, p. 139). Advocates of this view gained the initiative in the struggle over the configuration of the social welfare system, arguing on both philosophical and

political grounds that the national scale, federal state-led approach to poverty alleviation had failed. On these grounds, President Reagan initiated a reduction of the federal government's role in providing relief with an aim to reconfigure the social safety net around voluntary participation by private actors and to transfer its administration to local states and communities.

State restructuring and the privatization and localization of welfare

The degree to which a social safety net that relies on voluntary contributions (by private commercial and nonprofit actors) and local funding and administration has been achieved reflects the success of a political discourse that combines particular views about the causes of poverty, the function of government, and the scale at which it should intervene. The question of the role of government in the welfare system has been at the forefront of the broader debate in the United States over the "appropriate divisions of responsibility within and between the public and private sectors [that] is an ongoing process in the American federal system" (Kodras 1997, p. 79). Over the past two decades, the mantra of "less government" has summarized the prevailing, but contested, view that reductions in the scale and scope of the federal government's capacities would improve social welfare services. From this perspective, a greater reliance on "private initiative" and "local solutions" would improve the flexibility, efficiency, and precision of response. Since the era of Reagan's presidency, the doctrine of "less government" has been pursued and, to a substantial degree, achieved through the *devolution* of government functions from higher to lower levels of the federal hierarchy, the transfer of government functions to commercial firms or nonprofit organizations through *privatization*, and the *dismantling* of government programs by way of outright elimination or debilitating financial cuts (Kodras 1997, pp. 81-82). The state restructuring that occurred through these processes, highlighted by the passage of federal welfare "reform" in 1996 in the form of the Personal Responsibility and Work Opportunity Reconciliation Act, brought about a substantial re-location and reconstitution of the social safety net within the American political economy. Primary responsibility for the provision of social welfare was transferred from the public to the private sphere and from the federal to state and local levels of government.

As a putative strategy to improve the welfare system, the pursuit of "less government" has been given moral pretext by the revival of a view – longstanding in America – about the nature of poverty and its cures. In that view, poverty is primarily the result of individual behavioral deficiencies, such as a lack of work ethic and/or promiscuity, rather than structural processes, such as economic shifts, changing employment patterns, racial and sexual discrimination, and public disinvestment in education and social supports (Cope 1997). Remedies, from this standpoint, are designed to address the behavior of the individual rather than, for example, the lack of jobs and low wages. In the 1980s and 1990s, the strengthening of this view gave rise to a "symbolic politics" whereby the effects of poverty (i.e. the fact that individuals and families received low-income public assistance) rather than its causes were targeted as the objects of welfare reform (Handler 1995). Thus, for example, policies were designed to reduce federal cash supports for low income households as well as the numbers of poor people receiving them, while the economic and social causes of un- and under-employment, food insecurity, and homelessness were for the most part neglected.

Whether or not it was intended to alleviate poverty in America, welfare reform directly served the doctrine of "less government" by acting as a "a euphemism for cutting the cost of relief" (Katz, 1989, p. 138). Cope (1997, p. 186) explains the broader effect of welfare reform on the restructuring of the social safety net, "Individual responsibility [became] the catch phrase for welfare reform, which not only defuse[d] questions of the system's shortcomings, but also [let] government, at all levels, off the hook." This is reflected in program and funding cuts in all manner of social services, from public housing to food stamps to cash assistance (Cook and Brown 1997; Sard and Daskal 1998; Handler 2000).

The reduction of the scale and scope of the federal government's responsibility to provide social welfare was intended, moreover, to enhance the roles of the market and volunteer sectors in the safety net in order to, in Reagan's words, "rediscover America . . . the America whose initiative, ingenuity, and industry made this country the envy of the world, the America whose rich tradition of generosity began with simple acts of neighbor caring for neighbor" (Reagan, quoted in Poppendieck, 1998, p. 138). Reagan's emphasis on private actors and the local scale expressed the view that federal bureaucracy necessarily suppressed such community action by inhibiting both the "initia-

tive, ingenuity . . . and generosity" of local actors in position to help and the work ethic of those "dependent" on welfare (Katz 1996). Reagan asserted that a reduction of the federal government's role would bring government "closer to the people" and create a social space in which private actors would be free to innovate and implement locally appropriate policies and, thereby, produce a safety net that was more efficient, accountable, flexible, and responsive (or "targeted") to those in actual need.

While the notion of a safety net woven out of neighbor-to-neighbor caring is politically, fiscally, and, for some, morally alluring, critics have endeavored to show that privately organized and locally administered welfare will not be able to adequately serve the needs of the food insecure and homeless. Based on a survey of state-level reports documenting the impacts of state devolution on social welfare, Nestle and Guttmacher (1992) concluded that neither the private sector (commercial and voluntary) nor local states had the capacity to provide food and income assistance to meet present or future levels of need. According to Wolpert (1997) the inability of charity to serve as the basis of the national welfare system derives from some of its basic features. First, only around 10 percent of total charitable contributions are given to support programs and services for the poor. Second, the geographic distribution of charities receiving those contributions does not match the distribution of communities in need, and "most charities lack the mechanisms to reallocate donations where they are needed most" (Wolpert 1997, p. 102). Third, because the charitable sector receives around one-third of its income from government grants and contracts, the reduction of government support for welfare translates as a substantial deterioration in what were already meager resources with which to provide social support for the food insecure and homeless. Thus, as Wolpert points out, in the most optimistic scenario, charity would cover less than 2 to 5 percent of the cuts in federal welfare support.

Cook and Brown (1997) provide a specific example of this in their study of the American Second Harvest Food Bank (ASH), the largest distributor of donated food in the United States. They calculate that by 2002 the expenditure cuts in the Food Stamp Program contained in the 1996 welfare reform bill will increase the unmet need within the ASH system from 726 million pounds of food to 24.5 billion pounds. Prior to welfare reform, ASH was able to meet only 83 percent of the needs of the food programs it serves through its network; after reform it will meet less than 30 percent

of those needs assuming an optimistic growth scenario. More likely it will achieve a level of service that is much lower.

The capacity of the voluntary sector to serve as the basis for the national safety net derives not only from income and resources garnered from donations but also from the supply of volunteers, personnel management, logistical coordination, physical access, and local governance. For example, in her study of "emergency food" (i.e. that provided by soup kitchens, food pantries, and food banks), Poppendieck bases her critique of a charity-based safety net on issues of cultural appropriateness, nutritional adequacy, stability of service, accessibility, and efficiency, in addition to adequacy of charitable giving. Underlying each of these, and especially the issue of efficiency, is the question of coordination among charitable actors and between supply and need over time and space within a decentralized and supply-driven system: "Emergency food quantity, quality, coverage or accessibility, predictability, and social cohesiveness are not determined by some sort of societal plan to meet basic needs: in fact, they are driven as much by supply—by available food resources, volunteer time, space, and the like—as by need" (Poppendieck 1998, p. 229). A fundamental concern is that private welfare is not legally responsible for the equitability of social support that would be required of a federally organized system in which recipients have citizenship rights to assistance or, at least, appeals to such rights.

