CHAPTER 4

COASTAL MANAGEMENT ELEMENT

Introduction

Water defines a good deal of Levy County's boundaries; more than half of the county borders on the Gulf of Mexico, the Suwannee River and the Withlacoochee River. Whether attracting with the lure of food or pleasure, or threatening with its rise and fall, water continues to influence many citizens even outside the county. This zone of interaction with water is called the Coastal Zone and is defined by the area affected by a 100-year storm.

To clarify this region, its boundaries have been projected landward from topographic lines to the nearest section line [see Map 4-1]. As shall be seen historically rising sea levels will only push this zone inland with time, so projecting the boundary landward is a safe and more conservative assumption than using current topographic elevations to mark the 100-year flood zone.

This Element is created to enable Levy County citizens to assess the current condition and assets of the Coastal Zone as well as the consequences of future development or catastrophe. This document should serve as an aid to judging how well certain needs of citizens in the Coastal Zone are being met now and might be met in the future. Finally, this Element addresses the condition and future of natural and human resources in the Coastal Zone [CZ] in light of possible natural events and human activities.

The Introduction will serve to list the fundamental characteristics of the CZ such as physiography, geology, hydrology and soils. Section I on Natural Areas and Resources" will describe the aboriginal resources of the CZ such as wetland areas, wildlife habitat sources of fresh water and their condition as well as areas exposed to flooding. Section II, "Human Landscape" will describe the manner in which human uses have affected the appearance of the CZ as well as problems and opportunities arising therein. Section III on "Coastal Facilities and Infrastructure" will deal with all critical human fabrications which facilitate use of the CZ. Section IV, "Coastal Economy" will describe the degree and kind of human resources, outside sources of wealth and the improvements required to CZ infrastructure. In Section V, Managing Changes", the kinds of phenomena which can change or affect CZ resources and citizens and the methods available to deal with them shall be discussed.

Finally, in Section VI, "Objectives, Goals and Policies" which embody our understanding of CZ resources and facilities and which set up means for their long term enjoyment and use are laid out.

MAP 4-1

LEVY COUNTY COASTAL ZONE MAP

Physiography

The Levy County CZ is a terraced coastal plain at the foot of the higher ridges and valleys to the north and east. This lowland plain is the landward extension of a continental shelf which gently slopes for hundreds of miles into the Gulf of Mexico. CZ physiography is dominated by two marine terraces, the Silver Bluff and the Pamlico. These terraces reflect the ancient shorelines, littoral zones and sea bottoms of prehistoric seas which were, respectively, six [6] and twenty-five [25] feet higher than the present day Gulf of Mexico. The ancient shoreline of the Pamlico Terrace is roughly the landward boundary of the CZ.

The relatively flat surfaces of these terraces are covered with sand, freshwater marshes and coquina, deposited over the last 20,000 years. These deposits mask a fairly rugged terrain of sinkholes and depressions underneath. The area is crossed by a number of streams and creeks including Otter Creek, Cow Creek, Ten Mile Creek, Turtle Creek and the Wacassasa and Wekiva rivers.

Wave action along the current shoreline has cut a relatively steep sloped escarpment in to the limestone. Seaward of this, sand mud marshes, usually 2-3 miles in width, form a fringe on a coastal belt of land submerged under shallow water rarely more than four [4] feet deep. Land along the coast projects in many rocky fingers of bays, inlets and islands of fractured limestone. Sloping gently seaward, the bottom contains many irregularities of shell deposits, sand bars, oyster bars, limestone shelves and reefs. This sea bottom, also known as the "Modern Submarine Plain" continues on a gentle downward gradient for scores of miles until it ends abruptly as the Continental Shelf falls steeply off into the Gulf Basin.

The above-referenced islands are, with some exceptions, such as Cedar Key and Atsena Otie Key, very flat. They are also quite small and in remote locations; therefore, historic and potential development is limited by access problems, by the lack of potable water, by soils unsuited for septic tanks, by potential damage by flooding and wave action, and by surrounding ecosystems that are easily damaged or destroyed by development activities. These factors in combination dictate that only very low density can be allowed on private islands and still be consistent with the needs for natural resource protection and hurricane evacuation.

MAP 4-2

COASTAL ZONE PHYSIOGRAPHY - TERRACES
[Water-Resources Information For The Withlacoochee River Region, West-Central Florida]

Geology

The following is in large part derived from the work of Vernon (1), who did not recognize the Silver Bluff Terrace at the time. Hence, only the Pamlico Terrace is mentioned.

Moving seaward from the CZ inland border, one crosses two [2] bands of sediment which roughly parallel that border. First, is a narrow belt of sand up to three [3] miles wide which is covered with slash pine and palmetto. Second, a broad limestone shelf up to twelve [12] miles wide continues to the coast. Tertiary limestones such as Avon Park and Ocala outcrop between overlying sediments laid down in the Pleistocene. Numerous caverns and depressions characteristic of karst topography are well developed in the Ocala limestone.

Hydrology

Ground Water

Due to the general lack of overlying sediment layers, save for the thin layers of sands, marls and coquina which are sporadic and are not really confining, the sole aquifer of the region, the Floridan, is completely unconfined in the CZ. As a result, the Floridan aquifer is also the only source of groundwater, and the thickness of the potable water zone is two hundred fifty [250] feet or less for the majority of the CZ.

Surface Water

As previously mentioned, a number of creeks and rivers flow through the CZ since its low coastal elevation makes it a focal point for the collection of surface water flows in the region. This in turn is influenced by surface water - ground water connections. As Vernon (1) puts it:

> "Because the limestone shelf under the Pamlico Terrace is connected with the artesian water system, the water levels in the ponds and lakes of the coastal areas fluctuate greatly. During high seasonal rainfall the area is flooded, ponds, lakes and streams coalescing to form a shallow swamp. In periods of droughts, most of the surface is dry and paved with rock, but the discharge from the aquifer maintains swamps in shallow basins. This shelf is greatly fractured, which combined with the heavy discharge from ground water, gives rise to numerous clear water springs scattered throughout the hammocks. These are beautifully set in a tropical vegetation and are so located as to combine fresh water along the upper parts and brackish water along the lower parts of the channels, and both fresh and salt water species of fish inhabit some of the springs."

Soils

Most CZ soils are poorly drained, especially on the 2-3 mile wide coastal fringe and along the floodplains of the Suwannee, Wacassasa and Withlacoochee Rivers. Map 4-4 shows that aside from the Rosewood area, the remainder of the CZ is covered with moderately to poorly drained soils.

REFERENCES

(1) Vernon, Robert O. (1951) Geology of Citrus and Levy Counties, Florida. Stated Board of Conservation, Florida Geological Survey, Tallahassee, Florida.

(2) Knapp, Michael S. (1978) "Environmental Geology Series - Gainesville Sheet", Florida Department of Natural Resources, Division of Resource Management, Bureau of Geology, Tallahassee, Florida.

MAP 4-4

COASTAL ZONE SOILS

Natural Areas And Resources

The Levy County Coastal Zone is endowed with a variety of natural resources within a diverse number of settings. These range from the rocks and sediments laid down over the past sixty million years to the communities of plants and animals which have evolved together on these different terrains to the relatively pure waters which flow across the landscape and issue from the ground. Exposure in the CZ to ocean storms means that periodically various areas will feel the impact of flooding and storm surge.

These resources and the amenities attending the natural environments in which they are found continue to offer opportunities and enjoyment. However, as we recognize how fragile and irreplaceable many of them are, and as we see the price extracted by periodic flooding, our perception of these opportunities is tempered by the challenge to live comfortably while allowing these resources to renew themselves.

Minerals

The information from the following section was drawn primarily from a draft of a staff report for the Withlacoochee Regional Planning Council [W.R.P.C.] which in turn was based on a report from the Florida Geological Survey. Levy County is still relatively unexplored and unexploited, so the information is sparse. As such, the authors caution:

> The information presented is not intended to be an exhaustive investigation leading to immediate industrial development, because in many cases the data represents information on a single location, pit or mine. However, the data, where favorable, may indicate that certain areas might warrant further investigation.

Map 4-5 indicates the preliminary assumptions regarding mineral locations by the Florida Geological Survey.

Table 4-1 shows that, based on preliminary rough estimates of area containing various minerals by the Florida Geological Survey, the greatest mineral potential in the CZ is from limestone. Dolomite and sand make up the remaining potential in almost equal proportions.

TABLE 4-1

MINERAL POTENTIAL IN THE LEVY COUNTY COASTAL ZONE BY AREA COVERED

Mineral	Acreage Underlain In CZ	Percent Of CZ
Limestone	140,533 Acres	66.1
Dolomite	39,679 Acres	18.7
Sand	32,413 Acres	15.2
Total:	212,645 Acres	100.0

It must be kept in mind that these figures only indicate potential, not true mineral wealth. The latter will be known when the richness or purity of deposits and their depth are quantified and located.

Clay

While clay deposits do occur over irregular limestone surfaces on the Pamlico Terrace, preliminary test results of their firing products indicated poor structural strength. At present, no clay is commercially exploited in Levy County.

Limestone

As shown in Map 4-5, "Mineral Potential In The Levy County CZ", some two-thirds [2/3] of the CZ is underlain with limestone of good economic potential.

Presently there are five [5] known limestone mines in Levy County, four [4] in the vicinity of Gulf Hammock. The total production for the county in 1981 was 4,127,000 short tons, though some of this production may be attributable to dolomite. While reserves have yet to be rigorously determined, it is felt that the CZ has an abundant supply of high grade limestone which is easily exploitable since it lies under a thin overburden (1).

Dolomite

Dolomite, theoretically a 50/50 mixture of magnesium and calcium carbonates, occurs as thirty-six percent [36%] magnesium carbonate in Levy County (1). As shown in Table 4-1, some eighteen percent [18%] of the CZ is underlain with dolomite.

This dolomite is mined from Avon Park limestone and is tan to brown, unconsolidated to well indurated [hardened] rock. No exact figures are available for dolomite production or true resources in Levy County.

Sand

Relatively thick sand deposits are found along the ancient coastlines of the Pamlico Terrace which is roughly the inland boundary of the CZ. Map 4-5 shows one large deposit in the Rosewood area projecting like a prehistoric peninsula from the Pamlico coastline and one deposit along the Suwannee River. These deposits take up some fifteen percent [15%] of the CZ area. St. Lucie, Kureb, Candler, Apopka and Jonesville soils are rated as good sources of sand for use as construction materials (1).

Wetlands

A majority of the ecological land types in the land area in the Levy County Coastal Zone [CZ] are some kind of wetland as defined by the United States Fish and Wildlife Service [U.S.F.W.S.]. Table 4-2 is based on area calculations from these maps.

Calculations for Table 4-2 show roughly 137,000 acres of wetlands in the CZ which is approximately sixty-six percent [66%] of the land area. Of the wetland area, almost thirty percent [30%] is Cypress Stand, twenty-three percent [23%] is Salt Marsh, thirteen percent [13%] is Bay Forest and twelve percent [12%] is Successional Swamp.

Overall, the CZ has a large coastal belt of salt marshes and numerous rivers and creeks which are lined with Cypress Stands and, further upland, Bay Forests and Successional Swamps. In addition, the CZ has broad expanses of low, wet areas with Cypress heads, Bay Forests and Successional Swamps interspersed and dotting the landscape. Thirteen other wetland types make up the remaining twenty-four percent [24%] of the total. [See Tables 4-3 and 4-4.]

The interspersion of wetlands and uplands in the CZ is very close knit and dense, such that the landscape often appears as if it has been hit with scatter shot. As a result, there are portions of the CZ which technically are upland, but are so closely surrounded by wetlands that one must consider their use to be affected by the proximity of so much wet terrain. Map 4-6 shows salt water wetlands, fresh water wetlands and the aforesaid freshwater wetland/upland mix. Table 4-5 shows that when this latter mix is taken into account, the total land area which is either wet or influenced by wet terrain is 127,727 acres of fifty-six percent [56%] of the CZ.

MAP 4-5

COASTAL ZONE AREAS WITH MINERAL POTENTIALS

TABLE 4-2

COASTAL ZONE HABITAT MAPS: WETLANDS AREA ACREAGE

Type Of Wetland	Total Acreage	Percentage
Marsh Mangrove	929.6	0.68%
Salt Marsh	31,102.4	22.7%
Scrub Mangrove	481.6	0.35%
Red Cedar	1,576.4	1.15%
Sand Flats	1,500.8	1.10%
Mangrove	44.8	0.03%
Emergent Marsh	5,860.4	4.28%
Transitional Marsh	6,053.6	4.42%
Cypress	40,910.8	29.85%
Boggy Flatwoods	12,258.4	8.95%
Successional	16,226.0	11.84%
Deep Pond	145.6	0.11%
Man-made Pond	453.6	0.33%
Bay	17,393.6	12.69%
Open River	2,058.0	1.50%
Aquatic Bed	8.4	0.01%
River Emergent Bank	28.0	0.01%
TOTAL WETLAND ACREAGE	137,032.0	

TABLE 4-3

MAJOR WETLAND TYPES IN THE LEVY COUNTY COASTAL ZONE

Community Type	General location	General Appearance	Soils	Hydrology	Principal Species
Cypress Stand	Along rivers, lake margins, sloughs, stands or interpersed in flatwoods and sloughs.	Bald Cypress completely dominates the margins; Pond Cypress dominates the heads.	Nearly level or depressional; poorly drained loamy subsoils & sandy surfaces.	Water at or above ground for a good portion of the year.	Bald Cypress Pond Cypress
Salt Marsh	On the coastal fringes, often inland from mangrove communities.	An opn expanse of greasses, sedges and rushes with a matrix of interconnected tidal channels and creeks.	Level, very poorly drained muck or sandy clay loams.	Daily tidal flux causes salturation with salt water & flooding to a depth of several inches.	Cordgrasses Needlebrush Seashore dropseed Seashore paspalum Shoregrass
Bay Forest	Perched on hillsides, in depressions in flatwoods, in ravines, strips along creek swamps.	Forested wetland dominated by 1 or 2 species of evergreen with a number of shrubs.	Nearly level to gently sloping, poorly to very poorly drained acid, sandy or loamy.	Perennially damp or wet, maintained by seepage from higher ground.	Bays (swamp, loblolly, sweet) Black gum Dahoon holly Fetterbush Pines (pond, slash)
Successional Swamp	On floodplains often upland of cypress stands.	Stands of hardwoods with few cypress and a dense lower story of shrubs and emergents.	Nearly level, very poorly drained, dark colored, coarse to medium textured.	Sometimes flooded, subject to constant seepage and/or a high table.	Black gum Red maple Water tupelo Bald cypress Button bush Dahoon holly

TABLE 4-4

VALUES OF WETLAND SYSTEMS IN THE LEVY COUNTY COASTAL ZONE

Wetland Type	Environmental Value
Cypress Swamp	Cypress swamps are an extremely valuable resource. They can be used for environmental educational study, scientific research and recreation. They have a high value for use as wildlife habitats. This community has a relatively low diversity of plant species due to the fluctuating water levels and low nutrient availability. Both drastic changes in the water level and a stabilized water level may change the plant community. Often this will occur due to the effects of dams, dikes or drainage channels. The cypress swamp is not a prime area for residential development. When ditched and drained, these areas may be used for pine production although they are not as productive as the surrounding pine lands. Fire is a stress factor, primarily on the drier portions, but water is important in all areas. Water enters the swamp directly from rainfall or runoff. The water level is highest in summer and peak productivity occurs in early spring. Stagnant water will result in slow tree growth especially if it occurs during the growing season. Natural regeneration of cypress requires fluctuation of the water. Flooding during the dry season will prevent the cypress trees from reproducing. Water must be available to germinate the seeds because it provides natural stratification. However, when the seedling starts to grow, its top must be maintained above water. Cypress swamps provide water storage areas by holding excess water and slowly releasing it into the water table. Water quality is enhanced by the community, which functions like a waste treatment plant by absorbing nutrients from the water.
Salt Marsh	The functions of salt marshes are probably the most important and least understood and recognized of all ecological communities. On low energy coastlines and estuaries, the marsh functions as a transition zone from terrestrial to oceanic life. Salt marshes also perform an important function in the stabilization and protection of shorelines, especially during storm tides. Nutrients, sediments and detritus from upland systems are redistributed by tidal action, making the marsh one of the most productive natural ecological systems. The area serves as a habitat for the early life stages of numerous ocean species as they feed on countless invertebrate organisms. Many wildlife forms overlap normal ranges at least seasonally to become harvesters and, in many cases, part of the natural food chain.

Bay Forest	These are important as fire buffers. Seepage water keeps them almost constantly wet and they protect adjoining swamps from fire during dry periods. They act as small reservoirs by receiving seepage water and metering it out in a small but steady supply. Drainage of the bog or immediately up slope will strongly modify or destroy these environments. Shrub bogs are aesthetically pleasing. This community's primary value to game animals is the escape cover furnishes to deer, turkey and quail by the thick growth. This cover is also important to the black bear and the Florida panther. Shrub bogs provide good habitat for a variety of frogs, salamanders and drayfish; and predatory snakes and raccoons. Wading birds, particularly in south Florida, find this community valuable as safe roosting or nesting habitats.
Successional Swamp	Periodic flooding is essential to maintain this ecosystem and is the dominant factor for providing needed nutrients. If the system is drained or flooded for an extended length of time, a new community will result. Swamp hardwood areas are of great value for maintaining good water quality and quantity and for wildlife and wilderness values. Water plays an important part in this community. If the water table is lowered or periodic water is not available, the system will change. The community is highly endangered due to its sensitivity to changes in the water cycle. Practices such as improper channelization, drainage and storage areas for floodwater. They slow the flow of water, improve water quality and gradually feed water to the rivers. These areas also assimilate inorganic and organic waste and reduce pollution levels. Oxygen diffusion is great in the swamp forest because of the large air-to-water surface area. The slow movement of the rivers and obstructions also help with the diffusion. Downstream systems, including estuaries, receive energy through detritus from this system. The swamp forest is not a prime area for intensive agricultural or residential development. Costly water management facilities are needed for any use that modifies the existing natural vegetation. Development would destroy the important wildlife and environmental values of this community. Wildlife often use swamp forest for food and cover and for travel lanes between developed areas. This community hosts a large variety of wildlife. It is especially well suited fir waterfowl, reptiles, amphibians and mammals. Animals found in this community must withstand the flooding which occurs periodically. Gray squirrel, mink, raccoon and river otter are the most commonly found mammals. Many birds inhabit this area including chickadees and titmice, yellow-billed cuckoo, wood duck, limpkin, Acedian flycatcher, owls, woodcock, hooded warbler, cedar waxwing, woodpecker and wren. The various species of hardwood vegetation provides good food and cover for these wildlife species.

