North Carolina 2011 Long-Term Average Annual Oceanfront Erosion Rate Update Study

Methods Report

N.C. Department of Environment and Natural Resources - Division of Coastal Management

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The purpose of this study is to update the long-term average annual oceanfront erosion rates and ocean hazard setback factors.

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INTRODUCTION

The purpose of this study is to update the long-term average annual oceanfront erosion rates used in determining the ocean hazard setback factors initially established by the Coastal Resource Commission (CRC) under the Coastal Area Management Act (CAMA) in 1979. The long-term average annual erosion rates have been updated periodically since 1980, with the last update report completed in 2003. Setback factors are used to site oceanfront development and determine the extent of the Ocean Erodible Area of Environmental Concern (OEA), or the area where there is a substantial possibility of excessive shoreline erosion.

The purpose of establishing the ocean hazard setback factors is to minimize losses of life and property resulting from storms, long-term erosion, preventing encroachment of permanent structures on public beach areas, preserving the natural ecological conditions of the barrier dune and beach systems, and reducing the public costs of inappropriately sited development.

This update was completed using the end-point methodology. This technique of calculating shoreline change rates is consistent with earlier studies, and provides the North Carolina Coastal Resources Commission with results that can be generally compared to those from previous studies.

North Carolina's oceanfront shoreline change rate has historically been calculated using the end-point method since the first study conducted in 1979 (Tafun, Rogers, and Langfelder, 1979). This method uses the earliest and most current shoreline data points where they intersect at any given shore-perpendicular transect. The distance between the two shorelines (shore-transect intersect) is then divided by the time, or number of years, between the two shorelines (Figure 1). This information is then "smoothed and blocked" to determine the ocean hazard setback factor.

Technological advances in Geographic Information Systems (GIS) have made calculation of end-point rates a relatively simple process as compared to techniques employed in earlier studies. Raw end-point rates were calculated using Environmental Systems Research Institute's (*ESRI*) *ArcGIS 9.3 ArcMap* GIS software with the United States Geological Survey's (USGS) Digital Shoreline Analysis System (DSAS) 4.2.3882 (Thieler, Himmelstoss, Zichichi, and Ergul, 2009) extension for *ArcMap*. The end-point technique requires three essential spatial data map layers; an early shoreline, a current shoreline, and a transect map layer perpendicular to the two shorelines.

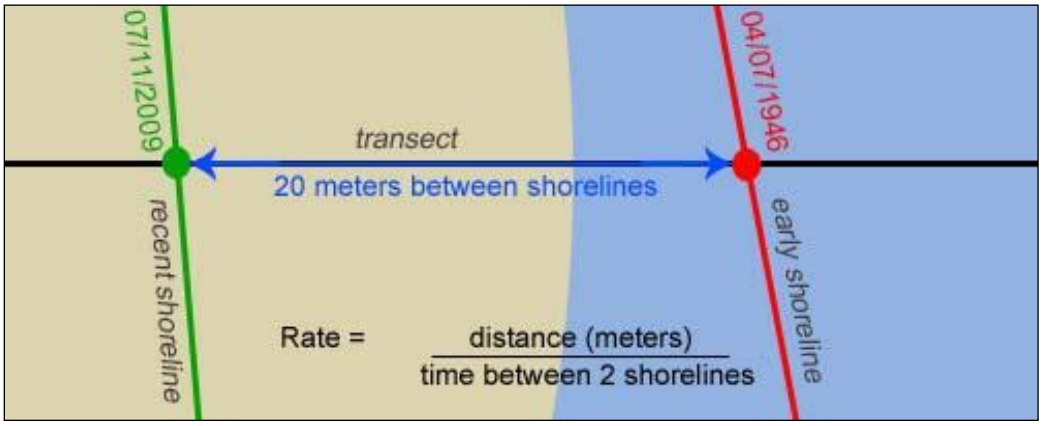

Figure 1. In this example, distance equals 20 meters, time between shorelines equals 63.3 years, and the resulting end-point erosion rate is equal to 0.32 meters per year, or 1.05 feet per year

Shoreline Identification

When interpreted from aerial photography, North Carolina's oceanfront shoreline is defined as the "wet-dry line". This "line in the sand" references an interpretation of where the wet sand ends and the dry sand begins, and usually can be distinguished by the contrasting sediment color or shade, hence "wet-dry" (Figures 2 and 3)(*e.g.*, Crowell, Leatherman, and Buckley, 1991; Dolan R. , Hayden, May, and May, 1980; Overton and Fisher, 2003). This shoreline interpretation is the most readily identifiable and considered in the worst case to be between high and low tides.

Figure 2. Interpretation of the "wet-dry" shoreline is illustrated here

Figure 3. Wet-dry shoreline interpreted on 2009 photograph

The "early shoreline" used in this study is the same early shoreline used in the 2003 Overton and Fisher study, and was digitized by the North Carolina State University (NCSU) Kenan Natural Hazards Mapping Program. It represents a composite of both Mean High Water (MHW) shorelines digitized from National Ocean Survey Topographic Surveys (NOS T-sheets) (1933-1952), and wet-dry line interpretations made from historical (1940-1962) imagery (Overton and Fisher, 2003). Use of NOS T-sheet shorelines is accepted by other researchers and has been adopted by the USGS in their shoreline erosion studies. A statewide set of NOS T-sheets for a single year do not exist; therefore, early dates do vary between 1933 and 1952. For approximately 30 miles of the state's oceanfront shoreline (north of Oregon Inlet to North Carolina/Virginia State

line) T-sheets do not exist. For this portion of the coast, a collection of early photography (1940–1962) was used to digitize a wet-dry shoreline. By using of a composite early shoreline, consistent comparisons at each transect can be made between the multiple shoreline change rate studies.

The most current shoreline used in the this study is a wet-dry interpretation digitized at a map scale of 1:1,200 utilizing 2009 United States Department of Agriculture (USDA) National Agriculture Imagery Program (NAIP) color imagery (1M Resolution). The USDA collects this imagery during peak crop growing season in an effort to estimate crop plantings and yields. Because these images were taken during the summer (July, 2009) they reflect shoreline conditions not influenced by high energy storms (hurricanes or North-Easters) which generally occur at other times during the year.

Transect Locations

Transects used in this study are generally perpendicular to the shoreline, spaced 50 meters (approximately 164 feet) apart, and are consistent with those used in the 1992 and 2003 erosion rate update studies. It is expected that they are spatially similar to those established by Dr. Robert Dolan in his early shoreline erosion rate studies since they have similar spacing (50 meters) (Dolan, Hayden, and Heywood, 1978); however, it is not possible to confirm since they did not exist in a digital form prior to the 1992 study (Overton and Fisher, 2003). For this reason, only comparison of ocean hazard setbacks from this and earlier studies (prior to 2003) can be made, and not the actual erosion rates.

Study Area

North Carolina's wave-dominated barrier island coastline (Figure 4) is defined by a series of prominent cuspate forelands (Cape Fear, Cape Lookout, and Cape Hatteras) (Hoyt, 1971) and embayments. In 2009, mean annual significant wave heights were 0.4 – 4.3 meters (1.3 – 14.1 feet) (National Oceanic and Atmospheric Administration, 2011), and

in one study using 2006 NOAA data (Limber, List, and Warren, 2007a.), semidiurnal tides ranged on average from approximately one meter (approximately 3.3 feet) along the northern coast to approximately 1.5 meters (4.9 feet) near the North Carolina/South Carolina border. Regional and local beach morphology is controlled by a combination of prevailing oceanographic conditions (Ashton, 2001), periodic storm events (Morton and Sallenger, 2003), inlet-related processes (Fenster and Dolan, 1996), and by underlying, antecedent geology (Riggs, Cleary, and Snyder, 1995).

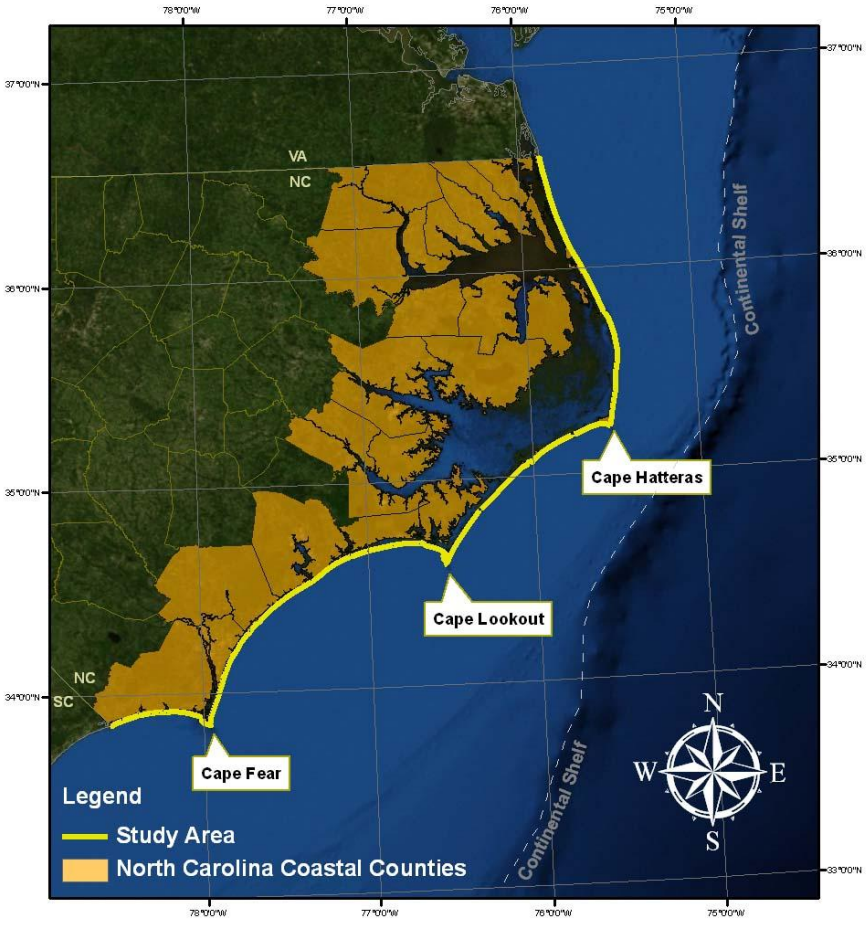

Figure 4. Study Area

METHODOLOGY

Shorelines and Preparations for Digital Shoreline Analysis System (DSAS)

Prior to the release of DSAS v4.2, shorelines were required to consistently start from the same direction. If digitizing an east-west barrier island, all shorelines would need to consistently start from the same end of the island. In DSAS v4.2, this was no longer necessary, thus making population of the date attribute field the only requirement (Table 1.). The "DATE" field stores the shoreline date and is referenced by DSAS when calculating the erosion rate according to the distance divided by time formula. This field must be created in GIS using the date format as shown in the table below.

Attribute Name	Data Type	Purpose
DATE	Text	Field length = 10 Format = mm/dd/yyyy

Table 1. GIS Shoreline date field

Transects and Preparations for DSAS

Transects used in this study are believed to be geographically consistent with those defined in N.C.'s first erosion rate study (Tafun, Rogers, and Langfelder, 1979; Dolan, Hayden, and Heywood, 1978), and utilized in subsequent update studies. It was not until the 1992 update study (Benton, Bellis, Overton, Fisher, Hench, and Dolan, 1997) that these data were used in a GIS environment, and not until after the 2003 study (Overton and Fisher, 2003) that these data were created as vector map layers for use in a GIS.

DSAS requires transect data to have several attribute fields (*OBJECTID, SHAPE, BASELINEID, GROUP, TRANSORDER, PROCTIME, AUTOGEN, STARTX, STARTY, ENDX, ENDY,* and *AZIMUTH*) associated with each unique identifier (Thieler, Himmelstoss, Zichichi, and Ergul, 2009) (Table 2). Most of these attributes are automatically

generated by DSAS during the analysis; however, a few (*BASELINEID*, *GROUP*, and *TRANSORDER)* can be defined by the analyst prior to the calculation.