The ability of local states to take on the social welfare responsibilities transferred to them by welfare reform has also come in question. It was pointed out above that one of the aims and effects of state devolution was to create a social space in which local initiative could flourish and provide welfare that was appropriate to local needs. To the extent that such outcomes will occur, local initiative requires a favorable institutional context defined by adequate fiscal resources, expertise, infrastructure, and political will, each of which varies considerably from place to place. While geographical unevenness is not a new feature of welfare provision in the United States, devolution tends to exacerbate the differences between places, as affluent and experienced localities are more able to take advantage of new "local powers" while those exhibiting a greater need for assistance often fail to realize these new capacities. In either case, however, the social space opened up by welfare reform is severely constrained by competitive pressures imposed by national or global forces that discipline "local initiative" to create a "favorable business climate" as a necessary

precondition, it is argued, to the community's ability to provide social welfare. Thus, "local states are left with less control . . . even as the national state passes off additional responsibility [to] them" (Kodras 1997, p. 90). In Tallahassee, for example, an attempt to establish health care service for the working poor – those earning too much money to qualify for Medicaid but not enough to afford private insurance – was derided by the local business association and city boosters as an unfair tax burden that would disable attempts to attract capital investment to the city and county (Staff 2001).

Despite the merits of these fundamental critiques, processes of state devolution have transformed the safety net into one that resembles the privatized and localized system depicted in Reagan's vision of a "new Federalism". How does such a welfare system work in practice? Poppendieck (1998) has provided a comprehensive answer to this important question with respect to food assistance, while Handler (2000) has examined the efficacy of welfare-to-work schemes. The purpose of this paper is to begin addressing this question from the perspective of a particular region, the Big Bend region of Florida. The next section will provide a brief description of the region and its level of need for food and housing assistance, followed by two sections, each of which will describe a major actor in the region's safety net.

Poverty in the Big Bend

The Big Bend is situated in rural north Florida, taking its name from the north-to-west curve of the coastline that connects the peninsula with the panhandle. Made up of 14 counties, the region is one of the poorest in Florida, with inequalities in wealth and poverty tracing their roots to late nineteenth century cotton and tobacco plantations. More recently, the agrarian economy has shifted to diversified vegetable and nursery-plant production with labor supplied by migrant labor. In 1997 the median household income across the Big Bend was nearly $10,000 less than the national average and $5,000 less than the statewide average. The poverty rate in the Big Bend reached 20.5 percent in 1997, compared with rates of 13.3 percent for the nation and 14.4 percent for state. Based on the cost of a subsistence diet, the rate of poverty is the best measure of food insecurity at the *county level*[2] but it provides a rather inaccurate gauge of overall material deprivation and economic insecurity. This arises from its failure to incorporate

an appropriate model of contemporary household expenditure, namely the increasing share of household income consumed by the high cost of shelter. Thus, by considering housing costs, we can draw a more complete picture of poverty in the Big Bend. According to the National Low Income Housing Coalition, approximately 48 percent of people in the Big Bend are unable to afford a two-bedroom apartment at a Fair Market Rent (a rent estimate determined by Housing and Urban Development) (National Low Income Housing Coalition 2000). The comparable figure for the state of Florida is 40 percent.

The Shelter

The Shelter, established in 1991 on the northeast edge of Tallahassee's downtown, regularly provides three meals daily and temporary lodgings for 120 people, and serves meals only to an additional 30 people. The facility, which is open every day of the year, is within walking distance of a number of social services as well as the public library and various parks. This central location has at times elicited scorn from nearby merchants who have requested that The Shelter be moved out of the district. Lodgers receive basic accommodations, either double bunk beds or mats for sleeping on the floor, as well as toilet, bathing, and laundry facilities, support services, and referrals to a range of community services, including food stamps, housing placement, health care, counseling, legal aid, and employment and job training (The Shelter 2001). Space permitting, it is The Shelter's policy to refuse no one and those taken in can stay as long as they wish free of charge, provided they abide by its rules. In 1999 The Shelter expanded to open a women's shelter that offers services to homeless women. There are two other shelters in the city, both small compared to the Shelter and both operated by charities. Each charges long-term guests. One is only open five days a week.

The Shelter's operations are paid for by a mixture of charitable donations and federal, state, and local (county and city) government grants, with administrative and staff salaries consuming the largest portion of these funds. The City of Tallahassee provides no money for its operation, but provides the building. The meals that are served three times a day at The Shelter are in large part the product of local volunteers and the regional food bank. Breakfast (both food and service) is provided by either The Shelter or a

Hindu group, while Good News, a "faith-based" charity that receives public funding, provides lunch. The evening meal is provided by various organizations, most of which are religious groups representing the Christian, Jewish, Moslem, and Hindu faiths. Non-sectarian groups also provide meals, including women's groups, those formed within government agencies or private enterprises, and student groups from the two universities in Tallahassee (Florida State University and Florida A&M University). Each volunteer group agrees to obtain food and prepare and serve the meal on a specific day of each month, and several have done so for six or more years. Volunteer groups provide approximately 85 percent of dinners at The Shelter (The Shelter 2001). When no volunteer groups are available, The Shelter provides meals with food purchased from private sector retailers or from ASHBB (examined in the next section), a major source of inexpensive food.

