

CHAPTER 4: NATURAL SYSTEMS ANALYSIS

The Natural Systems Analysis chapter of the Land Use Plan is intended to define, describe and analyze the natural features and environmental conditions found in the Sunset Beach planning jurisdiction (Town limits and ETJ). There are a total of 14 natural features and environmental conditions identified that contribute to quality of life and property values for residents, and could impact development suitability for certain types of new development and redevelopment in Sunset Beach.

This chapter also contains a series of natural features maps and inventories used to visually display the condition, location, and extent of the natural environment in the planning jurisdiction. The inventory in this section calculates an approximate acreage (from the best available data) of natural features and environmental conditions in the planning jurisdiction. The overall purpose of this section is to provide the Town and its decision-making officials with insight on the presence and function of environmental characteristics that exist in the jurisdiction as they will impact future planned development.

A primary goal of the Town of Sunset Beach is to preserve, conserve, and otherwise protect valuable and beneficial natural resources. Those natural resources primarily being the “Areas of Environmental Concern” (AECs), which include coastal wetlands, the vegetated dune system, the unvegetated beach areas, and estuarine shorelines.

The Town also intends to preserve and improve surface water quality through the;

- 1) continued enforcement of its stormwater management ordinance,
- 2) on-going improvements in design and proper maintenance of its existing stormwater management infrastructure (i.e. vegetated buffers, swales, ditches, outfall systems).

DEFINING NATURAL FEATURES AND AREAS OF ENVIRONMENTAL CONCERN

As stated in Chapter 1, the Division of Coastal Management (DCM) places emphasis on protecting Areas of Environmental Concern (AECs).

Features 1 – 7 following are all considered and regulated as Areas of Environmental Concern.

- 1) Coastal Wetland AEC - Coastal Wetlands are any marsh (salt, brackish, or freshwater) in the 20 coastal counties that regularly or occasionally floods by lunar or wind tides, and that includes one or more of 10 plant species: Salt Marsh (Smooth) Cord Grass, Black Needlerush, Glasswort, Salt (or Spike) Grass, Sea Lavender, Bulrush, Saw Grass, Cattail, Salt Meadow Grass, Salt Reed, or Giant Cord Grass.

Coastal Wetlands in Sunset Beach

The type of coastal wetlands found in the Sunset Beach planning jurisdiction is Salt/Brackish Marsh primarily in the extensive tidal marsh and creek system surrounding the island and running along the Intracoastal Waterway. There are approximately 1,863 acres of coastal wetlands in the planning jurisdiction. See the Areas of Environmental Concern Map [Map 4.1] and Natural Features Inventory Table [Table 4.7] for additional information.

The Town of Sunset Beach supports the preservation of coastal wetlands for their aesthetic qualities, flood and erosion prevention benefit, and for their water cleansing ability. The Town supports state regulations which limit the use and disturbance of coastal wetlands.

- 2) Inlet Hazard Area AEC - These areas cover the lands next to ocean inlets. Inlet shorelines are especially vulnerable to erosion and flooding and can move over relatively short time periods. For each inlet along the coast, DCM prepares a hazard area map. Each area is mapped based on a statistical analysis of inlet migration, previous inlet locations, narrow or low lands near the inlet, and the influence of man-made features, such as jetties and channelization projects.

Inlet Hazards in Sunset Beach

Sunset Beach has one inlet hazard area, Tubbs Inlet. Mad Inlet is closed to water movement but remains a threat area; however, the area is no longer recognized as an Inlet Hazard Area by the Division of Coastal Management. The closing of Mad Inlet now connects the state estuarine reserve of Bird Island to Sunset Beach. See Map 4.1 Sunset Beach AECs.

Because of their dynamic and constant movement, dense or large-scale development (such as multi-family or buildings in excess of 5,000 total square feet) should be discouraged or not allowed by the Town in an inlet hazard area. Examples of dangers from moving inlets to development can be seen in communities such as Ocean Isle Beach, Wrightsville Beach and North Topsail Beach. In Sunset Beach, there are approximately 244 recorded lots totaling 75 acres intersected by the Inlet Hazard Area (IHA) in the Town's planning jurisdiction. According to County Tax records, 26 of those lots totaling nearly 20 acres are vacant. The majority of the vacant lots that exist in the Inlet Hazard Area are located in the Palm Cove area on the eastern end of the island. The Conservation Reserve Zoning district accounts for the most significant vacant land available for development. This district limits development to larger lots (1 acre minimum) with a lower amount of impervious surface coverage (20% maximum).

Current zoning in the IHA includes Beach Residential 1, Beach Residential 2, and Conservation Reserve 1. See Table 4.1 for breakdown of vacant lots per zoning district in the IHA.

Table 4.1: Vacant Lots per Zoning District in the Inlet Hazard Area

Source: Brunswick County GIS Records and Cape Fear Council of Governments GIS

Vacant Land by Zoning District in the Inlet Hazard Area		
Zoning District	Count	Acres
BR-2	14	0.71
CR-1	12	18.7
Total	26	19.41

3) Estuary Waters and Estuarine Shoreline AEC - Estuarine Waters are oceans, sounds, and tidal rivers and creeks (including the Intracoastal Waterway), which link to the other parts of the estuarine system: public trust areas, coastal wetlands, and coastal shorelines.

Estuarine Shorelines include all lands within 75 feet of the normal high water level of estuarine waters. Development in this 75 foot “zone” must not cover more than 30% of the area with impervious surface. Along Outstanding Resource Waters (ORW), this definition includes lands within 575 feet of the normal high water level. There are no ORW waters in the planning jurisdiction.

Estuarine Shoreline in Sunset Beach

The estuarine shoreline AEC in Sunset Beach extends 75 feet landward from the mean high water line of all the shoreline of the Intracoastal Waterway, tidal creeks extending into the mainland, and all the navigable creeks in the coastal wetlands surrounding the Sunset Beach island (See the Areas of Environmental Concern Map [Map 4.1] for the location of estuarine waters in the planning jurisdiction).

Development in this 75 foot “zone” must not cover more than 30% of the area with impervious surface, and development within 30’ of the high-water line must be water dependent (i.e. dock, pier, etc.). Existing zoning in Sunset Beach along the Intracoastal Waterway estuarine waters additionally prohibits no more than 30% impervious coverage for the entire lot. Existing zoning in Sunset Beach on the island has varying lot coverage due to smaller lots (4,500 sq. ft.) and smaller property line setbacks, therefore impervious coverage per lot may exceed 30% of the site in some zoning districts on the island. However, the 30% impervious coverage for the estuarine shoreline 75’ zone still applies.

4) Ocean Erodible Area Setbacks AEC – This area covers beaches and any other oceanfront lands that are subject to long-term erosion and significant shoreline changes. The landward limit of this AEC is measured from the first line of stable natural vegetation. The first line of stable natural vegetation is the area on the oceanfront beach where natural dune-stabilizing plants are present. Such plants include sea oats and American beachgrass.

The Ocean Erodible Area Setback AEC is determined by adding:

- a distance equal to 30 feet (for small structures)* or 60 feet (for large structures)* times the 50-year long-term average annual erosion rate for that stretch of shoreline.

*Small structures include single-family homes and other units under 5,000 square feet of total area. Large structures generally include multi-family and commercial uses which are 5,000 square feet or more in total area.

Ocean Erodible Setback Area in Sunset Beach

Sunset Beach has an erosion rate setback factor of 2 feet per year, which is the minimum required setback factor, on all stretches of beach in its planning jurisdiction (including inlet areas). The setback factor is required regardless of whether a beach is gaining or losing sand. For Sunset Beach, the Ocean Erodible setback is 60' back from the first line of stable vegetation for "small" structures and 120' for "large" structures. All oceanfront property is currently zoned Beach Residential-1, with some minimal Beach Business-1 zoned around the pier. BR-1 only allows single family and duplex on minimum 7,500 square foot lots. Building height (35') and a limit on impervious surface limit the intensity development in this zone.

The Town has additional setback limitations codified in its BR-1 zoning district which limit seaward development to 150' from Main Street (most seaward road running parallel to the ocean). Given the distance of the ocean and unvegetated beach from Main Street (700' to 300'), the Town has seaward development restrictions that exceed the Ocean Erodible AEC setback requirements. This regulation is a desired management tool in Sunset Beach intended to provide long-term protection for existing properties and reduce the need for public expenditures caused from the natural movement (erosion) of the beach. Currently, no areas are experiencing significant shoreline erosion problems.

