was reported in Homestead on the 21st of September. Lowest barometric pressure was 28.44 inches, and top winds were 122 miles per hour. The hurricane killed 3 people and caused 105 million dollars damage.

The second 1948 storm ran from the 3rd to the 15th of October and started just off the Nicaraguan/Honduras coast in the northwest Caribbean Sea. This hurricane also moved across western Cuba into the Florida Straits and even crossed the September hurricane’s path near the coordinates 24.0N and 82.0W. This storm passed through the Keys and extreme south Florida into Grand Bahama Island. At about 31N latitude it did a gigantic loop in the middle of the Atlantic and finally became a non-tropical cyclone. A tornado was reported in Fort Lauderdale on the 5th of October. Lowest barometric pressure was 28.92 inches, and top winds were around 90 miles per hour.

In August 1949, another major hurricane, taking a course similar to the Great Hurricane of September 1928 entered the coast near Palm Beach. It was the worst hurricane felt in the Lake Okeechobee area since 1928. Hurricane force winds were reported at St. Augustine, Cape Canaveral, and Melbourne, and winds of 120 miles per hour or greater were felt from Stuart to Pompano. The highest recorded wind speed gust, 153 miles per hour, was at Jupiter, only 2 miles per hour less than the wind speed record set on September 27, 1947. The amount of damage in dollars, 45 million (equivalent to $270 million in 1990), was almost twice that of the 1928 hurricane. The storm was not classified as being among the Great Hurricanes in Florida’s history, but it fell into the category of only being slightly below them (U.S. Weather Bureau, August 1949). Tides were 24 feet and 23 feet at Belle Glade and Okeechobee, respectively.

Finally, here are some brief quotations, taken from the U.S. Weather Bureau reports, 1950, for the last two major hurricanes of the 1941-1950 decade; during this period the storms were named using World War II phonetic alphabet: Able, Baker, Charlie, Dog, Easy, etc.

**Hurricane Easy, September 1950, Cedar Key**

Old residents say this was the worst hurricane in 70 years... half of the houses were severely damaged or destroyed... The fish-
ing fleet upon which the town depends for a livelihood, was completely destroyed by wind and waves... The tide in Tampa Bay rose 6.5 feet., the highest since 1921.

This hurricane looped twice on the west coast, had top winds of 125 miles per hour and a barometric pressure of 28.30 inches, caused 38.7 inches of rain at Yankeetown in the September 5-6 period, and brought unfounded accusations of seeding by the Weather Bureau from residents of the area.

**Hurricane King, October 1950, Miami**

The path of principal destruction was only 7-10 miles wide through the greater Miami area and northward to West Fort Lauderdale on the 17 of October. It was at first reported that the damage was the result of a tornado or tornadoes... after careful inspection there was no evidence of tornado action ... It was simply that of a small violent hurricane.

Gusts were 150 miles per hour at Miami and 138 miles per hour at Ft. Lauderdale. Barometric pressure fell to 28.20 inches and tides were 19.3 feet at Clewiston. Three people died during this storm.

Following is a personal eyewitness report on Hurricane King described by one of the authors (J.M. Williams).

To begin, this storm, Hurricane King, formed down in the northwest Caribbean not too far from Swan Island. It curved its way northward to clip the west tip of Jamaica. From there King traveled almost due north across Cuba to slam into Florida close to Miami and made passage through western Ft Lauderdale. I was home on leave from Army duty on the 17th of October, 1950, visiting my folks who lived in Country Club Estates, which is now Plantation. This was my first hurricane on land—I had been in one on a ship at sea coming back from Occupation Duty in Europe. In the afternoon of the 17th, rain was coming intermittently in sheets and the wind was gusting pretty high. Then, as if nothing was going on, it would calm down and the sun would come out. We were from Iowa where when it looked stormy, you were going to get it! That, I found out didn’t mean anything down here in Florida. My mother had two cats who were progressively getting noisy
and mean. We found out later that they were affected by the barometric pressure drop as the storm approached. By the time the storm hit they were climbing the walls! The house was CBS block construction so we felt okay because shutters had been installed some years ago. On the front porch were aluminum jalousies.