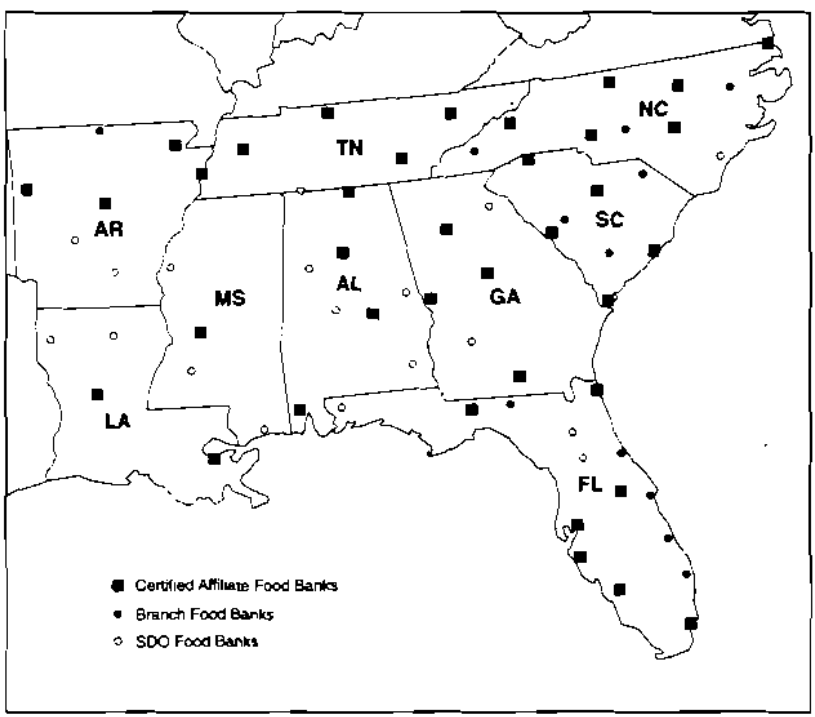
The Shelter exercises no control over the nutritional quality or type of food served by the volunteer groups on which it depends so heavily. To avoid scrutiny by the Board of Health there are no facilities for cooking at The Shelter. Food is brought already prepared to the serving area, which is equipped with a warming facility. Since all food is cooked elsewhere and brought to The Shelter, it is taken on faith by the management that the food is fresh and is prepared under sanitary conditions. The Shelter also receives an enormous amount of party leftovers, especially during the holiday and football seasons and graduation time at the local universities and high schools. This food is generally accepted without question and is used to supplement that which is brought by the scheduled providers.

Recognizing the overall lack of coordination within the local volunteer sector, in 2000 the City of Tallahassee budgeted $100,000 to the recently established Tallahassee Coalition for the Homeless. The money was to be used to complete a study to improve the articulation among local charities, including The Shelter, that offer emergency shelter, food, clothing, employment, and medical services. In addition to setting up a web site to serve as a central clearinghouse for relevant information on these services, the coalition has proposed the construction of a large multi-service facility, which has given rise to a contentious debate over the facility's location within the city.

American Second Harvest of the Big Bend

ASHBB is an affiliate of America's Second Harvest (ASH), a network of 200 food banks that distributes more than 1.4 billions pounds of food to 50,000 community agencies that serve 26 million people nationwide (American Second Harvest 2001). The ASH network is unevenly distributed across the United States. ASH food banks are located in every state, with the highest concentrations found in urban areas of the west and east coastal regions. The spatial distribution of ASH food banks in the southeast is characterized by a relatively even spread (Figure 2). In Florida there are seven ASH food banks, five of which are found in the southern half of the state. Founded in 1980 as an independent food bank, the ASHBB now distributes nearly 2.5 million pounds of food throughout its 14 county service area (American Second Harvest of the Big Bend 2001). While the total population of the Big Bend is not large

Figure 2
America's Second Food Harvest Bank Network in the Southeast



compared to the service areas of the other six ASH affiliates in Florida, a number of the counties in the region are among the poorest in the state. ASHBB is the major charitable food distributor (food bank) in the region, serving at least 190 non-governmental agencies. Five Big Bend counties are totally dependent on it, while in seven there is only one other source. ASHBB sponsors a variety of programs in addition to food collection and distribution, including advocacy and disaster relief. Today it maintains a large warehouse in a Tallahassee industrial park, equipped with cooler and freezer rooms. It also has a small branch warehouse in Madison, the seat of the like named county, located 60 miles east of Tallahassee.

ASHBB offers processed and fresh food and other household essentials to its member agencies, each of which is given access to the distribution network on the condition that products obtained from ASHBB are provided to poor individuals and families. Most agencies are associated with churches or other religious organizations, although there are many non-sectarian agencies, including youth groups and women's support centers. The selection of food available at ASHBB warehouses and outlets varies daily and is sold by weight to its members. Typical offerings include frozen and canned meats, fresh and canned vegetables, dry packaged foods, and kitchen supplies. Prepared foods, such as pastries and delicatessen items whose "shelf life" has expired, and aesthetically unappealing vegetables donated by supermarkets are often given away free of charge.

The volume of food products that pass through the ASHBB's warehouses necessitates a high degree of organization and logistical coordination. Deliveries must be appropriately timed, space in the warehouse requires careful management, and orders filled as accurately as possible. Seven full-time and four part-time employees accomplish these crucial tasks along with a group of volunteers. Inbound supplies are brought by trucks, most of them from private freight lines, that arrive constantly throughout the five-day work week. While these cargoes are unloaded and positioned in specific places in the warehouse, client agencies arrive at another entrance to pick up their orders. The ASHBB owns a small fleet of trucks that are used to pick up and deliver food within the local area.

ASHBB receives donations from the USDA and local and non-local private sources. The USDA is the largest single donor to the ASHBB, providing 916,000 pounds of food during the fiscal year

2000. Typically the ASHBB has at least 50 USDA products for sale, some in tremendous quantities if there is a glut in the national market. In the summer of 2001 there were 15 tons of canned fruit juices, eight tons each of frozen peaches and seedless raisins, two tons of corn grits, a ton of spaghetti, and two tons of canned and fresh cranberries.

Farms in the Big Bend are a significant source of fresh fruits and vegetables for the ASHBB. Growers occasionally decide they do not want to sell their produce, if, for example, they calculate that it will spoil before being sold or if the wholesale price has collapsed. In such cases they contact the food bank, which ascertains whether its agencies would be able to use the produce and then contracts with a freight line or uses its own trucks to pick it up. The ASHBB is presently trying to organize a "gleaner" program that would allow volunteers to collect produce from the fields of vegetable farms that farmers were not interested in harvesting. ASHBB also receives a great deal of fresh produce from farms outside the Big Bend region. Frequently growers in South Georgia and Central and South Florida will offer produce that they cannot sell profitably to the ASH affiliates, which notify the ASHBB when the volume is too large to be absorbed by their service areas. The ability of the ASHBB to retrieve such non-local surpluses is in jeopardy due to recent cuts in state funding for the transportation budgets of food banks outside of South Florida (Ensley 2001). Additionally, produce enters the ASHBB system from sources beyond the southeastern United States. In the winter of 2001 a cooperative of Idaho potato growers donated thousands of tons of potatoes to the ASH that had been held in storage to maintain a high retail price. The central office of the ASH coordinated the distribution of the potatoes to its members throughout the nation, including the ASHBB, which received several tons.