- 5) Un-vegetated Beach Area AEC – This area is the un-vegetated (sand) portion of the main beach strand from the low tide level up to the first line of stable vegetation.
- 6) High Hazard Flood Area AEC – This covers lands subject to flooding, high waves, and heavy water currents during a major storm. These are the lands identified as coastal flood with velocity hazard, or "VE" zones," on the Town's official flood insurance rate maps (FIRMs). The high hazard flood AEC often overlaps with the ocean erodible and inlet hazard AECs.

High Hazard Flood Areas in Sunset Beach

Sunset Beach's high hazard flood area (VE Zone) encompasses roughly 3,020 acres or 43% of the planning jurisdiction (See Special Flood Hazards Area Map [Map 4.2]). This total includes the extensive and undevelopable marsh system in the jurisdiction.

However, the area between Cobia Street and 6th Street on the island is completely within the VE zone from the ocean to the backside of the island. Also on the island, the areas around 40th Street and Bay and Inlet Streets are within the VE zone. Overall, approximately 60% of the island area is within the VE zone. As stated earlier, residential zoning in these areas are primarily BR-1 and BR-2. On the mainland, the properties immediately adjacent the Intracoastal Waterway and tidal creeks are within the VE zone. Zoning in these areas include Mainland Residential 1 (MR-1) and Mainland Residential 2 (MR-2). MR-1 zoning allows single-family on 15,000 square foot lots (i.e. 2.9 units per acre density). MR-2 zoning allows single-family on 10,000 square foot minimum lots (i.e. 4.3 units per acre density). There are approximately 759 lots with structures that are located within the VE flood zone. According to Brunswick County tax records the total value of housing units and/or structure on these lots is approximately \$193,378,610. Note: If adopted by Brunswick County, the new floodplain maps show a significant reduction in the areas impacted by the VE zone. The Land Use Plan will be updated to account for the new floodplain maps pending adoption by the county.

Sunset Beach is a participating community in the National Flood Insurance Program (NFIP) and enforces a Flood Damage Prevention Ordinance through its Building Inspections Department. The Flood Prevention Ordinance was adopted in the spring of 2006 after completion of the North Carolina Floodplain Mapping Project for the Lumber River Basin.

7) Public Trust Areas AEC – These areas include the coastal waters and submerged lands that belong to the “public” to use for activities such as boating, swimming or fishing. These areas often overlap and include estuarine waters. The following lands and waters are considered public trust areas:

- all waters of the Atlantic Ocean and the lands underneath, from the normal high water mark on shore to the state's official boundary three miles offshore;
- all navigable natural water bodies and the lands underneath, to the normal high watermark on shore (a body of water is considered navigable if you can float a canoe in it). This does not include privately owned lakes where the public doesn't have access rights;
- all water in artificially created water bodies that have significant public fishing resources and are accessible to the public from other waters; and
- all waters in artificially created water bodies where the public has acquired rights by prescription, custom, usage, dedication or any other means.

Public Trust Areas in Sunset Beach

The public trust waters within or adjacent the Sunset Beach planning jurisdiction include the Atlantic Ocean, the Intracoastal Waterway, all the navigable creeks surrounding the Sunset Beach island, and coastal wetlands (if “navigable” at high

tide). Bird Island on the southeastern edge of the planning jurisdiction is a state estuarine reserve in public trust.

Sunset Beach recognizes the rights of riparian property owners to access navigable surface water from their riparian property. However, the Town should proactively manage the construction of private piers and docks so as not to allow the creation of impediments to navigation in public trust areas. Such management can include establishing limits on the length of private piers.

ADDITIONAL NATURAL FEATURES AND ENVIRONMENTAL CONDITIONS

Other natural features and environmental conditions in the Sunset Beach planning jurisdiction in addition to AECs are described below.

8) Water Quality Classifications - Definitions for Water Quality Classifications come from the NC Division of Water Resources. All surface waters in North Carolina are assigned a primary classification by the NC Division of Water Resources (DWR). The tidal/salt water classifications that are applicable to the Sunset Beach planning jurisdiction are SA and SB.

SB - Surface waters that are used for primary recreation, including frequent or organized swimming. Stormwater controls are required under CAMA and there are no categorical restrictions on discharges.

SA - Surface waters that can be used for shellfishing, and all SB uses. All SA waters are also High Quality Waters (HQW) by definition. Stormwater controls are required under CAMA. No domestic discharges are permitted in these waters. The SA classification does not mean a body of water is always open to shellfishing. The status of shellfishing in a particular body of water is determined by the NC Division of Marine Fisheries on an individual basis.

Regulations over SA waters

The North Carolina Sediment and Erosion Control Act has established additional design standards for “sensitive watersheds” and/or High Quality Waters which can be found in 15A NCAC 4B .0124. The Act applies to development activities that disturb one acre or more of land, and is generally intended to protect water quality during the construction stage. If a Sedimentation and Erosion Permit is required, a Stormwater Control Permit is also required. The Stormwater Permit is intended to protect water quality after the construction stage and through the life of the development. Stormwater permits allow either a low or high-density development option. In a low-density development, the amount of impervious surface is limited and vegetated buffers are required along shorelines. In a high-density development, impervious surfaces can be increased but engineered stormwater control systems (i.e. retention ponds) must be included to control runoff. The Stormwater Permit rules can be found at 15A NCAC 2H .1000.

Sunset Beach Stormwater Quality Management and Discharge Control

The Town adopted a stormwater ordinance in 2006 based upon the Brunswick County ordinance. The Town’s stormwater ordinance is enforced by Brunswick County through an

interlocal agreement. The ordinance requires Stormwater Management Plans and approved control systems and BMPs to be developed for:

- any commercial development (includes developments of any lot size).
- any subdivision of a parcel into 6 or more residential lots (could include residential development under one acre).
- any development that increases the original grade of the lot by 4 inches or more (could include residential development under one acre).

Water Quality in Sunset Beach

Sunset Beach water quality classifications are SA (SA: Market Shellfishing, Salt Water) for the Intracoastal Waterway and all other waters surrounding the island, except the ocean which is classified SB: Primary Recreation, Salt Water (See Water Quality Characteristics Map [Map 4.3]). Sunset Beach is located in the Lumber River Basin, and falls within subbasin 03-07-59. This subbasin contains the southwest corner of Brunswick County primarily east of Highway 17. There are no classified surface waters impaired for aquatic life or recreation in subbasin 03-07-59. However, all waters are impaired for fish consumption and shellfish harvesting. Impaired fish consumption generally means there is an ongoing advisory (since 1996) regarding mercury levels in tissue of certain fish species found east of Interstate 85 (piedmont area) which exceeds state safety standards for large levels of consumption (added 9/20/06). For more information on fish consumption impairment, visit the NC Department of Health and Human Services website and search for Fish Consumption Advisories (<http://www.ncdhhs.gov/>).

At the time of the last Land Use Plan update in 2010, shellfishing had been an “impaired” use for all of the planning area’s estuarine waters and it continues to be impaired as of the date of this Land Use Plan update (See Water Quality Characteristics Map [Map 4.3]). According to the Shellfish Sanitation Branch of the North Carolina Division of Marine Fisheries, the permanent closure and conditional approval of shellfishing areas in the jurisdiction has been attributed to long-term septic system use in flood prone areas as well as existing manmade canals and residential lawns with little or no vegetative buffers to filter stormwater runoff. Stormwater runoff has been cited as the main contributor to shellfish closures. The conditionally approved open shellfishing sites in the planning jurisdiction (Jinks Creek, Blane Creek, and Tubbs Inlet area) are closed during every rain event causing 0.5 inch to 1.5 inches of rain primarily due to pollutants such as fecal coliform (i.e. pet, animal and human (septic system) waste in stormwater runoff. These Conditionally Approved Closed (CAC) areas may only be opened to shellfish harvesting during very dry periods and after water quality testing has been completed. These areas are monitored frequently while open and are immediately closed after a 0.5 inch rainfall event in a 24 hour period. According to officials with the Division of Marine Fisheries, there has been no improvement in water quality that would change status of these waters as closed for shellfishing.