The main part of King hit us in the late evening and it was really something, to me at least! The street in front of the house was gravel back then and the winds picked the rock up and blasted the front of the house! The noise on those aluminum jalousies was so bad we couldn't hear each other talk. There was a lot of lightening in the storm and we could see out through the shutters. Newspapers were flying all over the place. The only trouble however, the newspapers were not newspapers but were tiles off the roof.

We went outside during the eye and I found out what everybody had always said about the eye: we could see stars, the moon, and a few clouds, and we could feel a slight breeze. We detected a smell, some said was ozone. But ozone is odorless! Nevertheless we experienced the Hurricane Eye Smell.

The famous backside of the hurricane came right away, like now, and we rode out the remainder of the storm like we did the first part. Now the wind came from the other direction and it loosened up everything.

After the passage of Hurricane King we took a long look at the damage. Out of six fruit trees, only one was still standing. About half of the roof tiles were lost and would need to be replaced. The aluminum jalousies were dented and stripped of all paint. Debris could be seen all over the place. As the area was wooded in that period of time, trees were down here and there. A big tree, about two feet in diameter took down the power and telephone lines. I had returned to Fort Benning by the time power had been restored. We heard that a tornado was running around in the eye of King and wiped out a trailer park in the town of Dania, south of us. Some people were killed due to King.

The last 10-year period, 1951-1960, of the 1931-1960 thirty-year segment was marked by a sharp reduction in major hurricane activity; it was during this period when the Weather Bureau began giving hurricanes female names in 1953.

In October 1951, Hurricane How, as a tropical storm, crossed mid-Florida. In 1952, a tropical storm crossed south Florida in February. In 1953, tropical storm Alice struck northwest Florida in
June. Another tropical storm crossed south Florida in August. Yet another tropical storm crossed north Florida in September and Hurricane Florence hit northwest Florida also in September. Tropical storm Hazel crossed mid-Florida in October to finish out 1953.

In 1956, Hurricane Flossy struck northwest Florida in September. In 1957 two tropical storms hit the same region, one was unnamed and one was named Debbie. In October 1959 two more tropical storms came ashore in Florida—Irene into northwest Florida, and Judith crossing mid-Florida. None of these were of major consequence.

Hurricane Donna stole the show in 1960, while Brenda, as barely a tropical storm, crossed north Florida in September, and Florence also a very weak storm, crossed south and central Florida a week earlier.

Hurricane Donna ranked fifth, prior to Hurricane Andrew in 1992, among the most intense hurricanes ever to strike the U.S. this century (Hebert et al., 1992). Except for the western Panhandle, where Flossy with a barometric pressure of 28.93 inches affected Pensacola in 1956 with gusts at 98 miles per hour, Donna was the first hurricane to have a major affect on Florida since Hurricane King in 1950.

Hurricane Donna caused $300 million ($1.9 billion, 1990 dollars) in damages to the state and was one of the most destructive hurricanes to affect Florida in modern times (Dunn and Miller, 1964; Hebert et al., 1992), although Hurricane Andrew in 1992 will replace Donna as Florida’s most damaging storm.

At Conch Key, pressure was 27.46 inches on the 10th of September, 1960, and tides were 13 feet 40 miles northeast and 20 miles southwest. Donna was at her peak here, moving only 8 miles per hour. The storm killed three people in the Keys. Top winds of 180-200 miles per hour were recorded in the Keys, with gusts to 150 miles per hour at Everglades City and Naples. In central Florida, the pressure was 28.60 inches at Lakeland, 28.66 inches at Orlando, and 28.73 inches at Daytona. Barometric pressure was 28.05 inches at Ft. Myers. Fifty people died when a U.S. airliner crashed off Dakar, Africa, at the beginning of the storm.