TABLE 4-5

FRESH AND SALTWATER WETLANDS IN THE LEVY COUNTY COASTAL ZONE

Community Type	Acreage	Percentage Of CZ
Saltwater Wetlands	54,243	23.7
Freshwater Wetlands	46,572	20.4
Freshwater/Upland Mix	127,726	55.9
Total:	228,726	

Coastal Flooding

Theoretically, in the worst storm possible in one hundred [100] years, all of the CZ in Levy County would experience flooding to some extent. The degree of danger would probably diminish as one goes inland. For most storms, a danger zone has been established by the National Flood Insurance Program of the Federal Emergency Management Agency [F.E.M.A.]. The danger which one might encounter in this zone would be from high wind velocity and wave action, and so this is designated the Velocity Zone or "V-Zone". Map 4-7 illustrates the V-Zone in the CZ. The V-Zone covers some one hundred one [101] square miles [64,962 acres] or about thirty one percent [31%] of the CZ.

Wildlife

Species In Danger. Wildlife may be considered a resource as managers of the landscape. Vegetation stabilizes the soil and provides shade, cover, food and living opportunities for animals. Animals in turn forage on the vegetation, keeping its populations healthy and productive, and do the same for each other. As such, all of the wildlife in the Levy County CZ can be understood as a system which captures the energy from the sun and holds it in a large amount of biomass. This system manages itself and makes the environment more stable in the event of catastrophe. This system reproduces itself and requires no help from humans, so it can be considered maintenance free. Finally, wildlife is an asset in that its beauty and elusiveness are attractive to all manner of people whose desire to wander in the wilderness attests to their fascination with wildlife and the environment.

Map 4-8 shows the areas where many of the wildlife species are likely to be found in the CZ. Table 4-6 lists all species of plants or animals whose vulnerability or rarity deserve attention.

MAP 4-6

COASTAL ZONE WETLANDS

MAP 4-6

COASTAL ZONE WETLANDS [Continued]

MAP 4-7

COASTAL ZONE FLOODING "V-ZONE"

MAP 4-8

GENERAL LOCATIONS OF CRITICAL SPECIES

One species, the Gopher Tortoise, while only listed as threatened, should be given special protection. Its burrow provides a habitat for some twenty other species. The dependence of those twenty species on the Gopher Tortoise makes it a "keystone species", an integral supporting member in the community.

Another species which will deserve special attention is the Florida Black Bear, whose numbers should rebound when the effects of protecting the Suwannee River Refuge are felt. As a top predator, as shall be discussed, the Black Bear is a vital species.

Finally, the Manatee deserves special attention because of its maintenance of sea grass beds and its dependence on the Suwannee River as one of its principal summer homes.

Local manatee protection plans are normally included as a part of the coastal zone element of a comprehensive plan. The Board of Levy County Commissioners has no jurisdiction over land uses along the Withlacoochee River, but it does have jurisdiction over private lands along Lake Rousseau, at Cedar Key, and along a short stretch of the Suwannee River at Fowler's Bluff.

During 1989, two or three manatees were reported i Rainbow Springs and the Withlacoochee River upstream from Lake Rousseau, thus, some limited activity can be expected in Lake Rousseau. Manatee sightings in the Suwannee River and the Suwannee Sound are frequent. Lake Rousseau, the Cedar Key area and the Suwannee River are primarily summertime feeding areas and habitat, with the Manatees migrating to the Citrus County area [Kings Bay, Crystal River, Florida Power Corporation discharge channel and Homosassa Springs] in the winter months.

There have been no manatee accidents or deaths in the Suwannee or Withlacoochee Rivers for the past several years. This is probably due to the dispersed manatee population and the low levels of boating activity on each river. Posted speed limits are in effect in both areas, and they are routinely ignored and rarely enforced.

Given the limited coastal areas under county control, and the limited level of conflicts in 1989, no mitigation actions appear necessary.

Wildlife Habitat. Seeing wildlife as managers makes it easier to understand the importance of the top predators such as Florida black bear, bobcat, lynx and the Florida panther.

These carnivores are an extremely important part of the control of the health of many populations of creatures on which these predators feed. Without control by predators, many populations can fluctuate greatly in size, sometimes resulting in mass starvation or a large proportion of unhealthy individuals. Since humans cannot or do not always replace these top predators by hunting the same population, sometimes the wildlife community changes if top predators are lost, often for the worse. The diversity of wildlife declines and, therefore, so does the resilience of the community. Fewer populations of wildlife means fewer choices and opportunities for those who remain, and this can become critical in times of disaster.

To protect these top predators it is necessary to preserve areas both of sufficient size and connections to allow them to roam and find enough prey. This will ensure both the predator's survival and the prey's health. It now appears that it is not possible to preserve areas of sufficient size alone to ensure adequate hunting by predators, so the connections between areas becomes vital.

An ideal habitat to protect in order to maintain connections between wilderness areas is the banks and floodplains of rivers and streams. First, these are some of the most diverse wildlife habitats in the CZ. Second, predators already use them as a "highway". Third, no special additional action is needed, these river floodplains are already i place connecting the coast with inland wetlands and other wild areas. To protect the boundaries of rivers and streams would also preserve water quality, potential archaeological sites and fishing and canoeing areas.

Therefore, the importance of top predator habitats mandates that floodplains and the banks of moving water bodies be seen as "stream-side buffer zones" worthy of preservation as natural habitats.

Another habitat of predators which deserves preservation are coastal Loblolly pine stands ["in the salt spray"] which are perfect for eagles and osprey.

Natural Water Systems

The Levy County CZ has two major types of water systems: saltwater and freshwater. The saltwater system is the group of estuaries and bays which lie between the CZ coastline and the Gulf of Mexico. These are: Suwannee Sound, Wacassasa Bay and Withlacoochee Bay. The indentations formed by the coastal creeks projecting through marshes and mangroves make the coastal interface with saltwater several hundred miles.

The freshwater system is composed of the major rivers which traverse the CZ: the Suwannee, Wacassasa and Withlacoochee in addition to the many creeks and streams which feed them. There are no appreciable freshwater lakes or ponds in the CZ.

Freshwater Systems

Table 4-7 lists the major rivers and their principal characteristics.

TABLE 4-7

MAJOR RIVER SYSTEMS IN THE LEVY COUNTY COASTAL ZONE

River Name	Basin Size (1) [In Sq. Miles]	Flow Rate (2) [Cubic Ft. Per Sec.]			Quality Assessment (3)
		Av. Max.	Mean Av.	Min.	
Suwannee	1,600 (4)	23,243	10,760	5,311	Good
Wacassasa	924	2,637	317	-404	Good
Withlacoochee	2,059 (5)	8,660	1,095	112	Good

Footnotes:

(1) Source: Glen Horvath - Suwannee River Water Management District.
(2) Source: F.S.U. [1984] - Water Resources Atlas of Florida - Institute of Science and Public Affairs, Tallahassee, Florida.
(3) Source: Hant, et al. [1986] "1986 Florida Water Quality Assessment 305(b) Technical Report" - Florida D.E.R., Tallahassee, Florida.
(4) Suwannee River below the northern Withlacoochee River excluding the Santa Fe river basin.
(5) Wacassasa River and the coastal area between the Suwannee and Withlacoochee Rivers.

The "Quality Assessment" rating in Table 4-7 is explained in Table 4-8 as the summation of seven [7] pollution characteristics [see columns 4-10] which are used to calculate the Water Quality Index [WQI]. All surface water bodies in the CZ meet DER standards in all seven [7] characteristics as shown in the legend, and thereby receive a "good" quality rating.

Table 4-9 lists water quality parameters from groundwater taken from wells near Otter Creek, Gulf Hammock and Yankeetown.

It is further reported (4) that dissolved solids are less than two hundred fifty [250] milligrams per liter in the whole coastal zone. Based on these findings, CZ groundwater can be characterized as generally acceptable, though Gulf Hammock and Otter Creek exceed the D.E.R. limit on sulfates and are reported to have chronic problems with high iron.

TABLE 4-8

SURFACE WATER QUALITY IN THE LEVY COUNTY COASTAL ZONE

River System	WQI	WQI#	PH	BACT	NUT	TURB	OTOX	ITOX	DO	BD	ED
Suwannee	Good	26	7	10	30	4	30	13	12	70	85
Waccassasa near Otter Creek	Good	13	5	0	6	3	0	13	15	70	77
Waccassasa 2 miles from Gulf	Good	23	6	0	8	2	0	0	30	70	82
Ten Mile Creek	Good	13	4	0	12	9	0	16	17	70	77
Withlacoochee 3 miles from Gulf	Good	10	6	9	10	2	0	2	13	70	84

LEGEND:

Symbol	Meaning	Units	STANDARDS (1) Good	Fair	Poor	Fr.	Salt
WQI	Water quality index result: good, fair or poor						
WQI#	Water quality index number		0-29	30-59	60-100		
PH	Ph pH upper limits	7-5.2	5.2-4.5	4.5-3.7	6	6.5	
BACT	Bacteria pH lower limits	7-8.8	8.8-9.5	9.5-10.2	8.5	8.5	
NUT	Nutrients (primarily inorganic nitrogen and phosphorus)						
TURB	Turbidity		0-44	44-100	100-250	--	--
OTOX	Organic toxics						
ITOX	Inorganic toxics						
DO	Dissolved oxygen	mg/l	11-4.4	4.4-3	3-2	5	4
BD	Beginning date, first sample year from 1970 on						
ED	Ending date, last sample year up to 1985						

Footnote:
(1) Source: Hand, et al. (1986) "1986 Water Quality Assessment 305(b) Technical Report", Florida DER, Tallahassee, Florida. P.5.

TABLE 4-9

GROUNDWATER MEASUREMENTS IN THE LEVY COUNTY COASTAL ZONE

Well Area	PH	Conductivity	Alkalinity	Cl Units in mg/1	SO4 Units in mg/1	PO4 Units in mg/1	NH3 Units in mg/1	FE Units in mg/1
Otter Creek	7.05	1690	187	64	572	0.030	0.11	0.00
Yankeetown	7.30	1000	222	31.90	208.50	0.010	0.07	0.27
Gulf Hammock	7.50	900	214	30.20	364	0.017	0.00	0.00

Source: Suwannee River Water Management District (1984)
Flowing Artesian Well Inventory/Plugging Program

Salt/Freshwater Interface. As of this date, no rigorous program of test well drilling has been carried out to determine the saltwater interface in the CZ (5). Keeping in mind that such an interface is highly variable in contour, a broad rule of thumb may be applied Within one hundred [100] feet of shore, the depth of freshwater may be as little as one [1] to two [2] feet. Five [5] to six [6] miles inland the depth of freshwater down to saltwater may be two hundred [200] to three hundred [300] feet (5). This gives a slope of thirty-five [35] to fifty [50] feet per mile.

Saltwater Systems. Aside from the immediate vicinity of Cedar Key, the water quality of the estuaries and bays off the CZ is good to very good. When comparing the measurements as listed in Table 4-10 with the standards tabulated in the legend of Table 4-8, the readings are on the upper end of the "good" scale. This is borne out by the approval of the Florida Department of Natural Resources [D.N.R.] of shell fishing in all areas of the coast of the CZ except around Cedar Key (6) and from the north end of Deer Island up to Dixie County. Dissolved metals such as selenium, arsenic and lead can be a problem in some parts of Florida, but are not found in CZ estuaries. Neither are pesticides found in any appreciable quantities (7).

TABLE 4-10

SALTWATER QUALITY IN THE LEVY COUNTY COASTAL ZONE

Water System	Data Type	Dissolved Oxygen [DO]	Turbidity	Coliform
Cedar Key	Range	6.9 - 10.2	6-28	2-46
	Average	9.1	12.4	13.3
Wacassasa Bay	Range	4 - 10.6	0.92-30	2-240
	Average	4.9	7.3	9.6
Withlacoochee Bay	Range	4.2 - 21.5	0.72-46	2-920
	Average	3.9	6.6	16.2
Suwannee Sound	Range	4.8 - 14	1-80	2-920
	Average	7.8	3.4	72.7

Source: Florida Department of Natural Resources, Division of Marine Resources, Shellfish Environmental Assessment Section, provided the raw data for these calculations.

Marine Habitats. Two [2] kinds of marine habitats are of concern: 1) seagrass beds which support numerous marine species including the manatee, and 2) oyster beds, on which fishing is based.

Seagrass beds are mapped in Map 4-9 and tabulated in Table 4-11 for an area extending an average of fifteen [15] miles off of the coast.

TABLE 4-11

COASTAL MARINE BOTTOM HABITATS OFF LEVY COUNTY

Bottom Type	Grass Density/Description		Area	Percent Of Area
	Near Shore (1)	Offshore	[Acres]	
Dense Seagrass	309 Blades Per Sq. Meter	2,657 Blades Per Sq. Meter	54,848	21.9
Sparse Seagrass	41 Blades Per Sq. Meter	347 Blades Per Sq. Meter	56,385	22.6
Patchy Seagrass Bed		88,734		35.6
Non-Vegetated Sand	-----	------	36,325	14.5
Non-Vegetated Mud	------	-----	13,644	5.5

Source: Minerals Management Service, Department of Interior [1985] "Florida Big Bend Seagrass Habitat Study"; prepared by Continental Shelf Associates, Inc., 759 Parkway Street Jupiter, Florida and Martel Laboratories, Inc., 7100 30th Avenue North, St. Petersburg, Florida.

(1) Nearshore beds dominated by Thellasia and Syringodium.

There are two major seagrass species associations off Levy County. A near-shore, shallow water association dominated by Thelassia testudinum and Syringodium filiforme occurs in water less than thirty [30] feet deep. Farther seaward are broad areas covered by algae and several species of fringing seagrass [Halophila]. In between are large expanses where as many as five [5] species of seagrasses may overlap in patchy beds. The greater blade size of the near-shore species results in greater bottom coverage even though blade numbers are lower than for off-shore habitats.

Oyster beds are usually the most productive in estuaries where rivers provide abundant nutrients and enough fresh water to continuously vary the salinity. When salinities vary, marine predators are less likely to stay around oyster beds and lower the oyster population [Jay Sprinkel, Oyster Bed Specialist, Mote Marine Laboratory]. Such areas correspond to the main shellfish harvesting areas off Levy County: Cedar Key, Suwannee, Wacassasa and Withlacoochee.

As shown in Map 4-10, all areas but the Suwannee have been studied and have shown fecal coliform counts low enough to merit approval by the Florida D.N.R. [Robert Thompson & ISSP Standards]. The Suwannee Sound area is currently under study, and preliminary indications are that shellfishing for immediate sale will be banned in the Suwannee River mouth and littoral zone. A final opinion on the area from Deer Island north to the Suwannee River will be rendered by January, 1987.

Overall, it is a general, untested opinion that marine habitats in the Wacassasa Bay are less productive than elsewhere due to high turbidity. Since this turbidity has been observed even on windless days [Kelly Dixon, Mote Marine Laboratory], it is suspect that organic chemicals dissolved in river water cause the turbidity by reaction [flocculation] with ocean water.

REFERENCES

(1) Withlacoochee Regional Planning Council [1986] - Comprehensive Regional Policy Plan - Draft. W.R.P.C., Ocala, Florida.
(2) Soil Conservation Service [1981] Twenty-six Ecological Communities; U.S. Department of Agriculture, Soil Conservation Service - Forth Worth, Texas.
(3) Dr. Larry Harris, Professor of Zoology, University of Florida [personal communication].
(4) Miller, et. al. [1981] Water Resources Information for the Withlacoochee River Region, West-central Florida"; U.S. Geological Survey - Water-Resources Investigations 81-11, Tallahassee, Florida.
(5) Teresa O'Carrol, Suwannee River Water Management District [personal communication].
(6) Porter, et. al. [1984] "Comprehensive Shellfish Growing Area Survey - Cedar Key, Florida" - Florida Department of Natural Resources, Shellfish Environmental Assessment Section, Tallahassee, Florida.
(7) Varn Brooks, Florida Department of Natural Resources, Shellfish Environmental Assessment Section, Appalachacola, Florida [personal communication].

MAP 4-9

COASTAL MARINE BOTTOM HABITATS OFF LEVY COUNTY

MAP 4-10

SHELLFISH HARVESTING AREA MAP

The Human Landscape

Having built up layer by layer from the rock to the soil, and sediments to the water which erodes, and the plants and animals which stabilize, we reach the next higher force, humans. The human landscape is the product of the on-going process of modification of the environment for people's livelihood and profit. People are very much a part of the environment, the most dynamic and powerful part.