Donations from private corporations and cooperatives collectively account tor a larger tonnage of food than that donated by the USDA. Food retailers, both local and national chains, donate a wide range of food and other items for all manner of reasons. For example, products may be donated if the packaging or ingredients are changed, if the expiration date is approaching or has passed, or if the producer is closing out the product. In 2000 the ASHBB received 400,000 pounds of "salvage" from its largest private donor, the Supervalue supermarket chain. The latter operates a reclamation facility in Quincy, located about 20 miles west of Tallahassee, where dented cans, damaged packages, returns and

other rejects are collected. These goods are often sent to food banks where they are inspected and, if deemed suitable for use, distributed to non-governmental agencies.

Conclusion

The previous two sections provide an illustration of the means by which private (commercial and volunteer) and local actors deliver welfare services to the food insecure and homeless living in Florida's Big Bend region. The Shelter and ASHBB, which serve as crucial knots in the region's social safety net, embody an impressive array of charitable and regional/local effort and resources. The Shelter could not offer its services on local government money alone; its operations are made possible by the generosity of community groups who donate time, money, and other necessary resources. Private donations supply ASHBB with more than half of its food; the food programs organized by its member agencies are conducted by local volunteers.

The decline of the federal government's role in the welfare system has pushed to the foreground issues involving the logistics of service delivery. As individual actors, The Shelter and the ASHBB have apparently confronted these issues with considerable success. Yet the creative energy and time donated by volunteers and staff (which are mostly funded by charitable donations) are largely consumed in the pursuit and delivery of supplies (money, personnel, resources), leaving scant time, energy, and resources to address the causes of regional poverty, hunger, and homelessness through, for example, advocacy and participation in policy struggles. Indeed, The Shelter and ASHBB provide temporary and emergency services but, while they endeavor to provide a comprehensive range of services, they do not possess the financial resources, personnel, and organizational mandate to apply themselves to fundamental problems such as the supply of low cost housing and issues of employment (job training, sufficiency of wages). Furthermore, the lack of central coordination among local and regional actors puts into question the ability of the region's welfare system, as opposed to the individual actors within it, to adequately provision the region's poor. For example, The Shelter has no control over the quality nor the quantity of food provided by the volunteer groups, and the ASHBB is dependent upon what the government or private corporations donate, which is not necessarily what their clients need. Two decades of state devolu-

tion have produced a welfare system that is driven by, and oriented according to, the vagaries of supply, rather than the demands of citizens with rights to basic social provision, which points, in conclusion, to the need for further research on the adequacy of voluntarism and localism as bases for the national safety net.

Notes

[1]Dr. Winsberg is an active volunteer at The Shelter and in this role he also interacts frequently with the ASHBB.
[2]The Food Security Supplement included in the annual Current Population Survey provides a more direct and precise measure of the prevalence of food insecurity and hunger, but data are collected at the state level.

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The Internet: Where Does Florida Stand?[1]

Edward J. Malecki

Technology is now among the factors that make a place competitive. State-of-the-art economic development no longer focuses on "chasing" high technology companies, but has given way to building knowledge, networks, and collaboration. Newer, "fourth wave" of policies that have emerged since the mid-1990s now comprise a mix of public-sector policies to integrate local economies into global markets, develop local human capital resources, and increase use of telecommunications as a development tool (Clarke and Gaile 1998).

The argument that a "new economy" has developed is compelling. The Internet has changed how people, firms, and governments go about their daily routines. Yet the existence of a "digital divide" between haves and have-nots is also disturbing. In a series of reports, the US Department of Commerce has documented that the poor and those in rural areas are far more likely to be unconnected to the new economy (NTIA 2000a).[2] A "new geography" also is emerging, with some places taking better advantage of the new economic and technological situation than others (Kotkin 2000). The paper investigates briefly where Florida stands in the Internet economy, primarily using data for 2000. This is followed by a look at some statewide indicators. A third section examines in detail the connections to Florida metropolitan areas on the Internet's "backbone" networks. A fourth discusses interconnection and the two South Florida Internet Exchange (IX) points. The last section looks at several other rankings of Florida's metro areas related to the Internet.

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Statewide Picture

State-level comparisons of "new economy" indicators by the Progressive Policy Institute show that Florida, the 4th-largest state in population, ranks 20th in the US in overall "new economy" indicators (Atkinson et al. 1999). The state ranks better, 12th, in "digital economy" indicators. These include digital government (6th), commercial Internet domain names (12th), technology in schools (21st), and online population (27th). Overall, then, the picture is mixed, and shows Florida well behind several other states. What might lie behind the failure of Florida to surge to the lead in the Internet economy?

In part, Florida's economy is still highly dependent on tourism, retirees, and agriculture, rather than on the high-tech firms of the Internet economy. The Governor's Internet Task Force (itFlorida.com) has a directory of IT firms in the state on the Web site (www.itflorida.com). The number of firms included in the state's four regions (after deleting double listings within a region) are: South, 28; Central, 20; North, 4; Northwest, 8. This directory includes many large companies and firms based outside Florida, such as Microsoft and Novell, as well as listing some firms, such as KPMG LLP, in all four regions and Andersen Consulting (recently renamed Accenture) in three regions. Correcting for multiple listings, the directory includes a mere 54 IT firms in Florida, although because of multiple listings of some firms the total number reaches 60. An active trade group, InternetCoast.com, has coalesced to contradict this image and to capitalize on the advantages of South Florida. A slick web site includes news stories back to mid-1999, and links to nine newspapers and other publications in South Florida. The group's self-description connects with the legacy started when the IBM PC division was established in Boca Raton in the early 1980s:

> The InternetCoast is made up of a collection of Internet companies and organizations operating in Southeast Florida. It is an Internet cluster of businesses, organizations and educational facilities that is now reaching "critical mass" – in the same way that other U.S. technology clusters like Silicon Valley have grown in the past.
>
> Like the Internet itself, the InternetCoast is a grassroots movement being fueled by a natural progression of events in

> Southeast Florida, the original birthplace of the IBM PC (www.internetcoast.com)

The InternetCoast's Research Committee report a year ago shows 5,806 businesses in the three-county region, which would mean "establishments" as derived from the Dun & Bradstreet data base used (InternetCoast.com 2000). By comparison, the organization's directory of firms on its Web site (January 28, 2001) includes 988 firms. Both numbers are impressive evidence of "critical mass" in Internet and information technology companies.