There is one Division of Water Resources (DWR) water quality monitoring station (established in 1983) in the planning jurisdiction located near the Sunset Beach island bridge. This station (Station I19880000) consistently measured dissolved oxygen, fecal coliform, and total suspended solids levels as well as pH. The range of measurements from 2010 to 2013 is shown in Tables 4.2 and 4.3. Data is not currently available beyond 2013.

Dissolved oxygen (DO) is the oxygen present in water and is essential for the survival of aquatic organisms. Table 4.7 shows that the DO levels at the Sunset Beach Station frequently dropped below the NC standard during the summer months between 2010 and 2013. DO levels can change depending on temperature and movement of the water, plant and animal respiration, and decomposition of organic matter. When DO levels are low, it can cause stress for aquatic organisms. A typical pollutant observed in surface waters is fecal coliform. Fecal coliform is a bacteria found in the waste of humans and other warm-blooded animals. This bacteria can enter the waterways through direct discharge, stormwater runoff, or leeching from septic tanks. Table 4.2 shows that the fecal coliform levels at the Sunset Beach Station were often higher than the NC Standard between 2010 and 2013. These high levels of illness-causing pathogens can cause closures for recreation and shellfishing activities.

Table 4.2: Dissolved Oxygen and Fecal Coliform Levels at the Sunset Beach Water Quality Monitoring Station

Source: NC Division of Water Resources.

Year	Dissolved Oxygen (mg/L)	DO outside NC Standard?	Fecal Coliform (cfu/100mL)	FC outside NC Standard?
2010	3.3-10.6	Yes	2-220	Yes
2011	4.2-9.5	Yes	4-14	No
2012	4.4-9.4	Yes	2-31	Yes
2013	3.2-9	Yes	10-56	Yes

NC Standard for Dissolved Oxygen: not less than 5.0 mg/L for saltwater, not less than 6.0 mg/L for high quality water (HQW)

NC Standard for Fecal Coliform: 14 cfu/100mL

The pH of saltwater is generally between 6.8 and 8.5. Table 4.3 shows that the pH levels at the Sunset Beach water quality monitoring station are in the normal range for this water type. Total suspended solids (TSS) is a measure of turbidity, or the clarity of the water that is often blocked by suspended materials. Stormwater runoff, erosion, and algal blooms can decrease the clarity of the water. The measure of TSS between 2010 and 2013 at the Sunset Beach Station were generally normal but exceeded standards on several occasions, likely due to storm events causing runoff into the basin.

Table 4.3: pH and Total Suspended Solids Levels at the Sunset Beach Water Quality Monitoring Station

Source: NC Division of Water Resources.

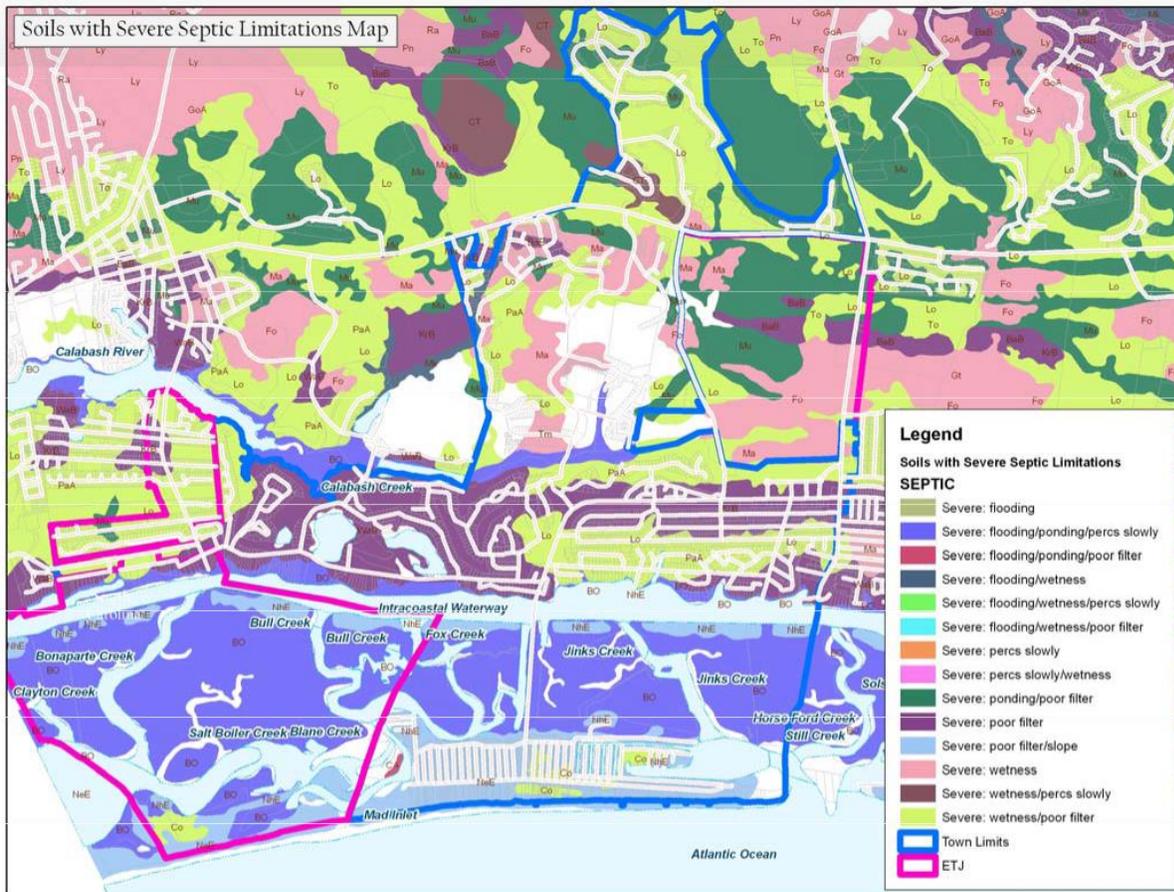
Year	pH	pH outside NC Standard?	TSS (mg/L)	TSS outside NC Standard?
2010	6.4-8	Yes	7-24	Yes
2011	7.5-7.9	No	13-34	Yes
2012	7.4-8	No	13-24	Yes
2013	6.8-7.9	No	10-30	Yes

NC Standard for pH: 6.8-8.5. NC Standard for total suspended solids (TSS): 20 mg/L

Soils with Septic System Limitations

The following map graphic shows that the majority of the planning jurisdiction contains soils with some type of limitation to the use of septic systems. It should be noted that Sunset Beach is now served mostly by a centralized sewer system through Brunswick County utilities.

Figure 4.1: Soils with Severe Septic Limitations.



The Town of Sunset Beach has begun or will undertake certain activities that should reduce or stabilize the contributing factors to the surface water quality problems in the jurisdiction. Those activities include requiring stormwater runoff controls and vegetative buffer and/or Best Management Practice standards for new developments and substantial redevelopments.

9) Special Flood Hazard Areas (100-yr flood zones) - The SFHA is defined as an area of land that would be inundated by a flood having a 1% chance of occurring in any given year (previously referred to as the base flood or 100-year flood).

AE - Zone AE is the flood insurance rate zone that correspond to the 100-year floodplains that are determined in a Flood Insurance Study by FEMA.

VE - Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with wave action caused by storm events.

Flood Zones in Sunset Beach

According to the NC Floodplain Mapping Program information, the 100-yr flood zones in the Sunset Beach planning jurisdiction are AE and VE. 99% of the island is within either the VE or AE zone. The VE zone accounts for a little over 60% of that total on the island. The AE zone encompasses 568 acres or 8% of the total planning jurisdiction (See Special Flood Hazards Area Map [Map 4.2]). The VE zone, as mentioned earlier, encompasses roughly 3,020 acres or 43% of the planning jurisdiction (See Special Flood Hazards Area Map [Map 4.2]). The remaining 49% of land within the planning jurisdiction is not impacted by a Special Flood Hazard Area. See table below for information on the number of lots and home value intersecting the Special Flood Hazard Areas (AE and VE).