This section shall describe the kind and quantity of different land uses, the conflicts between uses, the areas of historical and archaeological significance, areas of recreational use and uses in high hazard areas.

This section shall describe the kind and quantity of different land uses, the conflicts between uses, the areas of historical and archaeological significance, areas of recreational use and uses in high hazard areas.

Human Population

The CZ is relatively sparsely settled with the exception of Cedar Key. The CZ takes up some 32.3% [227 out of 704 thousand acres], yet as Table 4-12 shows, current population projections suggest that the CZ has only 13.7% of the county population of 22,460. In a county whose population density is fifty-fifth [55th] out of sixty-seven [67] counties in the state at twenty [20] persons per square mile, the CZ stands out as a low density area [8.7 persons per square mile].

It should come as no surprise, then that urban areas and roads amount to only one percent [1.0%] of the CZ [Table 4-13]. If the two densest nodes of population, Cedar Key and Yankeetown, are taken into account, the density drops to five [5] persons per square mile. As shall be seen, the major effect of human development on the CZ landscape has not been habitation, but forestry.

TABLE 4-12

COASTAL ZONE POPULATION PROJECTIONS

Enumeration District	Number Persons	Allocation To C.Z. [%]	Population In C.Z. [1980]	Population 1980 Countywide
County				19,870
340 A	664	10%	66	
341 T	1,208	20%	242	
341 U	926	20%	185	
350	279	100%	279	
348	383	50%	191	
349	72	50%	36	
351	838	50%	419	
Total	4,370	300%	1,480	
Towns				
Cedar Key	700	100%	700	
Yankeetown	600	100%	600	
Total	1,300	200%	1,300	
1980 Total Population in Coastal Zone: [14% of countywide population]		2,718		
1986 Population Projection (1):		3,080		
1990 Population Projection (1):		3,500		
1995 Population Projection (1):		3,808		
2000 Population Projection (1):		4,060		
2005 Population Projection (1):		4,298		
2010 Population Projection (1):		4,508		
2020 Population Projection (1):		4,998		

Footnote:

(1) Based on county-wide medium population growth projections from the Bureau of Economic and Business Research, University of Florida. The projections assume that the coastal zone population will continue to comprise fourteen percent [14%] of the county-wide population.

TABLE 4-13

LAND USE ACREAGES IN THE LEVY COASTAL ZONE, 1989

Land Use Type	Acres	% of Total
Residential	1,800	1%
Commercial	40	0%
Industrial	0	0%
Agriculture Row Crops & Pasture Forestry Range	30,129,122,131,862	 13% 54% 0%
Recreational	150	0%
Conservation (from Table 4-14)	58,875	26%
Educational	0	0%
Public Buildings & Grounds	477	0%
Other Public Facilities (roads etc.)	3,424	1%
Historic Districts/Properties	0	0%
Vacant but Platted or Transitional	761	0%
Non-Public Wetlands, Scrub	9,308	4%
TOTAL	227,957	100%

Land Use Inventory. A great deal of the Levy County CZ remains relatively unchanged by human influence. As shown in Table 4-13, salt marches, wet forest, wetlands and scrub and brush make up 36.5% of the CZ. Human modifications of the landscape in the form of forest, crops, range, grass, roads, urban and transition make up 64.5%. Some of the human portion should be ascribed to the unchanged portion since certain amounts of "forest" cannot be harvested or planted due to wetness, as determined by cross checking the Land Use Map with the Wetlands Habitat Map.

In broad terms, the CZ has a 2 to 3 mile wide bank of marches and mangroves along the coast. Inland from the marshes, from Yankeetown north to Wacassasa and around the bend west to Cedar Key, the CZ is a mixture of forest, wet forest and scrub with a few spots of cropland. Therefore, in this section, the uses are primarily agricultural (forestry and crops), recreational (hunting and fishing) and as wildlife habitat. From Cedar Key north to Fanning Springs, this inland land has considerably more cropland and grassland, and significant amounts of forest wetlands and wildlife habitat, forestry with some amount of row agriculture and pasture.

Official Preservation Areas. As shown in Table 4-14, almost 27% of all land in the CZ has been set aside for protection under the jurisdiction of the US federal government, the Florida State government or the water management district. In general, these arrangements have been designed to discourage trespass and destruction of native Florida species, geology and cultural artifacts. However, these areas are not exclusive; people are encouraged to visit and enjoy these environments, though sometimes under guarded circumstances.

The manner and means of accomplishing these goals are discussed in the sub-section on land management plans under the section "Managing Change".

TABLE 4-14

PUBLICLY OWNED LAND IN THE LEVY COUNTY COASTAL ZONE

Preservation Area Title	Acreage
Wacassasa Bay State Preserve	30,784
Lower Suwannee National Wildlife Refuge	18,746
Cedar Key Scrub State Preserve	4,988
Manatee Springs State Park	2,074
Cedar Key National Wildlife Refuge	721
Suwannee River Water Management District (a) Andrews Tract (b) St. Petersburg Tract (c) Meade/Scott Tract	576444524
Cedar Key State Museum	18
TOTAL	58,875

Beaches. Florida's west coast is labeled a "low energy" coast because marine wave and current power is so diminished by crossing the broad, shallow continental shelf. As a result, the wave impact with the coast is not sufficient to move sand laterally and build the beach-dune escarpment so famous on the east coast of Florida.

Natural beaches are almost unknown in Levy County, though there are some sandy deposits on the coastal fringes near the mouth of the Suwannee River. Public recreational beaches are the result of dredging out muck and importing clean sand. Map 4-17 shows the Cedar Key beach, formerly a mud bank under a railroad bridge (1). A beach of similar size is at the county park at the seaward end of CR 40 west of Yankeetown.

Once imported, neither of these beaches has lost an appreciable amount of sand even during hurricanes(1). However, erosion from normal current and wave action did eventually remove the "sand split" shown in Map 4-17, a hundred yard long sand peninsula which used to project out from the corner of 1st and G Streets until the early 1950's (1). So erosional loss of beaches remains a possibility.

Historical and Archaeological Impacts. Shown on Map 4-11, Levy County so far has not revealed much from history or archaeology, but exploration has been minimal (less than 5% of the CZ has been surveyed) and new potential areas are being discovered all the time. One new area of interest are bogs which have yielded numerous artifacts such as canoes in other parts of Florida.

The areas with the greatest archaeological potential in the CZ are wet sites along the banks of the major rivers (2). The danger is that these sites are nearly invisible even to archaeologists, and do not reveal their potential without laboratory "flotation" analysis.

Conflicts among Shoreline Uses. Conflict can arise out of incompatible neighboring uses, uses which do not seem compatible to area visitors as well as neighbors, and from uses which seem detrimental to the local economy or the environment.

Examples of incompatible neighboring uses are: 1) docks which hinder traffic in the boat channel, 2) residential areas close enough to the back water channels used by fishermen at night to feel adversely affected by the noise of air boats, and 3) residential areas in close proximity to processing plants on the shore.
An example of a use which appears incompatible to many area residents and to visitors would be the construction of large buildings right on the water. This would block the view of the ocean scenery for anyone but the owner. South Florida abounds with beachfronts so choked with construction that the open attraction of the beach is replaced with a feeling of congestion. Long term compatibility and living quality would be enhanced by encouraging public ownership of beachfront areas. This objective dovetails with the growing concern about the high costs perennially paid by beachfront owners following hurricanes.

A costal use which has been perceived by some county residents as detrimental to the local economy has been the public takeover which has removed large quantities of land from the county tax base. Considering only federal, state and special water district run lands, the net loss to the county tax revenue annually is $151,937 (5). Whether such lands are too wet, usable for private profit, or whether the protection of environmental resources over the long term will outweigh these tax revenue losses remains to be seen.

Environmental degradation by a shoreline use can also cause friction. The loss of species associated with a locale can enhance feeling of vulnerability in the face of change which does not appear controllable. One example of this was the apparent loss of diamond back turtles from a marsh area north of Cedar Key when state highway construction straightened the highway there, crossing the turtles' habitat (6).

The existing Land Use Map in Chapter 8 provides an indication as to why there are virtually no conflicts among shoreline uses in unincorporated Levy County... almost the entire coastline is undeveloped and in public ownership. These portions of the Cedar Key area which are not incorporated are the sole exception, as it is becoming urbanized (no unplatted lands remain) and it contains a county airport. The airport is described within the Traffic Circulation Element and it is addresses here because it represents a conflict with:

a. Flood elevation requirements which, if implemented can interfere with approach zones.
b. Surrounding ecosystems which, in the event of a runway extension, would be adversely affected.
c. Chapter 163 FS and Chapter 9J-5 FAC, which mandate limiting development in costal high-hazard areas and limit public expenditures that subsidize development in coastal high-hazard areas.

Other than the airport, there are no other known conflicts between land uses in the unincorporated portion of the Levy County Coastal Zone.

Existing and Proposed Land Use in High-Hazard Areas. High hazard areas, as indicated by the V-Zone, are predominantly uninhabited or sparsely inhabited wetlands and forest. The exceptions are Cedar Key and the extreme western portions of Yankeetown, some of whose urban areas fall in the V-Zone.

Proposed future land use for Cedar Key is high density residential along SR 24 and medium density residential for the most part near the airport and south of Hodges Avenue.

Yankeetown's future land use outlook is ti retain forestry and agriculture around major portions of the town boundary, but ti allow some residential development along the eastern boundary in the vicinity of SR 40-A, which is not in the V-Zone.

Comparing growth trends with the future land use plan leads one to the conclusion that future land use development will have relatively minor or no negative impacts. As indicated in Map 8-1, the most part in locations designated as "Prime Agricultural Land also suitable for development". Since row crop agriculture plays such a minor role in the CZ economy, and since this area can stand the use of septic tanks, such future land use would have acceptable impacts environmentally and positive impacts economically.

Cedar Key is also an area showing a higher growth rate than the rest of the CZ. These impacts will be greatly reduced when Cedar Key's sewage treatment capacity is upgraded. Otherwise, the impacts of tourism have so far proven negligible to the environment.

The remainder of the CZ will probably continue to grow at a very slow rate, so that such impacts should not become manifest for decades. Therefore, in the short term [5 years] planning horizon, monitoring the impacts in the Rosewood and Cedar Key areas is the main concern though no threats are perceived. In the long term [fifteen (15) years] planning outlook, the situation is not expected to change very much over most of the CZ.

Structures With A History Of Repeated Damage. No structure in Cedar Key or Yankeetown has a chronic history of damage from hurricanes. The unique characteristic [strength, duration, directions(s)] of each storm have yielded unique damages which do not correlate with previous damage history.

For example, in Cedar Key the 1950 hurricane struck with high winds from the northeast resulting in no storm surge damage, but much roof destruction. Hurricane Elena struck in 1985 with medium winds [seventy-five (75) m.p.h.] and wave action from the southeast, and the unusually long duration resulted in severe damage to the commercial establishments on Dock Street and the County Dock.

MAP 4-11

COASTAL ZONE HISTORICAL AND ARCHAEOLOGICAL AREA

REFERENCES

(1) Mr. R. B. Davis, long time fisherman and resident of Cedar Key, Florida.

(2) Dr. Barbara Purdy, Archaeologist, Florida State Museum, Gainesville, Florida.

(3) Mr. Lloyd Stevens, resident of Cedar Key, Florida.

(4) Mr. Bud Jauney.

(5) Mr. Frank Unger, Institute of Science and Public Affairs, Florida State University.

1985 Assessed Values for Lands In Levy County:

Federal Lands	$ 2,549,259
State Lands	4,791,706
Special Water District	2,841,460
	$10,182,425

- Average millage rate outside municipalities in the coastal zone is 16.1.
- Average annual return of proceeds from Federal lands is $12,000.

Source: Mr. Ken Litzenberger, USFWS, Dixie & Levy Counties.

0.016 x $10,182,425 - $12,000 = $151,937

(6) Mr. Lloyd Stevens, resident of Cedar Key, Florida.

Coastal Facilities And Infrastructure

The quality of living in the Levy County Coastal Zone [CZ] is greatly enhanced by equipment and structures which facilitate transportation, communication, power transmission, water use and drainage, health maintenance and education. Such infrastructure as roads, sewer and water facilities and drainage will be described.

In addition to such infrastructure, which is usually provided with the help of the government, certain facilities created by the private sector can give greater access to CZ water ways and other environmental attractions or can provide services which enhance the attraction to the CZ. Such facilities as marinas, boat ramps and piers and such commercial uses as relate to or depend on proximity to the water shall be described.

Infrastructure

With a population density of about twenty [20] persons per square mile (1), Levy County ranks 55th of sixty-seven [67] counties in the State of Florida. The CZ has an even sparser population than the county as a whole. Therefore, it is understandable that CZ infrastructure is relatively limited in size and scope and is mostly centered about the two coastal towns of Yankeetown and Cedar Key.

Roads. Roads in the CZ serve primarily to carry people and freight to and from the only two commercial centers: Cedar Key and Yankeetown. Table 4-16 summarizes the statistics of the major roads which total some fifty-seven [57] miles in length and 1.17 square miles in paved area. Numerous unpaved roads form a network between the major roads, the rural homes and logging sites. Because logging requires such continuous road construction, it is beyond current means to account for the status and extent of unpaved roads in Levy County (2).

Airport. The George T. Lewis Airport, located in Cedar Key, is considered vital by local residents for bringing outside business to the local economy. Table 4-15 lists some of its principal characteristics:

TABLE 4-15

GEORGE T. LEWIS AIRPORT

Runway Width:	100 Feet
Length:	2,357 Feet
Aircraft Based There:	4
Annual Use:	4,000 Aircraft Operations
Annual Earnings In Cedar Key	$176,458 (1)
Annual Accidental Losses:	$ 19,816 (2)

Footnotes: 1) Revenues, payrolls and jobs not at airport attributable to direct purchases from aircraft operators and passengers.

2) 13 deaths, 17 serious injuries between 1965- 1985.

Source: Dale Mills and Associates [1985] "Airport Master Plan: F.F.A. AIP Project No. 3-12-0010-01", Gainesville, Florida.

TABLE 4-16

MAJOR ROADS IN THE LEVY COUNTY COASTAL ZONE

Road	Access To Shore
S.R. 320	Boat ramp in the Manatee Springs State Park
S.R. 448	Boat ramp at Fowler's Bluff
C.R. 326	Boat ramp at Shell Mound
State Highway 24	Boat ramp at Bridge No. 4
Dock Street	Boat ramp in Cedar Key in marina
Dock Street	Sailboat ramp in Cedar Key
2nd Street	Public beach in Cedar Key
2nd Street	Cedar Cove Motel and Marina
C.R. 326	Boat ramp at Wacassasa Marina
C.R. 40	Boat ramp at Yankeetown Tip
C.R. 40	Yankeetown Beach
Riverside Drive	Yankeetown Boat Company
Riverside Drive	Cypress Marina and campground
Riverside Drive	Riverside Marina
Riverside Drive	Boat ramp adjacent to Coast Guard Station
Riverside Drive	Yankeetown Public Park and Boat Basin
Bonita Club Road	Allen Park and boat ramp on Covas Creek

Drainage. Infrastructure constructed to aid drainage along CZ roads consists of: 1) A crown or raised profile in the center of paved roads to encourage water to flow in the gutters and swales, 2) Ditches and swales [usually a foot or so deep and five [5] to ten [10] feet across] on both sides of all major roads, 3) culverts under roads to facilitate overland sheet flow under the raised road bed.

Not counting the town of Cedar Key's paved streets, the CZ has some fifty-seven [57] miles of crowned road and one hundred fourteen [114] miles of swales paralleling those roads. Map 4-12 also illustrates the underground drainage system and the drainage pattern of Cedar Key (3).

There are some one hundred fifty [150] culverts or multiple culvert structures under the major roads of the CZ with an average length of 85.7 feet and a total cross sectional area of 3,085 square feet. Locations and dimensions of these culverts are listed in the Technical Document accompanying the Comprehensive Plan.

Drainage ditches have also been created in the past twenty [20] years to discourage the transient shallow flooded areas which are optimum for mosquito breeding because they never remain flooded long enough for mosquito predators to establish themselves. Map 4-18 shows such ditches in the Yankeetown area.

Sewage Treatment. The majority of inhabitants in the CZ live in such low density that septic tanks are adequate for sewage disposal. The only place where population density and lack of adequate natural drainage and treatment capacity in the surrounding soils force reliance on a sewage treatment plant is Cedar Key.

Table 4-17 lists the average monthly performance figures for the Cedar Key Sewage Treatment Plant. The D.E.R. standard for annual average effluent output is twenty [20] milligrams per liter both for Biological Oxygen Demand [B.O.D.] and Total Suspended Solids [T.S.S.] (4). Based on this data, the sewage treatment plant appears to be in compliance.

However, on-site inspections have shown certain problems: 1) T.S.S. too high in the effluent from the clarifier, 2) Tertiary filters not being used, 3) Sludge drying arrangement is inadequate.

Currently, the sewage treatment plant is operating just at peak capacity [100,000 gallons per day], and any special event such as a festival overwhelms the system with one hundred fifty thousand [150,000] to two hundred thousand [200,000] g.p.d. demand. As a result, during such peak flows all the raw sewage passes untreated into the coastal waters. Clearly, sewage treatment capacity in the Cedar Key area needs expansion.

Yankeetown's sewage is handled entirely by individual septic tanks. Most houses are relatively widely spaced apart, and ground water contamination from septic tanks has never been noticed as a problem or discussed in Town Council (5). However, Yankeetown has a problem with excessively high bacteria counts in one of the wells (6), and this has forced the decision to eventually abandon the two present water wells and put in two new wells with a new water treatment plant (7). Therefore, the reliance on septic tanks may require re-study.