The Geography of Internet Backbones

This section provides a picture of the status of Florida metropolitan areas in their connectivity on Internet backbone networks. The Internet "is a composite of tens of thousands of individually owned and operated networks that are interconnected, providing the user with the illusion that they are a single network" (NRC 2001, p. 3). Backbone networks, known as "autonomous systems," are the core of the Internet and are essential for all but the most local of interactions. Although there is no consensus as to which networks are backbones, the following applies:

> A backbone is a set of paths that (LAN) local area networks connect to for long-distance connection. A backbone employs the highest-speed transmission paths in the network. A backbone can span a large geographic area. The connection points are known as network nodes or telecommunication data switching exchanges (DSEs) (NTIA 2000b).

The original Internet network was hardly more than a back-of-the-envelope sketch of connections among four university nodes in California and Utah (Abbate 1999). As computing and communications technology converged, private networks grew to serve corporate clients. It is the new telecommunications carriers, as well as older telecom firms, whose individual networks make up the present Internet. The competitive environment means that universal service has been replaced by "cherry-picking" and opportunistic behavior by the various backbone networks and other firms as they attempt to tap the demand in the world's largest cities (Graham 1999).

A large number of firms provide long-haul transmission, dominated by WorldCom, Sprint, and Cable & Wireless, which together account for perhaps 55% of the Internet market (TeleGeography 2000: 57). These firms and their competitors have invested heavily to install new fiber optic cables and in new technologies that provide greater bandwidth capacity. Data traffic demands high-speed (high-bandwidth) links to transmit video (especially) at normal speeds.[3] Indeed, it is the digitization of several products, such as music and video, that accounts for much of the growth of data traffic. Exactly how much traffic is not known; Coffman and Odlyzko (2001) suggest that we simply do not have comprehensive data on flows, yet best estimates confirm that traffic is probably doubling each year. Anticipating this future traffic, a great deal of new fiber-optic capacity is being installed throughout the US, much of it "dark" fiber – fiber-optic cable which has not yet been "lit" by the optoelectronic equipment that facilitates transmission of data. Indeed, several firms in the electricity, pipeline, and railroad sectors install such fiber along their rights-of-way. In Florida, such firms include FPLFiberNet and GRUNet among utilities, Williams and Enron among pipeline companies, and EPIK (a subsidiary of Florida East Coast Industries) among railroads.

Technological change also has permitted massive increases in bandwidth, the speed at which data can be transmitted through the cable. Enormous investment in Internet backbone capacity has *also* occurred between 1998 and 2000 in the US. In early 1998, only two of 38 national backbones offered bandwidth at OC-48 (2488 Mbps or 2.488 Gbps). By mid-2000, fully 17 of 41 backbone networks (41%) had installed capacity at bandwidths of 2488 Mbps or faster. Such bandwidths easily overwhelm networks of the slower capacity: a single OC-48 cable has the same bandwidth as 55 of the older DS-3 capacity. The current standard is OC-192, which moves data at speeds of nearly 10 gigabits per second, and work is underway to implement OC-768 in the near future.

At the national scale, Moss and Townsend (2000) compared the intermetropolitan Internet backbone capacity in the USA in 1997 and 1999. The 1997 data included 29 networks; there were 39 by the Spring of 1999. They found that a "core group of seven metropolitan areas (San Francisco/San Jose, Washington DC, Chicago, New York, Dallas, Los Angeles, and Atlanta) had maintained their dominance as the central nodes of the Internet in the United

States" (Moss and Townsend 2000: 41). They also found that a group of metro areas in the central part of the country had become "hubs for new, large network links" (ibid.). Third, they found that the principal global cities in the country – New York, Chicago, and Los Angeles – were relatively weak in backbone links. Similarly, Boston and Seattle, well-known for their technology-based firms, ranked below Atlanta and Dallas – largely because of the geographically central locations of the latter.

Using data from the annual *Boardwatch Directory of Internet Service Providers*, as Moss and Townsend's research did, and supplemented by maps on the Webs sites of many of those networks whose maps had greater detail, data were compiled for all links of 41 networks in mid-2000. Nationwide, the leading group of seven metro areas from Moss and Townsend's work remains intact.

Table 1 shows the total bandwidth that connects Florida metropolitan areas on Internet backbones. If a city is included on a backbone map, its bandwidth and the cities with which it is linked were recorded. Orlando emerges as the leading city, followed closely by Miami-Fort Lauderdale.[4] Perhaps more surprising is the standing of Tallahassee and rural Lake City. These cities are major hubs on several high-bandwidth networks as they extend south to other cities in Florida.

Table 2 confirms the concentration of bandwidth in Tallahassee and Lake City, but also in Orlando, Naples, and Jacksonville – all of which have more bandwidth per 1000 population than the average of all US metropolitan areas. However, Tampa-St. Petersburg and Miami-Fort Lauderdale are below average, as are most metro areas in the state. This situation is relatively significant, since 23 metro areas in the country have more bandwidth than the US metro average, including Salt Lake City (68.7 Mbps/1000 population) and Kansas City (50.8), but also, in the South: Atlanta (38.7), Dallas (37.4), Birmingham (28.9), Austin (28.7), New Orleans (25.1), and Charlotte (25.0).

Table 3 provides a historical perspective, comparing the results in Gorman's (1998) study of Internet backbones with those of this study, which used a similar methodology. Orlando is the only large Florida city that has risen in its national ranking between the two years. The relatively small bandwidth numbers for 1998 reflect the fact that few backbone networks provided even 155 Mbps (OC-3) at the time; 45 Mbps (DS-3) was more common.

Table 1
Florida Cities Linked by Internet Backbones, 2000

Metropolitan Area	Total Backbone Bandwidth (Mbps)	National Rank
Orlando	45,528	20
Miami-Fort Lauderdale	42,138	22
Tampa-St. Petersburg-Clearwater	30,310	30
Jacksonville	23,952	37
Tallahassee	17,684	44
Lake City*	10,331	63
West Palm Beach-Boca Raton	6,111	78
Daytona Beach	5,466	87
Melbourne-Titusville-Palm Bay	5,466	87
Naples	5,244	98
Pensacola	5,155	103
Fort Pierce-Port St. Lucie	4,976	110
Gainesville	356	126
Ocala	311	130
Sarasota-Bradenton	134	140
Fort Myers-Cape Coral	89	143
Fort Walton Beach	89	144

* Lake City, although not a metro area, is a listed hub on several national backbone networks.

Source: Compiled from data in *Boardwatch Magazine's Directory of Internet Service Providers* , 12th edition, 2000, and company Web sites.