Attribute Name	Data Type	Purpose
BASELINEID	Long Integer	DSAS can assign these values if left empty. Baseline segments with an ID equal to zero will be ignored by DSAS; no transects cast, and will not be included in the analysis.
GROUP	Long Integer	Values in this field are assigned by DSAS and are based on analyst input for grouping transects. This field is used to aggregate shoreline data and the resulting measurement locations established by the transects into groups.
TRANSORDER	Long Integer	Can be assigned by DSAS, or the analyst. Each transect must have its own unique number. This field is used to sort transect data in a predetermined order

Table 2. Transect attributes

Digital Shoreline Analysis System (DSAS) and Statistical Analysis

Before initiating the erosion rate calculations using DSAS, all data used must be managed within a Personal Geodatabase using ArcGIS, ArcMap and ArcCatalog. The Geodatabase is a Microsoft Access® database designed to store and serve spatial data and provides data structure to enforce topology rules, or spatial relationships. Additionally, DSAS also requires that data be in meters, rather than feet (Figure 5).

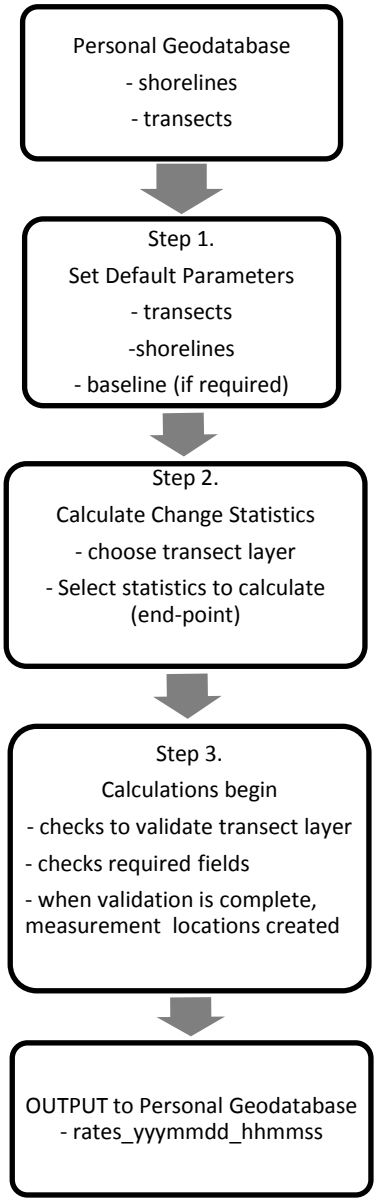

Figure 5. DSAS Workflow

Once the data were entered in the Geodatabase and properly attributed, the DSAS Application was used within ArcMap for the calculation of end-point rates. First, data parameters were established by opening the *Set Default Parameters* user dialog (Figures 6 and 7), then selecting the *Shoreline Calculation Settings* tab. Required parameters include identifying the shoreline layer, selecting the date (*DATE*) and uncertainty fields (default 4.4 meters), then selecting Intersection Parameters (*Closest Intersection*). The

intersection point defines which part of the shoreline to analyze where a single transect might intersect the same shoreline twice (*e.g.* inlets and spits). Closest Intersection was selected to avoid using shoreline segments not considered to be oceanfront.

Figure 6. DSAS toolbar - Set/Edit Parameters

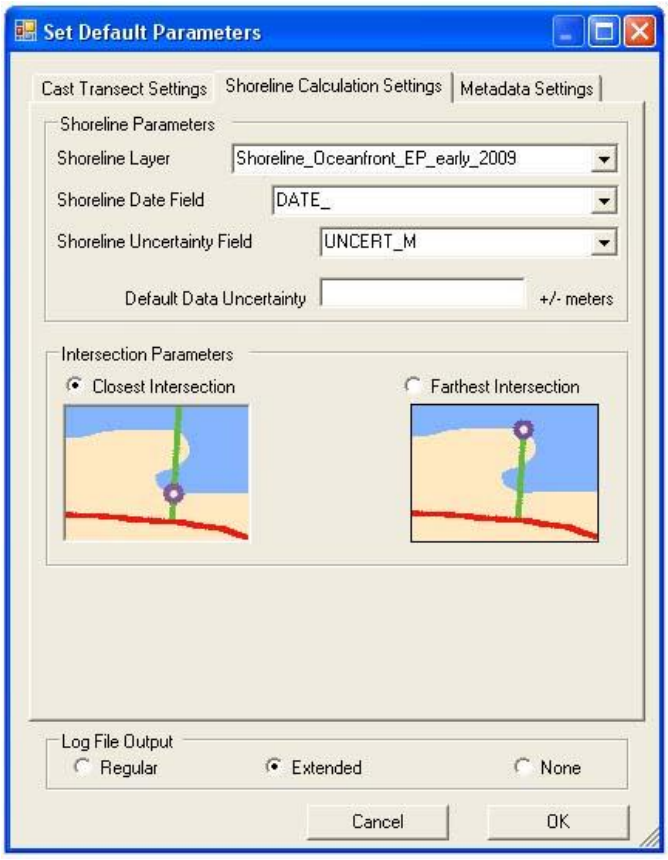

Figure 7. DSAS Set Default Parameter

Next, the transect data layer was identified using the *DSAS Toolbar* and selecting it from the *Transect Layer* dropdown menu (Figure 8). The dropdown menu will only list qualified transect layers from the ArcMap document. If the transect layer is not properly attributed (*BASELINEID, GROUP, TRANSORDER*) it will not be recognized as a qualified option.

Figure 8. DSAS toolbar - list of recognized transect layers in ArcMap document

With default parameters established and a transect layer identified, the last step is to select the output statistics (Figures 9 and 10). Once the *Calculate Change Statistics* dialog window opens, the only requirements are to: 1) select statistics to calculate, 2) apply confidence interval (accepted default 95 percent), and 3) start calculation algorithms.

Figure 9. DSAS toolbar - Calculate Statistics

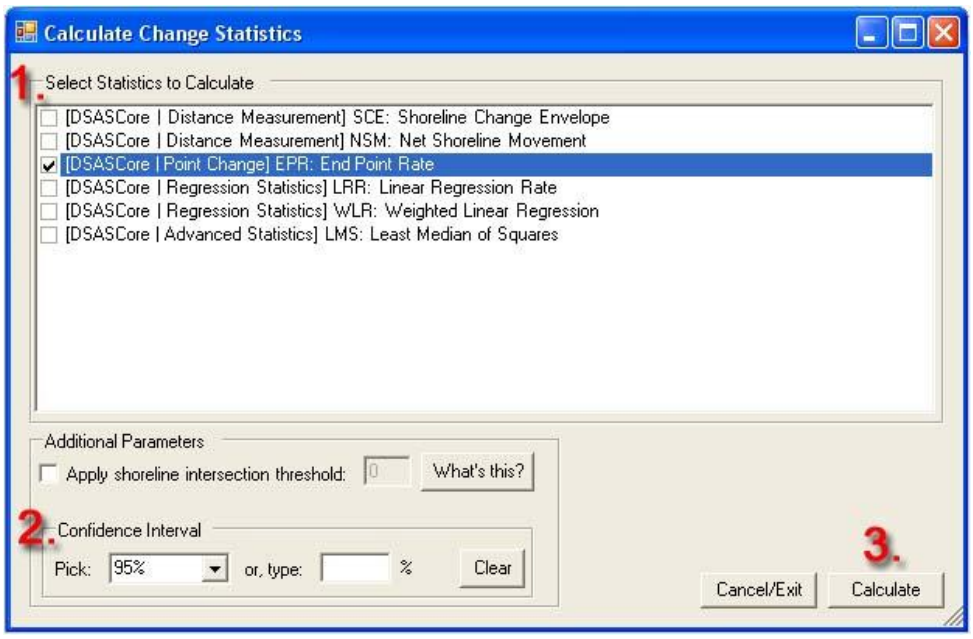

Figure 10. DSAS Calculate Change Statistics

Long-term average annual erosion rates were calculated at 9,897 transects (approximately 307 miles of shoreline). No rates were calculated at 542 transects (approximately 17 miles of shoreline) as a result of "missing" shoreline segments. These

gaps in the shoreline data are specific to areas where inlets have closed (*e.g.* Madd, Corncake, Moore's, and Old Topsail inlets) or have changed significantly as a result of accretion or erosion (*e.g.* New Topsail Inlet at Topsail Beach). Where early data show a shoreline stopping or starting at an active inlet, current data show a complete shoreline if the inlet has closed.

Raw end-point data were created as a table inside the Geodatabase, then joined by common attributes to transects *(TRANSORDER* and *OBJECTID*) using ArcMap. This served as a means to query the data and spatially view results. Data were then imported into a Microsoft Excel 2007® spreadsheet to take advantage of its available math functions. This was necessary to complete the smoothing and blocking process.

Long-Term Average Annual Erosion Rate Calculation

Smoothing

Smoothing effectively filters short-term dynamic shoreline phenomena such as beach cusps, smaller sand waves, and the attachment of landward migrating portions of offshore bar systems. Cusps and similar features range in size from 1.5 meters (4.9 feet) to 1,500 meters (4,922 feet) and have a life span ranging from days (smaller features) to seasons or years (larger sand waves) (Dolan and Ferm, 1968) (Davis, 1978). Bars generally range around 100 meters in length with migration and attachment rates ranging from seasons to years (Davis, 1978). Variations associated with larger, longer lived features such as secondary capes and capes are not filtered by the smoothing.

The procedure for spatially smoothing the shoreline erosion rate data is a simple moving average, or running mean technique described by Davis, 1973. For shoreline segments consisting of at least 17 transects (approximately 0.5 miles), an average is calculated for the 17 transects and centered on the ninth transect. This spatially averaged value is the "smoothed" rate. In the vicinity of inlets, the number of transects used in the average is decreased by two (dropping one from each side of the centered calculation) until the

end transect is reached. The last value is calculated by taking the weighted average using the last two transects.

$$R_s = (2 \times T_1 + T_2) / 3$$

***R_s** = smoothed rate*

***T_1** = erosion rate at last transect adjacent to the inlet*

***T_2** = erosion rate at second to last transect adjacent to inlet*

As can be seen in Figure 11, results from smoothing are more noticable in areas experiencing accelerated erosion or accretion (*e.g.* near inlets).

Blocking

Blocking the smoothed data creates spatially uniform rate segments. This allows for management of like sections of shoreline with the same or similar shoreline erosion rate. In addition, it minimizes the number of neighboring shoreline segments that have different shoreline change rates. Blocked erosion rate data are used to calcualte the ocean hazard setback and in the calculations of OEA (Figure 11).

Blocking procedures, itemized below, represent refinments and clarifications of procedures established by and used in all previous update studies. These refinements and clarifications are the result of improved accuracy of the data brought about by improvements in the shoreline delineation methodology and quantitative requirements that allow for increased repeatabiltiy of results. Transect spacing was reduced from 100 and 300 meters (1980 Dolan study) to 50 meters in subsequent studies; and in the 2003 Overton and Fisher update study, the minimum number of transects required for blocking was reduced by half (from 16 to 8). In areas experiencing an accelerated change in rates, this refinement resulted in smaller blocked groups. The following list describes the process of blocking:

1. Group “like” erosion rate segments based on rate at transect (*e.g.,* 2.0, 2.2, 2.1, 2.5, 2.6, 2.1, . . . 2.9) and use the mean of each segment as the blocked erosion rate. Transitioning at one-foot intervals are prefered for rate block boundaries. Fractional rates are rounded down to the nearest foot, or half foot interval for segments dominated by a half foot value and do not have values greater than the next highest one foot interval (*e.g.*, a rate segment equal to 5.4 would be rounded to 5.0; and 5.7 would be rounded to 5.5).

