

Section 3.2.2. Conservation Element

Background Discussion

The purpose of the Conservation Element of the *Sanibel Plan* is to promote the conservation, use and protection of natural resources.

The data and analyses for this element of the *Sanibel Plan*, pursuant to *Section 163.3177(6)(d), Florida Statutes* is provided in this sub-section.

The City of Sanibel, located on a 12-mile long barrier Island off the coast of Southwest Florida, is in the subtropic region. This unique environment has produced an abundance of natural resources.

Some of these natural resources have been significantly altered by past development activities. However, since the original adoption of the *Sanibel Plan*, the alteration of natural resources has been reduced and many impacts of this alteration have been mitigated. The conservation and enhancement of natural resources has always been a goal of this Plan.

About two thirds of the total land area on Sanibel lies within conservation areas owned by private or governmental conservation agencies. Although this may seem very high, it is not when one considers the Vision Statement of this Plan and the fact that very little of Sanibel's land is suitable for residential and commercial development. Those areas most in need of protection are beaches, mangroves, wetlands and areas of rare and high quality vegetation such as the areas of West Indian flora. Most of the mangroves are included within existing conservation areas, primarily the J. N. "Ding" Darling National

Wildlife Refuge. Most land owned by the Sanibel-Captiva Conservation Foundation is in the interior freshwater wetlands. The Gulf beach and bay beach are protected as preservation districts as provided in this Plan. However, in upland areas known as "hardwood hammocks", a disappearing habitat is the "coastal scrub", home to gopher tortoises and unique desert-like plants, including joewoods.

The major thrust of the entire *Sanibel Plan* is committed to the objective set forth in the City Charter of Sanibel to conserve the "unique atmosphere and unusual natural environment" of this Island community. Thus, all elements of the Plan are interrelated with the City's major objective to conserve its natural resources for present and future generations to enjoy.

Sanibel's natural environment performs many valuable functions for humans at no cost. It buffers storm winds and flood tides, stabilizes the shoreline, purifies water, and maintains a freshwater system that supports a rich wildlife population and lush vegetation. These functions support the health, safety and welfare of every Sanibel resident and must be preserved.

Different parts of the Island contribute in varying degrees to each particular function. For planning purposes, the Island has been divided into ecological zones, each with individual characteristics, each making specific contributions to health, safety and welfare, and each with varying tolerances to the range of human activities. Six ecological zones have been identified on Sanibel, three of which are further divided into subareas, Gulf Beach, Gulf Beach Ridge, Freshwater Wetlands, Mid-Island Ridge, Mangrove Forest and Bay Beach. The Gulf Beach Zone is subdivided into Gulf Front Beach and Gulf Back Beach. The Freshwater Wetland is composed of Upland and Lowland subareas. A Blind Pass Zone is designated in the Blind Pass area.

Ecological Zones

In general, Sanibel is a collection of truncated ridge-and-swale systems formed at varying sea levels. Hence, the Mid-Island Ridge is a series of ridge set truncations that forms a nearly continuous ridge of higher elevations. In some places the roadbed of the Sanibel-Captiva Road links or extends these elevations. The Gulf Beach Ridge is also a series of ridge sets which interact with the primary dune to create a nearly continuous ridge at an elevation of generally five feet or greater. The freshwater wetlands of the interior, while acting as a single basin with a connected surface water table, are actually a collection of ridges and swales. The ridges vary in elevation from approximately six inches to several feet. The swales and low ridges are frequently inundated while the more well-defined ridges become submerged only occasionally.

Gulf Beach Zone

The Gulf Beach Zone includes all land seaward of the 1974 Coastal Construction Control Line. This line was revised landward by the State in 1991; however, the City continues to use the 1974 Coastal Construction Control Line to define the landward extent of this Preservation District: the Gulf Beach Zone.

The Gulf Front Beach is the most active beach zone and includes the area between mean high water and the City's boundary one-half mile offshore. Sand in this zone is in constant motion. Sand migrates between the primary dune and offshore bars and is transported up and down the coast by longshore currents. Examination of historical surveys and aerial photographs shows that erosion and accretion of sand along the beaches is an ongoing dynamic process. This zone maintains several functions critical to public health, safety and welfare. It is the Island's first defense in the event of storm and flood, when the impact

of waves erodes the sand reservoir in the berm. The natural form of the Gulf Beach Zone is a response to the natural processes of wind, currents and waves. Undisturbed, it is in a state of balance with natural forces, thus maintaining the shoreline. This area also supports much of the marine life for which Sanibel is famous, and is an important feeding area for Island wildlife.

The Gulf Back Beach, though less volatile than the front beach, also absorbs considerable impact from storm-generated wind and waves. This is the area between mean high water and the 1974 Coastal Construction Control Line. It is a reservoir of sand that may be eroded after the primary dune in a severe storm, thus protecting property further inland on the Beach Ridge. The dunes are an important nesting area for wildlife, the loggerhead turtle being a prime example. The vegetation of the Back Beach is particularly important, as it stabilizes and holds the sand.

Both components of the Gulf Beach Zone have a very low tolerance to man's activities. Removal of sand, disposal of stormwater runoff, excessive foot traffic or any vehicular traffic can quickly induce major erosion and other impacts on the beach. Strict regulations are, therefore, required to maintain this zone. Removal of sediments from the beach should be avoided and construction of any sort that would change the configuration of the beach or inhibit sand movement should be undertaken only as a last resort in efforts to preserve the beach or protect vital infrastructure. Wildlife access to the beach should be maintained and public access to the beach should be confined to narrow paths and elevated walkways in heavily used areas such as resorts and public parks. Because of their shallow root system and propensity to form monocultures, Australian pines (*Casuarina sp.*) are not suitable plants in this zone and

should be selectively thinned and replaced with hardy dune vegetation.

Bay Beach Zone

The Bay Beach Zone, an “active beach” zone, extends along the Island’s bay shoreline between a 50-foot setback from the mean high water line to the City’s boundary one-half mile off-shore. Although the Bay Beach is a lower energy beach than the Gulf Beach, it nevertheless serves the same valuable storm and flood protection, shoreline stabilization, marine life and wildlife habitat and feeding functions. The natural processes are similar and so too are the constraints to development. Regulations similar to those outlined for the Gulf Beach Zone are required to maintain the functions of this zone.

Mangrove Zone

The Mangrove Zone includes black (*Avicennia germinans*), red (*Rhizophora mangle*), as well as, all buttonwood (*Conocarpus erecta*) and white (*Laguncularia racemosa*) mangrove areas that are tidal and less than three feet in elevation (1.8 feet NAVD) and the tidal flats within and around them. This zone includes most of the bay portions of Sanibel. In ecological and energy terms, no zone is more valuable and efficient. The number of jobs done for humans at no cost (save the price of preserving mangroves) is not exceeded by any other zone. Mangroves protect public health, safety and welfare by buffering storm winds and flood tides from the bay, by stabilizing and extending the shoreline, by maintaining and improving water quality, by protecting the highly productive marine ecosystem, and providing food, shelter and nesting areas for wildlife. This zone also has a low tolerance for alteration by man. Its existence is dependent on the regulation of activities in adjacent areas.

Wetlands Zone

The Wetlands Zone is the stormwater drainage watershed of the Island. Frequently, it forms a fresh surface water reservoir. Much of the Island’s interior is in this zone that essentially consists of a single large basin. The Freshwater Wetlands Zone is actually composed of parallel systems of ridges and swales with corresponding bands of vegetation that tolerate either persistent inundation within the swales or fluctuating wet/dry conditions on the ridges. There are two subareas within this zone: Lowland Wetlands and Upland Wetlands. The lowland area is composed of low ridges and wide swales; the upland consists of higher, broader ridges and narrower swales. The entire zone is the major recharge area for the shallow freshwater aquifer.

Brazilian pepper trees had infested hundreds of acres of the interior wetlands, drastically reducing their function as wildlife habitat. Exotic plant control programs are ongoing but efforts need to be continued to restore degraded areas of this vital system. The City is well into the successful implementation of its program of mandatory removal of Brazilian pepper. Brazilian pepper has been removed from about 3,200 acres, 80 percent of the 4,000 acres of non-conservation lands in the program.

Lowland Wetlands

The lowland area typically experiences extended periods of immersion each year. Since it is lower than the surrounding area, it serves as a storage area for surface waters until they are absorbed into the aquifer, evaporated or routed to another location. So long as the elevations in the lowlands are not substantially increased by filling, this area will serve as retention areas and high quality wetland habitat for wildlife

while reducing saltwater intrusion into the shallow ground-water aquifer.

This zone has a “fire ecology”. Periodic fires burn off accumulated dead plants, release nutrients to the soil and kill invading woody shrubs and trees. These large recurring wild fires are a hazard to human settlement in this area but are essential to the maintenance of this zone. Controlled or prescribed burns intentionally set by land managers can continue this natural process while limiting risks to private property. Controlled fire is being effectively used in management programs for conservation lands. Conservation lands are managed to reduce the risk of fire damage to adjoining lands and land uses, whether the fire is naturally caused or is a controlled or prescribed burn.

This zone also has the capacity to maintain and improve water quality, and provides food, shelter, water and nesting areas to many of Sanibel’s most renowned wildlife, including the American alligator and numerous species of wading birds.

Excavation of the aquiclude, the placement of fill, the impediment or impoundment of natural water flow, the disruption or alteration of natural drainage channels and the use of septic tanks are either prohibited or controlled through development performance standards. Impervious paving and the clearance of native vegetation are regulated in a fashion to minimize adverse impacts. Storm runoff from paved or developed areas is to be detained and dispersed slowly to the natural hydrologic system. Programs of fire management and water level control should be maintained. Wildlife corridors should be established connecting nature preserves to the Sanibel River, and providing for wildlife movement along the River.

Upland Wetlands

The upland area is characterized by less frequent flooding than the lowland area and has more upland vegetation types. This area is more tolerant to human activities than the lowlands, and therefore the performance standards need not be as strict as those for the lowlands. The placement of fill, excavation of the aquiclude and the use of septic tanks are prohibited or controlled by City regulations. The impoundment of natural water flow or disruption of natural drainage channels is also controlled. Wildlife corridors should be established connecting nature preserves to the Sanibel River. The Surface Water Management Plan, adopted in August of 1989, continues to be implemented in accordance with the provisions of the plan toward improving the wetland system of the Sanibel River, to enhance water quality and vegetative and wildlife habitat, while reducing the severity of major flooding events for those residing in wetland areas. To further restore the historic hydro-period in the freshwater wetlands, an additional weir is being considered. This weir can elevate the seasonal water table in the conservation lands to the west of the Sanibel Highlands subdivision and east of Tarpon Bay Road.