Following are some quotations from the U.S. Weather Bureau records, (September 1960) about this hurricane.
Storm damages range from very severe in the Middle Keys and the southwest coast from Everglades City to Punta Gorda, to relatively minor in northwest Florida and points north of the storm track. At Naples tides pushed inland to the center of the city damaging buildings and smashing docks all along the intrusion. Everglades City, a town that had been largely evacuated was also inundated by storm tides and about 50% of the buildings in that city were destroyed by tides and winds. Even well outside these areas, the wind toppled thousands of trees, demolished many weaker buildings, blew off or damaged roofs, and shattered many windows. Power and communication facilities fell throughout central and south Florida. Grapefruit losses were between 25 and 35% of the state’s crop. Gusts of 99 miles per hour recorded at the FAA tower in Daytona Beach marked Donna’s exit from Florida, having retained hurricane status throughout its entire passage in Florida.7

Donna inflicted major ecological damage. Dunn and Miller in 1964 reported that one of the world’s largest stand of mangrove trees was 50% wiped out in many areas and that 35 to 40% of the white heron population was killed.

In Everglades National Park, a monument on the road to Flamingo reminds visitors today about Hurricane Donna.

The Last Thirty Two Years, 1961-19938

There were 27 storms during this 32-year segment. Comparing these figures with the 21 hurricanes and 30 tropical storms for the previous 30 years, one can easily see the overall reduction in both hurricanes and tropical storms (Table 4). In the 1961-1992 period, 6 hurricanes (category 3 or higher), Betsy, Eloise, Elena, David, Inez, and Andrew, occurred as compared to 11 from 1931-1960. Hurricanes Inez and Kate did strike Florida but were categories 1 and 2 storms then. Inez and David were Category 4 storms in the Caribbean. Hurricanes Juan and Elena, in 1985, affected northwest Florida without a strike.

During the first 10-year period, 1961-1970, seven hurri-

7 See Figures 8 and 9.

8 See Plates 10-13.
canes—Cleo, Dora, Isbell, Betsy, Inez, Alma, and Gladys—hit Florida, a sharp increase over the previous 10-year period, 1951-1960. While there were no storms from 1961-1963, 3 hurricanes struck Florida in 1964 alone, making this year the costliest ($350 million and more, which is equivalent to $1.75 billion dollars in 1990) so far in Florida’s history.

In 1962, Alma as a tropical depression passed Florida’s east coast on 26 August. In 1965, a tropical storm crossed northwest Florida on 15 June from the Pacific.

In late August 1964, Hurricane Cleo was the first hurricane to strike the Miami area since Hurricane King in 1950. Cleo moved up the peninsula about 20 miles inland paralleling the east coast. It produced 138 mile per hour gusts at Bahia Mar Marina, Ft. Lauderdale, and knee-deep water was observed in some locations. Due to its small size, Cleo soon weakened to below hurricane strength around the Fellsmere-Melbourne area, yet the total storm damage was estimated at $125 million ($600 million in 1990 dollars). Cleo sailed through Georgia, South Carolina, and North Carolina to break into the Atlantic on the 1st of September. She regained hurricane status on the 2nd, but died in the north Atlantic near Nova Scotia on the 5th of September.

According to the U.S. Weather Bureau report of August 1964, principal losses caused by Hurricane Cleo were from glass and water damage in the Miami Beach area, and agricultural losses in the Indian River citrus belt.

Author John M. Williams provides the following personal account of Cleo whose path was tracked semi-hourly through southeast Florida (Figure 10), in the Ft. Lauderdale area.

Cleo was the worst in the southeast coastal area. Cleo was of Cape Verde vintage and traveled through the Atlantic and the Caribbean as a “textbook” storm. Between Jamaica and Haiti, however, she turned northward into the Guantanamo Naval Base in Cuba causing considerable damage there and in Cuba. Passing across Cuba brought the usual decrease in strength, but once into the Florida Straits she regained her hurricane status. The following is my eye-witness report on the passage of Cleo in western Ft. Lauderdale area.

There were winds and rain all day of the 26th August. Some gusts were in the 60 miles per hour category. It seems that I had
the only ladder in the neighborhood and since the people there knew I was in the weather business, a line of them formed as I was finishing the preparations on my house. I didn’t see the ladder again until after the storm had passed, but I heard it got as far as two blocks away.

I knew the storm was going to hit this area after dark so we decided to have supper and get all the other amenities out of the way. We put all the kids to bed early but that didn’t last for long, after all, it was their first hurricane! It was lucky that we towedled up all the doors and had the shutters on the windows because at the height of the storm we had water coming in the front door and through some of the windows—we had glass jalousies throughout the house!