Water Treatment. Outside of Cedar Key and Yankeetown, residents draw water from their own wells. Population density with the accompanying possibility of water contamination has caused water treatment plants to be constructed for the two towns.

Map 4-14 shows the location of the wells and the water treatment plant for the Cedar Key water system. The system is designed for two hundred fifty thousand [250,000] gallons per day production. 1985-86 performance figures are listed in Table 4-18.

TABLE 4-17

CEDAR KEY SEWAGE TREATMENT PLANT PERFORMANCE: MONTHLY AVERAGE

SEPTEMBER 1985 TO AUGUST 1986

Total Flow per month (million gal.)	**Average Flow** per day (Million gal.)	**Maximum Flow** per day (Million gal.)	**Industrial Contribution** BOD (Pounds per day)	TSS	**Effluent** BOD (Milligrams per liter)	TSS
2.8034	0.0945	0.1328	7.3	7.46	12.3 7.8	19.4 10.2*

*Disregard abnormally high December figures

MAP 4-12

CEDAR KEY DRAINAGE SYSTEM

MAP 4-13

CEDAR KEY SEWAGE SYSTEM

TABLE 4-18

CEDAR KEY WATER TREATMENT PLANT DATA
1985-1986 MONTHLY AVERAGE FIGURES

Water Treated Per Month [1,000s galls]	Residual Chlorine [mg/l]	pH	Lime Added Per Month [pounds]	Alum Added Per Month [pounds]
5,857.25	55.9	7.86	9,229	416.4

D.E.R. is not presently concerned with excessive residual chlorine or trihalomethanes, so only a minimum standard of 0.2 parts per million is set (10). Cedar Key drinking water is safely above this standard, indicating adequate oxidation of the water prior to distribution.

Cedar Key water does have a high iron content, but aside from occasional high counts, fecal coliform is not a problem and no citation has ever been issued by the County Health Department (6).

Yankeetown is addressing the water quality problem. A new well has been dug and a new water treatment plant is in the approval process with DER. The plant will have a design capacity of four hundred [400] connections and two hundred fifty thousand [250,000] to three hundred thousand [300,000] gallons per day capacity. The system will employ aeration, filtration and chlorination to treat for bacteria, particulate matter, humic and fulvic acids, iron and hydrogen sulfide. No water softening will be involved. Elevated storage capacity will be one hundred twenty-five [125,000] gallons (8).

Electric Power. Transmission and distribution lines as well as other equipment for electrical power delivery are shown in Maps 4-15 for Cedar Key and 4-16 for Yankeetown. This system is owned and operated by the Central Florida Electric Company.

Coastal Zone Protection Structures. Since more than ninety- nine percent [99%] of the CZ coastline is in its natural state, the only vulnerable assets requiring protection are in Cedar Key. A belt of rip-rap, some ten [10] to fifteen [15] feet wide extends some six hundred [600] to seven hundred [700] feet around the point which forms the corner for 1st and G Streets.

This rip-rap is an embankment of loose, un-cemented boulders and rocks. It is regarded as sufficient to slow further erosion of the point by normal wave and current activity. However, minor hurricanes have deposited some of the stones on the road, and it is not seen as any real protection from a major hurricane (9).

The seawall on Dock Street is a foundational structure for commercial buildings and does not have much protective potential. Hurricane Elena caused it to separate from the embankment it encases, and in that hurricane, wind speeds never exceeded seventy-five [75] mph.

The rock base on Palmetto Drive is reported (9) to have successfully resisted wave action during Hurricane Elena, however its construction is not expected to provide protection in the event of a major hurricane.

Cedar Key has no dikes to resist storm surge and flooding, and only a small rip-rap section to resist erosion. It would appear that the main protection for Cedar Key is the large expanse of shallow water which any approaching storm must cross.

High Hazard Area Infrastructure. The only infrastructure in the Yankeetown vicinity which exists in the V-Zone are the portion of C.40 west of 63rd street plus the bridges across MacDonald, Bird and Grass creeks and the electric power distribution lines going out to the county park.

As can be seen in Map 4-16, only a few of the higher slopes in the southwest and northwest parts of Cedar Key are not in the V-Zone. Therefore, the majority of the infrastructure [sewer, water, electric power and drainage] are in a high hazard area.

MAP 4-14

CEDAR KEY WELLS AND WATER TREATMENT AND ELECTRICAL POWER DISTRIBUTION

MAP 4-15

YANKEETOWN ELECTRICAL POWER DISTRIBUTION

MAP 4-16

FLOOD INSURANCE RATE MAP
LEVY COUNTY, FLORIDA

Facilities

In conjunction with the infrastructure which has opened parts of the CZ to greater use, facilities have been constructed which have increased the use of infrastructure and the environmental amenities which attracted people in the first place. One set of facilities has given people greater access to the shore and the Gulf, and the other set has facilitated the use of environment or have served the needs of people who simply visited the shore. In the former case, marinas, piers and boat ramps make boat use and fishing easier. In the latter case, restaurants and tackle shops provide the food and tools people might require.

Public Access To Shore. The large belts of coastal marshes and mangroves along more than ninety percent [90%] of the coastline make most of the CZ shoreline undevelopable. As a result, public access to saltwater bays and estuaries is very limited. Such access is confined for the most part to the vicinities of Cedar Key and Yankeetown. The few, widespread exceptions are in Manatee Springs State Park, Fowler's Bluff, Wacassasa Bay and Gulf Hammock. Examples of such public and private access areas are marinas, boat ramps, beaches, piers and parking.

(1) **Roads**. Roads in Levy County having access to water include S.R. 320, S.R. 448, C.R. 326, State Highway 24, C.R. 326 at Wacassasa, and C.R. 40. Table 4-16 gives the access points located near each of these roads. All of these roads, in a windshield survey, have been rated good to fair.

(2) **Boat Ramps**. The boat ramp at the No. 4 bridge leading into Cedar Key is a gravel and cement ramp and has a large area for loading and unloading boats. The ramp dimensions are fifty [50] ft. long and fifteen [15] ft. wide, and it is in fair condition. The road leading up to the ramp is paved and is in fair condition as it was at one time a part of Highway 24. Parking at bridge No. 4 is unmarked and limited for its popularity. There are approximately fifteen [15] available parking spaces for boaters and visitors. In addition, there is a large dock, which is the old No. 4 bridge, that fishermen and tourists use for fishing and crabbing. It is 422.5 feet long and 23.75 feet wide for a total of 10,034.4 square feet.

User survey [see Table 4-18 in the Technical Document] suggestions were: 1) adding more parking area [forty-three percent (43%)], and 2) adding restrooms, dredging the channel, lengthening the ramp and stopping illegal parking [fourteen percent (14%)].

Two [2] boat ramps exist in Cedar Key. The first enters into a small lagoon bounded on the south and east by Dock Street. The second, known as the "sailboat ramp" enters directly into the Gulf. Both ramps are easily accessible and have sufficient parking to accommodate current use, but there is no room to expand. All parking in the area is unmarked, but there are an estimated seventy-five [75] to eighty [80] available parking spaces.

In a user survey, forty-two [42] of the users suggested dredging the channel. The major concern was that at low tide, boats could not get in or out of the bay. Thirty percent [30%] surveyed suggested lengthening the ramp into the bay.

CEDAR KEY PUBLIC ACCESS - LEGEND TO MAP 4-17

Locator Number	Name	Description R = Related D = Dependent
1	Beachfront Motel	(R)
3	Brown Pelican & Pelican Realty Office	(R)
4	Captain's Table	(R)
5	Cedar Cove Motel and Marina	(D)
6	Cedar Inn Motel	(R)
7	Cedar R. V. Park	(R)
10	Dock Street Emporium	(R)
11	Dock Street Station Shoppes and Marina	(D)
12	Faraway Inn	(R)
13	Fishing Pier	(D)
14	Frogs Landing	(R)
15	Gulf Island Marina	(D)
16	Gulfside Motel	(R)
17	The Heron Restaurant	(R)
18	Island Hotel	(R)
19	The Island Place Condo	(R)
21	Johnny's Fish & Oyster Company	(R)
22	Key Motel	(R)
23	Park Place	(R)
25	Public beach	(D)
26	Public boat dock and boat ramp	(D)
27	Rains Restaurant	(R)
28	Salty's Oyster Bar	(R)
29	Sea Breeze Restaurant and Lounge	(R)
32	T & R Seafood	(R)

MAP 4-17

CEDAR KEY PUBLIC ACCESS

In the lagoon, boats can be launched from the one thousand three hundred seventy-five [1,375] square foot [55' x 25'] boat ramp or berthed in any of nine small finger piers on an L-shaped three thousand seventy-five [3,075] square foot dock. Such finger piers would be favored by boaters on the Gulf side ramp as would anything to reduce skidding on the ramp's surface according to the user survey [see the accompanying Technical Document].

The more remote Wacassasa boat ramp does not attract as many users as downtown Cedar Key; it's user rate is similar to that at bridge No. 4. The road leading to the ramp is paved, but parking is unpaved and unmarked. Restroom facilities and a picnic area are found there.

The user survey indicated that one hundred percent [100%] of the users surveyed stated that they like this area. Only one suggestion was made, which was to add overnight camping.

Yankeetown has a number of boat ramps, including ramps at or near Yankeetown Tip, the Coast Guard Station and east of Yankeetown Tip.

The Yankeetown Tip boat ramp is located at the end of C.R. 40. It's dimensions are thirty six feet by twelve feet [36' x 12'] and is in fair condition. A dock seventy-five feet by two feet [75' x 2'] runs parallel to the ramp and is also in fair condition.

The loading and unloading area is quite large as there is a turn about at the end of C.R. 40. Parking immediately next to the ramp is limited. Most boaters park their vehicles along side C.R. 40.

The closest restrooms are located at nearby Yankeetown Beach. Two [2] picnic tables are located near the ramp. Furthermore, there is a small beach area at the tip. This beach only extends for twenty [20] feet.

One hundred percent [100%] of those people surveyed stated that they liked this area. A majority, fifty-three percent [53%] versus forty percent [40%] favored the addition of improvements. Three [3] improvements were suggested with equal priority, eighteen percent [18%]: a paved ramp, redesign the ramp with shallower degree of incline and widen the ramp. Nine percent [9%] of the users suggested more parking, adding another dock and adding a barrier to slow the current.

There is a ramp west of the Coast Guard Station in Yankeetown. This ramp is thirty-six feet long by twelve feet wide [36' x 12'] and is in fair condition. There isn't a dock or any other facilities within this area. Parking is unpaved, unmarked and limited to one [1] space.

One-third [1/3] mile east from the Yankeetown Tip ramp along C.R. 40, another ramp is found with no facilities. This ramp is favored by people using air boats because, unlike the ramp at the tip, there are no strong lateral currents, so entry and exit is relatively easy. The road surface lading to the ramp is rutted and sandy, but it's width, eighteen feet [18'], is another attraction.

The Allen Park and Boat Ramp is named after Mr. Dewey Allen, former Mayor of Inglis, who dedicated the site to public use. [Mr. Allen died in 1986.] Located at the end of an unimproved road which starts at the junction of C-40, C-40A and 63rd Street in Yankeetown, this facility is reached by driving past the Bonita Club Road and continuing with no left turns until the road ends. Facilities are limited to a boat ramp and unmarked parking spaces.

(3) **Beaches**. Cedar Key's public beach is the largest beach located in Levy County. There are a total of fifty-two thousand two hundred fifty [52,250] square feet of white sand extending 522.5 feet from the parking area to the Cedar Cove Motel and Marina.

Parking is to the west of the beach. There are approximately forty-one [41] available unmarked parking spaces. If these spaces became occupied, the overflow could utilize parking spaces across the street at the Cedar Key ramp.

Facilities located on the beach include a gazebo, seven [7] picnic shelters with tables, five [5] grills, benches, restrooms and two [2] outdoor showers. There is also a playground for children which has five [5] big swings, two [2] small swings, one [1] large slide, one [1] smaller slide, two [2] play horses, seesaws and a merry-go-round.

The beach in Yankeetown is located at the end of C.R. 40. The beach area is one hundred thirty feet long by seventy-eight feet wide [130' x 78'] for a total of two thousand three hundred forty [2,340] square ft. There are three [3] picnic shelters and tables adjacent to the beach area. The restrooms are located past the picnic tables.

Beach parking is a large limerock lot with dimensions of two hundred sixty-four feet by ninety-six feet [264' x 96']. There are no designated parking spaces, therefore, the number of available spaces can only be estimated. The approximately parking capacity is sixty [60].

Water Dependent And Water Related Uses. Water dependent uses are defined as any activity which can be carried out only on, in or adjacent to water. Examples of such uses would be beaches, ports, marinas, power plants and wet storage for boats. Water related uses are here defined as any activity not directly dependent upon access to a water body but whose activity benefits from the nearby proximity of a water body in that it provides goods and services. Examples of such water related uses are marine bait and tackle shops, restaurants and fish wholesalers and retailers. Uses dependent on or related to water are concentrated in the vicinities of Yankeetown and Cedar Key.

Why discuss whether a use is water-dependent or not? Because Levy County has a very limited amount of shoreline which consists of usable uplands with direct access to open water. This is a non-renewable resource, which will come into increasing demand in the future. If the limited resource is converted to non-water dependent land uses, then the future population may be deprived of a reasonable supply of, or access to, the shoreline ... whether the purpose of the access is for commerce [such as a marina], or simply pleasure [such as walking on a beach].

The question is not simply one of supply, but also compatibility of uses. The use of shoreline for residences, for example, can cause severe problems if a marina is proposed to be constructed next door. Reasons for the incompatibility may include noise, traffic, light, reduced aesthetics, etc. As more and more residential development occurs on the shoreline, there are increased probabilities for conflict, and decreased opportunities for water-dependent development.

MAP 4-18

YANKEETOWN PUBLIC ACCESS

REFERENCES

(1) Shoemyen, et ed. [1985] 1985 Florida Statistical Abstract, Bureau of Economic and Business Research, University Presses of Florida, Gainesville, Florida.

(2) Mr. Skip Hammel, Chief of the Levy County Road Department [personal communication].

(3) Mr. G. Quipman Hodges, City Council Member, Cedar Key, Florida [personal communication].

(4) Mr. Azeem Syeed, Florida Department of Environmental Regulation, Gainesville, Florida [personal communication].

(5) Mrs. Jimmie Wall, Liaison to County Planning Commission, Yankeetown resident [personal communication].

(6) Mr. Don May, Levy County Health Department [personal communication].

(7) Mr. Joe Jereb, Department of Environmental Regulation, Tampa Office [personal communication].

(8) Mr. Nick Nichols, Seaburne and Robertson Engineering, Tampa, Florida [personal communication].

(9) Mr. Lee Mills, Mills Engineering Company, Bronson, Florida [personal communication].

(10) Mrs. DeFalco, D.E.R., Drinking Water Section, Jacksonville Office [personal communication].

Coastal Economy

The economy of the Levy County Coastal Zone [CZ] is bolstered by several kinds of activity. Natural resources such as minerals, timber and marine life are exploited for profit. Goods and services are sold to support the use of those resources, the general lifestyle of CZ residents and the enjoyment of tourists visiting the area. And the establishment of a self-supporting local population and viable local industries provides the tax base which supports the creation and maintenance of a coastal infrastructure. The use of resources, the exchange of goods and services, the enjoyment of coastal amenities and the ability to rely on infrastructure which facilitates all these activities, all contribute to the quality of life and the general welfare. The viability and functioning of the coastal economy is measured in part by: 1) the need for facilities and business such as water dependent and water related uses, 2) the need for redevelopment, and 3) the need and feasibility of relocating infrastructure threatened by hurricanes.

Economic Base Analysis

The exploitation of natural resources along with the selling of goods and services are the fundamental movers of the economy in the CZ. First, the economic potential derived from the stock of natural resources will be assessed. Then the annual money flow generated by resource exploitation will be described. Economic activity generated by sale of goods and services will then be outlined, and finally the tax base resulting from all of this activity will be described.

Economic Resource Base. Natural resources which support economic activity in the CZ are minerals, timber and marine life. The latter two are renewable and sustainable under good management. The former, minerals, is limited and exhaustible.

Minerals found in the CZ include limestone, dolomite and sand. To assess the stock of mineral resources or the potential for future mineral exploitation is extremely difficult. The mineral base [or the pattern in which minerals occur] is not at all uniform in the CZ. Minerals occur in patches, pockets and narrow seams. Verification of minerals with good economic potential requires on-site drilling in a multitude of locations. The following projections should be seen as extremely rough estimates based on industry-wide rules of thumb.

The mineral resource base is assessed in Table 4-19. One key assumption is that in areas where there is any mineral potential, the success rate for discovery of economically viable mineral seams is five percent [5%]. Another key assumption is that current prices will hold. The first assumption leads to the conclusion that roughly 10,000 acres in the CZ can be exploited. The second set of assumptions yield a projected mineral wealth in excess of Two Billion Dollars [$2,000,000,000].

The figures for limestone should be considered very high. Current limestone mining rates in the entire county are roughly one million [1,000,000] tons per year and the current best estimates in the mining industry are for another forty [40] years of productive activity. [Therefore, if a total of forty million (40,000,000) tons of final product remain, then a more conservative estimate of limestone potential is One Hundred Fifty Million Dollars ($150,000,000)].

Dolomite of good economic potential is estimated at ten [10] to twenty [20] times that of limestone. Therefore, the figures for dolomite in Table 4-19 are more reasonable, though perhaps a bit high. The potential for sand mining is questionable. Map projections from the Florida Geological Survey showed some thirty-two thousand [32,000] potential minable acres, but no known quality sand areas are presently known, so figures for sand should be revised downward. A more conservative total value of mineral potential probably is under Two Billion Dollars [$2,000,000,000.00].