Table 4.4: Number of Lots with Structures in SFHA Flood Zones

Source: NC Flood Maps

Flood Zone	Number of Lots with Structures	Total Value of Structures
AE	1,065	\$222,218,540
VE	759	\$193,378,610
Total	1,824	\$415,597,150

Sunset Beach is a participating community in the National Flood Insurance Program (NFIP) and enforces a Flood Damage Prevention Ordinance through its Building Inspections Department. The Flood Prevention Ordinance was adopted in the spring of 2006 after completion of the North Carolina Floodplain Mapping Program for the Lumber River Basin. According to historical NFIP claims data from 1978 to 2015, Sunset Beach has one of the lowest damage claim and damage payout levels for all North Carolina communities with a beach strand (see the table following for comparison).

Table 4.5: NFIP Claims and Payments in Brunswick County, 1978-2015

Source: FEMA Policy & Claims Statistics for Flood Insurance.

Municipality	Total Claims	Total Payments
Bald Head Island	303	\$2,058,725
Boiling Spring Lakes	26	\$155,597
Calabash	3	\$50,396
Carolina Shores	1	\$0.00
Caswell Beach	130	\$634,112
Holden Beach	2,052	\$11,580,829
Leland	2	\$4,901
Long Beach	1,914	\$17,682,276
Navassa	1	\$15,809
Oak Island	184	\$4,971,278
Ocean Isle Beach	1,592	\$7,682,276
Shalotte	8	\$572,384
Southport	48	\$226,633
Sunset Beach	217	\$322,409
Yaupon Beach	85	\$749,362
Brunswick County	369	\$3,850,775

10) Hurricane Storm Surge Inundation Area (Fast Moving Storm) - The National Hurricane Center, in cooperation with the North Carolina Center for Geographic Information and Analysis, developed the GIS data set, Hurricane Storm Surge Inundation Areas (1993), to reevaluate the extent of the areas affected by hurricane inundation along the North Carolina coast. The data depicts the extent of hurricane storm surge inundation areas based on SLOSH (Sea, Lake, and Overland Surges from Hurricanes) models, for the North Carolina coast. The FAST model depicts hurricanes with forward velocities greater than 15mph (See Storm Surge Inundation Map [Map 4.4]).

Storm surge is water that is pushed toward the shore by the force of the winds swirling around the storm. This advancing surge combines with the normal tides to create the hurricane storm tide, which can increase the mean water level 15 feet or more. In addition, wind driven waves are superimposed on the storm tide. This rise in water level can cause severe flooding in coastal areas, particularly when the storm tide coincides with the normal high tides. The storm surge inundation area data used for the planning jurisdiction is based on the SLOSH Model developed by NOAA's National Weather Service.

Storm Surge Inundation Areas in Sunset Beach

In Sunset Beach, approximately 735 acres or 15% of the planning jurisdiction is considered outside of possible hurricane storm surge inundation. These areas are the most inland portions of the Sea Trail development and the former Angel's Trace development and Sandpiper Bay. More than 50% of the total area in the planning jurisdiction is likely to be inundated during a Category 1 or 2 hurricane, 65% in a Category 3 hurricane, and 85% of the total area in the corporate limits is likely to be

inundated in a Category 4 or 5 hurricane (See Storm Surge Inundation Map [Map 4.4]).

11) Non-coastal wetlands/probable 404 wetlands (NC-CREWS) – Section 404 of the Federal Water Pollution Control Act (“the Clean Water Act”) defines wetlands as “areas that are inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation adapted to life in saturated soil conditions.”

“Any person, firm, or agency (including Federal, state, and local government agencies) planning to work in navigable waters of the United States, or discharge (dump, place, deposit) dredged or fill material in waters of the United States, including wetlands, must first obtain a permit from the Army Corps of Engineers (ACOE).” If an activity requires an ACOE ‘404’ permit, the state of North Carolina requires that a ‘401’ water quality certification be obtained as well. The ‘401’ certification is basically a verification by the state that a given project will not degrade waters of the State or otherwise violate water quality standards.

The North Carolina Coastal Region Evaluation of Wetland Significance, or NC-CREWS, is a watershed-based wetlands assessment model that assesses the level of water quality, wildlife habitat, and hydrologic functions of individual wetlands. The primary objective of the NC- CREWS wetland functional assessment is to provide local government planners with information about the relative ecological importance of wetlands for use in land use planning and the overall management of wetlands. NC-CREWS produces 3 possible overall wetland rating scores: Exceptional Significance, Substantial Significance, or Beneficial Significance. NC- CREWS also evaluates the potential risk to watershed integrity if identified wetlands were “lost”. More than 70% of the wetlands within the Sunset Beach planning jurisdiction are classified as of “Exceptional Significance.” Wetlands of exceptional significance are the highest rated category of this ecosystem type and provide habitat and watershed integrity.

Non-Coastal Wetlands identified as NC –CREWS in Sunset Beach

The types of non-coastal wetlands located in the Sunset Beach planning jurisdiction are listed in Table 4.6.

Table 4.6: Non-Coastal Wetlands in Sunset Beach

Source: NC Department of Environmental Quality

Non-Coastal Wetlands	Acres
Bottomland Hardwood and Riverine Swamp Forest	119.50
Depressional Swamp Forest	33.89
Estuarine Forest	1.60
Estuarine Shrub/Scrub	12.96
Hardwood Flat	7.97
Human Impacted Wetlands	30.34
Managed Pineland	683.04
Pine Flat	38.52
Pocosin	70.17
Total	998.00

The bulk of the wetlands are located within or adjacent to the Sea Trail development and the former Angel's Trace development. In addition, "Sandpiper Bay/Wyndfall" areas account for much of the jurisdiction's non-coastal wetland inventory. (See the Wetlands Map [Map 4.5]).

While most of these types of wetlands will be regulated by the Army Corps of Engineers 404 Permitting Unit and the State's 401 Water Quality Certification Program, the Town of Sunset Beach can help protect these areas by not allowing future re-zonings to a more dense use in areas where these wetlands may be present. Including "planned or clustered unit development" options in the development ordinance can also help by allowing the developer to determine his/her own lot configuration and setbacks and still achieve the allowable density or number of units without having to disturb productive wetland areas on the site.

A description of the types of wetlands found in the planning jurisdiction are below.

Bottomland Hardwood or Riverine Swamp Forest – Riverine forested or occasionally scrub/shrub communities usually occurring in floodplains, that are semi-permanently to seasonally flooded. In bottomland hardwood systems, typical species include oaks (overcup, water, laurel, swamp chestnut), sweet gum, green ash, cottonwoods, willows, river birch, and occasionally pines. In swamp forest systems, typical species include cypress, black gum, water tupelo, green ash and red maple.

Depressional Swamp Forest – Very poorly drained non-riverine forested or occasionally scrub/shrub communities that are semi-permanently or temporarily flooded. Typical species include cypress, black gum, water tupelo, green ash and red

maple. These are distinguished from riverine swamp forests in the data by having a hydrogeomorphic (hgm) class of flat (f).

Estuarine Forest – A forested wetland community subject to occasional flooding by tides, including wind tides (whether or not the tide water’s reach these areas through natural or artificial watercourses). Examples include pine-dominated communities with rushes in the understory or fringe swamp communities such as those that occur along the Albemarle and Pamlico sounds.

Estuarine shrub scrub - Any shrub/scrub vegetation dominated habitat subject to occasional flooding by tides, including wind tides (whether or not the tidewaters reach the marshland areas through natural or artificial watercourses).

Hardwood Flat – Poorly drained interstream flats not associated with rivers or estuaries. Seasonally saturated by a high water table or poor drainage. Species vary greatly but often include sweet gum and red maple.

Human Impacted Wetlands - Areas of human impact have physically disturbed the wetland, but the area is still a wetland. Impoundments and some cutovers are included in this category, as well as other disturbed areas such as power lines.

Managed Pinelands - Seasonally saturated, managed pine forests occurring on hydric soils. This wetland category may also contain non-managed pine forests occurring on hydric soils. Generally these are areas that were not shown on National Wetland Inventory maps. These areas may or may not be jurisdictional wetlands.

Pine Flat – Palustrine (non-tidal), seasonally saturated pine habitats on hydric (saturated) soils that may become dry for part of the year, generally on flat or nearly flat areas that are not associated with a river or stream system. This category does not include managed pine systems.

Pocosin – Palustrine (non-tidal) scrub/shrub communities (i.e. non-Estuarine Scrub/Shrub) dominated by evergreen shrubs, often mixed with pond or loblolly pines. Typically occur on saturated, acid, nutrient poor, sandy or peaty soils; usually removed from large streams; and subject to periodic burning.