It peaked late in the evening just before the eye passage with gusts to 130 miles per hour at my location and there was considerable lightning, along with that tremendous roar. You could see almost like daylight through the shutters.

My children will never forget the “little leaf”, obviously sheltered by the house, hopping across the yard, in the opposite direction from the wind.

About ten minutes before the eye, a Florida room aluminum shutter, about 3 by 8 feet, ripped off the house next to mine. It slammed into the corner of my house and ricocheted out into my front yard. I had a small palm tree out there which was bending over from the winds and the shutter managed to wedge itself between the tree and the ground.

The eye passage lasted one hour and twelve minutes at my location.

I opened the door at that time to a rush of water about two inches deep. While the wife mopped that up, I stepped off the porch into nearly knee-deep water and waded to the palm tree. As hard as I tried, I couldn’t free the shutter from the tree.

I could see the stars in a beautiful sky about me and there was that unmistakable stillness and smell that only happens in the eye of a hurricane!

The guy across the street yelled over to me that he had lost all the glass jalousies from his Florida room and had to move inside the house. He had only taped his windows!

I tugged again and again at the tree and big shutter but to no avail. I couldn’t move it. I checked around the house and everything seemed all right or passable. But now it was time to get back in the house because the backside of a hurricane comes on like
'Gang Busters'!

Since the wind comes from the opposite direction and right now, it is there before you know it! And it came! The palm tree straightened up and the big shutter came loose and was last seen, in lightning flashes, heading north, up over the house across the street! We never saw it again. The back side of the storm was drier than the front but not by much.

Since the house leaked (all houses leak in a storm like Cleo), we had a lot of mopping to do. The pea-rock on the flat roof of the garage was all gone and there was a dent in the decklid of the car parked in the carport; something was flying around loose. When the water subsided, it left a mass of debris all over the place and power was off in some parts of town for five days. Our power came on again by late afternoon of the 27th of August one day after the storm passed by. There was widespread damage throughout the area but only occasional catastrophic type.

In a few days, we had the place almost cleaned up; I had my ladder back and the kids still wanted to know what happened to the 'little leaf'. For a period after the storm when I mowed the lawn, the clippings were a combination of grass and pea-rock shrapnel.

In September 1964, just a few weeks after Hurricane Cleo, Hurricane Dora struck the Florida coast at a near 90 degree angle from the east at St Augustine, Florida. It was the first hurricane to do so, north of Stuart, since the Great Hurricane of 1880. The hurricane’s winds of 125 miles per hour at St. Augustine resulted in a 12-foot storm tide which swept across Anastasia Island (St. Augustine) and also produced a 10 foot storm tide at Fernandina Beach, and Jacksonville. These massive storm tides caused extensive beach erosion, inundated most beach communities, washed out beach roads, and swept buildings into the sea. There was also considerable flooding along the St. Johns River in Jacksonville. Total damage was estimated at $250 million dollars (more than $1 billion in 1990 dollars) (U.S. Weather Bureau, September 1964).

Hurricane Isbell, while not a strong hurricane, struck Florida in October 1964 and is described as an eyewitness account by one of the authors, J.M. Williams.

This storm grew down south of the western tip of Cuba and proceeded northeast, across Cuba, the Florida Straits, and into the Ten Thousand Islands region of southwest Florida. From there,
Isbell took a more northeat course across Florida. On the evening of October 14th, the storm passed just northwest of Fort Lauderdale, Florida. Winds were 50 to 60 miles per hour with a recorded gust of 120 miles per hour. Many tornadoes, spawned by Isbell, caused as much damage as the hurricane did. Rains were extremely heavy in the early period of the storm but slacked off to nearly dry conditions at the end. A tornado, less than a block from where I lived, tore the whole Florida room, constructed of block, off a house. Isbell passed out to sea between the cities of Palm Beach and Vero Beach and dissipated in the Atlantic.

The following year, in September 1965, Hurricane Betsy, a Category 3 storm, struck extreme southern Florida from the east. Wind gusts up to 60 miles per hour were reported as far north as Melbourne. In south Florida, an observer at Grassy Key reported winds of 160 miles per hour before the anemometer was blown away at 7:15 AM on the 8th September. Six to eight foot storm tides and wave action caused considerable flooding between greater Miami and the Palm Beaches; rising waters flooded extensive sections of Key Biscayne, covering virtually all of the island (U.S. Weather Bureau, September 1965). (See Photographs).