2. Erosion rate segments must be at least eight (8) transects . In areas experiencing rapid erosion or accretion (*e.g.,* approaching inlets), it was not always possible achieve a one-foot transition from one blocked rate segment to the next, thus making it necessary to evaluate segments based on its mean so that transitions from one blocked segement to the next was as near to the one-foot interval as feasible.

3. In areas where blocked segments transition from one value to another (*e.g.*, from three to four feet per year) a determination must be made to select the transect that will serve as a delineation between the change in values. The lower rate would be applied towards the higher blocked segment.

4. Where two blocked boundaries meet and divide a property or parcel, the lower of the two blocked rates is applied in the direction of the higher rate in order to give the property owner the benefit of the lower rate. Where a large parcel containing multi-family structures was divided by a transition boundary, the lower of the two blocked rates was applied towards the higher rate so that no structure was split giving the structure the benefit of the lower rate.

5. Segments that have accreted or that have erosion rates of less than two feet per year are assigned a blocked value of two for the long-term average annual

erosion rate in accordance with the minimum ocean hazard setback of 60 feet or 30 times the shoreline erosion rate (15A NCAC 07H .0306(a)(2)(A).

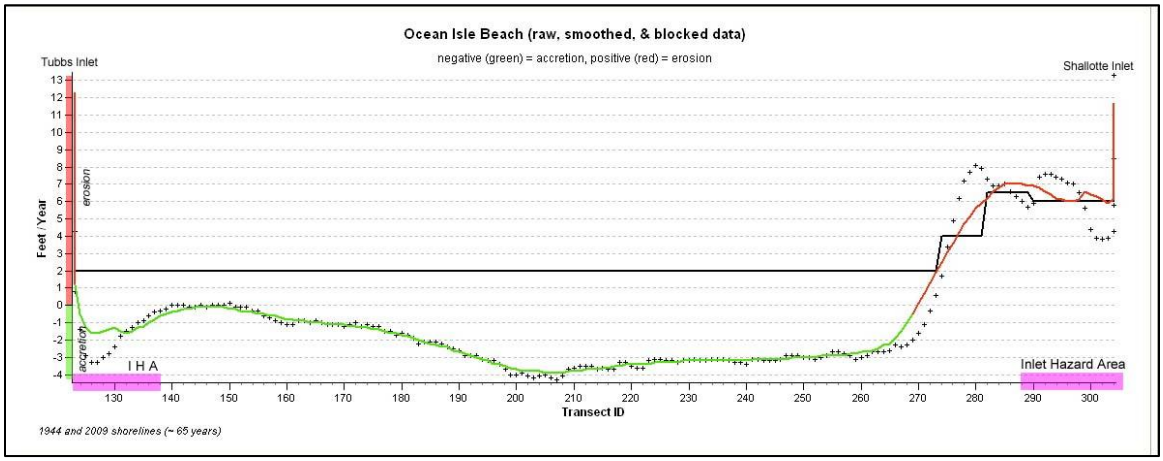

Figure 11. Example of Raw (points), Smoothed (solid green and red line), and Blocked (solid black line) data

RESULTS

A statistical summary of the blocked erosion rates (Setback Factors) was calculated for this study as it was in previous studies. These data are presented in below (Table 3). The percentages of shorelines are computed by dividing the number of miles of shoreline mapped in a given category (*e.g.*, Accreting) by the total number of miles of shoreline in a category (*e.g.*, South Facing). For purposes of this study, "south facing" beaches are defined as those with shorelines, or beach faces, generally perpendicular and between South-East and South-West (135° – 225°) (Table 4); while "east facing" between North-East and South-East (45° – 135°) (Table 5).

Statewide, the average blocked erosion rate value (3.4 feet per year) fell by a factor of one foot per year as compared to the 2003 Overton and Fisher update study using the 1998 shoreline. The 1998 shoreline used in the previous study also may have still been recovering from the effects of two major hurricanes in 1996 (Bertha and Fran) as the 2003 update study resulted in the highest average erosion factor (4.3 feet per year) among all studies.

	South Facing Miles (% of total)	East Facing Miles (% of total)	Statewide Total Miles (% of total)
Erosion and Accretion Comparison			
Miles of Shoreline Mapped/Analyzed	103.9	203.5	307.4
Accreting	50.1 (48 %)	53.6 (26.3%)	103.7 (33.7%)
Eroding	53.6 (52%)	147.1 (72.2%)	200.9 (65.4%)
No Data (*missing one of two shorelines*)	0.2 (0%)	2.8 (1%)	2.8 (>1%)
Maximum Erosion Rate (ft/yr)	12.5 ft/yr	28 ft/yr	28 ft/yr
Mean Erosion Rate (ft/yr)	2.8 ft/yr	3.7 ft/yr	3.4 ft/yr
Setback Factor Comparison (*Minimum = 2 feet*)			
Setback Factor (2 ft)	77.3 (74.4%)	112.8 (55.4%)	190.2 (61.9%)
Setback Factor (2.5 to 5.0 ft)	13.8 (13.3%)	48.3 (23.7%)	62.1 (20.2%)
Setback Factor (5.5 to 8.0 ft)	9.0 (8.7%)	22.4 (11.0%)	31.5 (10.2%)
Setback Factor (>8.0 ft)	3.6 (3.5%)	17.2 (8.5%)	20.8 (6.8%)

Table 3. Summary of 2011 Update Study Setback Factors (Blocked Erosion Rates). This table is separated into two sections: 1) the top section, "*Erosion and Accretion Comparison,*" illustrates total mapped and measured oceanfront shoreline, then subdivided into lengths of shoreline demonstrating long-term average annual accretion and erosion, and those segments where only one of the two shorelines exists (i.e. migrating or closed inlets); therefore the analysis could not be performed, thus given "no data." 2) the lower section, "*Setback Factor Comparison (Minimum = 2 feet)*," of the table is an illustrative comparison of total length of shoreline and its calculated construction Setback Factor, where sixty feet is the minimum construction setback (2 ft. x 30 = 60 ft.) referenced in Rule *15A NCAC 07H.0306(a)(2)(A)*. For example, when a section of shoreline is accreting, or when it is eroding at two feet per year or less, the Setback Factor is two (2). Therefore, length shown in the row labeled "*Setback Factor (2 ft)*" is inclusive of length values for all accreting shorelines, and those eroding at two feet per year or less. (*This table was updated for purposes of clarity based on public comments*).

	2009 South Facing Miles (% of total)	1998 South Facing Miles (% of total)	Change (miles)
Miles of Shoreline Mapped/Analyzed	103.9	96	7.9 (increase)
Setback Factor (2 ft)	77.3 (74.4%)	69 (72%)	8.3 (increase)
Setback Factor (2.5 to 5.0 ft)	13.8 (13.3%)	14 (14%)	0.2 (decrease)
Setback Factor (5.5 to 8.0 ft)	9.0 (8.7%)	9 (9%)	0 (same)
Setback Factor (>8.0 ft)	3.6 (3.5%)	5 (5%)	1.4 (decrease)

Table 4. Summary of 2011 Update Study Blocked Rates (Setback Factors) for South Facing Beaches. This table is an illustrative comparison of total length of shoreline mapped and analyzed, and its calculated construction Setback Factor, where sixty feet is the minimum construction setback (2 ft. x 30 = 60 ft.). Length shown in the row labeled "*Setback Factor (2 ft)*" is inclusive of length of all accreting sections of shoreline, and those calculated to be eroding at two feet per year or less. (*This table was updated for purposes of clarity based on public comments*).

	2009 East Facing Miles (% of total)	1998 East Facing Miles (% of total)	Change (miles)
Miles of Shoreline Mapped/Analyzed	203.5	216	12.5 (decrease)
Setback Factor (2 ft)	112.8 (55.4%)	124 (58%)	11.2 (decrease)
Setback Factor (2.5 to 5.0 ft)	48.3 (23.7%)	50 (23%)	1.7 (decrease)
Setback Factor (5.5 to 8.0 ft)	22.4 (11.0%)	19 (9%)	3.4 (increase)
Setback Factor (>8.0 ft)	17.2 (8.5%)	22 (10%)	4.8 (decrease)

Table 5. Summary of 2011 Update Study Blocked Rates for East Facing Beaches. This table is an illustrative comparison of total length of shoreline mapped and analyzed, and its calculated construction Setback Factor, where sixty feet is the minimum construction setback (2 ft. x 30 = 60 ft.). Length shown in the row labeled "*Setback Factor (2 ft)*" is inclusive of length of all accreting sections of shoreline, and those calculated to be eroding at two feet per year or less. (*This table was updated for purposes of clarity based on public comments*).

These data can be compared to the data presented in the 1997 and 2003 Methods Reports (Benton, et al., 1997; Overton and Fisher, 2003). However, when comparing these data, they should be used for general qualitative comparisons only. The data from the 1997 report (Benton, Bellis, Overton, Fisher, Hench, & Dolan, 1997) cannot not be compared directly because (1) there is a difference in the miles of shoreline in each study (probably due to approximations made near inlets and capes), (2) the early date used in the 1997 study is not the same as the one used in the 2003 study and; (3) changing the required minimum number of transects from 16 to 8 in the 2003 Overton and Fisher update study and reducing spacing between transects from 100 and 300 meters to 50 meters are refinements made in the blocking methodologies that may impact the statistics. Preliminary analysis of the data showed remarkable consistency with earlier updates (Table 6).

Statewide Totals Summary	**2009** Miles (% of total)	**1998** Miles (% of total)	**1992** Miles (% of total)	**1986*** Miles (% of total)	**1980*** Miles (% of total)
Miles of Shoreline Mapped/Analyzed	307.4	312	300	237	245
Setback Factor (2 ft)	190.2 (61.9%)	193 (62%)	165 (59%)	144 (61%)	149 (61%)
Setback Factor (2.5 to 5.0 ft)	62.1 (20.2%)	64 (20%)	54 (19%)	43 (18%)	52 (21%)
Setback Factor (5.5 to 8.0 ft)	31.5 (10.2%)	28 (9%)	30 (11%)	20 (8%)	22 (9%)
Setback Factor (>8.0 ft)	20.8 (6.8%)	27 (9%)	32 (11%)	22 (9%)	22 (9%)

Table 6. Summary of Blocked Erosion Rates (Setback Factors) for all studies. This table is an illustrative comparison of total length of shoreline mapped and analyzed, and its calculated construction Setback Factor for each of the five studies, where sixty feet is the minimum construction setback (2 ft. x 30 = 60 ft.). Length shown in the row labeled "*Setback Factor (2 ft)*" is inclusive of length of all accreting sections of shoreline, and those calculated to be eroding at two feet per year or less. Where the year ends with an asterisk (*), in the table header, that total shoreline distance is less compared to others because some, or all, of the National Seashore was not mapped for that study (i.e. Shackleford Banks, Core Banks). (*This table was updated for purposes of clarity based on public comments*).

South Facing Shorelines	2009 Miles (% of total)	1998 Miles (% of total)	1992 Miles (% of total)	1986* Miles (% of total)	1980* Miles (% of total)
Miles of Shoreline Mapped/Analyzed	103.9	96	106.8	82	80
Setback Factor (2 ft)	77.3 (74.4%)	69 (72%)	58.4 (55%)	59 (72%)	70 (82%)
Setback Factor (2.5 to 5.0 ft)	13.8 (13.3%)	14 (14%)	14.4 (13%)	12 (15%)	12 (14%)
Setback Factor (5.5 to 8.0 ft)	9.0 (8.7%)	9 (9%)	5.9 (6%)	3 (4%)	3 (4%)
Setback Factor (>8.0 ft)	3.6 (3.5%)	5 (5%)	9 (8%)	7 (9%)	0 (0%)

Table 7. Summary of Blocked Erosion Rates (Setback Factors) for all studies – South Facing Beaches. This table is an illustrative comparison of total length of shoreline mapped and analyzed, and its calculated construction Setback Factor for each of the five studies, were sixty feet is the minimum construction setback (2 ft. x 30 = 60 ft.). Length shown in the row labeled "*Setback Factor (2 ft)*" is inclusive of length of all accreting sections of shoreline, and those calculated to be eroding at two feet per year or less. Where the year ends with an asterisk (*), in the table header, that total shoreline distance is less compared to others because some, or all, of the National Seashore was not mapped for that study (i.e. Shackleford Banks, Core Banks). (*This table was updated for purposes of clarity based on public comments*).