12) Fish Nursery Areas - Salt marshes and estuaries (salt and freshwater mix) along our coast serve as nursery grounds for 90 percent of our fisheries.

Primary Nursery Areas are located in the upper portions of creeks and bays. These areas are usually shallow with soft muddy bottoms and surrounded by marshes and wetlands. Lower salinity and the abundance of food in these areas are ideal for young fish and shellfish. To protect juveniles, many commercial fishing activities are prohibited in these waters; including the use of trawl nets, seine nets, dredges or any mechanical methods used for taking clams or oysters. Marina activities that will require new dredging activities are not allowed in Primary Nursery Areas.

Special Secondary Nursery Areas are located adjacent to Secondary Nursery Areas but closer to the open waters of sounds and the ocean.

Fish Nursery Areas in Sunset Beach

There are 80,144 acres designated as Primary Nursery Areas in North Carolina, the Sunset Beach planning jurisdiction contains 2,251 acres or about 2.8% of the states total. There are 31,362 acres designated as Special Secondary Nursery Areas, the Sunset Beach planning jurisdiction does not contain special secondary or secondary nursery areas. See the Primary Nursery Areas and Significant Natural Heritage Areas Map [Map 4.6].

The Division of Marine Fisheries prohibits new dredging in waters classified as Primary Fish Nursery areas. Areas where dredging has occurred in the past is grandfathered and allowable with conditions. The new dredging prohibition includes any activity including piers, docks, and marinas. As with 404 wetlands, a final site survey is necessary for verification of the area's environmental condition (e.g. whether the exact site is a functional Primary Nursery or not).

- 13) Environmentally Fragile Areas (Significant Natural Heritage Areas) - Significant Natural Heritage Areas (SNHA) are areas identifying sites (land or water) that have special environmental significance. A site's significance may be due to the presence of rare species, rare or high quality natural habitat, or other important ecological features.

Significant Natural Heritage Areas (SNHA) in Sunset Beach

Bird Island

Bird Island (273 acres) on the southwestern side of the Sunset Beach barrier island is considered a Significant Natural Heritage Area. It was identified in the Town's 1997 Land Use Plan Update as a priority protection area and has since been acquired by the state as an estuarine reserve. See the Primary Nursery Areas and Significant Natural Heritage Areas Map [Map 4.6]

Bonaparte Landing Maritime Forest

The Bonaparte Landing Maritime Forest (55 acres) is in the westernmost portion of the mainland Town limits is listed as an SNHA. The Bonaparte site is privately owned and zoned by the Town as MR-1 and MR-2. Those zones allow single family at 2.9 to 4.3 units per acre. If no vested rights are in place and the Town wished to better conserve this area, the Town could consider re-zoning this area to AF-1 or CR-1 which would allow single family on minimum lot sizes of one acre. The Town could also pursue an overlay district that would lessen the amount of impervious surface allowed and strengthen tree removal requirements. See the Primary Nursery Areas and Significant Natural Heritage Areas Map [Map 4.6].

Wood Stork Ponds

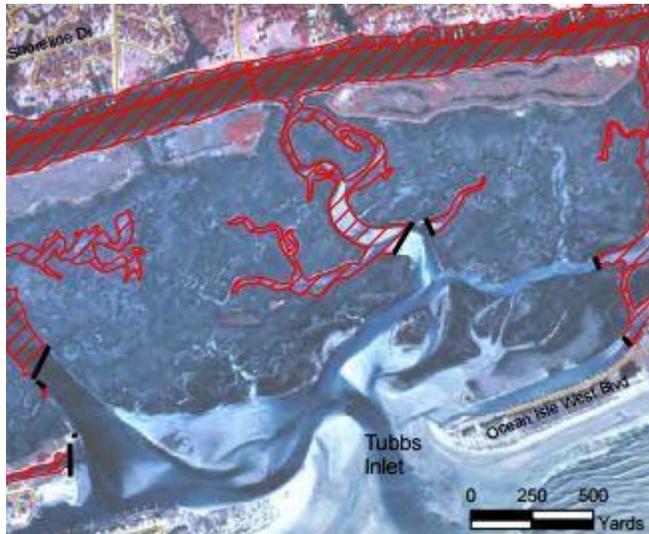
The Wood Stork ponds area is 554 acres north of Shoreline Drive on the mainland, which includes parts of Sea Trail (Clubhouse Dr.) and Lake Shore Dr. The area is subdivided and developed as residential and golf course use. The existing zoning is primarily MR-2 (single family/4.3 units/acre) with some MR-3 (single family and

multi-family/21 units per acre max.). See the Primary Nursery Areas and Significant Natural Heritage Areas Map [Map 4.6].

- 14) Closed Shellfishing Areas –Closed shellfish areas are areas where shellfish harvesting is prohibited by law due to unsafe levels of pollutants caused by conditions such as wastewater discharge and non-point source stormwater run-off.

Closed Shellfishing Areas in Sunset Beach

Within the planning jurisdiction of Sunset Beach, shellfishing is prohibited in the Intracoastal Waterway and Conditionally Approved Closed in all estuaries except



the Conditionally Approved Open areas around Jinks Creek and Tubbs Inlet (See #8 Water Quality in this section for more description on water quality in the planning jurisdiction). Also see the image depicting the Conditionally Closed shellfish areas (shown in red hatching) and Conditionally Approved Open areas around Tubbs Inlet (no hatching).

- 15) Hazard Mitigation Plan

The Town shall refer to its adopted Hazard Mitigation Plan for policy guidance and recommendations on any Town restructuring, reorganizing or development of any programs regarding the provision of emergency services, emergency services preparedness, emergency command procedure, public awareness, or evacuation procedure.

NATURAL FEATURES AND ENVIRONMENTAL CONDITIONS INVENTORY

The information on natural features and environmental conditions in table 4.7 was gathered by the Cape Fear Council of Governments through geo-processing and summarization of geographic data using geographic information systems (GIS). The majority of spatial (geographic) data used in this Land Use Plan was provided by the North Carolina Center for Geographic Information and Analysis and the Division of Coastal Management.

NOTE: These acreage calculations are derived from generalized data and are for general planning and informational purposes only.

Table 4.7: Natural Features Inventory

Source: NC Department of Environmental Quality and Cape Fear Council of Governments GIS

	Acres in Corporate Limits	Acres in ETJ	Comments
Total Area in Planning Jurisdiction	Approx. 4,600	Approx. 2,400	Source: County GIS Corporate Limits Data and Town of Sunset Beach Jurisdiction Data
"Land above Mean High Waterline"	3,400 acres	1,000 acres	Totals are approximations using Aerial
"Water/Wet Marsh/Spoils"	1,200	1,400 acres	Photography and Soils Data to establish "dry land" versus "wet" areas.
Natural Features and Environmental Conditions	Acres in Planning Jurisdiction (Town Limits and ETJ)		Comments
Areas of Environmental Concern (AECs)			
Coastal wetlands	1,863 acres		99.9% of wetland types are Salt/Brackish Marsh in the Town Limits and ETJ.
Estuarine waters	700 acres		All estuarine surface waters in the Town Limits and ETJ (Intracoastal Waterway and creeks between ICWW and barrier island) are classified as SA by the NC DWR. This includes the 75' buffer.
State, Federal or Institutional Protected Areas (Land and wet areas)	1,228 acres		The state of North Carolina and the Corps of Engineers own portions of Bird Island and much of the marsh system between Bird island and the ICWW.
High hazard flood area	3,020 acres		SFHA/100 Yr wave Velocity (VE) Flood areas and storm surge areas are considered High Hazard Flood Areas
Inlet hazard area	75 acres		26 lots totaling nearly 20 acres are vacant within the IHA. The Madd Inlet Hazard Area is no longer recognized by the Division of Coastal Management.
Soils			
Severe Septic Limitations	Almost Entire Jurisdiction		All soils within the entire jurisdiction have severe septic limitations. (i.e. ponding, poor filter, wetness) except approx. 260 acres in the Sea Trail development. However, the installation of sewer lines has alleviated the need for septic systems in much of the planning jurisdiction.