Hurricane Betsy, (Figures 11 and 12) was unique and formed far out in the Atlantic around the 27th of August, and was obviously a Cape Verde type hurricane. After moving west for a few days, it developed an erratic course starting around Puerto Rico (Sugg, 1966). The path was a zig-zag, generally in a northwest direction to a point about 300 miles almost due east of Cape Kennedy, (as the Cape was known in those days). She became stationary there for nearly two days, then suddenly moved in a south-southwest direction which took her right into the central Bahamas. Just east of Nassau, Betsy stalled again. For 20 hours, winds of 120-140 miles per hour buffeted the area causing death and destruction.

The following eye-witness (J.M. Williams) report is about the passage of Betsy in western Ft. Lauderdale.

During the 7th of September we were intermittently pelted with rain and strong wind gusts. Nassau is only about 150 nautical miles from Ft. Lauderdale and since Betsy was a large ‘Cane’, we were getting all sorts of weather in the area.
During the early morning of the 8th, we were getting rain in sheets with several gusts in the 125 miles per hour category. Sustained winds easily hung in there between 65 or 90!

Even though we did not experience the eye, things would calm down to almost sunshine conditions—but this would not last long.

There was a lot of flooding and house seepage but not as bad as last year’s Cleo. Betsy’s eye, which was huge and about 40 miles in diameter, was south of us and our pressure bottomed out at 29.12 inches.

This combination of pelting rain and heavy winds continued all day long, and even at supper time it was still not advisable to venture outside. Our power was off for more than ten hours and the usual mass of debris was all over the place. There was a lot of orange and grapefruit damage as well as damage to other crops; again most of the pea-rock was blown off the garage roof.

Our place was wet for a long time and I recorded more than eight inches of rain for the passage period. When there is no break up to the continuity of a storm (the eye), you get the effects all the time: more rains, more winds, more everything.

Inez was a Cape Verde type hurricane with a classic track through the Caribbean, across Haiti and Cuba and into the Florida Straits. From there she earned the name, "the Crazy One" by the National Hurricane Center. She took a very erratic course, first north, then south, then east, and finally west and this had everybody’s fingernails completely gone!

Before she died in the mountains near Tampico, Mexico, Inez had killed more than 1500 people, had recorded top winds of 190 miles per hour, and planted a barometric pressure of 27.38 inches (from air recom) in the books! Back then, that was called a "Severe" Hurricane. Today that would be a strong category 4.

The following eye witness report (J.M. Williams) is of the passage of the storm in western Fort Lauderdale, Florida.

I had put the wife and kids to bed early that night and told them that Inez was heading northeast. As erratic as it had been though, I was going to stay up and keep a check on it. I was off duty so there was nothing else to do, and I was a Storm-Hunter anyway. I was glued to the weather radio, TV, barometer and the rest of the instruments at my station. But as enthusiastic as I was
about the whole thing, I was guilty of dozing off two or three times.

The winds here were gusting more than 40 miles per hour and
I had pulled down the shutters just in case.

At 0800, 3 October, the pressure at the house was 29.65
inches, temperature was 78°F, Dew Point was 78°F, humidity was
100%, winds were north at 29 miles per hour sustained and it was
overcast with rain. Inez was 93 miles east-northeast of Miami
moving north-northeast at 7 miles per hour. We had it made.

At 1100, the storm was 75 miles west-northwest of Nassau
moving north-north east.

At 1400, she was stationary about 85 miles west-northwest of
Nassau.

At 2300, Inez was drifting slowly south-southwest pushing 25
foot seas as reported by a Coast Guard Cutter. The Southeast
Florida coast had gusts of more that 55 miles per hour. I dozed a
couple of times even though I knew it was now coming this way.

At 0345, 4 October, I awoke to shutters rattling and pelting
rain! Winds were gusting more than 60 miles per hour. Barometer
was 29.59 inches, temperature was 75°F, dew point was 73°F,
humidity was 91% and it was overcast with thunder and lightning!

At 0700, Inez was 45 miles southeast of Miami with winds of
at least 85 miles per hour and moving west at 7 miles per hour.