The acquisition and restoration of environmentally sensitive conservation lands has been a major accomplishment for the community. The conservation efforts by the U.S. Fish & Wildlife Service, the State of Florida, the Sanibel-Captiva Conservation Foundation and the City of Sanibel are coordinated to manage these essential natural resources. Acquisition and restoration efforts are highlighted by the Sanibel Gardens Preserve and Pond Apple Park projects.

Gulf Beach Ridge Zone

The Gulf Beach Ridge Zone is the major ridge dividing the Gulf from the wetlands in the interior. It extends to the western end of the Island and includes upland areas of Blind Pass Keys. Much of the Blind Pass area is included in this zone because of its relatively recent formation. The Gulf Beach Ridge Zone serves many valuable functions in the maintenance of the health, safety and welfare of Sanibel residents. The ridge buffers flood tides and storm winds and prevents increased flooding in the interior (unless overtopped by waves) and contributes to shoreline stabilization. Maintenance of elevation and vegetation are the keys to the protection of these valuable functions. Vegetation stabilizes the ridge and prevents erosion of the soil. Much freshwater runoff enters the ground in the Gulf Beach Ridge Zone, halting inward intrusion of saltwater from the Gulf and thus maintaining the extent of the fresh water lens. Soil and vegetation in the ridge filter runoff and protect water quality. Although this zone is crucial to health, safety and welfare, it is more tolerant to residential development than other more sensitive zones on the Island. An exception to this is the coastal scrub habitat, which supports many plant and animal species listed as threatened, and is rapidly being lost to development and intrusion by hardwoods and exotic trees. Another exception is the Blind Pass area, which is extremely dynamic and unstable in nature and hazardous to human settlement. The Blind Pass Zone is discussed separately later. Excavation that results in lowering the elevation of the ridge or in penetration of the aquiclude is prohibited. Disruption or alteration of natural drainage channels is restricted. The use of septic tanks has been eliminated through implementation of the Master Plan for Wastewater Treatment. Storm runoff from paved or developed areas to the beach is strictly controlled. Impervious paving and clearance of native vegetation is restricted. The planting of native beach ridge vegetation should

be encouraged in areas which are not well vegetated or that are dominated by exotic trees, such as Brazilian pepper.

Blind Pass Zone

The Blind Pass area is the youngest and least stable part of the Island. It is an inlet system very susceptible to dramatic change both in a storm and over time. One hundred years ago, most of the Blind Pass area existing today was non-existent. Over the past century, this area has been constantly changing; the shoreline has shifted and accreted and eroded. The loss of sand into inlets is, at most, temporary, and even then only where there are new inlets, which do not yet have tidal deltas, does this become a major process. Any sediment that is trapped in the inlet itself is ultimately moved either in or out into the tidal delta storage bins. Since the ebb currents are generally the dominant inlet force, most sand moving into an inlet will ultimately be deposited in an offshore ebb delta. The shape of the ebb delta and the sediment movement within the delta is strongly controlled by the interaction of the ebb and flood currents with the offshore wave system and the longshore currents. The sand stored in the ebb delta is now available for littoral transport onto the downdrift beach system. Also, high energy storms and floods flush out the inlet and move the sand laterally to be used to absorb the storm energy in the adjacent forebeach areas. Thus an inlet system plays an important role in sediment storage for use as an energy sponge during storms and has built-in sediment bypass mechanisms. Consequently, inlet systems represent an integral part of the overall sediment budget of the coastal system and contribute to the overall natural ability of the system to roll with the energy punches with minimal adverse effects. Modification and/or stabilization of an inlet will limit or eliminate this ability, increasing the potential for accelerated shoreline erosion resulting from major storms.

All standards for the Gulf Beach Ridge Zone should be applied here with several further restrictions in changing or developing this area. Permanent human settlement in this high hazard area should be restricted to very low density or prohibited. Any activity which would result in the alteration of or interference with inlet dynamics and island-building functions in this area should be carefully evaluated and avoided as much as possible.

Mid-Island Ridge Zone

This zone comprises the major ridges along much of the central axis of the Island and includes the Island's higher natural topographic elevations. In most areas, this zone divides the bay-mangrove watershed from the freshwater wetlands watershed. Like the Gulf Beach Ridge, this zone is important in providing storm and flood protection, in recharging the shallow freshwater aquifer, and in preventing degradation of water quality. This zone is the most tolerant for development with the application of regulations to protect crucial health, safety and welfare functions. Excavation that results in lowering the elevation of the ridge or in penetration of the aquiclude is prohibited. Storm runoff from paved or developed area is to be retarded and dispersed slowly to the natural hydrologic system. Natural drainage channels are not to be disrupted or altered. The use of septic tanks, impervious paving and the clearance of native vegetation is restricted.

Altered Land Zone

This is land altered by humans disturbing the natural topography, hydrology and vegetation of an area usually for real estate development purposes. In most cases, the area delineated on the Ecological Zones maps has been elevated to approximately four feet above mean sea level either by importing fill or by excavation within the site area. The purpose

of such modifications has been to transform low lying land that is often wet and unsuitable for development into high, dry land, associated in some cases with lakes, lagoons and canals formed by dredging below the water table. For planning purposes, only the larger areas of filled, cleared and builtout lands were mapped as Altered, thereby excluding spoil areas from mosquito ditches and canals that did not cover extensive areas. Some areas have been filled for 50 years or more, with subsequent reestablishment of grasses and woody plants. In such cases, they were not classified as Altered Land. Areas that were more recently altered and are classified as Altered Land frequently are bare but for the invasion of scattered weeds. Eventually, if left undisturbed, these lands may return to a natural state.

Delineation of the Ecological Zones

The designation of ecological zones is the basis for establishing the Official Zoning Map of the City of Sanibel.

The key that was used to determine and map ecological zones is provided as an appendix to this Plan.

Vegetation

The vegetation of Sanibel is a complex of many factors. Although it is subtropical by location, it contains a surprising number of communities despite its small size and lack of topographic variation. It embraces elements of tropical, subtropical and temperate flora, and it contains a confusion of foreign species established in the wild from cultivation or landscaping activities. These have taken advantage of disturbed areas and caused native species and even entire communities to all but disappear.

Sanibel's natural attributes are responsible for this wide ranging, sometimes lush vegetation. Except for fierce periodic storms, the climate is largely benign, with high seasonal rainfall, dazzling sunlit days, breezes and high humidity. These conditions permit luxurious, dense subtropical vegetation with rapid rates of succession and the incredible prospering of exotic species.

Since it is an Island, Sanibel's role as a provider of habitat for vegetation and wildlife is quite unique. Traditionally, islands have a more limited flora than their equivalent on the mainland. Although this is true of Sanibel, it is surprisingly diverse for an island. Some species are few in number, hinting that, at some time, there may have been a marked change in land use in the vicinity. It also indicates that these species might flourish if encouraged here. Islands are sites of specialization and hybridization. This may not be evident yet, but it is a process that goes on unless impeded by humans.

Development has brought additional indignities to the vegetation on the Island. Clearing methods, the introduction of ornamentals and manipulation of the drainage patterns have caused valuable vegetation to disappear. All of these activities have changed the Island. Fortunately, however, small vegetational remnants can still be seen from which the past can be reconstructed and from which historical vegetation could be increased.

The saline and brackish swampy areas are densely populated by red, black and white mangroves. Because of the nature of the substrate and due to very low light penetration, only special plants can coexist here. However, algae, fungi, a few halophytic shrubs and epiphytes do thrive. These mangrove areas are of such importance to the Island's ecosystem that they must be preserved and where they are disturbed, should be reclaimed.

All three coastal species, red (*Rhizophora mangle*), black (*Avicenna germinans*) and white (*Laguncularia racemosa*) and buttonwood (*Conocarpus erectus*), together form a system indispensable as habitat, wave buffer and major contributor to the marine detrital food web.

Along the Sanibel River and in low swales, the buttonwood-wax myrtle-sea oxeye association is very evident. It is probable that woody vegetation was once scarce in the interior. Now that trees line the banks, additional roosts and rookeries for birds, particularly wading birds and anhingas, have been created.

Although cordgrass is still common, it appears in disjunct patches on Sanibel, no longer covering several square miles of the interior as it once did. The Island vegetation at the turn of the century was probably that of an extensive prairie comprised of the very productive association of cordgrass and sawgrass. Together these two species provide both food and refuge for ducks, some songbirds and mammals. The graminola marsh also has an additional charm. Its simplicity of color, texture and pattern provides a pleasantly aesthetic and relaxing experience for many people.

The marsh elder-Brazilian pepper-cordgrass association is much more common in the interior today, due to disturbance of unwitting introductions. This association has exploited every elevation from spoil pile to ditched bank. Brazilian pepper is a noxious weed that in more than 30 years has spread throughout the wetlands and has replaced desirable native vegetation.

There are few areas of "no vegetation" on Sanibel except where paved, since clearing attracts recovery vegetation almost immediately. Included in this category are lawns and non-woody ornamentals. However, the ecologically sterile, fertilized, pesticided and herbicided lawn is becoming more commonplace.

West Indian flora probably was always relatively scarce, occurring only on Wulfert Point and along narrow upland strips. West Indian flora areas, though not actually endangered, should be protected and reinforced by good management. The most attractive, diverse and healthy tropical plants will flourish in these areas.

Australian pine and Brazilian pepper represent the very worst of the exotic vegetation problems on the Island. Each, when it occurs in a particular area, almost always becomes the dominant plant. These species should be removed and may not be planted deliberately. The invasive characteristics of the lead tree, air potato, java plum, earleaf acacia, exotic inkberries and bowstring hemp result in unacceptable impacts on vegetation communities and wildlife habitat.

Any tree determined to be a threat and nuisance to City public infrastructure should be removed.

Melaleuca had represented a similar problem, but eradication efforts have virtually rid the Island of this exotic plant. The City's phased program for the mandatory removal of Brazilian pepper has thus far impacted 3,200 acres of the City's 4,000 acres of non-conservation lands.

The sea oats, sea purslane, railroad vine, marsh elder, bay cedar and seagrape association includes the best of the beach species. These grow along the level strand and farther back along the dunes, including both herbaceous and woody species.

Because of the special contribution that the vegetation makes in a well-functioning ecosystem, certain associations and plants should be given special protection and encouraged wherever possible. Beach species are indispensable for stabilizing dunes and beautifying the beach. The mangroves are vital to many

aspects of the ecosystem as a contributor to the food chain, bank stabilizer and provider of habitat. The wetlands contain vegetation that makes a superior wildlife habitat and the ridge, with a variety of woody vegetation, offers a pleasant habitat to humans and wild creatures.