Town of Sunset Beach

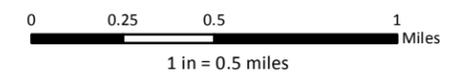


Comprehensive CAMA Land Use Plan Update Map 4.1 Areas of Environmental Concern (AEC)

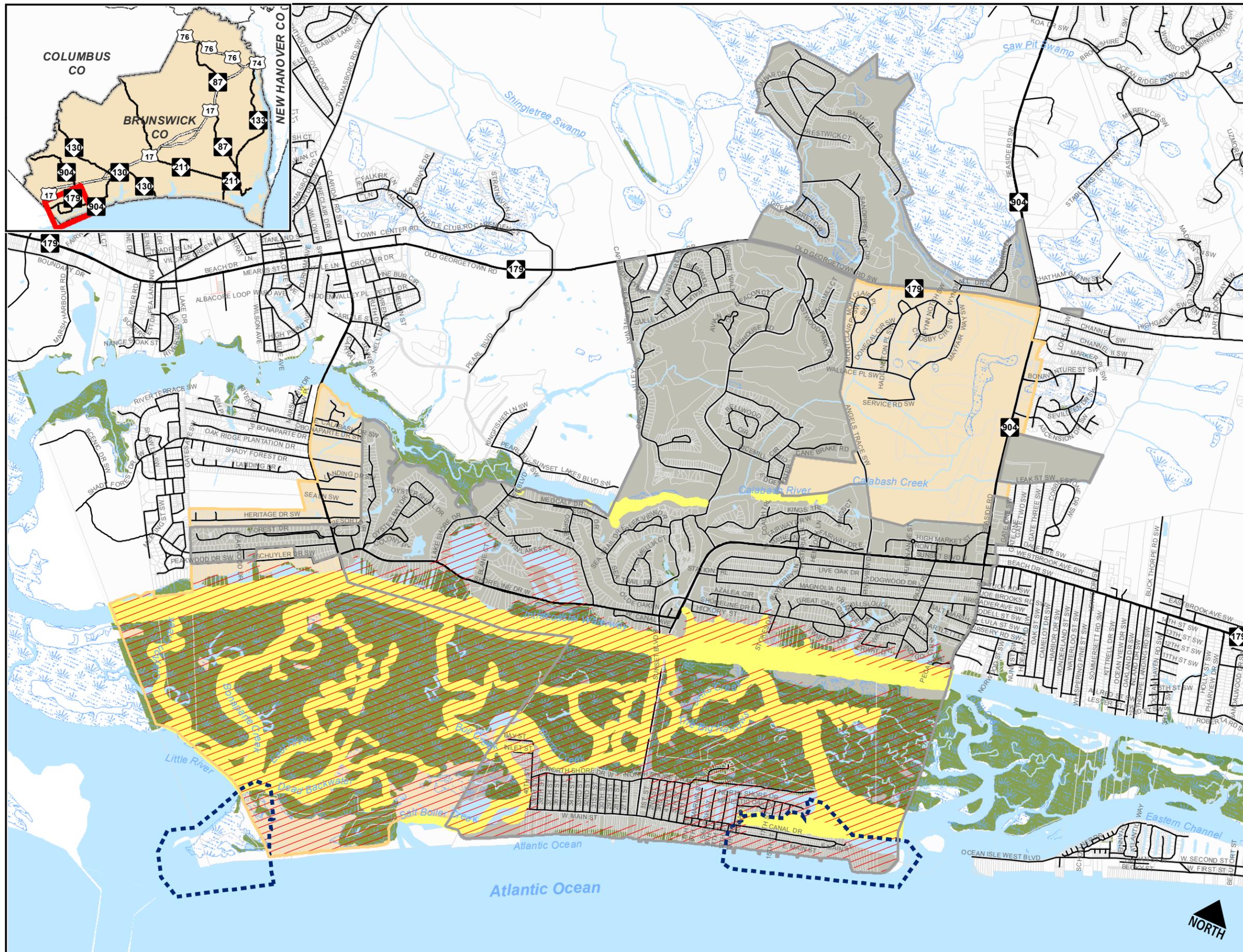
Legend

- Waterway
- Waterbody
- Swamp/Marsh
- Coastal Wetlands
- 75' Estuarine Shoreline AEC
- Inlet Hazard Area (IHA)
- High Flood Hazard (VE Zone)

Map is to be used for general purposes only. Spatial data used to generate this map was gathered from disparate sources and represent a condition at a fixed period in time. 100% accuracy of spatial data to current circumstances cannot be guaranteed. The Cape Fear Council of Governments is not legally responsible for the misuse of this map.



Map prepared by Cape Fear Council of Governments. Data sources: Brunswick Co., NCDENR, NCDOT, USGS.

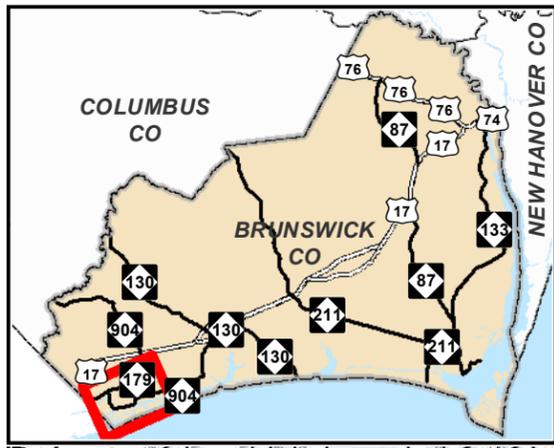
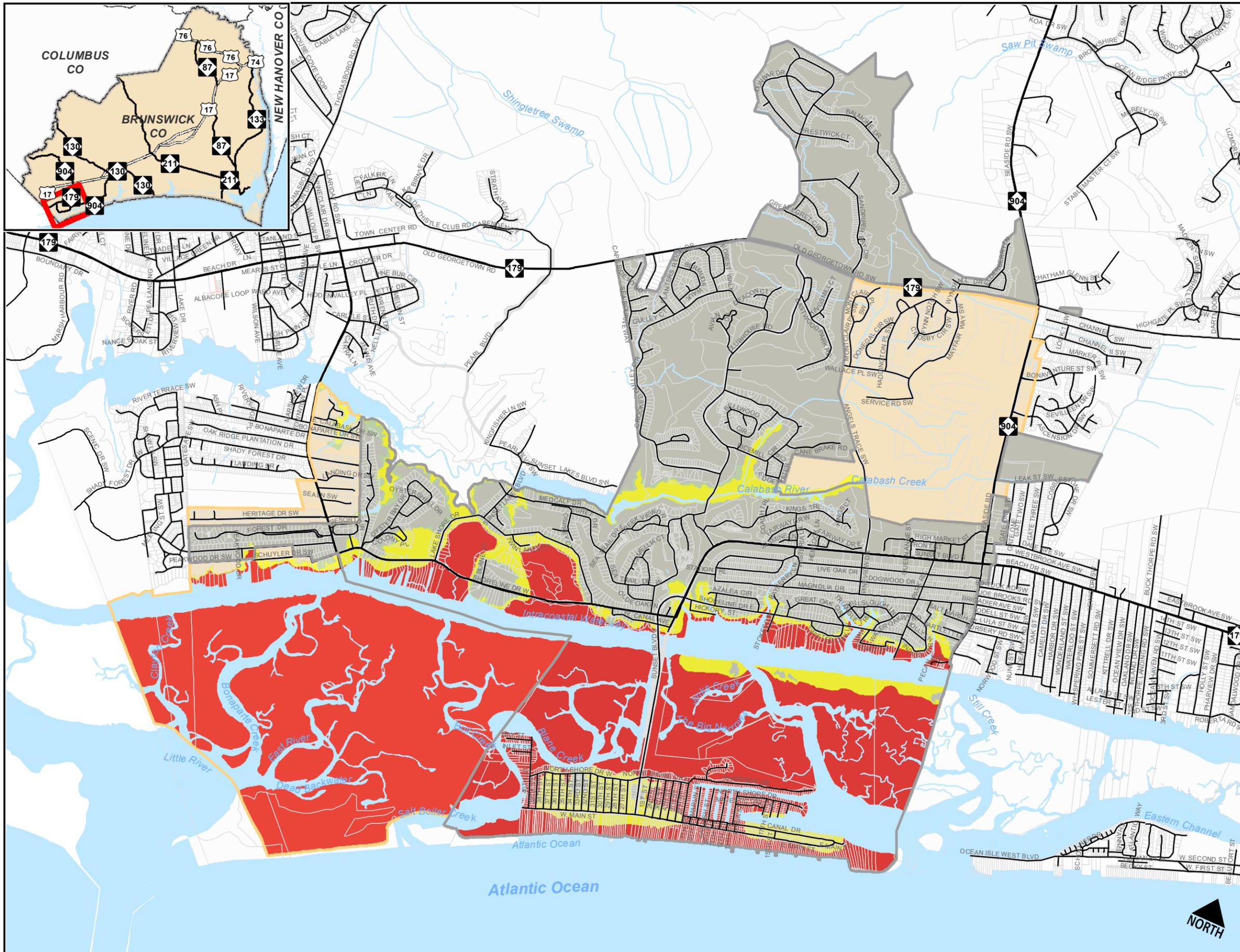