East Facing Shorelines	2009 Miles (% of total)	1998 Miles (% of total)	1992 Miles (% of total)	1986* Miles (% of total)	1980* Miles (% of total)
Miles of Shoreline Mapped/Analyzed	203.5	216	192.8	155	160
Setback Factor (2 ft)	112.8 (55.4%)	124 (58%)	89 (46%)	85 (55%)	78 (49%)
Setback Factor (2.5 to 5.0 ft)	48.3 (23.7%)	50 (23%)	39.9 (21%)	31 (20%)	40 (25%)
Setback Factor (5.5 to 8.0 ft)	22.4 (11.0%)	19 (9%)	24.3 (13%)	17 (11%)	20 (12%)
Setback Factor (>8.0 ft)	17.2 (8.5%)	22 (10 %)	23.4 (12%)	15 (10%)	23 (14%)

Table 8. Summary of Blocked Erosion Rates (Setback Factors) for all studies – East Facing Beaches. This table is an illustrative comparison of total length of shoreline mapped and analyzed, and its calculated construction Setback Factor for each of the five studies, where sixty feet is the minimum construction setback (2 ft. x 30 = 60 ft.). Length shown in the row labeled "*Setback Factor (2 ft)*" is inclusive of length of all accreting sections of shoreline, and those calculated to be eroding at two feet per year or less. Where the year ends with an asterisk (*), in the table header, that total shoreline distance is less compared to others because some, or all, of the National Seashore was not mapped for that study (i.e. Shackleford Banks, Core Banks). (*This table was updated for purposes of clarity based on public comments*).

Barrier Island Summaries

The following graphs show the data (raw, smoothed, and blocked) at each transect for all NC barrier islands. Positive rate values identify actual erosion (*positive = erosion*) while negative values represent accretion (*negative = accretion*). The black points, or crosshairs, are the raw data; the green and/or red line is the smoothed data; and the bold-black line is the blocked data.

Bird Island and Sunset Beach are considered low sloping south facing beaches with approximately 3.3 miles of combined oceanfront shoreline. Sunset Beach has been naturally accreting and has not required any nourishment projects (Figure 12). Several factors have had significant influences in defining today's shoreline position; a navigation jetty constructed at Little River inlet (left side of graph), the closing of Madd inlet (transect IDs 35-40), and engineering (end of island and inlet configuration) of Tubbs Inlet prior to 1970. There was no change in blocked erosion rate factors since 2.8 miles (83 percent) of its shoreline demonstrated accretional trends with only light erosion (two feet per year, or less) in the area adjacent to Tubbs Inlet for a shoreline distance equal to distance of 0.4 miles, or 13.9 percent of its oceanfront shoreline.

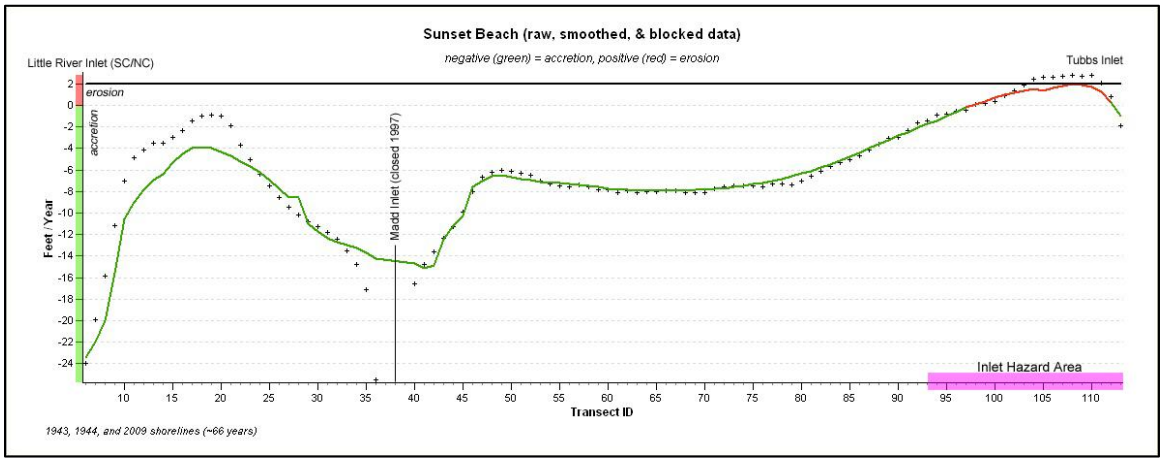

Figure 12. Sunset Beach data summary

Ocean Isle Beach is considered low sloping and south facing, with approximately 5.7 miles of oceanfront shoreline. Approximately 4.7 miles (78.5 percent) of this shoreline is accreting, while 1.2 miles (21.5 percent) is eroding (Figure 13). Ocean Isle has received several nourishment projects in the 2000s which may have had some influence on the 2009 shoreline position. Eroding areas are adjacent to inlets (Tubbs and Shallotte) located on each shoulder of the barrier island.

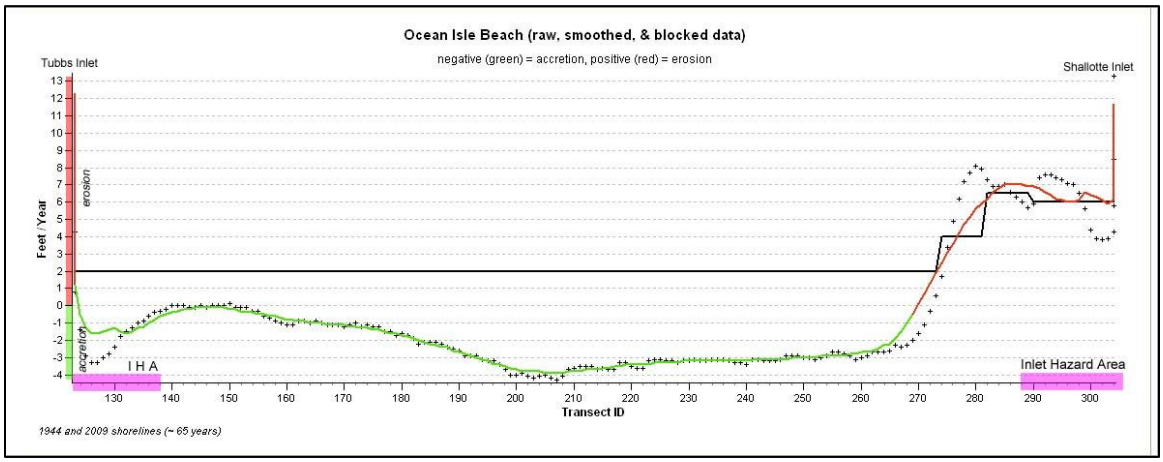

Figure 13. Ocean Isle data summary

Holden Beach is considered low sloping and a south facing, with approximately 8.0 miles of oceanfront shoreline. Approximately 1.6 miles (20.9 percent) of this shoreline is accreting, while 6.3 miles (79.1 percent) is eroding (Figure 14). Most (58.9 percent) of the erosion is 2 feet per year or less. Holden Beach has received several nourishment projects. Area with the highest erosion is adjacent to Lockwood Folly Inlet (located on right side of the graph).

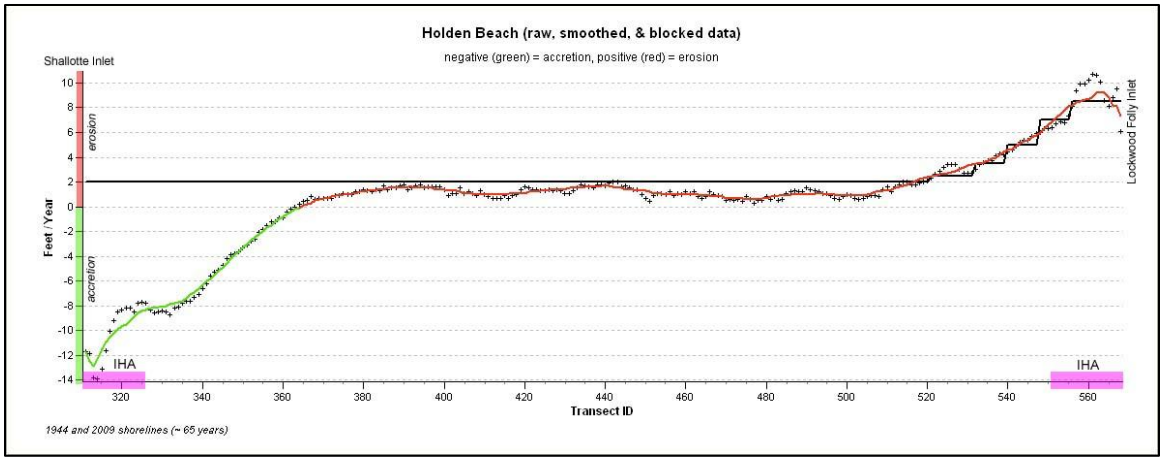

Figure 14. Holden Beach data summary

Oak Island, Caswell Beach, and Fort Caswell are all south facing beaches with a combined oceanfront shoreline reaching nearly 13 miles. Oak Island's portion of the shoreline is 9.3 miles with approximately 7.8 miles (84.3 percent) of accreting beach, while the remaining 1.4 miles (15.7 percent) is eroding (Figure 15). All of the measured erosion on this barrier island appears to be 2 feet per year or less and occurs at 1.4 mile stretch straddling the Oak Island/Caswell Beach town limit and adjacent to the siphon channel. The average, maximum, and minimum blocked erosion rate at Oak Island is two feet per year.

Caswell Beach and Fort Caswell make up the remaining 13 miles with combined shorelines totaling 3.5 miles. Approximately 2.5 miles (72.6 percent) are accreting, and 0.9 miles are eroding at two feet per year or less the average, maximum, and minimum blocked erosion rate at Caswell Beach is two feet per year. For the eroding shoreline segment, rate factors dropped from 3.5 to two feet per year.

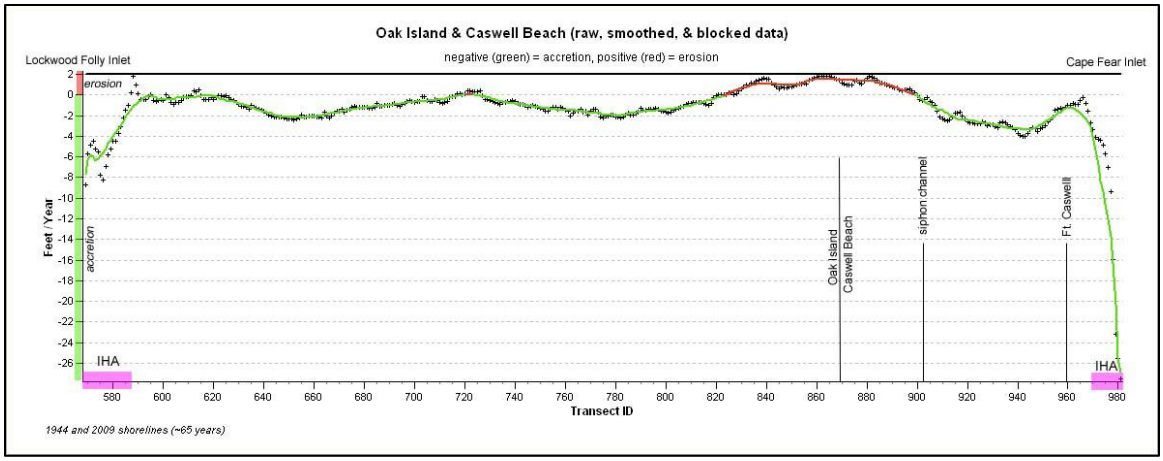

Figure 15. Oak Island and Caswell Beach data summary

Bald Head Island's "south beach" is the last south facing shoreline in Brunswick County before transitioning to east facing at Cape Fear. This 3.2 mile oceanfront shoreline is the region's most dynamic, and the state's second most dynamic developed shoreline, and has demonstrated consistently high erosion rates throughout all studies. The erosion rates for this segment of shoreline show erosion at all transects and are consistent with those from the 2003 study (Figure 16). The average blocked erosion rate is 5.3, the maximum is 10.5, and the minimum is two feet per year. Although this shoreline position is dominated by erosional processes, rate factors did decrease for nearly 2.3 miles (71.8 percent) of shoreline.