The resource base containing forestry products is described in Table 4-20. The CZ forest stretches over some one hundred twenty-eight thousand [128,000] acres. However, the area where timber exploitation is allowed [once state environmental preserves are subtracted] is roughly ninety thousand [90,000] acres. Assuming that

the proportions of different forest types is the same in the CZ as it is county-wide, the predominant forest type is the Longleaf-Slash Pine forest, forty percent [40%]; followed by Oak-Gum-Cypress, twenty-five percent [25%] and, Oak-Hickory, twenty-two percent [22%].

Stocking rates for timber are relatively poor in Levy County. None are above one hundred twenty-five [125] cubic feet per acre. This does not necessarily indicate a poor site index [production potential], but rather it more likely is an indication of substandard forest management. Using these stocking rates and amortizing their growth rates over a twenty-five [25] year period [the upper end of a cutting rotation for pulpwood - the main timber product in the county] the timber resource base is valued at some Fifty Million Dollars [$50,000,000] in the CZ.

This can be contrasted with the annual figures for timber product sales of the entire county of some $20,432,247 in 1985. If CZ forests are some nineteen percent [19%] of all county forests, one might expect an annual yield of nearly Four Million Dollars [$4,000,000]. These figures could be seen as high simply because after a number of large cuts in the CZ over the last few years, it is quite probable that there will be several years when harvests will be lower due to a general lack of timber at harvestable age.

Marine life economic resources such as shellfish and finned fish are listed in Table 4-21. Projections as to fishing stocks are highly variable on account of varying demand and the vagaries of nature. 1980 figures show an annual cash flow of 1.7 million dollars with the principal species of value being crabs, shrimp, oysters, and mullet, in order of importance. The generally good condition of the estuaries and coastal niches of the Gulf of Mexico would be an indication that, barring a sudden increase in demand, such yields are sustainable for the foreseeable future.

Areas In Need Of Redevelopment.

The CZ economy will improve if: 1) certain areas and structures are redeveloped so as to attract more tourist and investment dollars from outside, and 2) less money is needed for chronic storm repairs and can be used for purposes which produce more wealth, such as creating new or improved business industry.

The most obvious need in Cedar Key is for improved facilities to provide dockage, fuel and supplies. The county reconstruction solved part of the problem. The county dock is adequate as a place to tie up for a few hours and as a fishing pier. As such, it will attract more people to come to fish or to tie up and enjoy the town for a few hours. However, the county dock is not a good facility for docking for any extended period of time, especially for large boats and yachts. Winds and waves can shift fast enough to change a safe mooring into a very destructive place as the waves slam the boats into the concrete pilings.

If Cedar Key is to take advantage of the yacht traffic which comes down the Mississippi River and follows the Gulf Coast, then a safe marina is necessary. Currently a few elements of that lucrative market stop only so long as to pick up fuel, though they would prefer to get it elsewhere where it is easier. Few stay long enough to enjoy the town and to have any impact on Cedar Key's economy.

TABLE 4-19

MINERAL ECONOMIC BASE IN THE LEVY COUNTY COASTAL ZONE

Mineral	Acreage	Exploitation Acreage	Yield in Raw Material (tons)	Value ($)
Limestone	140,553	7,028	843,318,000	3,162,442,500 [2]
Dolomite	39,679	1,984	238,074,000	1,190,370,000 [3]
Sand	32,413	1,621	42,146,000	105,365,000 [4]
Total estimated value of potential reserves				4,458,177,500

Footnotes:

[1] Assuming a five percent (5%) successful discovery rate on land with mineral potential.

[2] Assuming a limestone value / $3.75 per ton.

[3] Assuming a dolomite value / $50.00 per ton.

[4] Assuming a low grade sand value / $2.50 per ton.

TABLE 4-20

LEVY COUNTY FORESTRY POTENTIAL

Item	County-wide [%]	Coastal Zone	Value Cords (4) / year	Value 25 year (5)
Forest - Total	480,089	128,174 (1)		
Forest - Commercial	463,355	90,328 (2)		
Longleaf - Slash	183,289 [39.6%]	35,789 (3)		
Loblolly - Shortleaf	6,959 [1.5%]	1,355 (3)		
Oak - Pine	55,698 [12.0%]	10,839 (3)		
Oak - Hickory	103,778 [22.4%]	20,233 (3)		
Oak - Gum Cypress	113,631 [24.55%]	22,130 (3)		
Site Class 3	90,999 [19.5%]	17,614 (3)	17,614	14,531,550
Site Class 4	288,024 [61.7%]	55,732 (3)	35,111	28,966,707
Site Class 5	87,561 [18.8%]	16,982 (3)	7,981	6,584,771
				50,083,028

(1) Includes “Forest” and “Wet Forest” classifications.

(2) Table 4-11 subtracting unexploitable lands - Wacassasa Bay State Preserve, Cedar Key Scrub Preserve, Manatee Springs State Park.

(3) Assumes that the same percentage for the total as in column 2.

(4) Based on the following: Class 3 [85-120 cubic feet/acre]; Class 4 [50-85 cubic feet/acre]; Class 5 [50 cubic feet/acre]; from Forest Statistics for Florida, 1980, USDA, Forest Service Southeastern Forest Experiment Station, Resource Bulletin SE-58 and 93 cubic feet per cord (Harrell Hemingway - State Forester, Bronson).

(5) Assuming price is $33.00 per cord and cutting cycle for pulpwood is 25 years.

TABLE 4-21

LEVY COUNTY FISH HARVEST
ANNUAL FIGURES, 1980

Species	Harvest Weight (lbs)	Dollar Value
Finned Fish:		
Groupers and Scamp	53,690	$59,239
Mullet, Black	673,012	$117,068
Pompano	8,242	$20,612
Sea Trout, spotted	18,049	$10,689
TOTAL FINNED FISH	743,000	$207,608
Shellfish:		
Crabs, Blue, hard	3,449,285	$738,561
Crabs, Stone	124,828	$141,427
Oysters	149,454	$162,373
Shrimp, saltwater	200,356	$241,589
TOTAL SHELLFISH	3,923,923	$1,491,558
TOTAL FINNED FISH & SHELLFISH	4,666,923	$1,699,166

A feasibility study is required to see if the increased revenue generated by a new marina would offset the costs of channel maintenance. Such a study would also need to investigate likely ways to dispose of channel spoils and the possibility of obtaining environmental permits.

Another redevelopment need would be to improve Cedar Key's image so as to attract more tourism and investment. Substandard housing, particularly north of Main Street and east of S.R. 24, needs re-leveling, foundation work, cleaning up of rotting wood and other items on the exterior (10). There are areas in and around Yankeetown which could use similar attention. Cleaning up some of the debris, trash and sunken boats which accumulate in the mud flats would help in this regard.

Another facet of redevelopment which might improve the CZ image would be to more clearly distinguish between hunting camps and residences. Without so tightening restrictions on future development, dilapidated buildings used as hunting camps are converted to substandard residences (10).

One approach to redevelopment which has already reduced post-storm repair costs has been the use of more stringent building codes. No house which had passed a building inspection under the stiffer requirements of the hurricane code showed any significant damage during Hurricane Elena (10).

These building codes could be strengthened if they were applied to components of a building rather than the whole structure at once. Thus, if damage to the foundation is greater than fifty percent [50%] of it's value, then the foundation must be brought up to code (10). Such a revised code would strengthen and improve the buildings already standing as well as those to be built.

Potential For Relocating Threatened Infrastructure.

The perennial threat of hurricane or cyclone damage raises the question of moving CZ infrastructures from danger zones to safer places where they can still serve CZ residents. It is probably too expensive to shift electric power transmission and distribution lines and the telephone lines underground, but the relocation of sewage treatment plant, the airport and the schools from Cedar Key and Yankeetown might be worth studying.

Schools. The Levy County School Board operates two [2] schools within the CZ, in Cedar Key and in Yankeetown. Based upon correspondence with Superintendent Will W. Irby, III [see Technical Document], these schools each have:

(a) A current value of $2,000,000.
(b) A replacement cost of about $1,900,000.
(c) A life expectancy of 50 years.
(d) Annual maintenance costs of $4,000.

The Cedar Key school is located within the designated "V- Zone", with a fifteen foot [15'] flood elevation. The Yankeetown school is not located within the "V-Zone"; therefore, destruction is not likely during a hurricane.

Cedar Key Airport. This facility, the George T. Lewis Airport, is owned by the Board of Levy County Commissioners. Very little in the way of structural improvements is found on this property as of 1986, and the airport is deficient in runway length. The airport is located within the "V-Zone", with an elevation of twenty [20] feet.

The 1985 Airport Master Plan **1/** proposes to extend the runway by one thousand eighty-three [1,083] feet, by filling 19.3 acres of wetlands; and, to add seven thousand thirty-three [7,033] square yards of parking apron. Relocation is not addressed by the plan, which projects a cost/benefit ratio of 1/0.99.

No estimate is currently available on the replacement cost for the airport.

During 1989, two [2] potential relocation sites were identified, both located in the Rosewood area on non flood-prone sites. To provide a three thousand five hundred [3,500] foot runway, it is estimated that a minimum of six hundred forty [640] acres would be required, with a land acquisition cost of between Five Hundred Thousand Dollars [$500,000] and One Million Dollars [$1,000,000]. A detailed study of available sites, their potentials and limitations for development, preliminary design and cost estimates, and the economic impacts of relocation is needed before the Board can make any rational decision regarding relocation.

1/ Airport Master Plan: F.A.A. AIP Project No. 3-12-0010-01, Dale Mills & Associates, Inc., Gainesville, Florida.

Even if such a study should document a net benefit to the area, huge subsidies in the form of federal and state assistance would be required. In the interim, the Board intends to maintain and operate the existing airport pursuant to F.A.A. standards.

Sewer Plant. The Cedar Key Sewer Plant is owned and operated by the Cedar Key Special Water and Sewer District. With a one hundred thousand [100,000] gallons per day capacity, this facility is currently overloaded. This facility is located within the designated "V- Zone", with a flood elevation of twenty [20] feet. Relocation and expansion is currently estimated to cost Three Million Dollars [$3,000,000].

Miscellaneous Infrastructure. Other coastal infrastructure which cannot be relocated includes shoreline protection devices and water-dependent uses, including:

(a) Riprap along Airport Road in Cedar Key.
(b) Riprap on "The Point" in Cedar Key.
(c) Retaining wall under the road to "The Dock" in Cedar Key.
(d) County boat ramps and the fishing pier and docks at Cedar Key.

Conclusions

There are governmental investments within high hazard areas which, at some time, could and/or should be relocated. From a practical viewpoint, relocation would be easiest with the Cedar Key School and the George T. Lewis Airport, as the leasing or sale of these properties for other uses offers the potential for raising the necessary funds. Relocation costs are estimated to be:

(a)	Cedar Key Airport:	unknown
(b)	Cedar Key Sewer Plant:	$3,000,000
(c)	Cedar Key School:	$2,000,000

Business

During 1986, a preliminary assessment of businesses was conducted within the Levy County Coastal Zone. On a preliminary basis, questionnaires were mailed out with stamped, self- addressed envelopes. Only twenty-two [22] responses were received, necessitating a door-to-door survey. Even this effort was a limited success, as most businesses were concerned about disclosure and were extremely reluctant to provide any information at all.

With the preceding disclaimer, Table 4-22 provides the best current estimate of business, employment, wages and gross sales in the Levy County Coastal Zone. This table shows that:

TABLE 4-22

LEVY COUNTY EMPLOYMENT, WAGES AND GROSS SALES

	Coastal Zone	**vs.**	**County-wide**
(1)	Businesses total	67	722
(2)	Employment totals	606	4,058
(3)	Annual payroll totals	$2,018,397	8,124,666
(4)	Total gross sales are	$38,840,759	185,376,000

For comparative purposes, county-wide data are provided above. From these comparisons, preliminary conclusions regarding the CZ are as follows:

(1) The Coastal Zone contains less than ten percent [10%] of all businesses.

(2) The Coastal Zone provides about fifteen percent [15%] of the County employment opportunities and twenty-five percent [25%] of the annual County payroll.
(3) Gross sales in the Coastal Zone are less than 5% of the County-wide total.

[The Florida Department of Commerce will be asked to provide a more reliable estimate of Coastal Zone gross sales, using sales tax receipts.]

Taxes

Table 4-22A provides an evaluation of the contribution to the Levy County Commission and School Board by ad valorem taxes in the Coastal Zone.

TABLE 4-22A

LEVY COUNTY TAXES AND COASTAL ZONE CONTRIBUTION, 1985

	Assessed Value	School Taxes Paid	County Commission Taxes Paid
Coastal Zone ['85]	$ 56,000,000	$ 179,000	$ 223,000
County-wide ['83]	$512,364,000	$1,887,000	$2,269,000
Millage ['83]		5.5000	6.615
% Coastal Zone	11%	9%	10%

This table indicates that the CZ contribution is relatively low, at about nine percent [9%] of taxes paid versus having thirty-two percent [32%] of the county land area. The data are consistent with the low contribution to employment and gross sales as previously described, and, with the fact that most of the CZ is not, and cannot be, developed.

Managing Change

In a fast growing state such as Florida, change is to be expected. The Levy County Coastal Zone [CZ] is constantly changing in response to such forces as growth and development, pollution, hurricanes and sea level rise. Change in CZ resources and assets is often seen as positive when the rate of change is in step with the abilities and expectations of the residents. To keep change at a comfortable pace towards net growth without damaging or dangerously depleting the environment or any other natural resources is the fundamental goal of management.

Development of coastal marshes and islands and wet riverine areas would have the greatest potential for damaging archaeological sites (1). Present wetlands law does not always ensure protection of such sites because detecting such sites is beyond the means of the permitting agencies and once the site are detected, the destruction from the use of earth moving equipment is often so widespread that there is little to be recovered (1). Wet riverine areas are exciting new interests in archaeology after having been ignored so that banks of the Suwannee, Withlacoochee and Wacassasa should be given careful attention (1). Due to very wet conditions, development in these areas is not very likely, but some vigilance in this regard is needed.

Impact On Estuaries

Because so much of the coastline of the CZ is low-lying marsh which is either publicly owned or of low development potential, the chances of effluents from construction activity or from everyday commercial and residential activity [paints, solvents, fertilizers, pesticides] reaching the estuaries is also very low except in Cedar Key and Yankeetown. No such impact has been recorded as yet.

The most likely developmental impact on estuarine water quality would be increased levels of fecal coliform bacteria. But the chances of this occurring are not imminent as yet. Five years of monitoring for fecal coliform on the Suwannee River and sound have shown no appreciable water quality degradation (1). Admittedly, growth along the Suwannee River has been slow.

The one demonstrable human factor in the excessive levels of fecal coliform at the mouth of the river is the City of Suwannee in Dixie County. There are many septic tanks within twenty-five [25] feet of the water there (1), an illegal practice by modern development standards.

Impacts On Natural Habitats And Wildlife

Increasing human population will surely mean mounting wildlife kills, from road kills to hunting. But the most pronounced effects come from habitat loss. Even if the habitat is not rare, its destruction reduces the area of intact habitat and creates more edge or perimeter. Therefore, the proportion of species which favor edges, such as deer, will increase. In such a case, wildlife remains, but not the original, native species. The epidemic explosion of Brazilian Pepper and Melaleuca in South Florida is one result of this.

Since development in the CZ will probably concentrate in the population centers of Cedar Key, Rosewood and Yankeetown, it is possible that the most crucial habitat will be spared. Floodplain forest, bottomland hardwoods and all riverine habitats are the last hope for large predators such as the black bear, bobcat, lynx, and the panther to have adequate territory. Since most of the Wacassasa floodplain and much of the Suwannee floodplain are intact and under some level of protection, the management functions of top predators may be restored, and wildlife habitats in Levy County may be revitalized.

Management Plans For Publicly Owned Lands

As of mid-1986, only two [2] areas in Levy County and under state jurisdiction have committed their management policies to writing as part of a formal document. These two [2] areas are the Manatee Springs State Park and the Cedar Key Scrub State Reserve, as described in the following sections.

(1) **Manatee Springs State Park**. This [draft] park plan contains: a land use component, an operations component, an inventory of native flora, and a resource management component.

(a) **Land Use**. Conversion of adjacent agricultural lands to residential uses is anticipated. The park itself covers two thousand seventy-four [2,074] acres, a first magnitude spring, and a two thousand five hundred [2,500] foot run to the Suwannee River. A boat ramp, leased to Levy County, has had its facilities: "...all but destroyed by vandals."

The spring runs and the Suwannee River are the primary visual resources of the park. Manatee use is increasing, which poses a potential conflict with boat use.

The park-use capacity of the park as currently developed is about one thousand five hundred [1,500] persons at one time, or two thousand seven hundred [2,700] per day. Improvements under consideration include a revised boardwalk alignment, a new concession/restroom building, new picnic shelters and twelve rustic cabins.

Optimum carrying capacity is only two thousand nine hundred thirty-one [2,931] persons.

(b) **Operations**. The park utilizes nine permanent employees. Revenues are derived from camping, day use, ramp fees, concessions and rentals. Programs include education, safety, resource protection, facility maintenance, and others. The park also has an emergency action plan.

(c) **Resource Management**. This component of the plan states that: "Manatee Springs State Park was acquired primarily to protect and maintain a large artesian spring and its appealing natural setting. In doing so, a great deal more was gained in the form of an increasingly important manatee refuge, plus an underwater cave system which has several unusual invertebrate inhabitants".