Wetlands

The major wetland basin on Sanibel is a 3,500-acre depression located in the Island's interior and characterized by a series of very subtle ridges and swales. This ribbed topography is the result of a long history of storms and tides which have alternately deposited sand and shell fragments which form mounds later to be rounded off by erosion.

The wetland areas serve a series of valuable functions on this small Island. When they are performing at their peak, they moderate the force of water, which can be devastatingly harsh during storm periods on this low Island. Because of the rapid permeability of the low ridges, rainwater can and should be allowed to seep in, replenishing the freshwater lens. Although these hydrologic functions are fundamental to the Island system, they are strongly dependent on the efficiency of the vegetative cover. This cover, which lends variety to the landscape, is the surface manifestation of the combination of the substrate and the water gradient. In turn, the matted grasses and low shrubs modify runoff. In addition to these hydrologic functions, the wetlands are valuable to Sanibel as superior wildlife habitat that must be protected.

Hydrology

Of the aquifers below Sanibel, only two affect the wetlands. Although the saline aquifer at about 30 feet from surface is beneath the clay stratum, it can still intrude on the freshwater

table aquifer and it does through unsealed wells and deep lagoons. For this reason it is necessary to direct as much freshwater as possible to the water table aquifer so that there is sufficient hydrologic pressure to push back this highly saline intruder. In order to maintain a healthy wetland through long dry winters and despite a high evapotranspiration rate, it is essential that all available freshwater is saved. The Sanibel River, ditches, ponds, real estate lakes and borrow pits are the visible manifestations of this aquifer and the more rainwater they can retain the less brackish they become.

Wildlife

Sanibel Island abounds in a wide variety of wildlife. Because of its position at the southern end of the Atlantic flyway, and being an Island subject to a combination of heavy storms, fluctuating tides and currents that affect it, this piece of land provides a necessary stopover for many birds and is a haven for a diverse range of mammals and reptiles, along with a rich environment for marine biota. Sanibel continues to enjoy worldwide renown for seashell collecting. To conserve this tremendously important ecological and economic resource, the taking of live shells within the City limits is now unlawful. Sport-fishing in the waters surrounding the Island also has a far-reaching reputation, attracting visitors year-round. The wealth of natural resources of this community continues to be vital to its economic viability.

Despite some habitat destruction on the Island, overall wildlife diversity is high, especially within saltwater areas. There are at least 280 species of birds, 70 species of marine fish, 48 reptiles and amphibian species and subspecies and more than two dozen species and subspecies of terrestrial mammals. Several species of marine mammals, including Atlantic bottlenose dolphins and West Indian manatees are also common. The freshwater wildlife community has a moderately varied fauna ranging from insects

and crustaceans, a few fish and several mammals and birds. The Island also has three bald eagle nests.

It is not surprising that Sanibel has such a multitude of creatures. Although it is an Island less than 20 square miles in area, there are several factors that contribute to making this a desirable place for birds and fish. Location has a great deal to do with it; it is well known that species diversity increases with proximity to the equator. This is especially true of birds, butterflies, insects and marine organisms, while numbers of benthic or burrowing creatures are likely to show some decline in numbers. Apparently, species proliferation in this subtropical area is a reflection of a higher vegetational productivity as well as an indulgent climate and geographical location. Many kinds of birds are especially drawn to a wind-blown shoreline and island context, while large numbers of marine organisms aggregate in food-gathering efforts along the shorelines. Needless to say, it is harder for mammals to reach and colonize islands, though once a pathway is established, this process advances rapidly.

Enforced isolation on islands heightens genetic mixing and speciation. Despite the fact that this complex system of interaction and adaptation takes place almost imperceptibly and over long periods of time, it is a most important biological end-product of island life and makes it a fascinating area for naturalists and biologists. The remarkable way in which organisms effectuate dispersal manifests extraordinary ingenuity in their search for a suitable habitat.

They are first attracted by a new environment that provides a measure of ecological opportunity no longer available on the mainland. Island colonization takes place in a variety of ways: a combination of unexpected migrants stopover to rest, winds carry in unusual seeds, drifting wood transports with it

unfamiliar species and currents and tides bring new and fascinating fish and crustaceans nearer to shore. Often these creatures find Sanibel to be a pleasing environment; they stay and contribute to the ever-growing gene pool.

The very complete and informative reports on birds, marine life, mammals, reptiles and amphibians and animals of fresh-water habitat have provided the basic data for this account of wildlife on Sanibel. Although an enormous number of birds are quite visible in even a brief visit to the J. N. "Ding" Darling National Wildlife Refuge, it takes several years on the Island to become familiar with its wildlife resources. This report is based upon visits to the Island, reference to scientific studies by the Conservation Foundation and discussions with Island residents who have special knowledge of the subject. Wildlife habitats can and should be closely correlated to the existing vegetation.

Unfortunately, the fauna of a small land area almost always suffer as human population increases. It is an objective of the Plan to indicate a way to lessen this negative stress. An attitude of co-existence with wild creatures must be wholeheartedly accepted by the public. Attitudes cannot be legislated but, with positive education such as that undertaken by Sanibel-Captiva Conservation Foundation, great strides can be made.

Each wildlife group has its own requirements and tolerances. Marine biota is sensitive to excessive sedimentation, toxicity and nutrient pollution and changes in configuration and vegetation in their nesting and sanctuary areas. Over-harvesting of fish and live shells is, of course, a quick way to extermination. High-speed power boats pollute the waters and can directly harm some species and disrupt the marine environment in general. Larger animals co-exist poorly with humans because they need sizeable undisturbed areas in which to roam where hiding places are abundant and where smaller prey exists. If these

requirements are met, the thrill of seeing a bobcat or panther in the wild could remain a possibility on Sanibel.

Birds coexist well with man as long as their food source is plentiful and uncontaminated, and they have private areas for nesting and raising their young. Unfortunately, this has not been the case with reptiles and amphibians that have been deliberately sought and exterminated. Snakes are very sensitive to human intrusion, many being very secretive and less adaptable to environmental modifications than warm-blooded creatures. Next to deliberate killing of these creatures, habitat destruction has been a major cause of their decline. Most lizards, snakes, turtles and crocodilians have very specific water demands though somewhat less specific food requirements.

Regulations that would set the tone of a sanctuary island can be legislated. Areas cordoned off would allow for non-interrupted nesting; maintenance of each historical habitat type would allow for all species to have a place to live; improvement of habitat through encouragement of native vegetation would give desirable species the best chance while rigorous monitoring should inhibit pollution of its air and waters.

Surface Water

The offshore water resources abutting the land area (above sea level) of the City of Sanibel are the Gulf of Mexico, San Carlos Bay, Pine Island Sound and Blind Pass.

The City of Sanibel is located on a barrier island that spans the mouth of the Caloosahatchee River just offshore of its discharge to the Gulf of Mexico. Sanibel is also located at the southern end of the Pine Island Sound Aquatic Preserve. These regional drainage systems significantly influence the quality of Sanibel's water resources, particularly that of the estuary. Tarpon Bay

and numerous bayous are located in the tidal wetlands on the bay side of the Island.

The City, Lee County and the Captiva Erosion Prevention District have constructed a culvert linking Clam Bayou to Dinkins Bayou and have reopened Blind Pass in 2010 to improve the quality of these waters.

The Island's estuaries and aquatic habitats are being negatively impacted by the lack of a comprehensive and environmentally sound water management plan for Lake Okeechobee and the resulting water releases from the Lake into the Caloosahatchee River and Estuary. The nutrient-rich water releases into the Caloosahatchee River and Estuary have resulted in the growth of toxic blue-green algae blooms and red drift algae outbreaks. These blooms have been associated with fish kills, impacts on shellfish, destruction of seagrass beds, mangroves and breeding grounds for many fish species, and impacts on recreational and commercial fishing. This nutrient runoff may have also contributed to a perceived long-term trend of more frequent, more severe and longer duration of destructive red tide events and severe impacts to the J. N. "Ding" Darling National Wildlife Refuge and aquatic preserves.

In addition, water released from Lake Okeechobee also carries large amounts of suspended sediment that are deposited in the mouth of the river and can be re-suspended by wave action. These impacts could lead to serious degradation in estuarine water quality and potentially irreversible impacts to seagrasses and other estuarine resources.

The main drainage way of the interior wetlands is the Sanibel River. Other surface water bodies consist primarily of human made canals and lakes in the dredged areas of the Altered Land Zone.

There are no major industrial or agricultural uses in the City of Sanibel. There are no major water users. Current and projected water needs are based on the demand for potable water by residential and commercial uses. The current and projected demand for potable water is provided in the Water Supply Element of the Plan.

Sanibel's water resources have not been jeopardized by drawdown due to drought or excess demand (use). However, an adequate supply of freshwater could become a serious economic constraint upon future growth and development in the City of Sanibel. Conservation of this precious resource is critical for meeting future demand.

Conservation and Recreational Uses

The recreational use of natural resources is discussed in the Recreation and Open Space Element of the Plan.

The majority of Sanibel's natural resources are managed for conservation purposes. The U.S. Department of the Interior, Fish and Wildlife Service, manages the J.N. "Ding" Darling National Wildlife Refuge. This 5,400-acre preserve is predominately tidal wetlands. The Sanibel-Captiva Conservation Foundation manages approximately 1,200 acres on Sanibel, consisting of predominately interior wetlands.

Plan for Natural Resources

Proper management of the natural resources in the City of Sanibel is essential to the maintenance of the economic well-being of the City and to preservation of its quality of life.

Plan for the Preservation of Ecological Functions Relating to Health, Safety and Welfare

The plan for the preservation of the ecological functions of the Island of Sanibel shall be provided for through the development regulations and performance standards set forth in the Land Development Code.

The key that was used to delineate the ecological zones shown on the Official Zoning Map of the City of Sanibel is provided as an appendix to this Plan.

Plan for the Interior Wetlands Conservation District

In July 1984, the Sanibel City Council adopted an ordinance creating the “Interior Wetlands Conservation District”, in order to extend a higher degree of protection to the interior wetlands than had been accorded under the development regulations in effect on an estimated 2,000 acres of interior wetlands.

Since 1984, three tracts were removed from the District. In 1989, 101 acres of the 2nd addition to the Beachview Subdivision were removed from the District and placed in a Special Use District that imposed specific surface water management requirements. In 2001, the 18-acre site of the existing water treatment plant for the municipality and neighboring Captiva Island was removed from the District and designated a Special Use District for the public utility. Also in 2001, a 3-acre site was removed from the District to allow the development of a 12-unit increased-density BMRH development (Woodhaven) on Casa Ybel Road.

In 2012, a more accurate, GIS-assisted process, calculated the acreage in the District at 1,715 acres.