At 1100, the storm was moving west-southwest at 8 miles per
hour with gale-force winds 175 miles to the north, and 100 miles
south. Here, we had hurricane gusts frequently and gales with
heavy rains all day. U.S. Highway No. 1 in the Keys was under
water. The eye of the storm was 30 miles in diameter.

At 2000, my barometer was reading 29.67 inches and I was
still getting gusts in excess of 45 miles per hour. By 1500, 5
October, Inez was stationary near Dry Tortugas with winds of 120
miles per hour. From there, she finally continued west to Mexico.

We got a bit of minor damage on the house and there was a lot
trash to pick up around the yard. Everything was wet for a few
days, however, we considered ourselves lucky!

The earliest hurricane to hit the U.S. was Alma. She struck
northwest Florida June 9, 1966.

During the 18th and 19th of October, 1968, Hurricane Gladys
struck the west coast of Florida between Bayport and Crystal River
about midnight on the 18th.

Gladys formed in the western Caribbean near Swan Island and
steadily move in a north track across western Cuba, over Dry Tortugas and into Florida's west coast.

Dry Tortugas and Plantation Key both reported winds near 90 miles per hour. The storm’s forward speed was about 15 miles per hour. Tides along the west coast were 6.5 feet above normal causing beach erosion and flooding mostly between Clearwater and Bayport.

Maximum gusts were over 100 miles per hour and lowest pressure was 28.76 inches. Citrus was heavily damaged and mobile-home damage was extensive, as usual, as far inland as Ocala. Gladys broke out into the Atlantic near St. Augustine having killed 3 people in Florida and one in Cuba. One more death was added in Nova Scotia and the total damage was nearly $17 million in 1968.

The next to the last 10-year period, 1971-1980, had the lowest storm total of the 122-year history. Three hurricanes and one tropical storm. The three Florida hurricanes were Agnes, Eloise and David.

Hurricane Agnes, which occurred in 1972, was barely a Category 1 hurricane in Florida but resulted in major devastation in the middle, southern, and northeastern states, and caused 122 deaths and six billion dollars damage in 1990 dollars. Agnes struck the Florida panhandle, then merged with another system in the mid-U.S., triggering torrential rains and extreme flooding throughout the entire eastern seaboard.

The threat of a hurricane usually diminishes rapidly as it moves inland and loses its oceanic heat source, however, sometimes the storm will encounter an environment that supplies an auxiliary source of energy to maintain strength far inland. Such is the case with Agnes, which from landfall near Apalachicola, Florida, where losses were less than $10 million, she traveled nearly a thousand more miles to become one of the most destructive storms in U.S. history.

Hurricane Eloise, in 1975, was a Category 3 hurricane. Hurricane David, in 1979, had weakened from a Category 4, to a Category 1 hurricane when it struck Florida, but David still caused over $400 million in damage.

Hurricane Eloise, which came in September 1975, made landfall about midway between Ft. Walton Beach and Panama City (Balsillie, 1985). It was the first direct hit by a major hurricane in the 20th Century in that area. Measurements of high water marks by the U.S. Army Corps of Engineers indicated hurricane tides of 12-16 feet
above mean sea level. Eglin Air Force Base, 20 miles west of the center, reported the highest sustained wind of 81 miles per hour when the instrument failed; 14.9 inches of rain fell. However, maximum sustained winds were estimated at about 125 miles per hour with gusts to 156 miles per hour. The combined effects of winds and tides undermined or demolished numerous structures along the beach from Ft. Walton Beach to Panama City (North Atlantic Tropical Series, volume 26, 1975); the lowest barometric pressure was 28.20 inches. Damage was over $1 billion in 1990 dollars from this category 3 hurricane; there were 21 deaths in the United States.

In 1979, the National Hurricane Center decided to integrate Male and Female names for the hurricanes in the Atlantic for the first time... Bob was the first Atlantic hurricane and the 'guys' decided to out-do the 'gals'...and they did!