Table 4 illuminates further what makes up total backbone bandwidth for any city: the number of backbone networks that pass through it and include it as a hub and, more importantly, the number of high-bandwidth links. Although only third among Florida cities in the number of backbone networks, Orlando ranks first in total bandwidth largely because 10 of those networks link the city with high-bandwidth links – 2.488 Mbps of higher. Indeed, Table 4 demonstrates that the number of high-bandwidth links largely determines the ranking with respect to total bandwidth. A great deal of new, even high-bandwidth capacity is being installed in Florida, some of it lit since the data were gathered in mid-2000. Much of this bandwidth has been installed by ***so-called*** "carriers'

Table 2
Backbone Bandwidth per 1000 Population in Florida Cities and Metro Areas, 2000

Metropolitan Area	Total Backbone Bandwidth/ 1000 Population
Lake City*	192.3
Tallahassee	68.0
Orlando	29.7
Naples	25.3
Jacksonville	22.7
US metro average	**18.4**
Fort Pierce-Port St. Lucie	16.6
Tampa-St. Petersburg-Clearwater	13.3
Pensacola	12.8
Melbourne-Titusville-Palm Bay	11.6
Daytona Beach	11.5
Miami-Fort Lauderdale	11.4
West Palm Beach	5.8
Gainesville	1.8
Ocala	1.3
Fort Walton Beach	0.5
Sarasota-Bradenton	0.2
Fort Myers-Cape Coral	0.2

* Lake City, although not a metro area, is a listed hub on several national backbone networks.

Source: Compiled from data in *Boardwatch Magazine's Directory of Internet Service Providers* , 12th edition, 2000, and company Web sites.

carriers," such as EPIK, Enron, and Williams, which lease their bandwidth to other firms, rather than by backbone network providers. Additional research – and greater data availability on the part of providers in Florida – is needed to determine the comprehensive status of Internet connectivity in the state.

To provide a national perspective on the data reported in Table 4, both Chicago and New York have over 50 links of 2.488 Mbps or more connecting them to other cities, and Dallas-Forth Worth, San Francisco, and Washington have over 40 such links. Indeed, these five metro areas, as well as Kansas City and Salt Lake City, have a larger number of high-bandwidth (2.488 Mbps) links than the

Table 3
Shifts among Florida Cities in Internet Backbone Links, 1998-2000

	2000		1998	
Metro Area	Total Backbone Bandwidth (Mbps)	National Rank	Total Backbone Bandwidth (Mbps)	National Rank
Orlando	45,528	20	990	24
Miami-Fort Lauderdale	42,138	22	1,575	19
Tampa-St. Petersburg	30,310	30	810	26
Jacksonville	23,952	37	855	25

Source: Data for 2000 compiled from data in *Boardwatch Magazine's Directory of Internet Service Providers* , 12th edition, 2000, and company Web sites; data for 1998 from Gorman (1998).

number of networks linking them, indicating both a high degree of redundancy and a high level of recent investment.

Data traffic between pairs of cities or metro areas travels along specific routes, much like segments of the Interstate highway system. In general, the routes in the US with the highest concentrations of backbone networks and of high-bandwidth links are located outside Florida. The top three inter-city links in the US are Washington-New York (55,059 Mbps), Los Angeles-San Francisco (44,636 Mbps), and Boston-New York (44,281). The Miami-Orlando route, with 15,709 Mbps, is the 21st-largest link in the US Internet, and the Orlando-Atlanta route ranks 31st nationally in total backbone bandwidth.

Network redundancy is a high priority for firms that rely on the Internet. Having alternative networks assures an Internet Service Provider (ISP), for example, that its links to the Internet are not severed if one network is temporarily "down." Large firms, such as banks, also utilize redundant paths to the Internet for similar reasons. Table 5 shows that multiple, redundant backbone networks are available primarily in the four major metro areas. Miami, Tampa, and Orlando are all linked to 12 or more cities, and by an average of about three links to each. Miami is the best-linked metro area in the state, with an average of 3.9 links per city. However, the high-bandwidth connections that pass through Fort

Table 4
Internet Backbones Links and Broadband Links to Florida Cities, 2000

Metro Area	Total Backbone Bandwidth (Mbps)	Number of Backbone Networks (out of 41)	Number of Backbone Links of OC-48 (2.488 Mbps) or greater
Orlando	45,528	19	10
Miami-Fort Lauderdale	42,138	26	9
Tampa-St. Petersburg	30,310	20	7
Jacksonville	23,952	14	5
Tallahassee	17,684	4	5
Lake City	10,331	3	4
West Palm Beach-Boca Raton	6,111	6	2
Daytona Beach	5,466	4	2
Melbourne	5,466	4	2
Naples	5,244	4	2
Pensacola	5,155	3	2
Fort Pierce	4,976	2	2
Gainesville	356	1	0
Ocala	311	1	0
Sarasota-Bradenton	134	1	0

Source: Compiled from data in *Boardwatch Magazine's Directory of Internet Service Providers* , 12th edition, 2000, and company Web sites.

Pierce, Tallahassee, and Lake City provide those three cities with the highest average levels of bandwidth per link – all at gigabit per second speeds. Among the major metro areas in Florida, Orlando again is the best linked, with 892.7 Mbps per link to other cities.

The standing of Florida's cities on Internet backbones largely reflects network geography. As a peninsula, Florida is not on the way to anywhere, except perhaps the Latin American market. Bandwidth to Latin America is very small in comparison to that connecting the US to Europe and to Asia (TeleGeography 2000). If Internet use in Latin America grows significantly, Florida's bandwidth will increase as hubs in Florida become intermediate stops to Central and South America. This is the goal of the NAP of the Americas, which aims to become the Internet equivalent of Miami

Table 5
Florida Cities Linked by Internet Backbones, 2000: Details of Links

Metro Area	Number of Cities Linked	Number of Links	Average Number of Links per City	Average Bandwidth per Link
Orlando	15	51	3.4	892.7
Miami-Fort Lauderdale	15	58	3.9	726.5
Tampa-St. Petersburg	12	43	3.6	704.9
Jacksonville	12	35	2.9	684.3
Tallahassee	7	11	1.6	1607.7
Lake City	5	10	2.0	1033.1
West Palm Beach	7	14	2.0	436.5
Daytona Beach	4	8	2.0	683.2
Melbourne	4	8	2.0	683.2
Naples	4	8	2.0	655.6
Pensacola	3	6	2.0	859.2
Fort Pierce	2	2	1.0	2,488.0
Gainesville	3	3	1.0	118.6
Ocala	2	2	1.0	155.5
Sarasota	3	3	1.0	44.7
Fort Myers	2	2	1.0	44.7
Fort Walton Beach	2	2	1.0	44.7

Source: Compiled from data in *Boardwatch Magazine's Directory of Internet Service Providers* , 12th edition, 2000, and company Web sites.