The need for the Conservation District was evidenced in 1984 by development trends that occurred after adoption of the Comprehensive Land Use Plan in 1976. These trends generally included:

1. Increased development pressures in the interior wetlands as other lands more suitable for development became less available.
2. Development taking place in proximity to the Sanibel River with the potential to pollute ground and surface waters.
3. Lack of requirements contained in the regulations to direct development away from sensitive portions of the site.
4. Excessive amounts of vegetation clearing permitted to support assigned development intensities, particularly for large parcels.
5. Lack of prohibitions against dredging and filling of wetlands, leading to alteration of natural features and functions.
6. Development taking place in subdivisions platted prior to the adoption of this Plan, inadequate infrastructure and substandard lot sizes which were unable to conform with the management standards of this Plan.

Since 1984, there have been many changes in the Interior Wetlands Conservation District. In 2012, recognizing that lands used for conservation purposes are in use, there is virtually no vacant land remaining in the District. Over the past 26 years,

there have been significant acquisitions of freshwater wetlands for conservation purposes. In 2012, 90% of the lands in the Wetlands Conservation District are owned and managed for conservation purposes. The restoration of these natural resources, highlighted by the restoration of the Sanibel River to its historical course as part of the Sanibel Gardens Preserve, represents the further success of the Interior Wetlands Conservation District.

Residential and non-residential development has also occurred in the Interior Wetlands Conservation District, in accordance with the standards and regulations in the Land Development Code for the District.

Five major subdivisions for residential units have been developed or approved for development in the District since 1984. The 67 lots for single family residential development platted in the District have been located on higher land. These lots have been sited in a manner that is not disruptive to the natural functions of the interior wetlands and does not decrease the water storage or hydrologic regime of the wetlands. Significant acreage of wetlands was preserved and dedicated for conservation purposes as part of the creation of these residential lots.

The 12-unit Airport Way Below Market Rate Housing (BMRH) development (single family and duplex units) and the 12-unit Casa Mariposa BMRH development (multi-family units) were developed in the District at the density permitted by the Development Intensity Map. Both projects were built in general accordance with District regulations, even as City-exempt projects.

The Shell Museum, the Sanibel-Captiva Conservation Foundation Maintenance Facility and the Parish Hall for St. Isabel Catholic

Church were also built in the District since 1984, in accordance with District regulations. The Sanibel-Captiva Conservation Foundation administrative facilities were expanded in the District in accordance with District regulations.

In 2012, twelve parcels comprising 72 acres were added to the District and three parcels comprising 6.6 acres were removed from the District.

The purpose and intent of the Interior Wetlands Conservation District is:

1. To protect public health, safety and welfare.
2. To protect and conserve interior wetlands in the Sanibel River watershed so as to restore and maintain the integrity of these lands in as near a natural state as possible;
3. To set forth standards and limitations on the placement of fill on and the excavation of wetlands in and nearby the Freshwater Management Area.
4. To prohibit development activity within 200 feet of the banks of the main channel of the Sanibel River.
5. To identify areas suitable and unsuitable for development within the Sanibel Gardens, Tarpon Bay, and Sanibel Highlands Subdivisions, and to specify the standards at which development may take place in the Sanibel Highlands, Sanibel Gardens and Tarpon Bay Subdivisions.
6. To identify suitable development activities to be permitted and standards to be applied in the

development of wetlands in the Sanibel River watershed.

7. To ensure that, where development activity does take place in the wetland area, it will be located on those portions of the site and in a manner that will be the least disruptive to the natural functions of these environmentally-sensitive lands.
8. To ensure that the maintenance and restoration of wetlands is an integral part of the wetlands management program.

In order to fulfill the above-stated purpose and the objectives for the Interior Wetlands Conservation District, the following additional actions have been and should continue to be undertaken:

1. Proceed with the program of public acquisition, as opportunities, or the need, arise, based upon, but not limited to:
 - a. Lands or lots rendered undevelopable by the standards of the Interior Wetlands Conservation District ordinance.
 - b. Lands or lots within 200 feet of the Sanibel River.
 - c. Lands with little or no elevation above 1.8 feet NAVD (3 feet NGVD) for the placement of dwelling units, in accordance with the standards of the Interior Wetlands Conservation District ordinance.
 - d. Lands abutting parcels currently under public or quasi-public ownership.

2. Continue to encourage the dedication of those portions of lands, not utilized for development under the standards of the Interior Wetlands Conservation District ordinance, to the City of Sanibel or a non-profit conservation entity.
3. Continue to implement a program for the maintenance and restoration of lands dedicated to the City and, to the extent possible, to nonprofit conservation entities, so as to approximate their natural condition, to the extent practical.
4. To implement the plan for sewage treatment, undertake a program to upgrade existing septic tank systems where there is evidence that they are improperly designed, installed or maintained, and that they pose the potential to pollute ground or surface waters of the interior wetlands system.

Plan for Environmentally Sensitive Lands

There are many environmentally sensitive lands in the City of Sanibel that are owned and managed for conservation purposes.

As stated in the Future Land Use Element of the Plan, the principal use of over 65 percent of the area in the City of Sanibel is conservation use. More than eight square miles of the City are owned and managed by the federal government as a wildlife refuge. The Sanibel-Captiva Conservation Foundation owns more than a square mile of additional land that is managed for conservation purposes.

The Future Land Use Element contains a projection that approximately 400 acres of undeveloped land in the City are

located in the tidal and interior wetlands. A major use of this acreage, even if developed at very low residential density, is projected as conservation lands.

The City of Sanibel began a funded program in 1987 to acquire environmentally sensitive lands for conservation purposes. The City has acquired numerous small parcels of land, totaling 400 acres, which will be preserved and protected. An estimated \$1 million to \$1.5 million worth of environmentally sensitive lands has been purchased through this program. In addition to the City's acquisition program, the Plan for Environmentally Sensitive Lands focuses on the restoration and management of these environmentally sensitive lands.

The initial (1976) Comprehensive Land Use Plan initiated development regulations and performance standards based on the ability of each ecological zone to tolerate future development. In 1984, the City established the Interior Wetlands Conservation District to provide a higher degree of protection from development impacts for 2,000 acres of interior wetlands. In 1991, to provide for the use and preservation, maintenance, enhancement and restoration of environmentally sensitive lands, the City of Sanibel established an Environmentally Sensitive Lands Conservation District.

With about two-thirds of the area in the City of Sanibel owned and managed for conservation purposes, an Environmentally Sensitive Lands Conservation District is needed to ensure the protection and preservation of these lands and the coordinated management of these natural resources that function as an ecological system.

The purpose of the Environmentally Sensitive Lands Conservation District is:

- To ensure the preservation of environmentally sensitive lands owned and managed for conservation purposes
- To restrict development in environmentally sensitive lands that is not consistent with conservation purposes
- To promote coordinated management of environmentally sensitive lands
- To encourage enhancement and restoration of disrupted natural systems

In order to fulfill the purpose of the Environmentally Sensitive Lands Conservation District, permitted uses, required conditions and performance standards have been established in the Land Development Code. The District may include environmentally sensitive lands owned and managed for conservation purposes whether publicly or privately owned. The District incorporates lands that have been acquired in the past and will be acquired in the future by the City for conservation purposes. The District map for the Environmentally Sensitive Lands Conservation District is part of the Future Land Use Map and is also included in the Land Development Code.

Plan for Vegetation Preservation

In order to protect the vegetation values identified, it is necessary that the City of Sanibel:

1. Prohibit the introduction of exotic species of plants which out-compete or otherwise displace native species of plants.

2. Encourage the removal of undesirable exotics currently existing on the Island and develop programs for the management of all prohibited exotic species of plants.
3. Limit clearing of native vegetation.
4. Protect valuable native species of plants from destruction.
5. Encourage the use of native species of plants in the landscaping of future developments.

To achieve those ends, performance standards shall be set out in the Land Development Code that establish certain restrictions on the development of land in regard to exotic and native species of plants. However, the standards and criteria for development activity are not sufficient to achieve Island-wide protection of vegetation values. Therefore, the City should encourage sound ecological management of vegetative resources in those portions of the City for which future development is not proposed.

PROTECTED NATIVE PLANTS

Protected native plants are those plant species whose natural range included Florida at the time of European contact (1500 A.D.) as identified on the Atlas of Vascular Plants Website, which is identified as follows: Atlas of Vascular Plants, University of South Florida Institute for Systematic Botany:

<http://www.plantatlas.usf.edu/default.asp>.

PROHIBITED EXOTIC PLANTS

Australian pine -	<i>Casuarina equisetifolia</i>
	<i>Casuarina cunninghamiaria</i>
Brazilian pepper -	<i>Schinus terebinthifolius</i>
Cajeput -	<i>Melaleuca quinquenervia</i>
Lead tree -	<i>Lucaena leucocephala</i>
Air potato -	<i>Dioscorea bulbifera</i>
Java plum -	<i>Syzygium Cumini</i>
Earleaf Acacia -	<i>Acacia auriculiformis</i>
Exotic inkberrys -	<i>Scaevola taccada</i>
	and <i>s. frutescens</i>
Bowstring hemp -	<i>Sansevieria thyrsiflora</i>

Source: Sanibel Department of Natural Resources

Note: The contribution of mature Australian pines to the historical and scenic attributes of some recreational areas is a significant factor in the City's development and implementation of its policy for the management of prohibited exotic plants. When the historical and scenic benefits of retaining mature Australian pines outweigh the safety and environmental benefits derived from their removal, immediate and mandatory removal is not required. These exotic, but long-established features of the community, treasured by some and tolerated by others, may be retained for their historic and scenic attributes.

The City may make additions and deletions to this list through its normal legislative processes.

The following native plants are commonly found on Sanibel and are listed to provide the reader with easy reference to protected native plants and context for the Plan for Vegetation Preservation.