In September 1979, Hurricane David moved inland south of Melbourne on the east coast and then northward along the Indian River to exit at New Smyrna Beach. It was the first hurricane to strike the Cape Canaveral area since the hurricane of 1926. Severe beach erosion from a near five foot storm tide was reported in Brevard County and the southern portion of Volusia County. Some homes, businesses, and public buildings were severely damaged or destroyed, however, most of the damage, though widespread, was minor because the strongest winds were just offshore over the adjacent Atlantic Ocean.

Figure 13 shows Hurricane David from the 22,000 mile high Geosynchronous Operational Environmental Satellite (GOES) orbiting the earth. At this point, August 31, David was about to make landfall on Hispaniola about 1800 EST. Winds were near 150 miles per hour and the central pressure was 27.34 inches. Earlier, about 125 miles south of Puerto Rico, sustained winds of 150 miles per hour and central pressure of 27.29 inches was David's strongest point, then rated as a category 4 hurricane.

On 1 September at 0600, David broke into the sea north of Hispaniola and Haiti. Winds were down to about 75 miles per hour after crossing a 10,000-foot mountain in the Dominican Republic. Later that day, a hurricane watch was posted for south Florida with the weakened storm some 350 miles southeast of Miami. In the late evening of the same day, hurricane warnings were up as the now strengthened hurricane, with 90 mile per hour winds, was 300 miles
from Miami.

At 0700 on September 3rd, David was 35 miles east of Ft. Lauderdale with 85 mile per hour winds and a pressure of 28.85 inches. Ft. Lauderdale experienced torrential rain, in squalls with gusts over 75 miles per hour. Since the eye and strong side of the storm were over the ocean, this condition kept up most of the day.

Figure 14 shows David, at about 1800 that evening. David made landfall about 20 miles south of Melbourne with 90 mile-per hour winds and central pressure of 28.75 inches, a Category 1 hurricane.

From there, the hurricane made it to Savannah, Georgia, before downgrading to a tropical storm, on September 4th. On the 7th, David was no longer a threat and died near Newfoundland (see Figure 14a).

Fatalities were: 5, United States; 7 Puerto Rico; 56 Dominica; and 1200 in the Dominican Republic. The damage was $5 million (1990 dollar value) in the U.S. and Florida.

While Hurricane Frederic (1979) did not strike Florida directly, hurricane warnings extended over to Panama City on September 11th, and gale warnings were displayed south to Cedar Key (Balsillie, 1985).

Frederic had a development that was similar to David. This caused much apprehension because people were not ready for another storm so soon, one week, after David.

The final thirteen years (1981-1993) of the thirty-two year period, had several storms and hurricanes, marking an upswing in overall storm activity (Table 4). Some of the storms became hurricanes after they passed Florida, and will be mentioned briefly here.

On August 17 and 18, 1981, tropical storm Dennis struck Florida. Dennis started as a tropical storm southwest of the Cape Verde Islands on the 6th of August, and continued at this level near Barbados. Dennis became a tropical depression south of Puerto Rico and then turned into a mere disturbance. Just west of Jamaica, Dennis regained tropical storm status, turned north and slammed into the southwest Florida coast. The track was up through central Florida to become stationary between Ft. Myers and southwest Lake Okeechobee. Southeast Florida had 10 inches of rain, and Homestead had 20 inches. Winds were more than 55 miles per hour. Finally, Dennis moved across the lake and out to sea near Melbourne and Cape Canaveral, Florida.
On the 20th, east of Cape Hatteras, Dennis became a hurricane.

On August 25th, 1983, tropical storm Barry struck Florida. This storm crossed Florida on a track from Melbourne to Tampa on the 25th, first as a tropical storm and then as a tropical depression. After crossing the Gulf, Barry became a hurricane southeast of Brownsville; Texas, on the 28th of August.

Hurricane Diana, which gained hurricane status on September 10, 1984, scraped the Florida coast between Daytona and Jacksonville on the 9th-10th as a tropical storm; winds were in excess of 70 miles per hour.

Tropical storm Isidore occurred during the period between September 25 and October 1, 1984. On the 27th, it had winds of 50 miles per hour. Landfall occurred between Vero Beach and Melbourne on the evening of the 27th. From there it went to Orlando at about midnight, then travelled west, to about 75 miles north of Tampa. On the 28th it made another turn, headed northeast, crossing over to Jacksonville and then out to sea; the storm was accompanied by heavy rains.