International Airport, which serves as a hub for the entire Latin American region.

Urban areas located in the central region of the USA, such as Dallas-Fort Worth, that serve as intermediate hubs in the transcontinental routes, are the best connected with high-bandwidth links. Florida cities are not alone in this geographical impact. Well below-average bandwidth/population ratios also are seen in the largest eastern cities: Boston, Philadelphia, and New York; in the western cities of Phoenix and San Diego; and in the manufacturing-belt cities of Detroit and Pittsburgh. In Florida, Orlando, as an intermediate hub connecting both Tampa and Miami, and the crossroads for east coast and west coast routes, is far better connected with bandwidth despite its relatively small size.

The itFlorida *1999 Annual Report to the Legislature* provides a few generalities but no detailed data on backbone connections in the state. It notes that seven networks have high-bandwidth (OC-48 or OC-192) networks in Florida "so that access to redundant fiber should not be a major issue" (p. 94). The report then continues: "The IP networks in Florida are of more concern. Several major IP backbones have limited presence in Florida" – proceeding to cite most of the high-bandwidth networks just listed (itFlorida 2000). In fact, the picture is more uneven, and there is real cause for concern for Miami's standing as an Internet hub if new bandwidth is not installed at a pace that keeps up with the other two dozen major Internet hubs in the US.

Florida Bandwidth Not Accounted for in Backbones

The bandwidth figures reported here do not account for all the bandwidth in the state. Several categories are excluded:

- BellSouth's and Genuity's local networks within Florida, which connect the national backbones to local users in Florida communities
- Internet2 links that connect Florida's universities to the very high-speed Abilene backbone
- Bandwidth that belongs to carriers' carriers, such as national players Enron and Williams and regional providers such as FPLFiberNet and EPIK Communications. These firms primarily lease bandwidth to other firms.
- Local networks, such as Gainesville Regional Utilities' subsidiary GRUCom, which serves as the primary link from the University of Florida to the Internet
- Metropolitan area networks, or MANs, that link sites within metropolitan areas
- Networks still under construction, such as the Florida Fiber Network

All of these categories add considerable, but unknown amounts of, bandwidth to locations within Florida. However, providers of most of these networks make available only scanty data on their networks. Some provide a great deal of detail; others very little. In nearly all cases, these networks function by leasing and trading bandwidth with other, often national carriers whose networks are included in the totals reported in this paper. The advantage of the

Boardwatch data used here is the consistent format, including detail on bandwidth on each network link.

The InternetCoast and Network Access Points

The InternetCoast Research Committee report (2000) highlighted the need for South Florida to establish a network access point (NAP) where interconnection between Internet backbones would be facilitated. This proposal also was highlighted in itFlorida's (2000) report.

In fact, many interconnection or Internet exchange (IX) points now exist around the world, most of which are privately operated and increasingly "carrier-neutral" or facilitating access to many backbone networks. The call for a South Florida NAP was more successful than anticipated, and has resulted in two potentially competing IX points. The NAP of the Americas opened in July 2001 in downtown Miami and BellSouth has built a four-location all-optical Florida Multimedia Internet Exchange (FloridaMIX).

The NAP of the Americas is the more successful of the two, as measured in the number of members (63) and the number of backbone networks (9). The networks that are considered backbones here include: 360networks, AT&T, Broadwing, Cable & Wireless, Enron, Global Crossing, Level3, NetRail, Williams, and XO, as well as several Latin American and European firms. Not all of those are in the analysis above; Enron and Williams are carriers' carriers, wholesaling their bandwidth to others, as do EPIK and other regional firms. The FloridaMIX has 17 participants, among them backbone providers Exodus, NetRail, Qwest, and UUNET, along with Diveo, a firm that is focusing on the Latin American market and that is one of the few companies in both NAPs. It is apparent that US firms were forced to choose with which NAP to be associated, since no network, with the exception of Diveo, is included in both.

If high-bandwidth connections reach Latin America in the next few years, they almost certainly will be connected through one or both of the South Florida IX points. There may well be room for two IX points in the region; Washington and San Francisco have at least three each, in addition to several data centers where private interconnection occurs. Several of the 55 IX points in TeleGeography's current list (www.telegeography.com) are in multiple-IX cities, such as Atlanta, Chicago, New York, San Jose, and Washington. Whether Miami has the demand or the Internet

traffic to support both will soon be known.

In Internet data centers and co-location facilities, which is what the NAP of the Americas also advertises itself as, Florida cities are mid-range in importance at best. Miami and Orlando fall in a third tier of locations for these facilities, behind both the top tier that includes Los Angeles, New York, San Francisco, and Washington and a second tier comprised of Boston, Chicago, Atlanta, Dallas-Fort Worth, and Seattle. Orlando and Miami share this third tier with Philadelphia and Portland. Further research as well as the dynamic growth of the colocation-data center sector suggest that the situation may change, but it is unlikely that either Florida city will rise to the upper tier of Internet hubs. Some firms in the "telecom hotel" or data center-colocation industry are Florida-based, including one of the first, Switch and Data Facilities, based in Tampa, and Terremark Worldwide, the developer of the NAP of the Americas, based in Miami.

Most Wired

A final perspective from which to see where Florida stands in the Internet economy is the occasional compilations of "wired" places. *Yahoo! Internet Life*, for example, compiles an annual list of the 50 "most wired" cities and towns. The rankings are a composite of *five* indicators: (1)home and work net use; (2) domain density; (3) hosts per capita; (4) directory density; and (5) content quality.

A comparison of these rankings for the years 1998, 1999, and 2000 shows that several Florida metro areas have appeared in the US top 50 (Table 6). The Yahoo! rankings mirror closely the results concerning Internet bandwidth data mentioned earlier. Miami has fallen from 10th in 1998 to 28th in 1999 to 35th in 2000. Orlando, not included in 1998's top 50, was 33rd in 1999, and rose to 19th in 2000. Like Miami, Tampa-St. Petersburg has fallen steadily throughout the three years. Jacksonville, in fact, fell out of the rankings in 2000, after falling from 29th in 1998 to 47th in 1999. The emergence of Fort Lauderdale as 42nd in 2000 could, if it were combined with Miami as it is in the Census Bureau's CMSA, enhance the region's standing. West Palm Beach-Boca Raton has appeared, ranked a steady 45th, in both 1999 and 2000.