Beach creeper -	<i>Ernodea littoralis</i>	Wild sage -	<i>Lantana involucrata</i>
Sea oats -	<i>Uniola paniculata</i>	Wild olive -	<i>Forestiera segregata</i>
Railroad vine -	<i>Ipomoea pes-caprae</i>	Paradise tree -	<i>Simarouba glauca</i>
Sea purslane -	<i>Sesuvium portulacastrum</i>	Buckthorn -	<i>Bumelia celastrina</i>
Bay cedar -	<i>Suriana maritima</i>	Myrsine -	<i>Rapanea guianensis</i>
Inkberry -	<i>Scaevola plumieri</i>	Wax myrtle -	<i>Myrica cerifera</i>
Bay bean -	<i>Canavalia rosca</i>	Spanish stopper -	<i>Eugenia foetida</i>
Bitter panicum grass -	<i>Panicum amurum</i>	Wild tamarind -	<i>Lysiloma bahamensis</i>
Florida maytens -	<i>Maytenus phyllanthoides</i>	Pigeon plum -	<i>Coccoloba diversifolia</i>
Leather fern -	<i>Acrostichum danacifolium</i>	Varnish leaf -	<i>Dodonaea viscosa</i>
Swamp fern -	<i>Blechnum serrulatum</i>	Coontie -	<i>Lamia integrifolia</i>
Sea oxeye daisy -	<i>Borrchia frutescens</i>	Seven year apple -	<i>Casasia Genipa</i>
Bald cypress -	<i>Taxodium distichum</i>	Yellow elder -	<i>Tecoma stans</i>
Pond apple -	<i>Annona glabra</i>	Wild cotton -	<i>Gossypium hirsutum</i>
Joewood -	<i>Jacquinia keyensis</i>	Marlberry -	<i>Ardisia escallonioides</i>
Seagrape -	<i>Coccoloba uvifera</i>	Satin leaf -	<i>Chrysophyllum oliviforme</i>
Necklace pod -	<i>Sophora tomentosa</i>	Pitch apple -	<i>Clusia rosea</i>
Snowberry -	<i>Chiococca alba</i>	Sweet acacia -	<i>Acacia farnesiana</i>
Red stopper -	<i>Eugenia rhombea</i>	Wild lime -	<i>Zanthoxylum fagara</i>
White stopper -	<i>Eugenia axillaries</i>	Simpson stopper -	<i>Myrcianthes fragrans</i>
Cocoplum -	<i>Chrysobalanus icaco</i>	Mahogany -	<i>Swietenia mahagoni</i>
Jamaica caper -	<i>Capparis cynophallophora</i>	Pamotis palm -	<i>Acoelorrhaphe wrightii</i>
Coral bean -	<i>Erythrina herbacea</i>	Southern red cedar -	<i>Juniperus silicicola</i>
Strangler fig -	<i>Ficus aurea</i>	Royal palm -	<i>Roystonea elata</i>
Gumbo limbo -	<i>Bursera simarouba</i>	Cordgrass -	<i>Spartina bakerii</i>
Mastic -	<i>Mastichodendron foetidissimum</i>	Sawgrass -	<i>Cladium jamaicense</i>
Cat claw -	<i>Pithecellobium unguis-cati</i>	Blechnum fern -	<i>Blechnum serrulatum</i>
Jamaica dogwood -	<i>Piscidia piscipula</i>	White mangrove -	<i>Laguncularia racemosa</i>
White indigo berry -	<i>Randia aculeata</i>	Buttonwood -	<i>Conocarpus erecta</i>
Saw palmetto -	<i>Serenoa repens</i>	Red mangrove -	<i>Rhizophora mangle</i>
Butterfly orchids -	<i>Epidendrum tampense</i>	Black mangrove -	<i>Avicennia germinans</i>
	<i>Tillandsia spp. except Spanish Moss</i>	Christmas berry -	<i>Lycium carolinianum</i>
Whisk fern -	<i>Psilotum nudum</i>	Muhly grass -	<i>Muhlenbergia capillaris</i>
Sabal palm -	<i>Sabal palmetto</i>	Live oak -	<i>Quercus virginiana</i>
Hairy grama grass -	<i>Bouteloua hirsuta</i>	Slash pine -	<i>Pinus elliotti</i>
Hercules club -	<i>Zanthoxylum clava-herculis</i>		
Dahoon holly -	<i>Ilex cassine</i>		

Source: Natural Resources Department and Vegetation Committee

Plan for Wetland Protection

The protection of wetlands is better achieved by continued restoration of the historic hydroperiod in the freshwater wetlands. In order to establish the most suitable water level, detailed topographic and engineering studies have been done. The Tarpon Bay and Beach Road weir control structures are now set at elevations of 3.2 and 2.7 feet NGVD, respectively. These elevations may be manipulated in the event of a flood or potential flood occurrence in accord with the City's Weir Control Policy, adopted by City Council Resolution No. 94-75. An additional weir that can elevate the seasonal water tables in the conservation lands to the west of the Sanibel Highlands subdivision is being considered.

It is also imperative that the Sanibel River, ditches, ponds, lakes and wetlands be protected from any sewage pollution. These water bodies are now largely eutrophic, with high nutrient levels and low dissolved oxygen. The Sanibel River is currently listed as an impaired waterbody by the Florida Department of Environmental Protection. The cause (and remedy) for this is not immediately apparent. However, organic materials reaching the water, whether from pollution, natural plant decay, fertilizers or other are likely contributors. In any event, this should be studied and appropriate remedial action taken (such as source control or dredging of organic deposits, etc.). The excessive growth of undesirable aquatic vegetation is an almost certain outcome of high nutrient levels; this is now evident in various places along the river where algae blooms have been observed. Not only is this unsightly vegetation, but it has negligible value for wildlife.

Wetlands provide natural cleansing of stormwater runoff and prevent nutrients and contaminants from reaching into the Gulf of Mexico. Retaining natural wetlands significantly contributes

to the attainment of good water quality. All options to avoid damage to wetlands shall be considered, including the reduction in the intensity and mass of the proposed development, the reconfiguration of the proposed development and the relocation of the proposed structures.

When public or private projects produce unavoidable damage to wetland areas, restoration or mitigation programs shall be implemented. Mitigation activities for the impacts from the unavoidable losses of wetlands due to development require habitat preservation, restoration or creation. Mitigation shall be on-site wherever possible.

The first priority is always to avoid damage to wetlands.

Where it is not possible to avoid damage to wetlands areas or to mitigate for the unavoidable damage to wetland areas on-site, mitigation for the unavoidable damage to wetlands may be off-site, only if a plan for off-site mitigation is prepared that clearly demonstrates that:

- On-site mitigation would result in a remote wetland area that would be isolated from larger wetland areas and contribute little to improvement in water quality
- The failure to allow off-site mitigation denies the property owner beneficial use of the property, where it is not possible to avoid damage to wetlands areas or to mitigate for the unavoidable damage to wetlands areas on-site
- The off-site mitigation can be undertaken on-Island, on property that is adjacent to or nearby where the unavoidable damage to wetlands areas is to occur

- Off-site mitigation, to create or restore unavoidable damage to wetlands areas, produces an overall improvement in water quality

For any acre of unavoidable wetlands losses, there shall be:

- 3 acres of wetlands created and preserved, or
- 10 acres of wetlands restored and preserved, or
- A proportionate combination of created wetlands and restored wetlands.

Created and restored wetlands should be of the same type of wetland that is to be destroyed.

As an additional measure for achieving maximum ecological preservation of vegetative values, the City implements a program for replacing with more beneficial vegetation all prohibited exotic species of plants, including Australian pines and Brazilian pepper tree, from City-owned land. The City supports the efforts of other levels of government and private individuals with land ownership on Sanibel doing the same. Although the Melaleuca tree has already been virtually eradicated, the community must continue to be alert to eliminate volunteers of this species.

Plan for Wildlife Preservation

Habitat preservation plays a key role in the plan for wildlife preservation.

The City should give further consideration to enacting regulations that would encourage the preservation of the

Island's natural wildlife and would set the tone appropriate for an Island designated as a sanctuary. Special consideration should be given to endangered and protected species.

The endangered smalltooth sawfish (*Pristis pectinata*) is known to inhabit the estuarine waters around Sanibel.

The City should also pursue means to obtain local control over the use of fertilizers, pesticides and other chemicals that will result in the degradation of wildlife habitat, and where possible, develop a program to appropriately regulate their use in order to protect wildlife and wildlife habitat.

All bird nests on the Island are protected under both the Federal Migratory Bird Act and City Ordinance.

Consideration should be given to adopting Federal guidelines for bald eagle protection.

Plan for Water Resources

The Plan for Water Supply is provided in the Water Supply Element of this Plan. In addition, the Plan for Stormwater Management is provided in the Storm Drainage Element of this Plan.

Plan for Water Quality

In order to protect the quality of water resources, the City of Sanibel regulates development activities to protect natural water-cleansing processes and to reduce or prevent the discharge of contaminants into the water system. The Plan for Stormwater Management is provided in the Storm Drainage Element of this Plan. The Plan for the Water Supply (quality and conservation) is provided in the Water Supply Element of

this Plan. The Plan for Vegetation and the Plan for Wetlands, in this section, contribute to the Plan for Water Quality.

However, there is a critical need to improve policies controlling water releases from Lake Okeechobee in order to maintain the water quality of coastal waters surrounding Sanibel. It is vitally important that the U. S. Environmental Protection Agency and the State of Florida implement the Total Maximum Daily Loads (TMDLs) for pollutants provision of the Federal Clean Water Act.

Pollutants have had a dramatic and unacceptable impact on the quality of surface waters surrounding the City. Sanibel is susceptible to over nutrification through runoff from development. Although the City has put a significant effort and investment into wastewater treatment facilities, efforts and investments to improve water quality have not been as extensive in other areas within the watershed of the Caloosahatchee River. Continued surface water runoff within the watershed of the Caloosahatchee River containing nonpoint source pollution contributes to the further degradation of the quality of the waters surrounding the City.

However, this degradation of waters surrounding the City is exacerbated by water releases from Lake Okeechobee exceeding Total Maximum Daily Loads for pollutants.

Intergovernmental cooperation from the U.S. Army Corps of Engineers, the Florida Department of Environmental Protection and the South Florida Water Management District is essential to adequately address these Regional challenges.

Plan for Air Quality

The air quality on Sanibel is considered good. To ensure that the City continues to enjoy good air quality, the impact of

future development on local air quality should be considered. Land uses and transportation facilities (roads) should be compatible with the desired level of air quality.

Increases in traffic volumes, not associated with land use development in the City, is a major contributor to traffic congestion along major roadways in the City. This traffic congestion has the potential to degrade the air quality of surrounding areas. The carrying capacity of the natural resources within the City, as well as the quality of life for residents and visitors, can be negatively affected by poor air quality.

The maintenance of good air quality is a regional concern, requiring intergovernmental coordination for approaches and solutions.

Plan for Hazardous Wastes

Although the amount of hazardous wastes generated in the City of Sanibel is not great, some of this waste is being disposed of improperly. Some hazardous wastes are dumped in wastewater disposal facilities, some onto the ground and some transported to the County landfill. Hazardous waste best management practices should be established to improve hazardous waste storage and disposal methods.

Lee County operates a Hazardous Waste Disposal site.

Plan for Conservation and Recreational Use

Conservation of natural resources is an essential component of the *Sanibel Plan*. The City's development regulations reflect and promote this conservation effort.