Major sections of the resource management component include: natural resources, biological communities, and a discussion of management need[s] and problems. Management objectives include: eliminating topographic disturbances, monitoring nitrate levels, controlled [prescribed] burning, eradication of exotic species and protecting native species and unique natural features. Research needs are also described.

(2) **Cedar Key Scrub**. This management plan includes a resource description, management objectives, descriptions of public and commercial use, a land acquisition component, and conclusions. At present, the scrub contains a total of about five thousand [5,000] acres.

(a) **Resource Description**. The sand pine scrub community is found at the higher elevations [i.e., >15 ft. ms.l.] in the eastern portion of the reserve. The high ridges on which this association flourishes were at one time coastal dunes. The soil is very well drained white sand.

This community is inhabited by several rare, endangered or threatened species, including:

Common Name	Scientific Name
Florida Coontie	Zamie floridana
Florida Scrub Jay	Aphelocoma coerulescens
Florida Mouse	Peromyseus floridanus
Gopher Tortoise	Gopherus polyphemus
Florida Gopher Frog	Rana areolata aesopus
Eastern Indigo Snake	Drymarchon corais couperc

Other communities within the scrub include scrubby flatwoods, pine flatwoods, freshwater ponds an marsh, mixed hardwood-bald cypress swamp, salt marsh and hardwood hammocks.

(b) **Geological Features**. In the northeastern portion of the reserve there is a series of scattered sand ridges roughly oriented in a northeast to southwest direction. At approximately twenty [20] feet m.s.d., these ridges are the highest and driest elevations on the property. It is on these ridges and slopes that the sand pine scrub and scrubby flatwoods communities thrive. There is little doubt that these ridges are the remnants of ancient coastal sand dunes formed during a time when sea level was much higher than its present level.

The relict dunes are of interest from a biological-ecological perspective as well as geological. The dunes support the only scrub habitat in a long stretch of Gulf coast.

Thus, several species of wildlife common to scrub habitats and found in the Cedar Key scrub are either totally or partially isolated from other nonspecific populations in the rest of the species range. The Florida scrub jay, the Florida mouse, the pocket gopher, and the gopher tortoise are prime examples of such species.

(c) **Archaeological And Historical Sites**. Although the reserve has not been systematically surveyed, a number of archaeological and historical sites are either known or suspected to exist on the property. One or more aboriginal Indian mounds reportedly lie along the coast within reserve boundaries; a large Indian shell mound is located on Seabreeze Island [portions of which are now part of the Lower Suwannee River National Wildlife Refuge] immediately west of the reserve.

(d) **Management Objectives**. The management objectives for Cedar Key Scrub are designed to preserve and protect the natural resources of the reserve. The Governor and Cabinet authorized the purchase and subsequent management of the Cedar Key Scrub to:

i) Protect the natural plant communities, particularly the scrubby flatwoods, the sand pine scrub and the salt marsh;

ii) Protect the native plants and animals, particularly endangered, threatened, rare or unique species;

iii) Protect the estuarine system, including the quality of surface water entering that system;

iv) Preserve the ancient sand dunes; and,

v) Protect the archaeological and historical sites.

(3) **Andrews Tract**. This tract of land was purchased in 1985. A consensus meeting was conducted by the Florida Game and Fresh Water Fish Commission on April 3, 1986. Initial priority items for management strategies included, but are not limited to, the following in order of decreasing priority:

(a) Provide an on-site manager: [self-explanatory].

(b) Year-round controlled use: Hunters should be able to use the area along with a variety of other users. Consumptive use during part of the year does not destroy others ability to use the area for nonconsumptive pursuits, but all uses should be carefully designed and controlled.

(c) Protect the pristine state of the mature hardwood forest: This means the tract should be retained in as near its original natural state as possible. Roads and other permanent facilities should be limited. The long-term management view should be to retain the tract in a wilderness-like condition.

(d) Maintain the high quality and visibility of the wildlife and timber resources: The state bought this land for its uniqueness and abundance of wildlife. If these qualities are destroyed, the tract becomes ordinary. Hunting should be used primarily as a means to control overpopulation. Small game hunting should be on a limited basis

also. Consumption should be controlled to allow an abundance of wildlife for high visibility by those who simply want to view and appreciate these resources.

Pollution

Air, water and soil quality in the CZ continue to maintain a high standard; no complaints have been registered so far. Studies of water quality have shown unsafe levels of pollutants in the littoral zone and the mouth of the lower reaches of the Suwannee River and in the vicinity of Cedar Key (2).

Point Sources. The only known point source of pollution within the CZ is the sewage treatment plant in Cedar Key. Occasionally the sewage flow exceeds its 0.1 m.g.d. capacity, and one hundred thousand [100,000] to two hundred thousand [200,000] gallons flow raw into the waters of Cedar Key. Given Cedar Key's growth, it appears that this plant will inevitably be replaced with a plant of greater capacity located inland as soon as funding sources can be located.

There are a number of point sources of pollution outside the CZ which affect river and estuarine water quality. The septic tanks of the City of Suwannee in Dixie County are felt to contribute to the high fecal coliform counts which will shut down shellfishing in the lower reaches of the Suwannee River down to and including the mouth (21). Gold Kist, Inc. poultry farm discharges near the confluence of the northern Withlacoochee river and the Suwannee River in addition to the discharge of several small city sewage treatment plants along the northern Withlacoochee. However, swift water movement flushes the Suwannee River before any eutrophication problems occur, though the northern Withlacoochee river does add turbidity to the Suwannee (3).

Non-Point Sources. Non-point sources of pollution could be forest clear-cutting in the Wacassasa River basin, since the river has a relatively high sediment load which might be linked to forest run-off (3). Nutrient enriched run-off causes aquatic weed problems in Lake Rousseau (3), just east of the CZ, but eutrophication problems are not reported downstream in the Withlacoochee River.

It is stormwater run-off that can cause the greatest non- point source impacts in terms of estuarine pollution. The sediment load as noted above can be increased, thereby depositing silt on or in oyster beds, and the increased turbidity might shade out grass beds that ware not smothered by silt. Stormwater run-off also can carry large amounts of animals wastes, human wastes, and toxic compounds such as petroleum derivatives into the estuaries. It is for these reasons that the watersheds draining into the estuaries are deserving of high performance standards for all land uses.

Effect Of Future Land Uses On Natural Resources In The Coastal Zone

The Levy County Future Land Use Map provides the following inventory of proposed land uses:

(1)	Conservation	55,680
(2)	Forestry/Rural Residential	154,357
(3)	Recreation	60
(4)	Residential/Municipal Service District	3,200
(5)	Agriculture	2,500
(6)	Future Conservation	12,160
		227,957

In the sections which follow, this inventory is described by individual category in terms of the potential for each land use to affect natural resources in the coastal zone.

Conservation And Future Conservation

Combined, these uses would total approximately sixty-eight thousand [68,000] acres, or about thirty percent [30%] of the delineated coastal zone. These would remain either in a state of preservation or management for wildlife or timber, with limited improvement for public access. The impact upon natural resources will be extremely beneficial, as the sole justification of the conservation areas is to protect those resources.

Some coastline remains in private ownership just north of Cedar Key. Because this area lies between existing conservation areas, it is logical for the entire coastline to receive a conservation designation. This use will protect natural resources in the coastal area.

Forestry/Rural Residential

Population densities of one [1] dwelling unit per twenty [20] acres in a conventional subdivision, or greater if density bonuses are earned by P.U.D. design that preserves forestry uses, would:

(a) Allow commercial forest management to continue without being confronted with incompatible land uses.

(b) Allow hunting camps, primitive camping and weekend or vacation homes at very low densities; thus, virtually no impact upon resources.

(c) Allow rural residential subdivisions.

These will be no short-term [initial planning period] effect a forest resources; however, the long term result will be significant decrease in the commercial forest and resource base, unless other lands currently in row crops or pasture are contended to forestry uses.

Recreation

Existing facilities will be maintained, improved and increased in capacity to serve increased demand. The increased demand will inevitably result in some damage to natural resources, primarily from oil and gasoline spills from boats utilizing the county-maintained boat ramps. Bilge pumping and human waste disposal will increase, and so too will littering on coastal islands, which is already a problem.

Residential/Municipal Service District

As an "urban service" area, this is a clearly marked [see Land Use Map] unincorporated area within which municipal growth is expected. Given the existing amount of developed land in the Cedar Key MSD [640 acres], little or no affects upon natural resources are expected. The remaining area [about 2,560 acres] around Inglis/Yankeetown, could adversely impact upon Wacassasa Bay unless carefully planned in terms of waste disposal and storm water run-off.

Agriculture

This land use designation represents only one percent [1%] of the coastal zone land area, at two thousand five hundred [2,500] acres. Almost all of the area is used for cattle pasture and timber production, with some scattered for existing residential and hunting camp uses. Because no plowing or discing is normally conducted in this area, and because the acreage is so small, potential impacts on resources are considered insignificant.

Effect Of Development And Redevelopment On Historic Resources And Sites

No redevelopment is proposed within the unincorporated coastal zone. If one compares 4-1, which locates coastal zone historical and archaeological areas, with the future land use map, it may be concluded that:

(1) The Cedar Key Cemetery and the salt works at Salt Island already are in public ownership and they lie within a designated "Conservation" future land use category.

(2) Two historic sites lie outside the coastal zone.

(3) Almost all archaeological survey areas be within an existing public ownership and a designated "Conservation" future land use category. A single site which is in private ownership and is designated as a "Conservation" future land use category [3 miles north of C.R. 347/S.R. 24 intersection] and another site in private ownership is designated as a Forestry/Rural Residential future land use category.

From this analysis, it is concluded that development will have no impact upon historic resources and sites in the Levy County coastal zone.

REFERENCES

(1) Dr. Barbara Purdy, Archaeologist, Florida State Museum, University of Florida, Gainesville, Florida.

(2) Bill Porter, Florida D.N.R., Division of Marine Resources, Shellfish Environmental Assessment Section [personal communication].

(3) Robert Thompson, Florida D.N.R., Division of Marine Resources, Shellfish Environmental Assessment Section [personal communication].

(4) Joe Hand, et al. [1986] Florida Water Quality Assessment 305(b) Technical Report, Department of Environmental Regulation, Division of Environmental Programs, Bureau of Water Quality Management, Water Quality Monitoring and Quality Assurance Section, Tallahassee, Florida.

Hurricane Evacuation Planning

The local Peacetime Emergency Plan is a basic plan that outlines methods that will be taken in case of a natural disaster related to Levy County. The purpose of this plan is to provide for prompt effective response to and recovery from emergency situations for the protection of lives and property of the citizens and visitors of Levy County.

It is required by the state that the Department of Emergency Management update this plan every three [3] years. Levy County's local Peacetime Plan is presently in the process of being reviewed by the state so that it can be typed and printed.

As the Peacetime Plan has not been finalized, this Hurricane Evacuation study will be analyzed from portions of the peacetime plan, the Technical Data Report Withlacoochee Hurricane Evacuation Study 1/ and the Hurricane Decision Making Guide, Levy County. 1/

Vulnerability Zone

There are two [2] principle hurricane hazards which necessitate evacuation. The first is hurricane force winds which are defined as seventy-four [74] m.p.h. or greater. Depending on the storm type and intensity, wind speeds were predicted by the National Hurricane Center to vary from eighty-four [84] to one hundred seventy-four [174] m.p.h. In the event of hurricane force winds, mobile homes are particularly vulnerable because of their lightweight construction and flat sides and ends. In addition, they are more vulnerable to flying debris. As a result, it is recommended that all mobile home residents evacuate when an order is issued.

The second hurricane hazard is a storm surge, which is a rising wall of ocean water produced by hurricane force winds. The storm surge is the most dangerous hurricane hazard and is the cause for nine [9] out of ten [10] hurricane related deaths. Depending on the storm type and intensity, the peak surge heights that are predicted to affect Levy County range from four [4] to thirty-three [33] feet. Even though each storm type and intensity produces a different peak surge height, the extent to which the surge travels inland for several of these storm types and intensities does not change significantly, due to the topographic changes in coastal areas. Therefore, these storm types and intensities are condensed into two [2] vulnerability levels. The approximate limits of the areas in Levy County subject to this hazard are separated into evacuation zones A and B, shown in Map 4-19. These vulnerability zones are inclusive, meaning level B includes level A in all storm types and intensities.

Evacuation Process

Notification To Public. In the event of a hurricane threat, public actions may be directed through public information. The Department of Civil Defense has prepared a script to be read over radio and/or television. Scripts for both a hurricane watch and warning are readily available when needed.

1/ Prepared by Withlacoochee Regional Planning Council, June, 1984.

Instructions for evacuation will be given for all vulnerable zones and directions to shelters will be announced. Residents will be reinformed of the endangered areas, evacuation areas and locations of shelters.

For the initial method of warning, the civil defense sirens will maintain a steady blast or tone lasting from three [3] to five [5] minutes. These sirens were strategically located so that they can be heard by a large portion of the residents of Citrus and Levy Counties and are the main disaster or attack warning system.

In addition to these forms of notification, law enforcement and fire vehicles equipped with sirens and public address systems will be utilized throughout areas to be evacuated to warn all persons not already informed that an evacuation has been ordered. Should the warning occur at night, law enforcement and fire personnel will make every effort to awaken residents and inform them of the emergency.

Evacuation. The Department of Emergency Management has developed an order of priority for evacuation:

(a) All infirm, handicapped and people without transportation from all areas.
(b) All coastal and island residents.
(c) All mobile home parks of the mainland.
(d) All residents of low lying areas on the mainland.

For those residents with special needs, priority (1) evacuation assistance will be offered by the County using ambulances, buses or other means as deemed necessary. The Oak View Care Center located in Williston contains approximately one hundred thirty [130] residents, whom may require special assistance.

Levy County is in the process of registering all persons who are disabled or would need transportation in case of an emergency. Thus far, all persons needing evacuation assistance in Yankeetown and Inglis have been registered and Cedar Key is in the process of registering. Mostly those registered have done so as a result of the Radiological Emergency Plan from the Crystal River Nuclear Plan. A reply card for requested assistance has been issued to the public, provided by the Levy County Civil Defense through their Nuclear Power Plant Information, Emergency Information for Levy County.

Map 4-19

EVACUATION ZONES - LEVY COUNTY

LEVY COUNTY EVACUATION ZONE BOUNDARIES FOR MAP 4-19

Evacuation Zone	Zone Boundary Description
L1	South of Suwannee River; west of C.R. 347 and S.R. 24; all of Cedar Key; north and east of the Gulf of Mexico.
L2	South of S.R. 24 and Main Line Road; west of Wacassasa River; north of the Gulf of Mexico; east of S.R. 24.
L3	South of Wacassasa River and Robinson Road; west of two miles west of U.S. 19; north of Levy County line; east of the Gulf of Mexico.
L4	South of C.R. 326; west of U.S. 19; all of Inglis; north of Levy County line; east of two miles west of U.S. 19.
L5	South of two miles north of Main Line Road; west of U.S. 19; north of Robinson Road and Main Line Road; east of Rocky Run.
L6	South of Suwannee River, two miles northeast of C.R. 347 and Purdue Road; west of Rocky Run; north of Main Line Road and S.R. 24; east of C.R. 347.
L7	South of S.R. 24 and Yearty Road; west of 01 Road #4 and #7; north of two miles north of Main Line Road; east of Rocky Run.
L8	South of Osteen Road; west of C.R. 337 and Levy County line; north of Levy County Line; east of U.S. 19, on Road #4 and #7.
L9	South of C.R. 343; west of Levy County line; north of Levy County line; east of C.R. 337 and Williston Highlands Area Road.
L10	South of Levy County line; west of Levy County line; north of C.R. 343 and Osteen Road; east of Wacassasa River.
L11	South of Levy County line; west of Wacassasa River; north of Otter Creek; east of C.R. 336, C.R. 330, Chiefland, railroad and S.R. 49.
L12	Chiefland City limits.
L13	South of Suwannee River and Levy County line; west of S.R. 49, railroad, Chiefland, C.R. 330 and C.R. 336; north of two miles north of Main Line Road, Purdue Road and Moody Road; east of two miles east of C.R. 347.

All coastal and island residents are the next priority for evacuation. These residents will be evacuated by zones as shown previously in Map 4-19, and will retreat to specific shelters according to their zone. Residents living in the level A flooding zone, specifically in the Cedar Key, Yankeetown and Inglis area, are instructed to take Routes 19 and 24 northward to Chiefland where there will be a uniformed officer to give directions to the nearest shelter.

During this time, all mobile home residents from all areas must evacuate their homes regardless of the location if the hurricane is determined to be severe. If the recreation center of any mobile home park is a certified hurricane shelter, local residents may utilize that shelter.

Once all of these residents have been evacuated, all residents living in low lying areas on the mainland will be evacuated. These residents may not experience the actual hurricane, but they may get the extensive rains from the hurricane.

If a hurricane occurs during school hours, children will be transported to the nearest shelter by county school buses. Parents, in the past, have been notified by the Department of Emergency Management to not pick their children up from school. Instead, they are to join their children at the shelters.

Evacuation Routes. The principal roadways used as evacuation routes were designated on the basis of providing eastward access from coastal areas and to provide the major arterial roads for inter-county and intra-county evacuation. Intra-regional evacuation routes refer to those routes which will be used predominately by evacuees within Levy County, with shelter destinations primarily in their respective counties. Inter-regional evacuation routes refer to those routes which will be used primarily by intra-regional evacuees with evacuation destinations outside their respective counties and/or the Withlacoochee region, and by evacuees outside the Withlacoochee region, such as Tampa Bay evacuees, with shelter destinations within or outside the Withlacoochee region.