Town of Sunset Beach



Comprehensive CAMA Land Use Plan Update

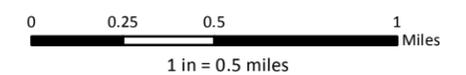
Map 4.2 Special Flood Hazard Areas (SFHA)



Legend

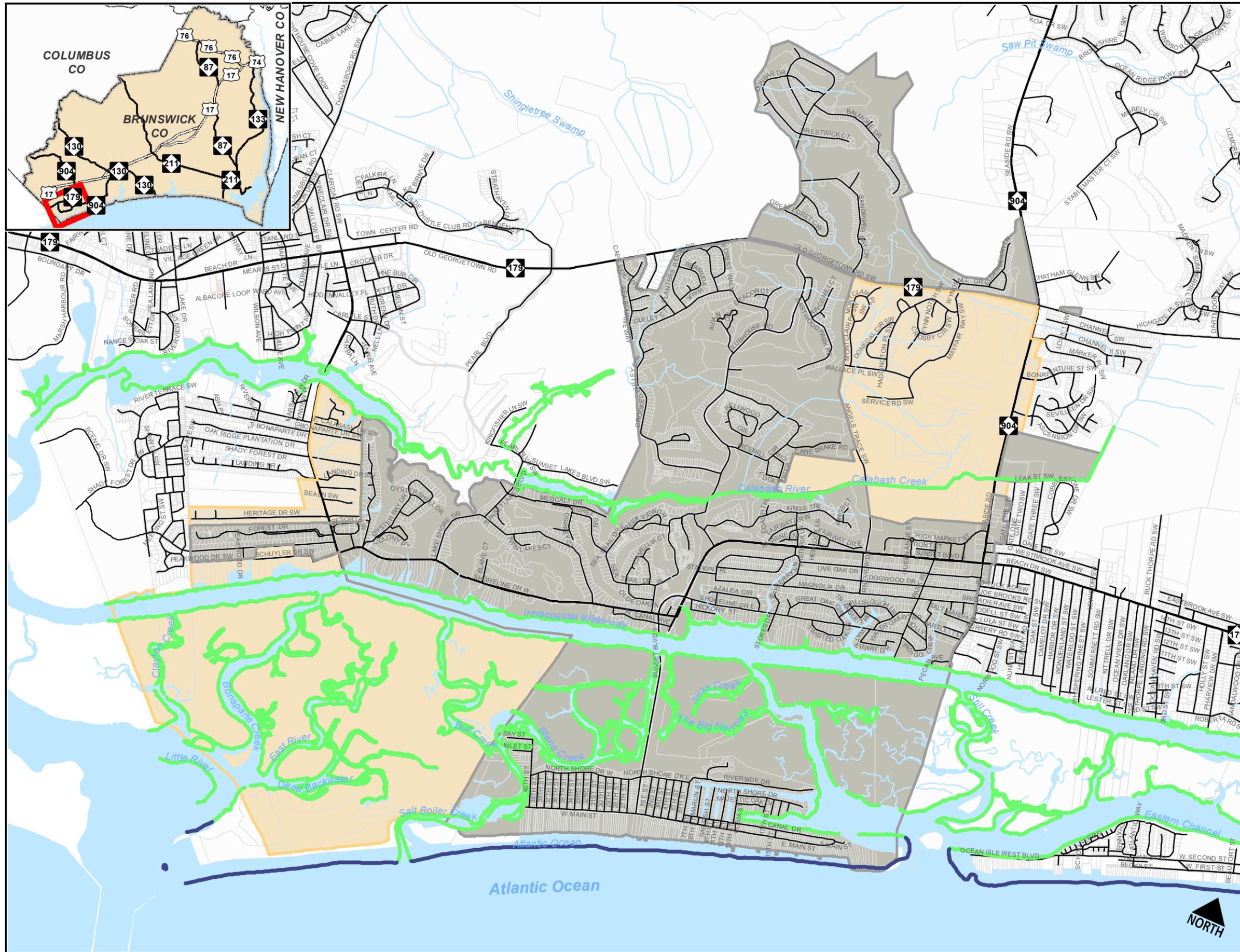
- Sunset Beach City
- Sunset Beach ETJ
- Waterway
- Special Flood Hazard Area (SFHA)**
- 0.2% Annual Chance
- AE Zone
- VE Zone

Zone	Descriptions
0.2% Annual Chance Flood	- Is the area determined to be a 0.2% annual chance flood hazard and is inside the 500 - year flood plain.
AE	- 1% annual chance of flooding; high risk. Base flood elevations are provided. Floodway is the area along both sides of a river, tributary, or creek including the main channel.
Zone VE	- An area inundated by 1% annual chance flooding with velocity (wave action); BFEs have been determined.



Map prepared by Cape Fear Council of Governments. Data sources: Brunswick Co., NC Flood Maps, NCDOT, USGS.





Town of Sunset Beach



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Map 4.3 Surface Water Classifications

Legend

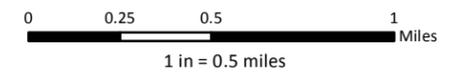
- Sunset Beach City
- Sunset Beach ETJ
- Waterway
- SA; HQW
- SB

Surface Water Classification

SA; HQW = Market Shellfishing and High Quality Water
 SB = Primary Saltwater Recreation

Note: The majority of estuarine waters are closed to shellfishing in the Sunset Beach area. Only a certain area around Tubbs Inlet is conditionally approved as open for shellfishing. See the figure included in the text for more information.

Map is to be used for general purposes only. Spatial data used to generate this map was gathered from disparate sources and represent a condition at a fixed period in time. 100% accuracy of spatial data to current circumstances cannot be guaranteed. The Cape Fear Council of Governments is not legally responsible for the misuse of this map.



Map prepared by Cape Fear Council of Governments. Data sources: Brunswick Co., NCDEQ, NCDOT, USGS.



Town of Sunset Beach



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Map 4.4 Storm Surge Inundation (Fast Storm)