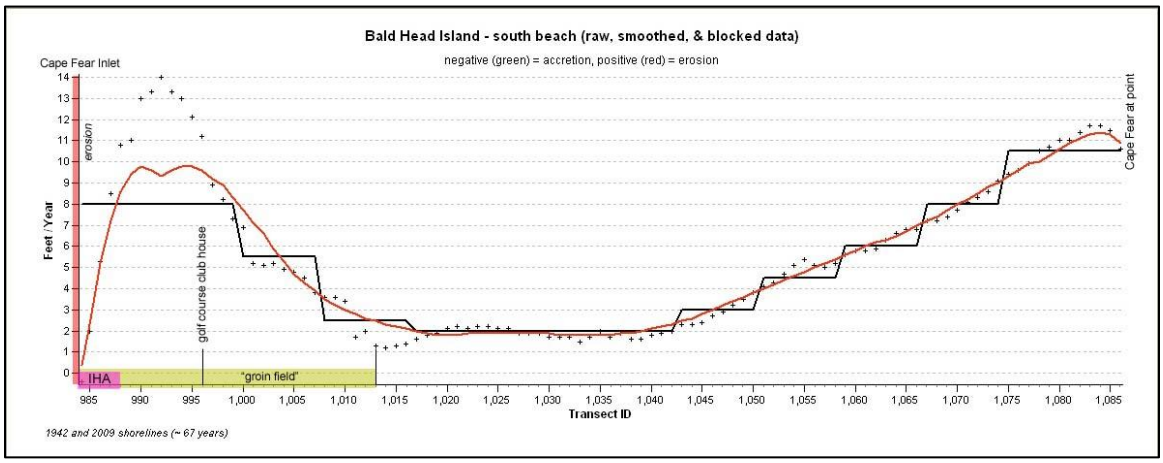

Figure 16. Bald Head Island ("south beach") data summary

Moving from Bald Head Island's south beach to east beach while rounding Cape Fear the data show an erosion-accretion pivot point along the shoreline. Bald Head Island's east beach under normal conditions has been demonstrated through the data to be accretional with rate factors equal to two feet per year. Moving northward towards the now closed Corncake Inlet, which formally separated Bald Head and Zeke's islands, the shoreline movement demonstrates erosional characteristics. From the point at Cape Fear to Fort Fisher the average blocked erosion rate is 4.3, the maximum is 9.0, and the minimum is two feet per year. This shoreline segment extends 8.5 miles, 3.3 miles (38.5 percent) of this shoreline demonstrates accretional characteristics, while 5.1 miles (59.6 percent) is eroding. Approximately 43 percent of this shoreline segment did receive reduced erosion rate factors when compared to the 2003 Overton and Fisher study.

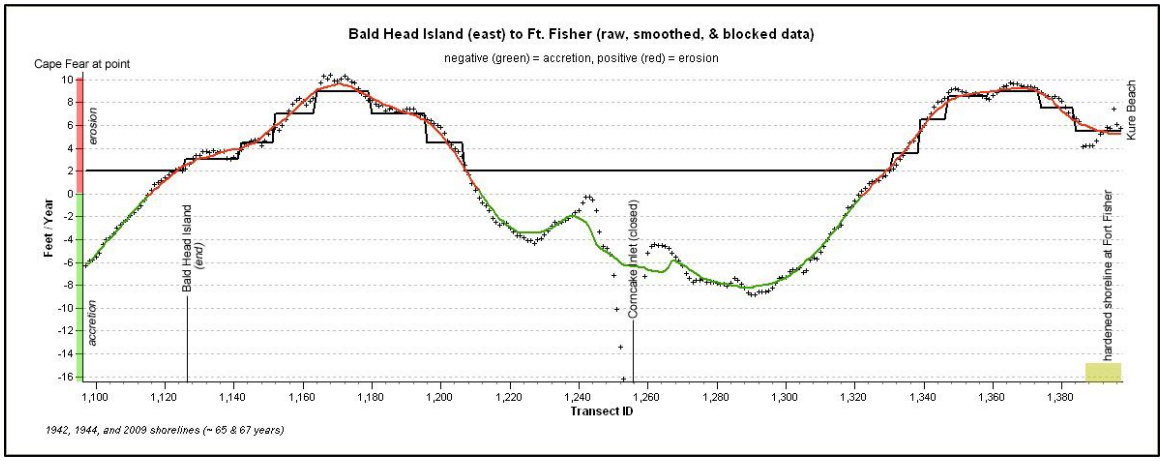

Figure 17. Bald Head Island ("west beach") to Fort Fisher data summary

Kure and Carolina Beaches are all east facing beaches with a combined oceanfront shoreline reaching nearly seven miles. Kure Beach has 2.9 miles of shoreline with approximately one mile (34 percent) of accreting beach, while the remaining 1.9 miles (66 percent) is eroding (Figure 18). The average blocked erosion factor at Kure Beach is 2.3, the maximum is 5.5, and the minimum is two feet per year. All erosion at Kure beach is located adjacent to Fort Fisher.

Carolina Beach has approximately four miles of oceanfront shoreline of which 2.6 miles (66.1 percent) is accretional and the remaining 1.3 miles (33.9 percent) is eroding from two and 5.7 feet per year nearing Carolina Beach Inlet. The average blocked erosion rate at Carolina Beach is 3.0, the maximum is 5.0, and the minimum is two feet per year (Figure 18).

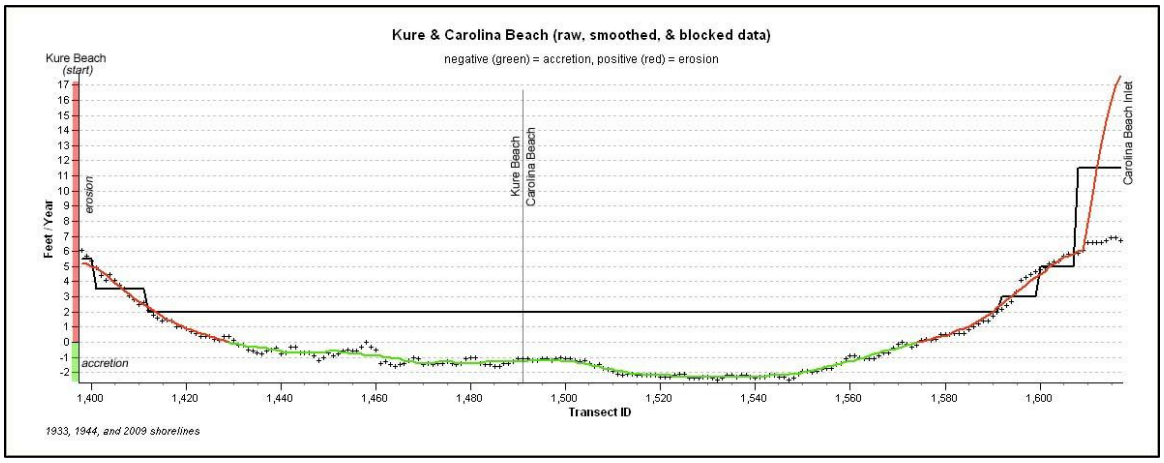

Figure 18. Kure and Carolina Beach data summary

Masonboro Island is an undeveloped barrier island. Its oceanfront shoreline is east facing and extends 7.8 miles with Carolina Beach inlet on its southern end (left side on the graph) and Masonboro inlet on its northern flank (right side on the graph). Approximately 7.5 miles (96 percent) of its shoreline has demonstrated erosional characteristics based on results, while the remaining 0.2 miles (3.6 percent) is accreting. This small accreting area is adjacent to the rock navigation jetty at Masonboro inlet. The average blocked erosion rate at Masonboro Island is 7.0 feet per year, the maximum is 28.0 feet per year, and the minimum is two feet per year (Figure 19). The highest erosion factor occurs on the end adjacent to Carolina Beach Inlet.

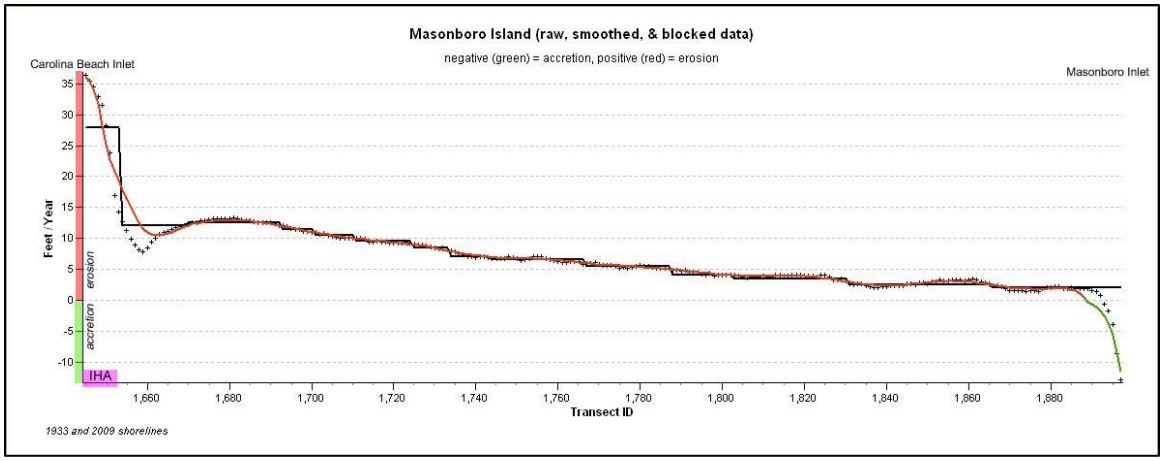

Figure 19. Masonboro Island data summary

Wrightsville Beach has approximately 4.5 miles of oceanfront shoreline, is east facing, and flanked by two inlets (Masonboro and Mason). Masonboro Inlet is hardened with two rock navigational jetties (one on each side). Approximately 4.1 miles (91 percent) of its shoreline has demonstrated accreting characteristics based on results, while the remaining 0.2 miles (2.1 percent) is eroding. The average, maximum, and minimum blocked erosion rate at Wrightsville Beach is two feet per year (Figure 20).

Figure 20. Wrightsville Beach data summary

Figure Eight Island has approximately 3.6 miles of oceanfront shoreline, is east facing, and flanked by two inlets (Mason and Rich). Approximately 2.8 miles (78 percent) of its shoreline is characterized as accreting based on results, while the remaining 0.8 miles (22 percent) is demonstrates eroding characteristics. The average, maximum, and minimum blocked erosion rate at Figure Eight Island is two feet per year (Figure 21).