Use of natural resources should be compatible with conservation efforts. Commercial uses of natural resources, except for those that are incidental to recreation use that is compatible with conservation use, should be prohibited. The wetlands, particularly in the lowland and the remaining mangrove areas, are not well suited to intensive recreation but may be used for low intensity recreation such as walking, canoeing or bird-watching.

Plan for Surface Water Management

Implementation of the Surface Water Management Plan adopted by the City in August of 1989 has enhanced the viability of the interior freshwater wetlands system.

This plan sets forth the following goal and objectives:

Goal

To safeguard human health and welfare and to maintain and improve the wetland system of the Sanibel River and its tributaries in order to enhance and promote water quality as well as vegetative and wildlife habitat diversity.

Objectives

1. To reduce extreme flooding in developed areas and the length of time of flooding in order to keep roads, driveways, house pads and septic systems drained to the greatest extent possible.
2. To use surface water management as one of many tools in undeveloped areas in order to encourage and support the return to savannah and marsh vegetation as well as other native habitat types,

including but not limited to ridge hammocks, buttonwood sloughs and transition zones and to discourage the continued invasion of exotic plants.

- a. To identify undeveloped areas for habitat preservation and restoration that are large enough to support representative plant and animal populations, economically and physically feasible to manage and compatible with the water management needs of developed areas.
 - b. To increase rainfall detention in undeveloped areas to allow for recharge of the water table aquifer and to return to conditions of environmental extremes in surface water and water table elevations which had controlled natural characteristics in the past.
3. To use natural drainage methods wherever possible with minimum impact to the environment and requiring minimal maintenance. Human-made drainage structures are a less-preferred alternative.

Plan for Enhancement and Restoration of Natural Resources

To increase the productivity and viability of natural resources that have been disturbed or diminished by past activities, restoration efforts can facilitate natural recovery. To that end, extensive restoration efforts by the U.S. Fish and Wildlife Service, the Sanibel Captiva Conservation Foundation and the City have been widely undertaken. Although a lot of progress has been made, as evidenced by the hundreds of acres cleared and maintained free of invasive exotic vegetation and the

restoration of the historic course of the Sanibel River through the Sanibel Gardens Preserve, additional projects have been identified.

The tidal circulation of impounded mangrove areas in Clam Bayou has recently been improved. So has the tidal circulation in the artificial impoundment areas in the J. N. “Ding” Darling National Wildlife Refuge, in the wetlands east of Dixie Beach Road. Elevating the seasonal water tables in the conservation lands to the west of the Sanibel Highlands subdivision is also being considered.

Prescribed fire will continue to be used as a successful management tool to replicate the benefits wildfires have historically had in maintaining natural ecosystems. Such managed burns help maintain Sanibel’s fire adapted freshwater wetland savannahs, thereby improving wildlife habitat. Lands bordering on conservation areas and other lands where wildfires are possible should be managed in a fire-wise fashion.

Goals, Objectives and Policies

Goal Statement

Protect and appropriately manage Sanibel’s natural resources to ensure the conservation of ecosystems by maintaining air quality, water quality, native vegetation, native habitats and species diversity.

Objective 1

Sanibel is and shall remain a barrier island sanctuary.

Policy 1.1. Evaluate all local plans and programs for conservation and natural resource protection to ensure that they are consistent and compatible with one another and that they are unified in their efforts.

Policy 1.2. Strive to sustain ecological balance and preserve and restore natural settings for residents, visitors and wildlife.

Policy 1.3. The adequate and appropriate protection and conservation of natural resources, including wetlands, shall be accomplished through:

- Maintenance, and appropriate expansion, of the Environmentally Sensitive Lands Conservation District,
- Maintenance and appropriate expansion of the Interior Wetlands Conservation District, and
- Maintenance, and appropriate revisions, to regulations, such as the Interior Wetlands

Conservation District and environmental performance standards of the Land Development Code

Objective 2

The City shall strive to manage the Island's carrying capacity to ensure that the Island's natural resources are sustained.

Policy 2.1. The City shall use appropriate methods to sustain and manage the carrying capacity of the beach for use by wildlife. The City may conduct research regarding existing and emerging best practices and establish current base line and future performance metrics or measures necessary to ensure the Island's sustainability during the *Sanibel Plan's* initial (5 years) and long range (10 years) planning periods. While the primary focus on this effort will be the City of Sanibel, regional conditions, trends and projections may also be considered.

The carrying capacity research and resulting management strategies may essentially be an important component of the ongoing implementation and performance evaluation of the *Sanibel Plan's* goals, objectives and policies. This effort would consider the Island's sustainability in a holistic manner.

Objective 3

If the Florida Department of Environmental Protection (DEP) notifies the City of Sanibel that minimum established air quality levels are being exceeded within the City, a program approved by the DEP will be implemented to bring air quality into compliance with minimum established standards.

Policy 3.1. Achieve minimum air quality standards by implementing an air quality improvement program within one year of notification by DEP that minimum established air quality standards are not being met.

Objective 4

Protect and conserve water resources and prevent impairment of the quality and quantity of surface and groundwater resources.

Policy 4.1. To provide filtration of stormwater runoff into surface waters, ensure that setback requirements from open bodies of water are maintained by continued implementation of the development regulations and performance standards established in the Land Development Code.

Policy 4.2. With cooperation from the Department of Environmental Protection, establish a surface water quality monitoring program and seek further cooperation from Lee County, the Department of Environmental Protection and the South Florida Water Management District.

Policy 4.3. Assist the Sanibel-Captiva Conservation Foundation with its groundwater quality monitoring program.

Policy 4.4. With cooperation from the South Florida Water Management District in establishing cones of influence for wellheads, establish a wellhead protection program for existing and future wells.

Policy 4.5. Work toward the elimination of virtually all septic systems on the Island. Connect 99 percent of all homes and businesses to the City's central sewer system.

Policy 4.6. The City shall remain vigilant and proactive in its insistence that the regulation, design and operation of water releases from Lake Okeechobee will not further degrade the quality of coastal waters and the estuaries of Southwest Florida. It is the City's intent to convince the South Florida Water Management District and the U.S. Army Corps of Engineers to change policy so that the waters surrounding Sanibel are no longer threatened. The Sanibel City Council is approaching the water quality problem on three tracks:

- 1) through public education,
- 2) in the policy and legislative arena, and
- 3) as a last resort, through potential litigation.

Policy 4.7. The City shall also remain vigilant and proactive to ensure that surface water runoff from other jurisdictions into the Caloosahatchee River watershed will not further degrade the quality of water in near Island coastal waters, including the estuaries within the boundaries of the City.

Objective 5

Protect and conserve soils and native vegetation communities and maintain the natural functions of the City's ecological zones by continued implementation of the adopted development regulations and performance standards established in the Land Development Code and best management practices.

Policy 5.1. To limit clearing of native vegetation, including the under story and groundcover, ensure the continued enforcement of the environmental performance standards of the Land Development Code and best management practices.

Policy 5.2. Protect valuable native species of plants from destruction by requiring a City vegetation permit for vegetation removal.

Policy 5.3. The planting or seeding of prohibited exotic plants that out-compete or otherwise displace native species of plants is prohibited.

Policy 5.4. In conjunction with the development of any site, prohibited species of vegetation are to be removed from the site and prevented from re-establishing on the site.

Policy 5.5. Reduce the spread of prohibited exotic plants and noxious aquatic vegetation by implementing regulations prohibiting the planting of these species and by requiring their removal when land is developed.

Policy 5.6. Consider development of a program requiring removal, from developed property, all prohibited exotic plants, except for Australian pines.

Policy 5.7. Restrict development in the Blind Pass Zone by including regulations in the adopted Land Development Code that limit development intensity in a manner that is consistent with the dynamic nature of this zone.

Policy 5.8. Continue to implement Local regulations to better protect mangroves.

Objective 6

Protect and conserve wildlife and its habitat, including marine habitat, and maintain the natural functions of the City's ecological zones by the continued implementation of the adopted development regulations and performance standards established in the Land Development Code and best management practices.

Policy 6.1. Natural wildlife corridors will be established and maintained to connect wildlife habitat to the Sanibel River and to provide for wildlife movement along the River.

Policy 6.2. Develop a program for the enhancement of marine resources.

Policy 6.3. Wildlife access to and from the beach will be maintained by restricting the location of fences.

Policy 6.4. Commercial uses of natural resources, except for those uses that are incidental to recreational use compatible with scenic preservation and conservation uses, will be prohibited.

Policy 6.5. Protect sea turtle nesting areas by prohibiting the disturbance of nests, prohibiting mechanical beach cleaning and controlling the emission of light from structures on or near the beach.

Policy 6.6. Protect the habitat of gopher tortoises, eastern indigo snakes, eagles, ospreys, loggerhead

turtles, alligators, pileated woodpeckers and river otters.

Policy 6.7. To ensure the protection of habitat for protected species during the development process, require that viable habitat be preserved and that provisions be made for long-range habitat management and monitoring.

Policy 6.8. Protect manatees by enforcing slower boat speeds in their primary habitats.

Policy 6.9. Protect all bird nests on the Island under both the Federal Migratory Bird Act and City regulations.

Policy 6.10. Protect all bald eagle nests on the Island by adopting and implementing Federal, State and Local guidelines for bald eagle protection.