Evacuation routes for Levy County are displayed on Map 4-20. These routes were designed as part of the transportation model of a hurricane evacuation in the Withlacoochee region. 1/

1/ Withlacoochee Regional Planning Council, 1984.

MAP 4-20

EVACUATION NETWORK - LEVY COUNTY

Residents that are vulnerable to a hurricane should evacuate to the nearest shelter using only designated routes to avoid unimproved roads, as well as hard surface roads which can be expected to become impassable due to washouts, flooding, debris, etc.

Furthermore, the evacuation network will be controlled by the county. The Sheriff shall coordinate the placement of law enforcement officers along the evacuation routes to direct evacuees to the appropriate shelters. The Sheriff will also redirect traffic flow as required to be compatible with road conditions. The Director of the Department of Road Works shall position heavy equipment at critical locations. Traffic control points will also be set up to direct traffic, resolve congestion problems, and to divert traffic to other shelter destinations when the capacity of public shelters is reached. The intensity of traffic during a hurricane evacuation will always be accompanied by a certain number of traffic accidents and breakdowns. These traffic control personnel [points] will be positioned at each key roadway link [node], as shown in the previous Map 4-20, so that one can assist disabled vehicles as needed. A tow vehicle will be positioned at each critical link to facilitate the removal of immobilized vehicles to keep the flow of traffic as steady as possible.

Evacuation Times. Evacuation times consist of three components: pre-landfall hazard time, behavioral response time, and clearance time.

Pre-landfall hazard time is the number of hours before the eye of the storm strikes or makes its closest point of approach in which gale force winds occur. It is assumed that evacuation must be completed before the occurrence of gale force winds due to the potential of hazardous driving conditions.

Behavioral response time is the amount of time it takes for the vulnerable population to respond to the evacuation order. These times were based on the survey of hurricane response behavior conducted in the Withlacoochee region and previous evacuation studies and were calculated as part of the transportation model.

Clearance time [which includes behavioral response time] is the amount of travel time it takes for the vulnerable population to reach their evacuation destinations. This time was calculated as a part of the transportation model developed for the Withlacoochee region.

Evacuation time is the length of time between the issuance of an evacuation order and the time the eye of the storm is predicted to strike [landfall], with the constraint that enough time be allowed for all evacuees to respond to the order and travel to their evacuation destination before the onset of gale force winds. Table 4-23 and 4-24 display the evacuation times by each level of vulnerability for Levy County. In addition to the evacuation times for vulnerability zones A and B, evacuation times for Tampa Bay are shown with vulnerability levels A and B. As can be seen in Table 4-25, evacuation times in Levy County do not change if there is a concurrent Tampa Bay evacuation, whereas in some other counties in the Withlacoochee region, evacuation times are greatly increased.

There are two reasons why evacuation times do not change. First, Hernando and Citrus Counties absorb some of the traffic from Tampa Bay on U.S. 41 before reaching Levy County. Second, and more importantly, it was assumed in the transportation model that through traffic [that is, traffic not seeking public shelter in Levy County] will gravitate toward I-75 and therefore not produce as much congestion on the roadways.

Even though the evacuation times are much longer in some other counties if there is a concurrent Tampa Bay evacuation, the evacuation times are still long enough in Levy County such that readiness conditions may have to be accelerated.

Table 4-26 shows the kinds of storm that effect different vulnerability levels. Using this information, the population at risk can be calculated, which in turn can be used to figure Evacuation order times.

Evacuation Shelters

Number of Evacuees. The population at risk can be shown by vulnerability levels:

Vulnerability Levels	Population At Risk
A	12,077
B	13,919
"A" with Tampa Bay	13,675
"B" with Tampa Bay	18,460

The number of Tampa Bay evacuees entering Levy County will depend on available public shelter capacity in Levy County. Approximately four thousand five hundred [4,500] to five thousand [5,000] shelter spaces are available for incoming Tampa Bay evacuees, depending on the level of vulnerability.

Tables 4-27 and 4-28 show the number of evacuating population and evacuating vehicles by vulnerability zones. Also, it shows the destinations of the evacuating population.

Number Of Evacuees Requiring Shelter. In the event of an evacuation order, the evacuees usually go to a public shelter, friend/relative or hotel/motel. As a result of a survey and discussion, the Regional Disaster Preparedness Advisory Committee developed the following evacuation destination distribution:

Evacuation Destination	Percentage of Population At Risk Seeking Destination
Public Shelter	30.6%
Friend/Relative	40.6%
Hotel/Motel	28.8%

For those evacuees whose destination is a hotel/motel, there is not sufficient hotel/motel capacity to accommodate the expected number of evacuees seeking this destination. Therefore, it is assumed that those persons unable to locate hotel/motel accommodations locally will seek destinations outside of the region.

To determine the number of persons seeking shelter in hotels/motels, the population at risk in the coastal counties, from the Vulnerability Analysis, is multiplied by the percentage of persons indicating hotels/motels as their shelter destination from the behavioral survey. The following are the results for each of the coastal counties:

County	Population At Risk		Percentage Hotel/Motel		Number of Persons
Levy	13,919	x	28%	=	3,897
Citrus	29,261	x	28%	=	8,193
Hernando	25,597	x	28%	=	7,167
Total	69,077	x	28%	=	19,257

Table 4-29 shows the total capacity of hotels/motels located in Levy County, multiplied by the vacancy rate to get the available capacity for evacuees. Once the available capacity is calculated, a comparison can be made with the number of persons seeking shelter in hotels/motels yielding the net capacity for the hotels/motels.

County	Available Capacity		Number of Persons		Net Capacity
Levy	679	-	3,897	=	-3,200

TABLE 4-23

EVACUATION TIMES [In Hours]

VULNERABILITY LEVEL "A"

County	Response Curve	A	A With Tampa Bay Evacuation
Levy	A-Quick	8 3/4 - 12 1/4	8 3/4 - 12 1/4
	B-Medium	11 3/4 - 15 1/4	11 3/4 - 15 1/4
	C-Slow	14 3/4 - 18 1/4	14 3/4 - 18 1/4
Citrus	A-Quick	12 1/4 - 15 3/4	12 1/4 - 15 3/4
	B-Medium	14 - 17 ½	14 - 17 ½
	C-Slow	16 - 19 ½	16 - 19 ½
Hernando	A-Quick	8 3/4 - 12 1/4	29 ½ - 33
	B-Medium	12 - 15 ½	24 - 27 ½
	C-Slow	15 - 18 ½	30 3/4 - 34 1/4
Marion	A-Quick	9 ½ - 13 ½	22 ½ - 26
	B-Medium	12 ½ - 16	24 - 27 ½
	C-Slow	15 ½ - 19	25 ½ - 29
Sumter	A-Quick	0 - 12 ½	22 ½ - 26
	B-Medium	11 3/4 - 15 1/4	24 - 27 ½
	C-Slow	14 ½ - 18 1/4	25 ½ - 29

Source: Hurricane Evacuation Decision Making Guide, Levy County.

TABLE 4-24

EVACUATION TIMES [In Hours]

VULNERABILITY LEVEL "B"

County	Response Curve	B	A With Tampa Bay Evacuation
Levy	A-Quick	10 3/4 - 14 3/4	10 3/4 - 14 3/4
	B-Medium	13 1/4 - 16 1/4	13 1/4 - 16 1/4
	C-Slow	16 1/4 - 19 1/4	16 1/4 - 19 1/4
Citrus	A-Quick	16 1/4 - 18 1/4	16 1/4 - 18 1/4
	B-Medium	18 - 20	18 - 20
	C-Slow	20 - 22	20 - 22
Hernando	A-Quick	15 1/4 - 18 1/4	32 - 34 ½
	B-Medium	15 1/4 - 17 1/4	32 ½ - 34 ½
	C-Slow	17 ½ - 19 ½	33 1/4 - 35 1/4
Marion	A-Quick	12 - 14	25 1/4 - 27 1/4
	B-Medium	15 - 17	25 3/4 - 28 3/4
	C-Slow	18 - 20	28 1/4 - 30 1/4
Sumter	A-Quick	11 ½ - 13 ½	25 - 27
	B-Medium	14 1/4 - 16 1/4	26 ½ - 28 ½
	C-Slow	17 1/4 - 19 1/4	28 - 30

Source: Hurricane Evacuation Decision Making Guide, Levy County.

TABLE 4-25

CLEARANCE TIMES
LEVY COUNTY COASTAL ZONE

RESPONSE CURVE	A	B	A W/TAMPA BAY EVACUATION	B W/TAMPA BAY EVACUATION
A-Quick Response	4 1/4	4 3/4	4 1/4	4 3/4
B-Medium Response	7 1/4	7 1/4	7 1/4	7 1/4
C-Slow Response	10 1/4	10 1/4	10 1/4	10 1/4

Source: Post, Buckley, Schuh & Jernigan, Inc., as taken from Table 30, Page 113, Technical Data Report, Withlacoochee Hurricane Evacuation Study, Withlacoochee Regional Planning Council, July 1984.

TABLE 4-26

EVACUATION TIMES AND STORM INTENSITY

Storm Type	Storm Intensity	Evacuation Time
Existing	1	11.5 Hours
Existing	2	12.5 Hours
Paralleling	1	11.5 Hours
Paralleling	2	12.5 Hours
Paralleling	3	14.0 Hours
Paralleling	4	15.0 Hours
Normal	1	12.5 Hours
Normal	2	13.0 Hours

VULNERABILITY LEVEL "B"

Population At Risk

Surge-vulnerable Residents:	7,493
Mobile-home Residents:	6,426
TOTAL	13,919

Number requiring public shelter: 4,259

Recommended Evacuation Order Times

Storm Type	Storm Intensity	Evacuation Time
Normal	3	15.0 Hours
Normal	4	16.0 Hours
Normal	5	14.0 Hours

TABLE 4-27

LEVY COUNTY EVACUATING POPULATION AT RISK AND EVACUATING VEHICLES

	Evacuating Population	1	2	3	4	Evacuating Vehicles	1	2	3	4
Zone #L01	2,260	692	918	651	0	877	268	356	253	0
Zone #L02	113	35	46	33	0	44	13	18	13	0
Zone #L03	2,341	716	950	674	0	909	278	369	262	0
Zone #L04	756	231	307	218	0	293	90	119	85	0
Zone #L05	54	17	22	16	0	21	6	9	6	0
Zone #L06	127	39	52	37	0	49	15	20	14	0
Zone #L07	124	38	50	36	0	48	15	20	14	0
Zone #L08	405	124	164	117	0	157	48	64	45	0
Zone #L09	1,901	582	772	547	0	738	226	300	212	0
Zone #L010	1,696	519	688	488	0	658	201	267	90	0
Zone #L011	429	131	174	124	0	167	51	68	48	0
Zone #L012	216	66	88	62	0	84	26	34	24	0
Zone #L013	1,655	506	672	477	0	642	197	261	185	0
	12,077	3,696	4,903	3,480	0	4,687	1,434	1,905	1,351	0

1 = Red Cross Shelter
2 = Friends Home
3 = Hotel/Motel
4 = Do Not Know

% Participation 100
# per Mobile Home Unit 2.7
# per Other Unit 2.7
Avg. Veh. Per D.U. 1.6

Surge Zones L01, L02, L03

Veh. Usage % 65.5
Dist. %: S=30.6 FR=40.6 HM=28.8 DK=0

Source: Technical Data Report, Withlacoochee Hurricane Evacuation Study, WRPC.

TABLE 4-28

LEVY COUNTY EVACUATING POPULATION AT RISK AND EVACUATING VEHICLES

	Evacuating Population	1	2	3	4	Evacuating Vehicles	1	2	3	4
Zone #L01	2,260	692	918	651	0	877	268	356	253	0
Zone #L02	113	35	46	33	0	44	13	18	13	0
Zone #L03	2,341	716	950	674	0	909	278	369	262	0
Zone #L04	2,371	725	962	683	0	920	282	374	265	0
Zone #L05	130	40	53	37	0	50	15	20	14	0
Zone #L06	278	85	113	80	0	108	33	44	31	0
Zone #L07	124	38	50	36	0	48	15	20	14	0
Zone #L08	405	124	164	117	0	157	48	64	45	0
Zone #L09	1,901	582	772	547	0	738	226	300	212	0
Zone #L010	1,696	519	688	488	0	658	201	267	190	0
Zone #L011	429	131	174	124	0	167	51	68	48	0
Zone #L012	216	66	88	62	0	84	26	34	24	0
Zone #L013	1,655	506	672	477	0	642	197	261	185	0
	13,919	4,259	5,650	4,009	0	5,402	1,653	2,195	1,556	0

1 = Red Cross Shelter
2 = Friends Home
3 = Hotel/Motel
4 = Do Not Know

% Participation 100
# per Mobile Home Unit 2.7
# per Other Unit 2.7
Avg. Veh. Per D.U. 1.6

Surge Zones L01, L02, L03, L04, L05, L06

Veh. Usage % 65.5
Dist. %: S=30.6 FR=40.6 HM=28.8 DK=0

Source: Technical Data Report, Withlacoochee Hurricane Evacuation Study, WRPC.

Location Of Shelters And Capacity. A shelter analysis is conducted with four main purposes.

First, to analyze the vulnerability of potential coastal shelters and medical facilities to surge flooding.

Second, to determine the amount of available shelter capacity in Levy County. The principal shelters addressed in this analysis are those designated as primary shelters by the county civil defense departments. The principal criterion used for primary shelter designation is the structural integrity of the shelter. These shelters largely consist of the public schools in Levy County.

Third, an inventory of the shelter characteristics is taken in order to evaluate the suitability of the shelters for evacuation purposes. Of particular importance are auxiliary power and an emergency water supply.

Fourth, a comparison is made between the number of persons desiring public shelter in Levy County with the available primary shelter capacity in Levy County. A comparison is also made with the number of persons desiring shelter from the Tampa Bay region entering the coastal counties via U.S. 41.

Potential primary shelters which are subject to possible surge flooding should not be used for evacuation purposes. In addition, medical facilities and nursing homes which may be vulnerable to surge should be identified as special personnel and emergency vehicles will be required to evacuate these persons. These potential primary shelters will not be used in calculating shelter capacity.

Table 4-30 shows shelters and facilities which are vulnerable to surge.

The capacity of each shelter is determined based on a requirement of twenty [20] square feet of usable shelter space per person. This relatively small requirement is justified on the basis that the shelter duration period will probably not exceed eighteen [18] to twenty-four [24] hours in most cases.

Areas of usable shelter space within each shelter must be calculated. This area must contain a small percentage of window space on the exterior walls and must have a fairly large percentage of open space to be effectively utilized as a shelter space. Thus, storage areas, heavy equipment areas, offices, etc., are unacceptable as shelter space. Therefore, the most usable space can be found in school classrooms, cafeterias and libraries.

TABLE 4-29

AVAILABLE COASTAL COUNTY HOTEL/MOTEL CAPACITY - LEVY COUNTY

Hotel/Motel Name	Location	Total Capacity	Vacancy Rate	Available Capacity
Holiday Motel	US 27A & Main St. Bronson, Florida	158	36.3%	57
Chiefland Motor Court	US 19 & US 27A	124	36.3%	45
Funny Farm Family Inn	Main St. & SE 9th Ave. Chiefland, Florida	78	36.3%	28
Holiday Motel	US 19N & C237 Chiefland, Florida	140	36.3%	50
Manatee Springs Motel	US 19N & C346 Chiefland, Florida	176	36.3%	63
Tomahawk Motel	US 19N & C346 Chiefland, Florida	120	36.3%	43
Crystal Oaks Motel	US 19N & C346 Fanning Springs, Florida	68	36.3%	24
Holiday Lodge Motel	US 19 & SR 26 Fanning Springs, Florida	256	36.3%	92
J-R Motel	US 19 & C 55A Fanning Springs, Florida	84	36.3%	30
Southern Inn Motel	US 19 & C 346 Fanning Springs, Florida	48	36.3%	17
Williston Motor Inn	W. Noble Ave. & 6th St. Williston, Florida	636	36.3%	230
TOTAL	----	1,888	36.3%	697

TABLE 4-30

SHELTERS/MEDICAL FACILITIES VULNERABLE TO SURGE

	Shelter/Facility Name	Vulnerability Level A	B
	Cedar Key High *	X	X
(L8)	Yankeetown School *		X
	Crystal River High	X	X
	Crystal River Middle	X	X
	Crystal River Primary	X	X
	Homosassa Elementary	X	X
(H8)	Westside Elementary		X
	Crystal River Geriatric Center (90)	X	X
	ACLF Home (18)	X	X

* Levy County

Source: Technical Data Report, Withlacoochee Hurricane Evacuation Study Withlacoochee Regional Planning Council.

An inventory of primary shelters shows that most shelters do not have auxiliary power or an available emergency water supply. Water and wastewater treatment are mainly provided by municipal service, although some utilize wells, septic tanks, and on-site wastewater treatment plants. Most of the kitchen facilities require electric power for cooking; however, some use gas, which is useful in the event of power outage. Ample parking may be a problem at some shelters due to a small number of parking spaces or a limited area for potential parking.

Table 4-31 gives the location, address and capacity of all primary shelters for Levy County. Table 4-32 gives the characteristics of each of these primary shelters. As can be seen, none of these shelters have either independent power or independent water. Table 4-33 shows the availability of parking spaces for each primary shelter.

Net shelter capacity is the comparison of the number of persons requiring shelter in Levy County with the available primary shelter capacity. A comparison is also made with the shelter demand generated by the Tampa Bay region.

Table 4-34 displays the net shelter capacity for Levy County. This table indicates the number of persons vulnerable to storm surge and hurricane force winds who desire public shelter by vulnerability level in Levy County. Also shown is the total primary shelter capacity for Levy and the net shelter deficit or surplus.