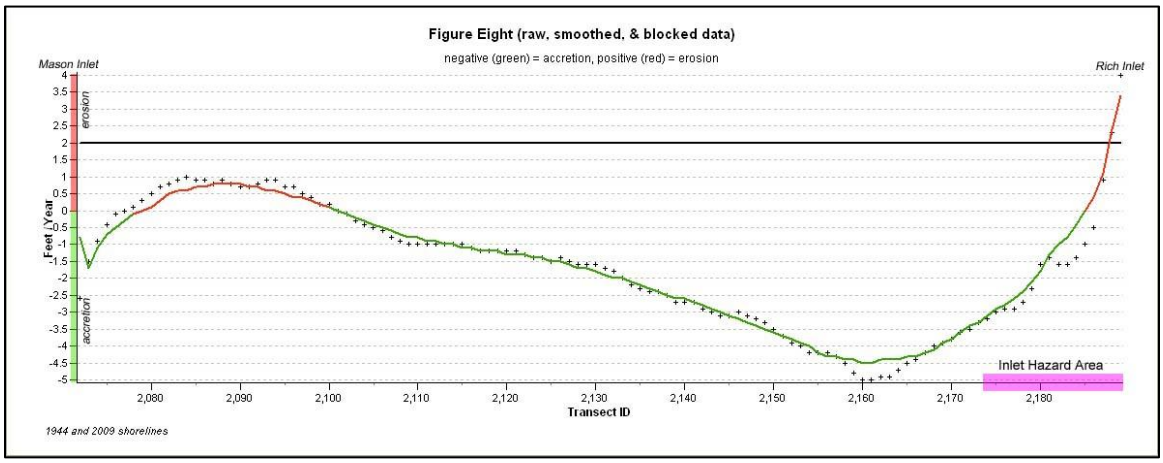

Figure 21. Figure Eight data summary

Lee-Hutaff Island has approximately 3.6 miles of oceanfront shoreline, is east facing, and flanked by two inlets (Rich and New Topsail). Approximately 3.2 miles (88 percent) of its shoreline is characterized as eroding based on results, while the remaining 0.8 miles (22 percent) contains a data gap as a result of the closure of Old Topsail Inlet, which once separated Lee and Hutaff Islands. The average blocked erosion rate is 5.7 feet per year, the maximum is 10.0 feet per year, and the minimum is two feet per year (Figure 22).

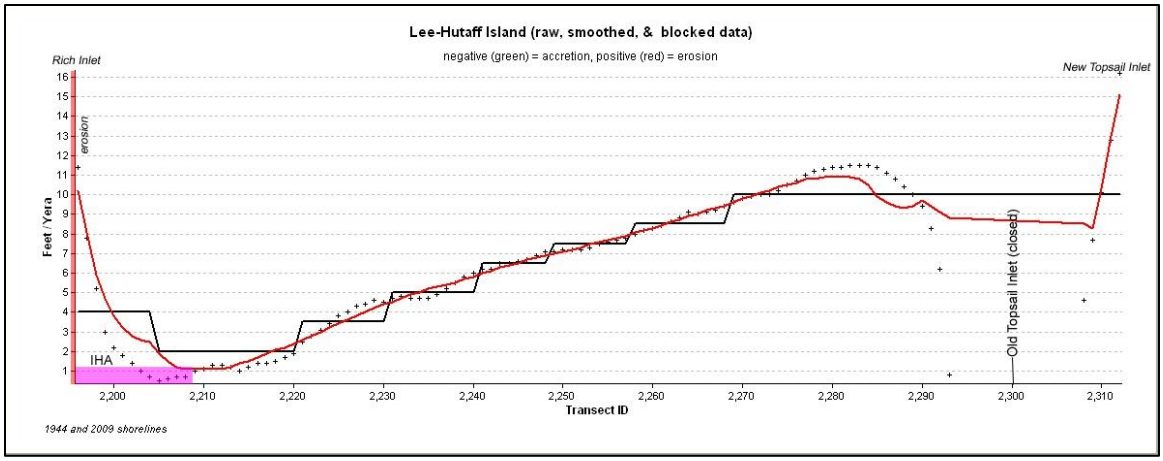

Figure 22. Lee-Hutaff Island data summary

Topsail Island has approximately 22 miles of oceanfront shoreline and is an east facing barrier island flanked by two inlets (New Topsail and New River). Topsail Beach makes up 28.1 percent (4.8 miles) of its shoreline, Surf City 27.3 percent (6.0 miles), and North Topsail Beach 50.1 percent (11.1 miles).

Approximately 3.9 miles (81.9 percent) of Topsail Beach's shoreline is characterized as accreting based on results, while 0.6 mile (13.5 percent) is considered eroding. The average, minimum, and maximum blocked erosion rate is two feet per year (Figure 23).

At Surf City, approximately 5.2 miles (86.1 percent) of its shoreline is characterized as accreting based on results, while 0.7 mile (12.9 percent) is considered eroding. The average, minimum, and maximum blocked erosion rate is two feet per year (Figure 23).

At North Topsail Beach, approximately 9.8 miles (88.6 percent) of its shoreline is characterized as eroding based on results, while 1.2 miles (11.4 percent) is considered accreting. The average blocked erosion rate is 2.3 feet per year, the maximum is 14 feet per year, and the minimum is two feet per year (Figure 23). The area of North Topsail adjacent to New River Inlet is experiencing the highest erosion.

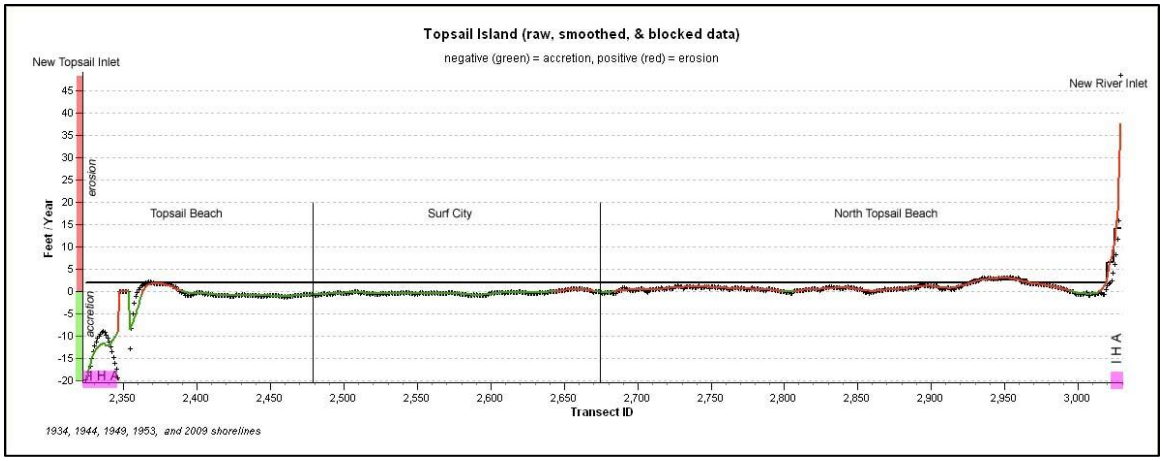

Figure 23. Lee-Hutaff Island data summary

Onslow Beach has approximately 7.3 miles of oceanfront shoreline and is east facing. Approximately 4.8 miles (65.3 percent) of its shoreline is characterized as eroding based on results, while 2.5 miles (34.7 percent) is considered accreting. The average blocked erosion rate is 4.1 feet per year, the maximum is 11 feet per year, and the minimum is two feet per year (Figure 24).

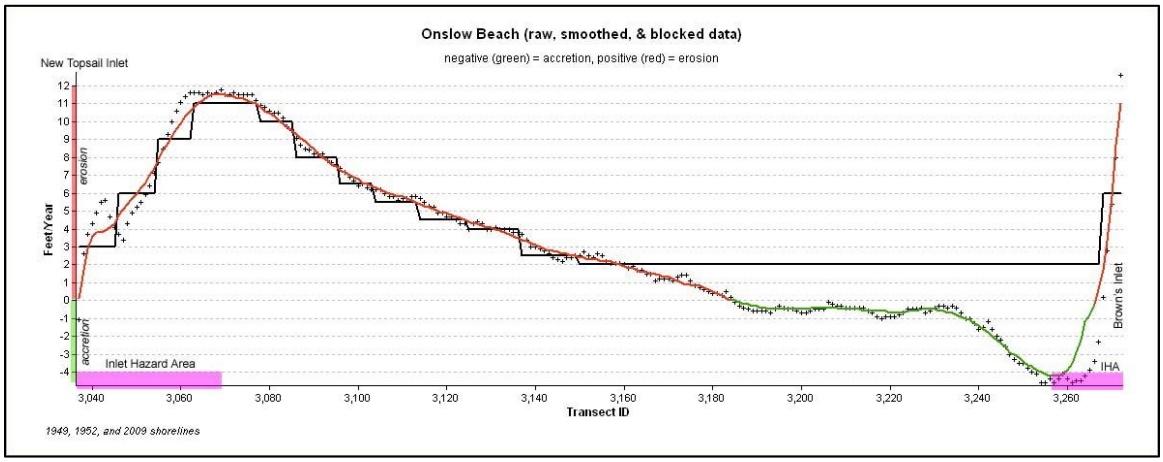

Figure 24. Onslow Beach data summary

Brown's Island is an undeveloped barrier island and marks the transition point, moving up the coast from Cape Fear to Cape Lookout, where the beach begins facing a southerly direction. This island oceanfront shoreline is approximately 3.3 miles long with 3.0 miles

(92.5 percent) of its shoreline characterized as eroding based on results, while 0.2 of a mile (7.5 percent) is considered accreting. The average blocked erosion rate is 3.0 feet per year, the maximum is 6.0 feet per year, and the minimum is two feet per year (Figure 25).

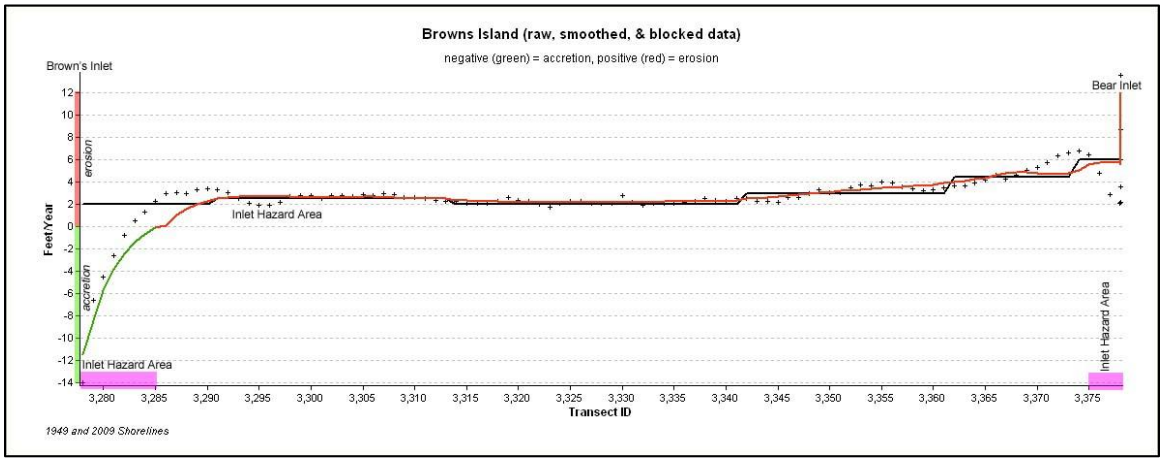

Figure 25. Brown's Island data summary

Bear Island (Hammocks Beach State Park) is an undeveloped south facing barrier island with approximately 3.0 miles of oceanfront shoreline. Approximately 2.1 miles (69.4 percent) of its shoreline is characterized as eroding based on results, while 0.9 of a mile (30.6percent) is considered accreting. The average blocked erosion rate is 2.6 feet per year, the maximum is 5.5 feet per year, and the minimum is two feet per year (Figure 26).