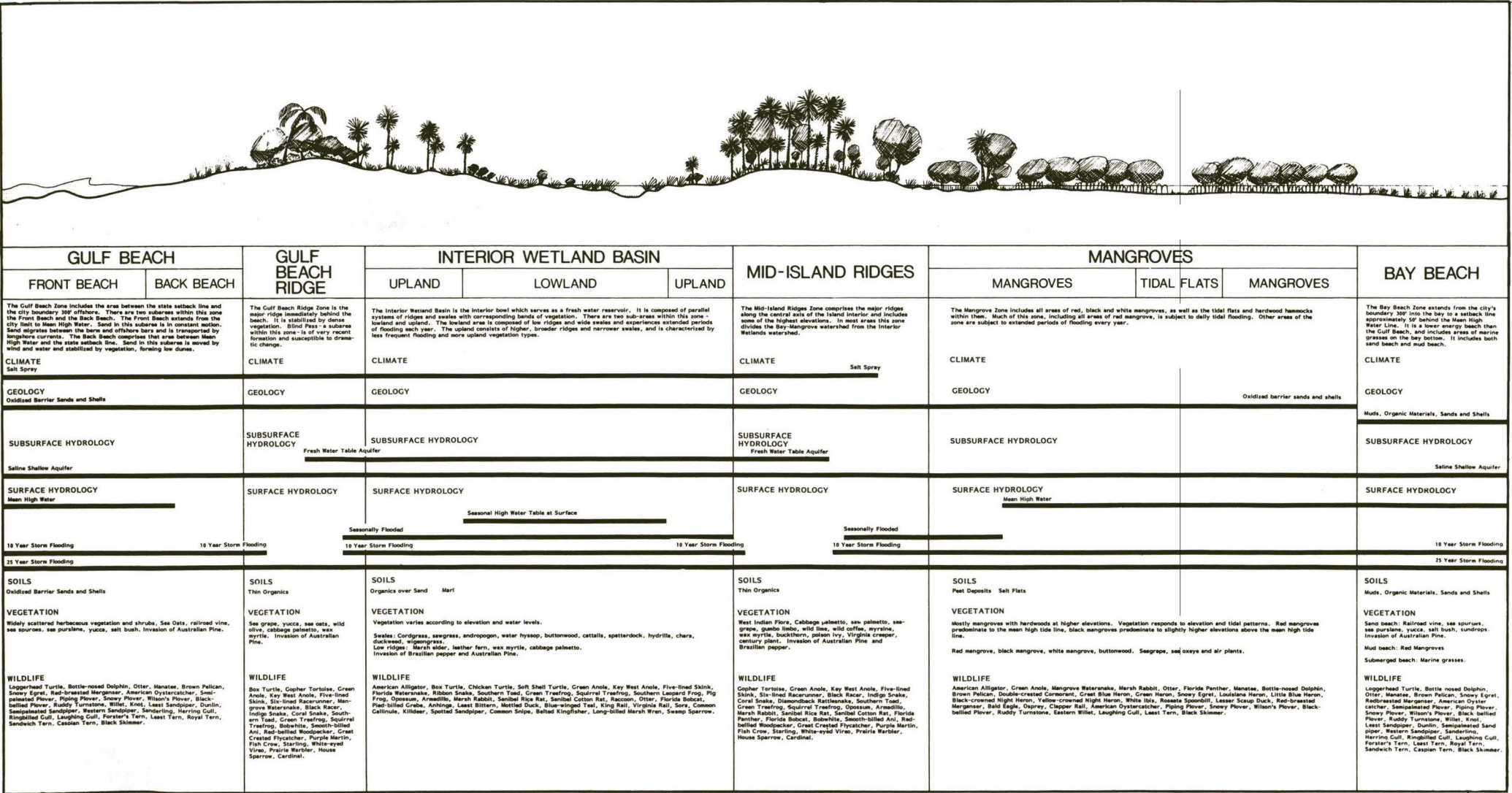
Objective 7

To ensure protection and preservation of environmentally sensitive lands and the coordinated management of these natural resources that function as an ecological system, retain and expand the Environmentally Sensitive Lands Conservation District for lands owned and managed for conservation purposes.

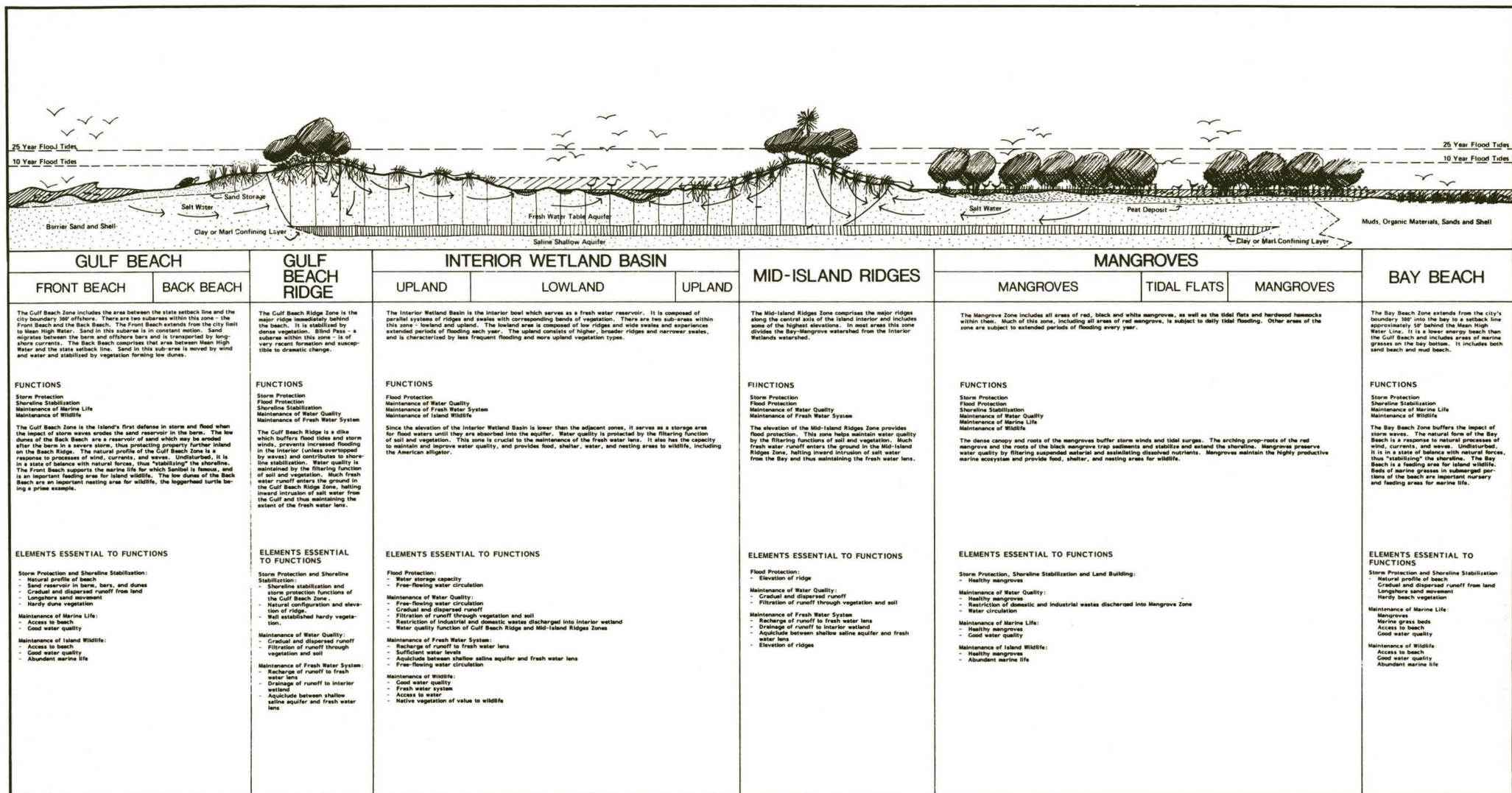
Policy 7.1. Restrict permitted use in the Environmentally Sensitive Lands Conservation District to environmental preservation, passive recreation, surface water management, minor utilities installations primarily for transmission, enhancement and restoration.

Policy 7.2. Coordinate management of lands in the Environmentally Sensitive Lands Conservation District in recognition that these natural resources function as an ecological system.

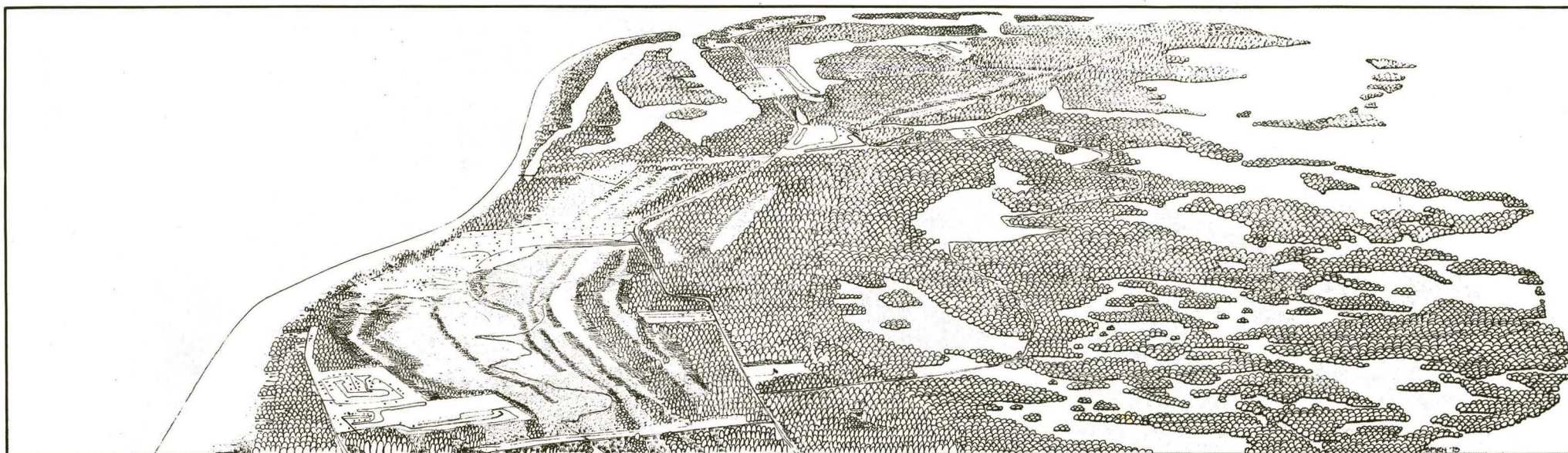
Policy 7.3. Include all lands purchased by the City of Sanibel with environmentally sensitive lands acquisition funds in the Environmentally Sensitive Lands Conservation District.