This table also shows the net shelter capacity in the coastal counties in the event of a hurricane striking the Tampa Bay region. The shelter demand figure represents the worst case Tampa Bay regional evacuation scenario for the coastal counties of the Withlacoochee Region.

In addition, Table 4-34 indicates that in the case of an evacuation order issued for the Withlacoochee region only, there is sufficient primary shelter capacity. However, if the Tampa Bay region is also ordered to evacuate, a net shelter deficit for primary shelters would result.

As a consequence of the deficit in shelter capacity, secondary shelters have been designated. Secondary shelters consist of only churches and civic centers. The criteria for inventorying these secondary shelters are

less stringent than for public schools, which are primary shelters. The reason for this is because secondary shelters will only be used if primary shelter capacity is insufficient. Also, secondary shelters will only be used for the shelter duration period, the amount of time before and after the occurrence of gale force winds.

TABLE 4-31

LEVY COUNTY PRIMARY SHELTER CAPACITY

	Shelter Name	Address	Capacity 2/
(L1)	1/Bronson Elem. School	School St. & Pine St. Bronson, FL 32621	477
(L2)	Bronson High School	School St. & Pine St. Bronson, FL 32621	360
(L3)	Joyce Bullock Elem. School	SW 3rd St. & SW 1st Avenue Williston, FL 32696	1,055
(L4)	Chiefland Elem. School	US 19W & 8th Avenue Chiefland, FL 32626	1,270
(L5)	Chiefland High School	US 19W & 8th Avenue Chiefland, FL 32626	1,095
(L6)	Williston High School	US 41 & SW 6th Street Williston, FL 32696	1,159
(L7)	Williston Intermediate School	C-511 & C331A Williston, FL 32696	385
(L8)	Yankeetown School	Port Ave. & Schoolcraft Drive Inglis, FL 32649	212
TOTAL			**6,015**

1/ Corresponds with shelter identification number on maps

2/ Based on twenty (20) square feet of usable shelter space per person

Source: Levy County School Board

TABLE 4-32

LEVY COUNTY PRIMARY SHELTER CHARACTERISTICS

Shelter Name	Independent Power	Independent Water	Sewer Septic/Sewer	Kitchen Gas/Electric
Bronson Elem. School	No	No	Septic	None
Bronson High School	No	No	Septic	Gas
Joyce Bullock Elem. School	No	No	Sewer	None
Cedar Key High School	No	No	Septic	Gas
Chiefland Elem. School	No	No	Sewer	None
Chiefland High School	No	No	Sewer	Gas
Williston High School	No	No	Sewer	Gas
Williston Intermediate School	No	No	Sewer	Gas
Yankeetown School	No	No	Septic	Gas

Source: Levy County School Offices.

TABLE 4-33

VEHICLE CAPACITY AND GENERAL COMMENTS: LEVY COUNTY

Shelter Name	Vehicle Capacity # of Parking Spaces	Vehicle Capacity Acres	General Comments
Bronson Elem. School	0	0	Kitchen cafeteria, & parking shared with Bronson High School
Bronson High School	100	5	
Joyce Bullock Elem. School	25	3	Kitchen & cafeteria shared with Williston High School
Cedar Key High School	30	3	
Chiefland Elem. School	75	10	Kitchen & cafeteria shared with Chiefland High School
Chiefland High School	150	10	
Williston High School	75	4	
Williston Intermediate School	20	20	
Yankeetown School	20	6	

Source: Levy County School Offices

* All shelters do not have weather alert radios.

TABLE 4-34

NET SHELTER CAPACITY

County	Vulnerability Level	Shelter Capacity	Shelter Demand	Net Shelter Capacity
Levy	A	6,013	3,696	2,317
	B	5,801	4,295	1,542
Citrus	A	13,110	8,046	5,064
	B	13,110	8,954	4,156
Hernando	A	11,018	5,715	5,303
	B	9,126	7,833	1,293
Coastal County Total	A	30,141	17,457	10,490
	B	28,037	21,046	6,991
Tampa Bay Evacuees		28,037	16,793 1/	11,244
Coastal County Total Plus Tampa Bay Evacuees		28,037	37,839	-9,802

1/ "Report On The Expected Coastal Demand For Inland County Shelter Facilities From The Tampa Bay And Southwest Florida Regions", Florida Bureau of Disaster Preparedness.

Source: Technical Data Report, Withlacoochee Hurricane Evacuation Study.

Table 4-35 gives the names, addresses and capacity of the secondary shelters in Levy County.

Table 4-36 presents a comparison between the shelter demand from the coastal counties and Tampa Bay with available primary and secondary shelter capacity. The coastal county shelter demand figures are based on the worst case surge vulnerability. It can be seen that there is still a very small deficit if both the Withlacoochee and Tampa Bay regions are issued an evacuation order.

However, it should be noted that, in reality, if the number of Tampa Bay evacuees entering the Withlacoochee region and/or if the percentage of the population at risk desiring or requiring public shelter in the coastal counties is lower, there will probably be more than sufficient coastal shelter capacity to accommodate both the Withlacoochee and Tampa Bay regions.

TABLE 4-35

LEVY COUNTY SECONDARY SHELTER CAPACITY

	Shelter Name	Address	Capacity 2/
(L9)	Methodist Church	235 Court Street Bronson, Florida	200
(L10)	First Baptist Church	Court St. & Capital St. Bronson, Florida	300
(L11)	Church of Jesus Christ	CR 418 & SR 345 Chiefland, Florida	196
(L12)	Ebenezer Baptist Church	CR 30 & CR 339 Chiefland, Florida	250
(L13)	First Baptist Church	US 27A & NE 4th Street Chiefland, Florida	500
(L14)	Firsts United Methodist	NE 1st Street & NE 7th Ave. Chiefland, Florida	50
(L15)	Church of Christ	CR 326 & US 41 Morriston, Florida	125
(L16)	Church of God	SE 4th St. & SE 3rd Ave. Williston, Florida	150
(L17)	Faith Baptist Tabernacle	SR 500 & CR 335A Williston, Florida	228
(L18)	First Baptist Church	131 E. Noble Avenue Williston, Florida	800
(L19)	First United Methodist Church	W. Noble Ave. & SW 2nd St. Williston, Florida	200
TOTAL			**2,999**

TABLE 4-36

NET SHELTER CAPACITY WITH SECONDARY SHELTERS

County	Primary Shelter Capacity		Secondary Shelter Capacity		Shelter 1/ Demand		Net Shelter Capacity
Levy	5,801	+	2,999	-	4,259	=	4,451
Citrus	13,110	+	3,056	-	8,954	=	7,212
Hernando	9,126	+	3,664	-	7,833	=	4,957
Coastal County Total	28,037	+	9,719	-	21,046	=	16,710
Coastal County Total Plus Tampa Bay Evacuees	28,037	+	9,719	-	37,839	=	-83

Sources: Withlacoochee Regional Planning Council staff analysis.

Report On Expected Coastal Demand For Inland County Shelter Facilities From The Tampa Bay And Southwest Florida Regions, Florida Bureau Of Disaster Preparedness.

Notes: **1/** Based on worst case surge vulnerability.

Conditions in the Coastal Zone at the Date of the EAR

Coastal Zone Data and Analysis

Existing Land Uses

Land uses in the coastal zone are depicted on the 1996 Existing Land Use Map included with the EAR.

Public Conservation Lands in the Coastal Zone are included in Map 8-7 in the Natural Resources Series in the Appendix to Part 2 of the EAR.

Conflicts Among Shoreline Uses

The corresponding narrative from the 1990 Plan is current, with the following exceptions:

> Sea level is rising. The Florida Division of Forestry has reported that thousands of Sabal Palms along the Levy County shoreline have died. The updated Comprehensive Plan needs to assess the potential impacts of increased flooding in coastal areas, and a shoreline that is migrating to the east.
>
> In 1995, the Levy County Commission adopted a Manatee Plan to minimize conflicts between shoreline and water recreation uses and the West Indian Manatee which inhabits the Withlacoochee River. The Plan was mandated by the Department of Community Affairs as a prerequisite for moving the Citrus and Levy County boundary from the Levy shoreline to the center of the Withlacoochee River. It is anticipated that the Manatee Protection Plan may become part of the Levy County Comprehensive Plan when it is adopted in 1997.

Economic Base Analysis

The economic base analysis summarized in Part 1 is still descriptive of economic conditions in the coastal zone. However, because economic data are not available for specific geographical areas within the unincorporated area of Levy County, there does not exist at this time a sufficient database to describe changed economic conditions except in narrative form, as below.

A very definite negative impact on the coastal zone economy was the fishing net ban enacted by Florida voters in November 1994. This has directly lead to the closing of some fish and seafood houses and has disrupted the water-dependent livelihoods of fishermen in the Levy County coastal zone. Ongoing efforts to promote shellfish farming off the Levy County coast may result in increased demands for appropriate marine bottomlands and related shore support facilities.

Need for Water-Dependent/Water Related Development Sites

The base conditions described in the 1990 Plan are considered to be largely unchanged. It is not possible to measure or estimated the need for water-dependent and water-related development sites with any confidence. However, increased tourist activities could result in increased demands for fishing piers, boat ramps, marinas, baithouses and other water-related facilities such as restaurants and accommodations.

The need for redevelopment activities could arise at any time as the result of hurricane or other natural disaster damage to the coastal zone's buildings and infrastructure. This was demonstrated by the unforseen destruction cased by the "Storm of the Century" in March 1993.

Impacts of Future Land Uses on Natural Resources

The 1990 Plan assessed the possible impacts of proposed future land uses on natural resources in the coastal zone. Because of the importance of this analysis to the preparation of the Evaluation and Appraisal Report and the update of the Comprehensive Plan, the then-unanticipated effects of each land use category are generalized below.

Conservation/Future Conservation

These uses were planned to comprise about 30% of the delineated Coastal Zone, which would remain in a state of preservation or management for wildlife or timber with limited improvement for public access. This impact was seen to be beneficial to natural resources in those areas (LCCP: 4-83).

Forestry/Rural Residential

Proposed densities of one dwelling unit per 40 acres (or one unit per 10 acres in an approved Florida Quality Development) were expected to continue to: allow commercial forest management without being confronted with incompatible land uses; allow hunting camps, primitive camping and weekend or vacation homes at very low densities with "virtually no impact upon resources;" and, allow rural residential subdivisions pursuant to the "highest review and performance standards available under Florida law." Not short term impact on forest resources was anticipated, although "the long term result was expected to be a significant decrease in the commercial forest and resource base unless others lands currently in row crops or pasture are converted to forestry uses" (LCCP: 4-83, 84).

Forestry/Greenline Area of Concern

Densities in this category were identical to Forestry/Rural use above except that any rural residential subdivision with more than one dwelling unit per 40 acres would require municipal water and sewer services. Long term impacts were expected to enhance the protection of natural resources by removing septic tanks in use and requiring planned developments to install central sewer service. This was expected to keep septic waste from negatively impacting the resource that the "greenline" designation was intended to protect (LCCP: 4-84).

Recreation

Existing recreation facilities were proposed to be maintained, improved and/or increased in capacity to serve increased demand. However, increased demand and usage was seen to have the potential to damage some resources, primarily from oil and gasoline spills from boats utilizing county boat ramps as well as from bilge pumping and human waste disposal and littering (LCCP: 4-84).

Residential/Municipal Service District

The Cedar Key Municipal Service District was seen as having little or no effect on natural resources. However, residential urban service areas around Inglis and Yankeetown were expected to adversely impact Waccassasa Bay unless "carefully planned in terms of waste disposal and storm water run-off" (LCCP: 4-84).

Agriculture

Only about 1% of the coastal zone was designated as Agriculture as a proposed future land use. These areas were suited for cattle pasture and timber production. It was anticipated that potential impacts on natural resources were insignificant (LCCP: 4-84).

Impacts of Development on Historic Resources

The 1990 Plan concluded that development and redevelopment would have no impact on historical resources and sites in the Coastal Zone.

Estuarine Pollution

Because much of the Levy County coastline was either in public ownership or of low development potential, the chances of effluent from development activity or from commercial or residential activity reaching the estuaries was low except around Cedar Key and Yankeetown.

The most likely development impacts on estuarine water quality was anticipated to be increased levels of coliform bacteria. However, the 1990 Plan stated that "...the chances of this occurring are not imminent as yet" (LCCP: 7-4-78).

Natural Disaster Planning

The Peacetime Emergency Plan, adopted in 1992 and updated in 1994, is being revised as a Comprehensive Emergency Management Plan (CEMP) in 1996, and will be available for use in the 1997 update of the Comprehensive Plan. The Corps of Engineers (COE) Cedar Key Basin Hurricane Evacuation Study is the basis for CEMP's updated database for hurricane preparedness planning. Tables from the COE study are included in the Appendix to Part 2 of the EAR to update Coastal Zone database for emergency planning.

Beach and Dune Systems

Because Florida's west coast is a "low energy" coast with insufficient wave action to move sand to build up beach-dune formations along the shoreline, naturally-occurring beaches are almost unknown in Levy County. However, there were some sandy deposits on the coastal fringes near the mouth of the Suwannee River. The two beaches on the county were man-made, the result of dredge and fill operations. There were located at Cedar Key and at the county park west of Yankeetown (LCCP: 4-44).

Public Access Facilities

Public access facilities at Yankeetown and Cedar Key destroyed in the March 1993 storm were reconstructed by the County.

Infrastructure

Infrastructure in the Coastal Zone was limited in size and scope and was mostly centered around the two coastal towns of Yankeetown and Cedar Key. Coastal Zone infrastructure is generalized by type below.

Roads

There were approximately 57 linear miles of roads in the Coastal Zone comprising a paved area of 1017 square miles. Numerous unpaved roads formed a network between the major roads, rural homes, and logging sites. No attempt was made to account for the status and extent of unpaved roads in the Coastal Zone (LCCP: 4-49).

Airport

A county airport was located in the Coastal Zone near Cedar Key. The status of this facility is discussed in the Traffic Circulation portion of the Evaluation and Appraisal Report.

Drainage

Infrastructure constructed to aid drainage along Coastal Zone roads consisted of: 1) a crown or raised profile in the center of paved roads to encourage water flow in the gutters and swales; 2) ditches and swales on both sides of all major roads; and, 3) culverts under roads to facilitate overland sheet flow under the raised road bed. Not counting, the town of Cedar Key's paved streets, the Coastal Zone had approximately 57 miles of crowned road and 114 miles of swales paralleling those roads. Additionally, there were approximately 150 culverts or multiple culvert structure under the major roads of the Coastal Zone with an average length of 85.7 feet and a total cross sectional area of 3,085 square feet (LCCP: 4-52).

Sewage Treatment

The population of the unincorporated portion of the Coastal Zone was sewered by septic tanks. The only place where population density and lack of adequate natural drainage and treatment capacity in the surrounding soils force reliance on a sewage treatment plant was Cedar Key. The 1990 Plan stated that the sewage treatment plant was then operating just at peak capacity (100,000 gallons per day) and that a special event such as a festival overwhelms it with 150,000 to 200,000 gallons per day demand passing raw sewage untreated into coastal waters. The Plan observed, "clearly, the treatment capacity in the Cedar Key area needs expansion")LCCP: 4-52).

Potable Water

Except for Cedar Key and Yankeetown, all residents in the Coastal Zone drew water from private wells (LCCP: 4-56).

Electric Power

Electric power in the Coastal Zone was provided by the Central Florida Electric Cooperative (LCCP: 4-57).

Port Master Plan

Not applicable.

Impacts of Cedar Key Hurricane Evacuation Study

Map 4-3 (p.2-59A) show the coastal high hazard area as it was known in 1990, and it has been increased as a result of the Storm Surge Atlas prepared by the US Army Corps of Engineers as part of the Cedar Key Hurricane Evacuation Study. As shown on the map, a Category 1 storm, the "mildest" category of hurricane, is now expected to reach farther inland, thereby expanding the "Coastal High Hazard Area". As assessment of the impacts of this expanded area includes:

1. Shelter Capacity. A surplus of shelter space exists. About 3,500 persons could require in-county public shelter (TS-2 Scenario), but capacity exists for 5,672 persons, leaving a surplus of 2,172 spaces.

2. Land Use. All of the increased high hazard area is in the Forestry-Rural Residential land use category, with allowable densities of 1 dwelling unit per 20 acres for a conventional subdivision. This is the lowest density allowed by the county, and none of the effected area should be given higher densities in the future.

3. Infrastructure. According to Billy Cobb, Levy County Administrative Assistant, the only county infrastructure within the expanded high hazard area consists of roads. C-347 is included in the area, extending for about 14 miles, and it is a part of the evacuation network (Segment E), and C-326 provides access to the Waccasassa River and marina. All other county roads in the affected area are limerock roads. With the exception of the designated evacuation routes, which periodically will require reconstruction, no other county infrastructure should be placed within the expanded coastal high hazard area.

Conservation

The shorelines of the Suwannee Waccassasa and Wekiva rivers and designated on the Future Land Use Map as "Conservation", and in the Conservation Element the streamside management zones are designated as "Environmentally Sensitive." The provision of resource-based recreation opportunities within these areas will now have to be accomplished with consideration of the probability of a storm surge that extends up the Suwannee River for about 14 miles and up the Waccasassa River for about 6 miles.

Interagency Hazard Mitigation Team Report

prepared in March 1992, this plan must be adopted by Levy County pursuant to the Levy County Comprehensive Plan, Coastal Element Policy 3(h)(4). As discussed in Part 6 of this EAR, there are five (5) recommendations in the report that should be considered for adoption. These recommendations can then be incorporated into the new post-disaster redevelopment policies.