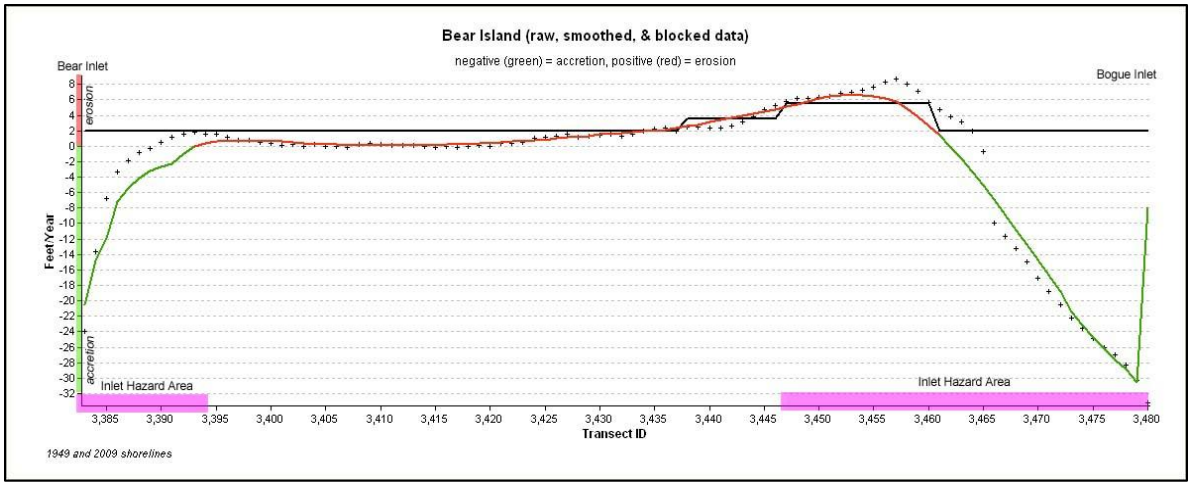

Figure 26. Bear Island data summary

Bogue Banks is a south facing barrier island with nearly 25 miles of oceanfront shoreline, and is comprised of five townships and a state park. Emerald Isle makes up approximately 11.2 miles (49 percent) of its shoreline, Indian Beach 1.7 miles (approximately 7 percent), Salter Path 0.8 mile, Pine Knoll Shores 4.8 miles (19.2 percent), and Atlantic Beach and Fort Macon State Park 6.1 miles (24.4 percent). It is also flanked by two inlets (Bogue and Beaufort).

At Emerald Isle, approximately 7.7 miles (68.8 percent) of its shoreline is characterized as accreting based on results, while 3.5 miles (31.2 percent) is considered eroding. The average blocked erosion rate is 2.2 feet per year, the maximum is 12.5 feet per year, and the minimum is two feet per year (Figure 27). The highest erosion occurred immediately adjacent to Bogue Inlet; however, this side of the island is currently demonstrating accretional characteristics.

At Indian Beach, approximately 1.5 miles (89.3 percent) of its shoreline is characterized as eroding based on results, while 0.2 mile (10.7 percent) is considered accreting. The average, minimum, and maximum blocked erosion rate is two feet per year (Figure 27).

At Salter Path, approximately 100 percent (0.8 mile) of its shoreline is characterized as eroding less than two feet per year based on results. The average, minimum, and maximum blocked erosion rate is two feet per year (Figure 27).

At Pine Knoll Shores, approximately 2.7 miles (56.1percent) of its shoreline is characterized as accreting based on results, while 2.1 miles (43.9percent) is considered eroding. The average, minimum, and maximum blocked erosion rate is two feet per year (Figure 27).

At Atlantic Beach and Fort Macon, approximately 4.9 miles (81.6 percent) of its shoreline is characterized as accreting based on results, while 1.1 miles (18.4 percent) is considered eroding. The average, minimum, and maximum blocked erosion rate is two feet per year (Figure 27).

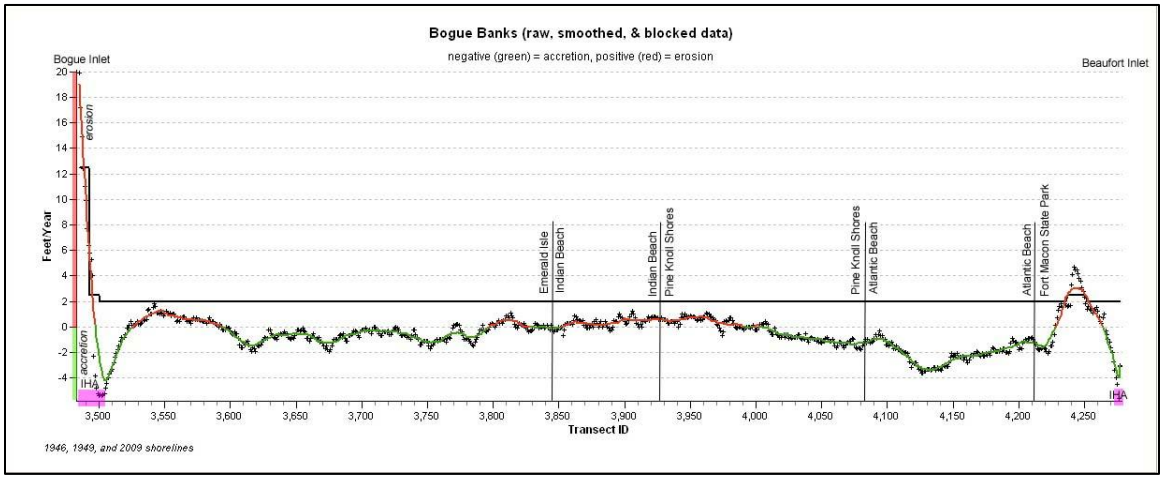

Figure 27. Bogue Banks data summary

Shackleford Banks is an undeveloped south facing barrier island with approximately 8.1 miles of oceanfront shoreline and is flanked by two inlets (Beaufort and Barden). Approximately 5.8 miles (71.8 percent) of its shoreline is characterized as eroding based on results, while 2.3 miles (28.2 percent) is considered accreting. The average blocked

erosion rate is 3.4 feet per year, the maximum is 5.5 feet per year, and the minimum is 2 feet per year (Figure 28).

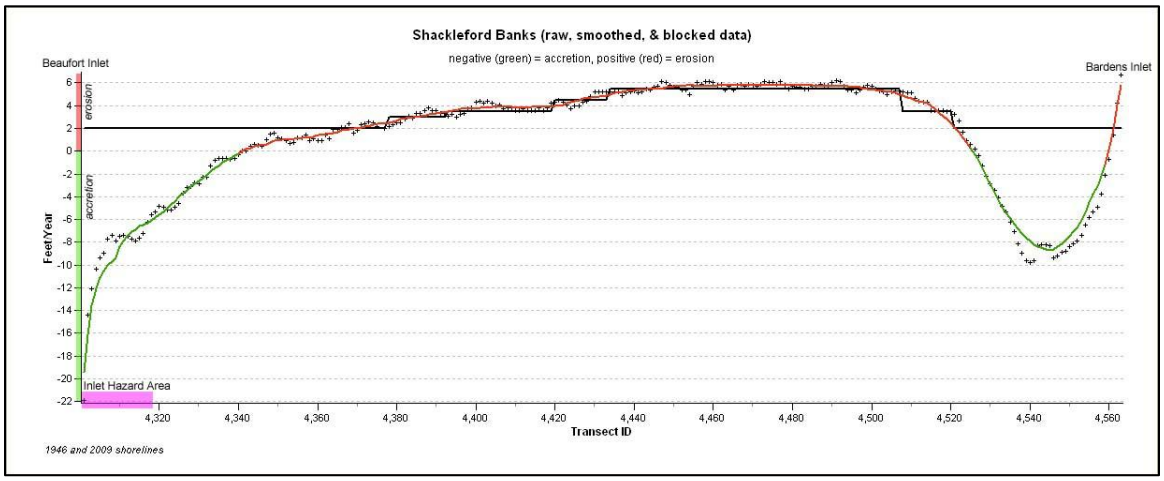

Figure 28. Shackleford Banks data summary

At Cape Lookout starting at Barden Inlet moving towards the point at the cape is an undeveloped south facing portion of the Core Banks with approximately 2.4 miles of oceanfront shoreline. Approximately 1.9 miles (81.8 percent) of its shoreline is characterized as accreting based on results, while 0.4 of a mile (18.2 percent) is considered eroding. The average blocked erosion rate is 5.2 feet per year, the maximum is 11.0 feet per year, and the minimum is two feet per year (Figure 29).

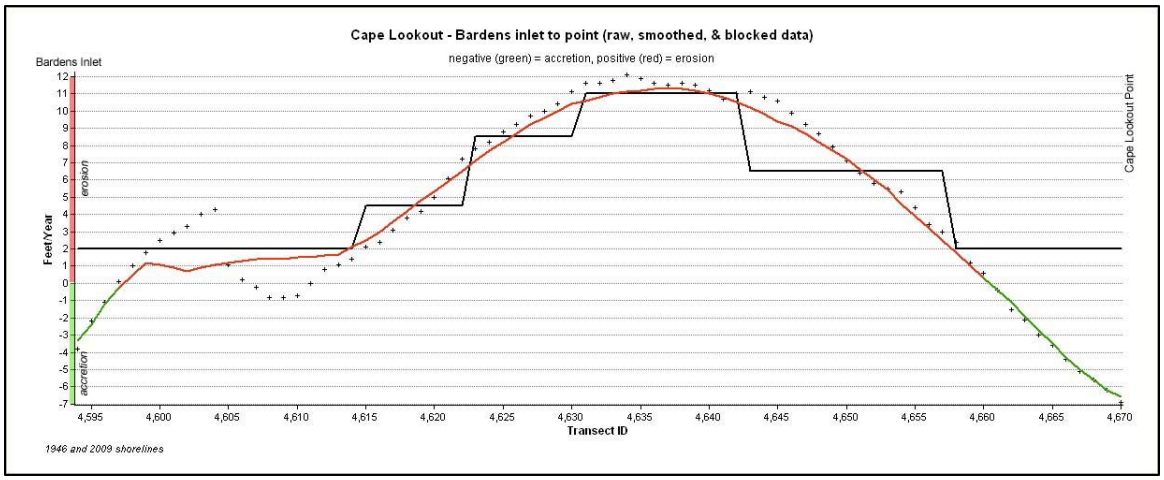

Figure 29. Cape Lookout data summary

Cape Lookout starting at the point at the cape and moving towards Drum Inlet is an undeveloped east facing portion of the Core Banks with approximately 20.9 miles of oceanfront shoreline. Approximately 18.7 miles (89.5 percent) of its shoreline is characterized as eroding based on results, while 2.2 miles (10.5 percent) is considered accreting. The average blocked erosion rate is 4.2 feet per year, the maximum is 18.0 feet per year, and the minimum is two feet per year (Figure 30). The highest erosion is measured adjacent to Drum Inlet.