Detailed data for Yahoo!'s 2000 rankings provide more detail. The only city to crack the top 10 on any criterion is Miami, which ranks 7th in domain density. This is likely due to the fact that the

Table 6
Rankings of Florida Cities in Yahoo!'s "Most Wired" Lists

City (Metro Area)	1998	1999	2000
Miami	10	28	35
Orlando	–	33	19
Fort Lauderdale	–	–	42
West Palm Beach-Boca Raton	–	45	45
Tampa-St. Petersburg-Clearwater	29*	37	49
Jacksonville	29	47	–

* Tampa only

Source: *Yahoo! Internet Life* (1998, 1999, 2000).

Web sites of the Latin American divisions of companies that use Miami as their headquarters for the region are hosted in Miami. Zook (2000) corroborates Miami's status as a domain name hub. He found the Miami-Fort Lauderdale Consolidated Metropolitan Statistical Area (CMSA) ranked 9th in the US in number of commercial (.com) domain names in 1998. The leading metro areas include the big seven of Moss and Townsend's research: New York, San Francisco, Los Angeles, Chicago, Boston, Washington, and Dallas-Fort Worth, as well as Philadelphia. Miami placed ahead of Atlanta, Denver, and Seattle in Zook's study.

An alternative list is internet.com's CyberAtlas, which reports Nielson//Net Ratings' rankings of the top 20 markets. Tampa ranks 13th and Miami 19th among the top 20 markets based on Internet penetration (internet.com 2000). Other Florida cities were not ranked by Nielson//Net Ratings.

Web Design Firms

There is no comprehensive directory of firms in the Internet economy. The Design Survey of 167 Web design firms in the September 1, 2000, issue of *Internet World* provides one snapshot. Six Florida firms appear among the 167 companies that took part in the online survey: of these, 3 were in Boca Raton, 1 in St. Petersburg, 1 in Deerfield Beach, and 1 in Vero Beach. A larger directory is that maintained by *The Industry Standard*, one of the major providers of "intelligence for the Internet economy." A tally of the 838 Web Development firms (the net number after eliminating 17

that were double-listed) in its Company Directory (716 in the US) yielded 33 firms, including a cluster of 10 firms in Miami.[5] The Miami-Fort Lauderdale metro area has 16 of the state's 33 Web development firms, to which one could add the 3 in Boca Raton.

Tracing data paths in the Internet

Traceroutes provide a simple means to identify the routes taken by Internet traffic between two points. A few examples illustrate the actual geography traveled by Internet data – seemingly within the state of Florida:

- A trace from my home in Gainesville to either the University of Miami (www.miami.edu) or Florida International University in Miami (www.fiu.edu) on BellSouth's ADSL service travels to Orlando on UUNET's backbone, then to Atlanta, to travel to Miami – all on UUNET. The same route is taken to a commercial site in Miami: www.NAPoftheAmericas.com.
- A trace to www.fsu.edu in Tallahassee travels via UUNET from Gainesville to Orlando to Atlanta to Jacksonville to Tallahassee.
- A trace to www.usf.edu in Tampa also travels to Orlando and Atlanta on UUNET, changing there to the Sprint backbone to return to Orlando and on to Tampa.
- The route from Gainesville to www.internetcoast.com and www.itFlorida.com, both in Boca Raton, travels from Gainesville to Orlando, to Atlanta, to Washington DC, where it shifts to the Verio backbone, passing back through Atlanta to Boca Raton.

The same paths – to Atlanta or Dallas – are taken by data packets traced from Davie, FL. Redundant networks allow different paths to be taken but, again, circuitous routes are the norm:

- Paths to UF and FSU travel to Atlanta and Jacksonville on their way to Gainesville and Tallahassee.
- A trace from Davie to www.itFlorida.com in nearby Boca Raton travel to Washington, DC, the nearest location where UUNET and Verio interconnect.
- A trace to www.internetcoast.com, also in Boca Raton, traveled on the Level3 network to Dallas, interconnecting with Verio's network, returning to Boca via Houston and New Orleans.

Neither South Florida NAP at present includes Verio, suggesting that these long-distance routes to facilitate interconnection (or peering) will continue.

Conclusion

It remains the case that Florida is, at best, a second-tier state in Internet backbones as well as in other indicators of "wiredness" or digitization. For large businesses, the presence of several, redundant backbones in Florida's large cities is, as the itFlorida report suggests, "not a major issue." However, in general, small businesses are not targeted by the companies that provide connection to those backbones.

In cities with low bandwidth passing through, web development and other bandwidth-intensive businesses are less likely to succeed. It is noteworthy, for example, that Tallahassee appears among Florida's cities as a web development center, corresponding with its commercial backbone bandwidth, while Gainesville does not. Although the University of Florida is a major hub, a GigaPoP, on Internet2, Gainesville businesses cannot take advantage of this network. Indeed, the university makes access to this network available to faculty, staff, and students from their homes. Businesses and others not affiliated with the university do not have this advantage.

Most of Florida may not have the high-bandwidth backbone connections to permit state-of-the-art work on Internet applications. The major metropolitan areas in Florida, not linked with the number of high-bandwidth backbone links of other US cities, are, with the exception of Orlando, falling behind as high-capacity links are installed elsewhere in the country. Orlando and Miami-Fort Lauderdale are certain to remain important hubs on the Internet, Tampa-St. Petersburg and Jacksonville somewhat lesser hubs.

In general, the new information and communication technologies per se do not make local and regional milieus dynamic; rather, more dynamic milieus "are better able to use new technologies to their advantage than are less dynamic ones" (Gilbert and Villeneuve 1999: 115). Florida and its cities must continue to keep up their efforts to compete with other places in a competitive environment that includes investment in Internet backbone networks and data centers as well as traditional forms of investment.

Notes

[1]This research has been supported by the National Science Foundation and by the University of Florida's Center for International Business Education and Research (CIBER).
[2]The Digital Divide Web site (www.digitaldivide.gov) provides a wealth of information and full reports, including the series by the National Telecommunications and Information Administration (NTIA).
[3]Bandwidth is the term commonly used to designate transmission speed, measured in bits per second. A simple "rule of thumb is that good video requires about a thousand times as much bandwidth as speech. A picture is truly worth a thousand words" (Mitchell 1995: 180, note 28). *Broadband* generally refers to transmission speeds above 64kbps, the base normal speed of a voice call. Higher bandwidths generally are made possible by multiplexing the base line.
[4]The convention here, as in most such research, is to use the official Metropolitan Statistical Areas (MSAs) and their combination into Consolidated MSAs (CMSAs) when so defined. For the current definitions, see http://www.census.gov/population/www/estimates/metrodef.html.
[5]Only one Florida firm appears in both lists, illustrating both the ephemeral nature of such directories and the turbulence of the industry.

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