ECOLOGICAL ZONES: INVENTORY

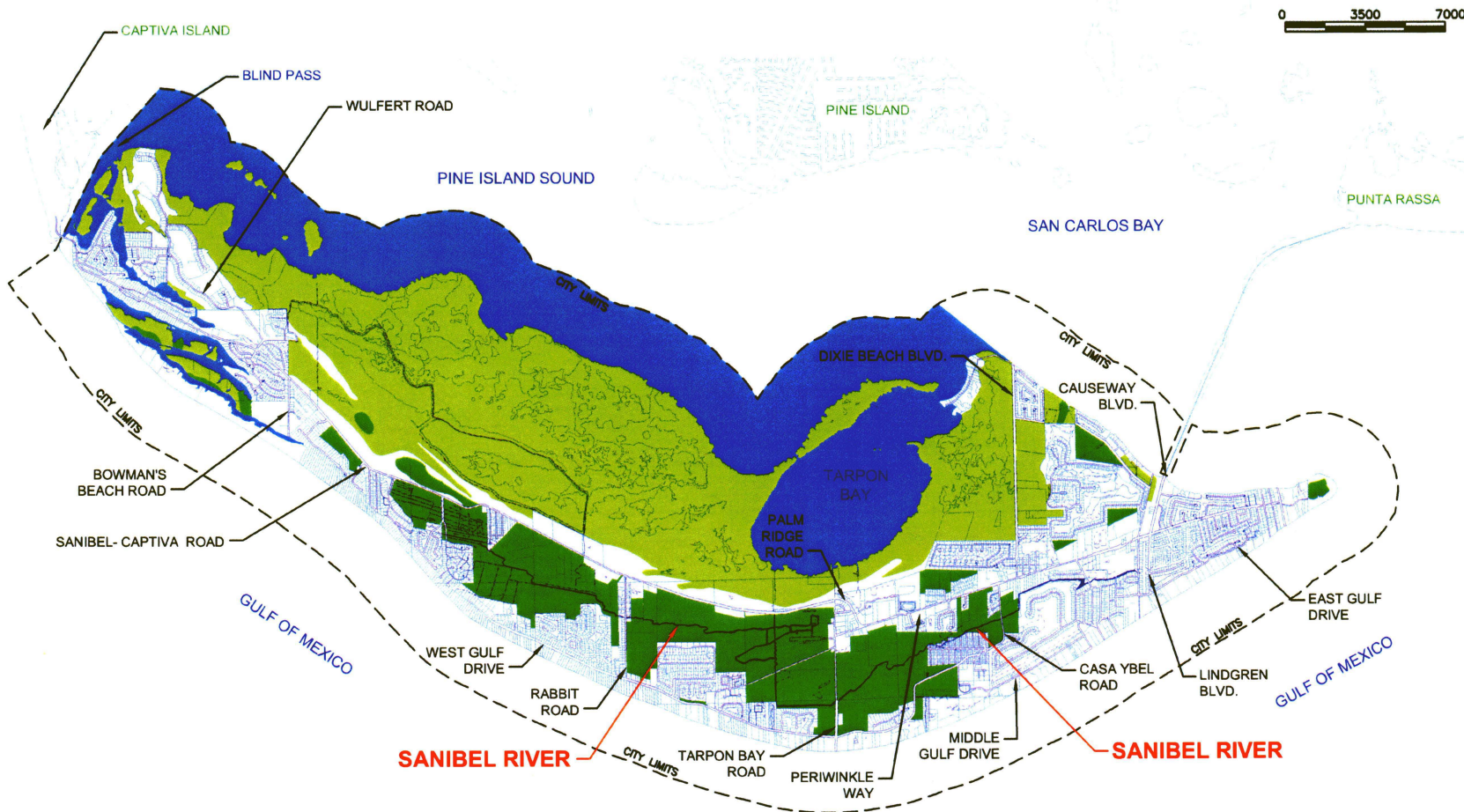


ECOLOGICAL ZONES:FUNCTIONS



GULF BEACH		GULF BEACH RIDGE	INTERIOR WETLAND BASIN			MID-ISLAND RIDGES	MANGROVES			BAY BEACH	
FRONT BEACH	BACK BEACH		UPLAND	LOWLAND	UPLAND		MANGROVES	TIDAL FLATS	MANGROVES		
MANAGEMENT GUIDELINES		MANAGEMENT GUIDELINES	MANAGEMENT GUIDELINES			MANAGEMENT GUIDELINES	MANAGEMENT GUIDELINES		MANAGEMENT GUIDELINES		
STORM PROTECTION AND SHORELINE STABILIZATION Maintain natural profile of beach bars, bays, and dunes: - Prohibit removal of sediments from beach. - Prohibit construction of any sort on Front Beach. - Prohibit construction on Back Beach except to provide beach access. - Restrict public beach access to elevated walkways over the Back Beach. Maintain sand reservoir in bars, bays, and dunes: - Prohibit removal of sediments from beach. Maintain natural patterns of gradual and dispersed runoff from land: - Restrict runoff from paved and developed areas onto beach. Allow for longshore sand movement: - Prohibit construction of groins or any other structures which inhibit or prevent sand movement. Maintain hardy dune vegetation: - Restrict public beach access to elevated walkways over the Back Beach. - Prohibit clearance of hardy native vegetation. Replace Australian Pines on Back Beach with hardy native dune vegetation.		STORM AND FLOOD PROTECTION AND SHORELINE STABILIZATION Maintain natural profile and elevation of ridge: - Prohibit development which would lower existing elevation. Maintain hardy native vegetation: - Restrict clearance of existing native vegetation. - Establish hardy native vegetation in areas which are not well vegetated. - Replace Australian Pine with hardy native vegetation whenever possible. Maintain storm protection and shoreline stabilization functions of Gulf Beach: - Restrict runoff from paved or developed areas from draining onto the Gulf Beach Zone.	FLOOD PROTECTION Maintain water storage capacity of the Interior Wetland Basin: - Prohibit development activities which would result in a reduction of freshwater storage capacity. Maintain natural free-flowing patterns of water circulation: - Do not impede or impound water flow. - Improve the Sanibel River system to provide for a continuous free-flowing system. MAINTENANCE OF WATER QUALITY Maintain natural free-flowing patterns of water circulation: - See guidelines above. Maintain natural patterns of gradual and dispersed runoff: - Retard and disperse runoff from paved and developed areas. Filter runoff from paved and developed areas through vegetation and soil: - Limit cleared area and impervious surfaces. Regulate quality of domestic and individual wastes discharged into Interior Wetland Basin: - Provide that all released effluent be of water quality equal to that achieved by advanced treatment.			FLOOD PROTECTION Maintain existing elevation of ridge: - Prohibit development activities which would result in lowering elevation of ridge. MAINTENANCE OF WATER QUALITY Maintain gradual and dispersed runoff: - Retard and disperse runoff from paved and developed areas. Filter runoff from paved and developed areas through vegetation and soil: - Limit amount of cleared area and impervious surface. - Retard runoff over porous soils. MAINTENANCE OF FRESH WATER SYSTEM Maintain recharge of runoff to fresh water lens: - Limit cleared area and impervious surfaces. - Retard runoff over porous soils. Maintain drainage of runoff to interior wetland: - Restrict alteration of existing natural drainageways. Maintain integrity of aquiclade between shallow saline aquifer and fresh water lens: - Prohibit excavation of the aquiclade.			STORM PROTECTION, SHORELINE STABILIZATION, LAND BUILDING Maintain healthy mangroves: - Protect mangroves. - Restrict excavation or filling. - Maintain good water quality. MAINTAIN WATER QUALITY Maintain healthy mangroves: - See guidelines above. Regulate quality of domestic and industrial wastes discharged into Mangrove Zone: - Provide that all water or other effluent which is released be of water quality equal to that achieved by advanced treatment prior to its release. Maintain natural patterns of water circulation: - Elevate roads and pathways so as not to impound or impede water flow. - Maintain existing natural patterns of fresh water runoff from interior. Maintain water quality function of Mid-Island Ridges Zone: - Refer to guidelines for Mid-Island Ridges Zone. MAINTENANCE OF MARINE LIFE AND WILDLIFE Maintain healthy mangroves: - See guidelines above. Maintain water quality: - See guidelines above.		STORM PROTECTION AND SHORELINE STABILIZATION Maintain natural profile of beach: - Prohibit removal of sediments from beach. - Prohibit construction on beach which would result in change of the natural beach profile. - Restrict public access over vegetated areas of beach to elevated walkways. Maintain natural patterns of gradual and dispersed runoff from land: - Restrict runoff to beach from developed areas. Allow for longshore sand movement: - Prohibit construction of groins or any other structures which inhibit sand movement. Maintain hardy beach vegetation: - Restrict public access over vegetated areas of beach to elevated walkways. - Prohibit construction of native beach vegetation. - Replace Australian Pines on the beach with hardy native vegetation.
MAINTENANCE OF MARINE LIFE AND WILDLIFE Maintain access to beach from water: - Prohibit discharge of insufficiently treated domestic or industrial wastes. - Restrict runoff from paved and developed areas onto beach.		MAINTENANCE OF WATER QUALITY Maintain gradual and dispersed runoff: - Retard and disperse runoff from paved and developed areas. Maintain integrity of aquiclade between shallow saline aquifer and freshwater lens: - Filter runoff from paved and developed areas through vegetation and soil: - Limit cleared area and impervious surfaces. - Prohibit excavation of the aquiclade. Maintain natural free-flowing patterns of water circulation: - See guidelines above.	MAINTENANCE OF FRESH WATER SYSTEM Maintain recharge of runoff to fresh water lens: - Limit cleared area and impervious surfaces. Maintain sufficient water levels to prevent salt water intrusion. Filter runoff from paved and developed areas through vegetation and soil: - Limit cleared area and impervious surfaces. - Prohibit excavation of the aquiclade. Maintain natural free-flowing patterns of water circulation: - See guidelines above.			MAINTENANCE OF ISLAND WILDLIFE Maintain good water quality: - See guidelines above. Maintain fresh water system: - See guidelines above. Maintain wildlife access to water: - Provide for wildlife corridors connecting conservation areas with Sanibel Slough. Maintain native vegetation of value to wildlife: - Restrict clearance of vegetation valuable to wildlife. - Remove exotic plant species which out compete or displace native species.			MAINTENANCE OF MARINE LIFE AND WILDLIFE Maintain healthy mangroves on beach: - See guidelines for Mangrove Zone. - See guidelines for Mangrove Zone. Maintain good water quality: (See below.) Maintain wildlife and marine life access to beach: - Prohibit construction on beach blocking access by wildlife or marine life. Maintain good water quality: - Prohibit discharge of insufficiently treated domestic and industrial wastes. - Prohibit runoff from paved and developed areas onto beach. - Maintain water quality functions of Mid-Island Ridges and Mangrove Zone.		MAINTENANCE OF MARINE LIFE AND WILDLIFE Maintain healthy mangroves on beach: - See guidelines for Mangrove Zone. - See guidelines for Mangrove Zone. Maintain good water quality: (See below.) Maintain wildlife and marine life access to beach: - Prohibit construction on beach blocking access by wildlife or marine life. Maintain good water quality: - Prohibit discharge of insufficiently treated domestic and industrial wastes. - Prohibit runoff from paved and developed areas onto beach. - Maintain water quality functions of Mid-Island Ridges and Mangrove Zone.

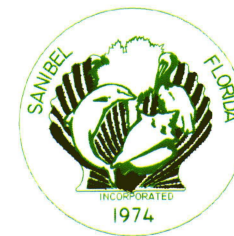
ECOLOGICAL ZONES: MANAGEMENT GUIDELINES



LEGEND

- AQUATIC PRESERVE
- MANGROVES
- INTERIOR WETLANDS

Source: This graphic was redrawn from the 1997 *Sanibel Plan*.
The principle source of the base map used in this illustration is from the Lee County Property Appraiser's Office.
Prepared by the Planning Department.



INFORMATIONAL
NON-REGULATORY
ILLUSTRATION

WETLANDS