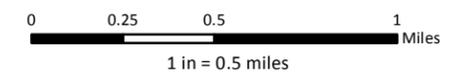
Legend

- Waterway
- Waterbody
- Swamp/Marsh

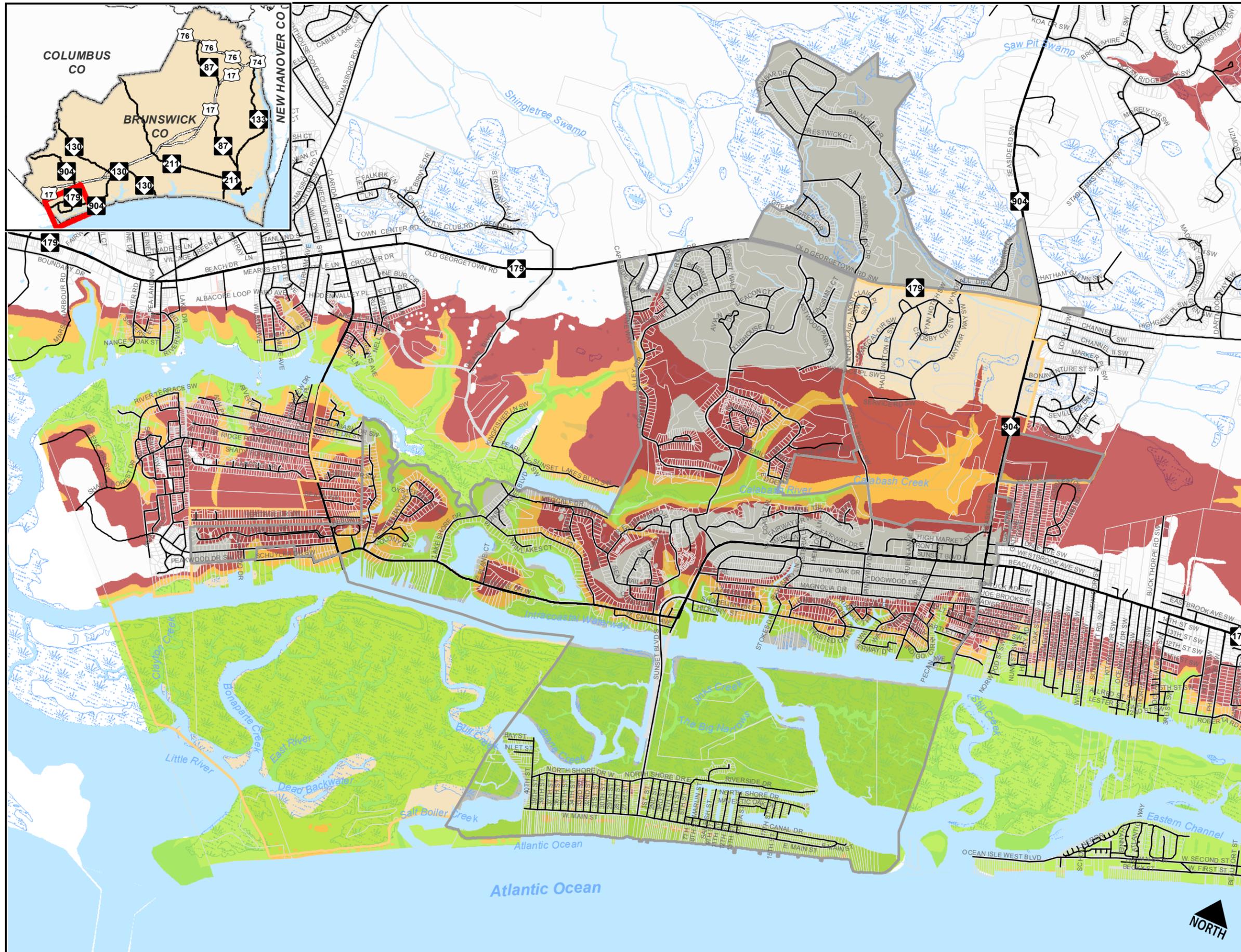
Storm Surge Inundation Hurricane (Fast Moving Storm)

- Category 1 & 2
- Category 3
- Category 4 & 5

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Map prepared by Cape Fear Council of Governments. Data sources: Brunswick Co., NOAA SLOSH Model, USGS.



Town of Sunset Beach



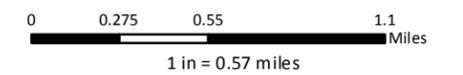
Comprehensive CAMA Land Use Plan Update

Map 4.5 Wetlands

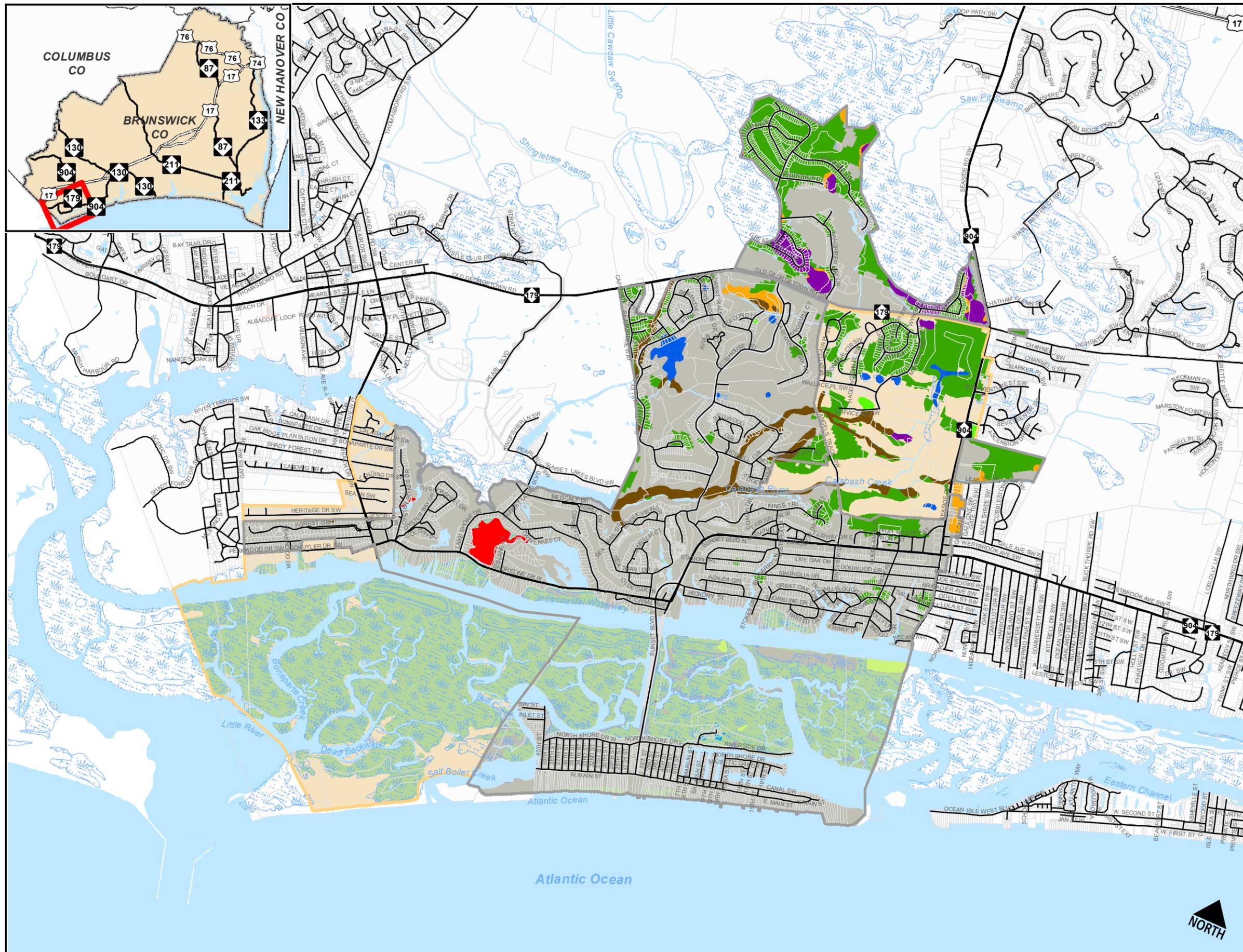
Legend

- Waterway
- Waterbody
- Swamp/Marsh
- Coastal Wetlands
- Non-Coastal Wetlands**
- Bottomland Hardwood/Riverine Forest
- Depressional Swamp
- Hardwood Flat
- Pine Flat
- Pocosin
- Estuarine Forest
- Estuarine Shrub/Scrub
- Human Impacted
- Managed Pineland

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Map prepared by Cape Fear Council of Governments. Data sources: Brunswick Co., NC CREWS, USGS.



Town of Sunset Beach



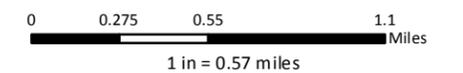
Comprehensive CAMA Land Use Plan Update

Map 4.6 Primary Nursery Areas &
Significant Natural Heritage Areas

Legend

- Waterway
- Waterbody
- Swamp/Marsh
- Primary Nursery Areas
- Significant Natural Heritage Areas**
 - Bird Island
 - Bonaparte Landing Maritime Forest
 - Sunset Beach Wood Stork Ponds

Map is to be used for general purposes only. Spatial data used to generate this map was gathered from disparate sources and represent a condition at a fixed period in time. 100% accuracy of spatial data to current circumstances cannot be guaranteed. The Cape Fear Council of Governments is not legally responsible for the misuse of this map.



Map prepared by Cape Fear Council of Governments. Data sources: Brunswick Co., NCDEQ, USGS.