Hurricane Bob was relatively short-lived and struck the southwest Florida coast near Ft. Myers on July 21-25, 1985 as a tropical storm. Winds were 50-70 miles per hour. Bob crossed Lake Okeechobee and went out to sea near Vero Beach on the 23rd of July, followed by a sharp turn to the north, skirting Daytona on the 24th. Bob became a hurricane at sea on the 24th, east of Georgia.

On October 9-13th, 1987, Hurricane Floyd appeared. It moved across the western tip of Cuba on the 11th on a northeast track. A more eastern turn was made across the Dry Tortugas and into the Keys on the 12th of October. It became a hurricane near Key West with winds of 80 miles per hour. The eye of the hurricane crossed over Key West at about noon. Warnings were given all across south Florida; some tornadoes occurred in the southwest coast of Florida. The eye of the storm appeared over Marathon later and over Key Largo at about 1800 on the 12th. Floyd's winds were 75 miles per hour and the barometric pressure was 29.32 inches. About 30 miles south of Miami, Floyd broke out into the Atlantic near midnight on the 12th. Winds and rains attributed to Floyd were felt as far as Palm Beach.

Hurricanes Elena, Juan, and Kate, which occurred in 1985, are briefly discussed below.
Hurricane Elena, a Category 3 hurricane in August/September 1985, deserves discussion although it never actually made landfall in Florida (Figure 15). Its center passed within 40 miles of the West Coast, where it stalled for about 24 hours offshore from Cedar Key, and then moved west northwest, passing within 30 miles of Cape San Blas. In its passage the storm tide that caused heavy waterfront damage in the City of Cedar Key and the disappearance of 1500 feet of the exposed south tip of Cape San Blas. Because of the offshore location of Elena’s peak winds, most of the damage to the coast was due to the storm tide (7-9 feet) and wave activity causing destruction which stretched from Venice to Pensacola. Nearly 2 million people were evacuated from low lying coastal sections in the warning areas posted for Hurricane Elena (Case, 1986).

While not directly striking the Florida coastline, Juan (Figure 16) in October/November 1985, nevertheless, impacted the extreme northwest Florida panhandle. Also, Pinellas, Manatee, Sarasota and Lee Counties were continuously pounded by the storms spiral bands through the evening of Halloween (see Figures 16a, b and c).

On November 21, 1985, Hurricane Kate (Figure 17), a category 2 storm, struck the coast near Port St. Joe in the Florida Panhandle. It was the only hurricane to strike Florida so late in the season this far north. Just prior to making landfall near Mexico Beach, about halfway between Panama City and Port St. Joe, Kate slowed her forward speed and weakened in the early morning because of cooler sea surface temperatures in the northern Gulf of Mexico. The total damage, was mainly due to the storm tide and wave activity. A sizeable $300 million in damages (adjusted to 1990 dollars) resulted, yet it caused only about one-fourth of the damage inflicted by Hurricane Elena. As with Elena, damage to the coast was mainly due to the storm tide and wave activity.

Hurricane Chris was a tropical storm during the period August 21-29th, 1988. Chris, with heavy rains, skirted the Florida east coast from Miami to Jacksonville, first as a tropical depression then as a tropical storm on the 27th and 28th.

Hurricane Keith was a tropical storm during November 17-24, 1988. The storm moved into Florida’s west coast between Ft. Myers and Tampa on the 22nd, a tropical storm with 65 miles per hour. The storm crossed the state intact and came out into the Atlantic near Melbourne and Cape Canaveral on the 23rd. Heavy rains and some


tornadoes were sighted throughout the state.

While 1990 produced 14 named storms, the most since naming began in 1953, only Marco, a tropical storm affected the northwest portion of Florida slightly and Klaus, as a final disturbance got into the central and north central part of Florida. 1991 couldn’t rally anything more than a brush with tropical storm Fabian on the extreme southeast tip of Florida.

Hurricane Bob, the most potential of the 1991 season headed toward the Miami-Palm Beach area but 200 to 300 miles off the Florida coast he executed an almost 90 degree turn to the north and missed all of Florida. So the Sunshine State escaped once again. Thus, in 1991 no hurricanes struck Florida.