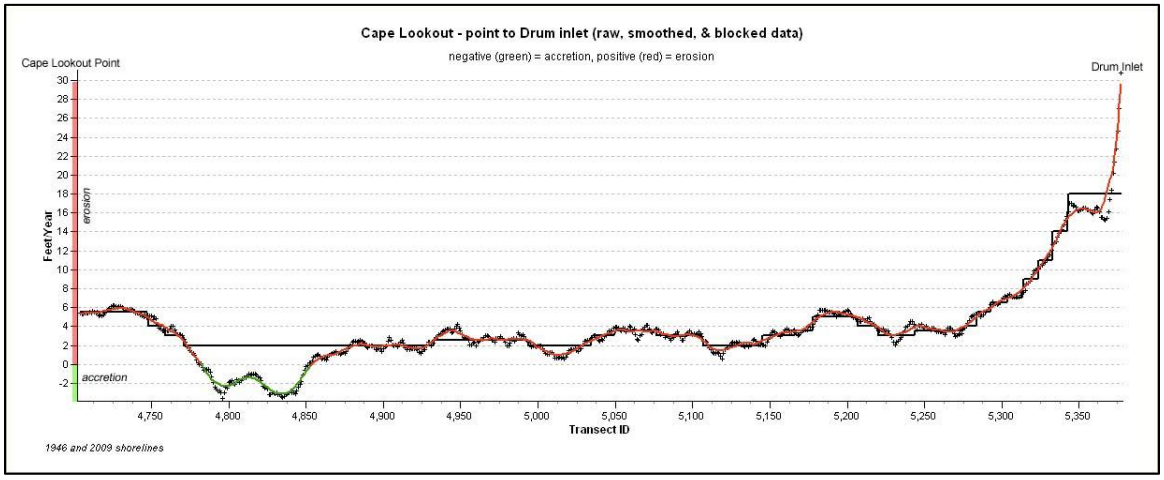

Figure 30. Cape Lookout to Drum Inlet data summary

Core Banks from Drum Inlet to Ocracoke Inlet is the remaining undeveloped east facing portion of the Core Banks with approximately 21.5 miles of oceanfront shoreline. Approximately 18.7 miles (87 percent) of its shoreline is characterized as eroding based on results, while 2.8 miles (13 percent) is considered accreting. The average blocked erosion rate is 3.7 feet per year, the maximum is 8.5 feet per year, and the minimum is two feet per year (Figure 31).

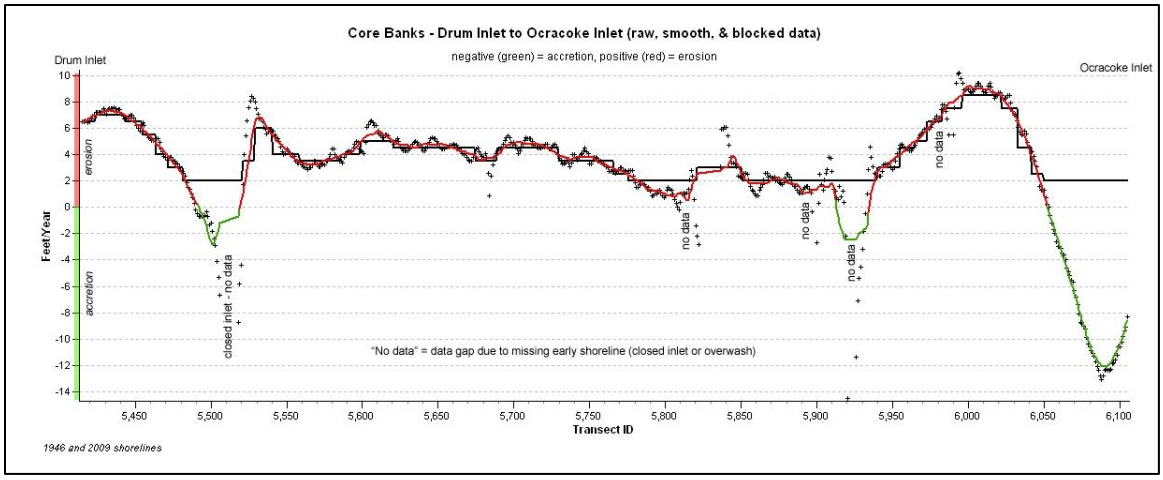

Figure 31. Core Banks data summary

Ocracoke Island marks the transitional point from east to south facing beaches moving south to north approaching Cape Hatteras. Ocracoke's oceanfront is undeveloped and its shoreline is approximately 16.3 miles in length. Approximately 13.3 miles (69.7 percent) of its shoreline is characterized as eroding based on results, while 4.9 miles (30 percent) is considered accreting. The average blocked erosion rate is 3.8 feet per year, the maximum is 8.5 feet per year, and the minimum is 2 feet per year (Figure 32).

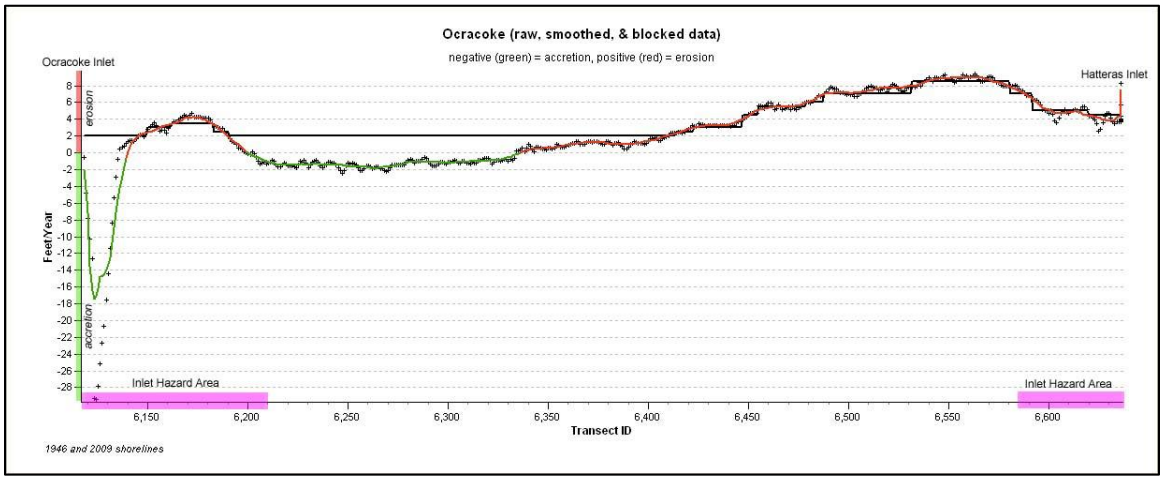

Figure 32. Ocracoke data summary

Hatteras from Ocracoke Inlet to Cape Hatteras has a south facing shoreline and is approximately 12.9 miles in length. Approximately 6.6 miles (51.1 percent) of its shoreline is characterized as accreting based on results, while 6.2 miles (48.2 percent) is

considered eroding. The average blocked erosion rate is 2.9 feet per year, the maximum is 11.5 feet per year, and the minimum is two feet per year (Figure 33).

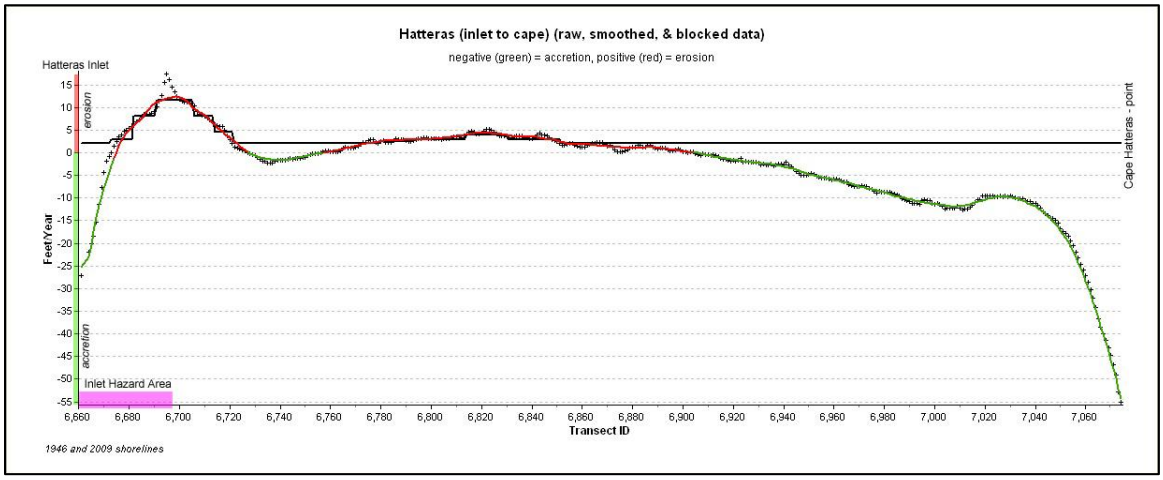

Figure 33. Hatteras (inlet to cape) data summary

The Outer Banks from Cape Hatteras to Avon is an east facing beach with an oceanfront shoreline of approximately 10.6 miles. The region between Cape Hatteras and Avon makes up 7.1 miles (approximately 67 percent) of this shoreline segment. Approximately 6.6 miles (92.6 percent) of this shoreline segment is characterized as eroding based on results, while the remaining 0.5 mile (7.4 percent) has data gaps. The average blocked erosion rate is 6.2 feet per year, the maximum is 11 feet per year, and the minimum is two feet per year (Figure 34).

The shoreline segment adjacent to Avon is approximately 3.5 miles long and makes up 33 percent of this portion of shoreline. Approximately 2.2 miles (64 percent) of Avon's shoreline is characterized as eroding based on results, while the remaining 1.2 miles (36 percent) is accreting. The average blocked erosion rate is 2.9 feet per year, the maximum is 4.5 feet per year, and the minimum is two feet per year (Figure 34).

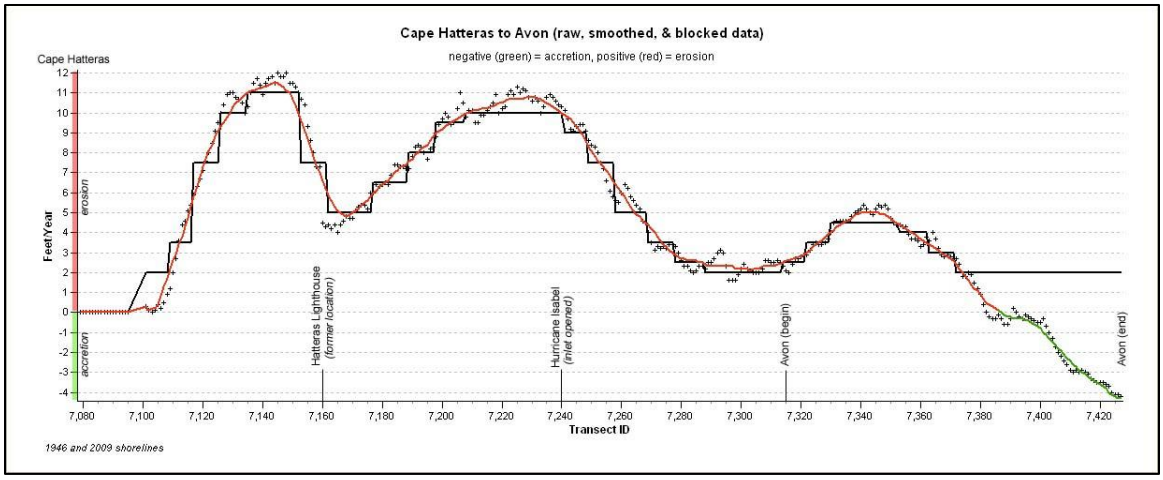

Figure 34. Cape Hatteras to Avon data summary

The Outer Banks from Avon to Rodanthe are east facing beaches with approximately 16.9 miles of oceanfront shoreline. The region between Avon and Salvo makes up 11.5 miles (68 percent) of this shoreline segment. Approximately 8.1 miles (92.6 percent) of this shoreline segment is characterized as eroding based on results, while the remaining 3.4 miles (29.3 percent) of shoreline is accreting. The average blocked erosion rate is 2.4 feet per year, the maximum is 4 feet per year, and the minimum is two feet per year (Figure 35).

The Outer Banks beaches that include Salvo, Waves, and Rodanthe are east facing beaches making up 5.4 miles (32 percent) of shoreline for this portion of the Outer Banks. Approximately 3.2 miles (60 percent) of this shoreline segment is characterized as eroding based on results, while the remaining 2.1 miles (40 percent) of shoreline is accreting. The average blocked erosion rate is 5.5 feet per year, the maximum is 12.5 feet per year, and the minimum is two feet per year (Figure 35). The highest blocked erosion rate in the state for a developed barrier island occurs at the North end of Rodanthe (12.5 feet per year).

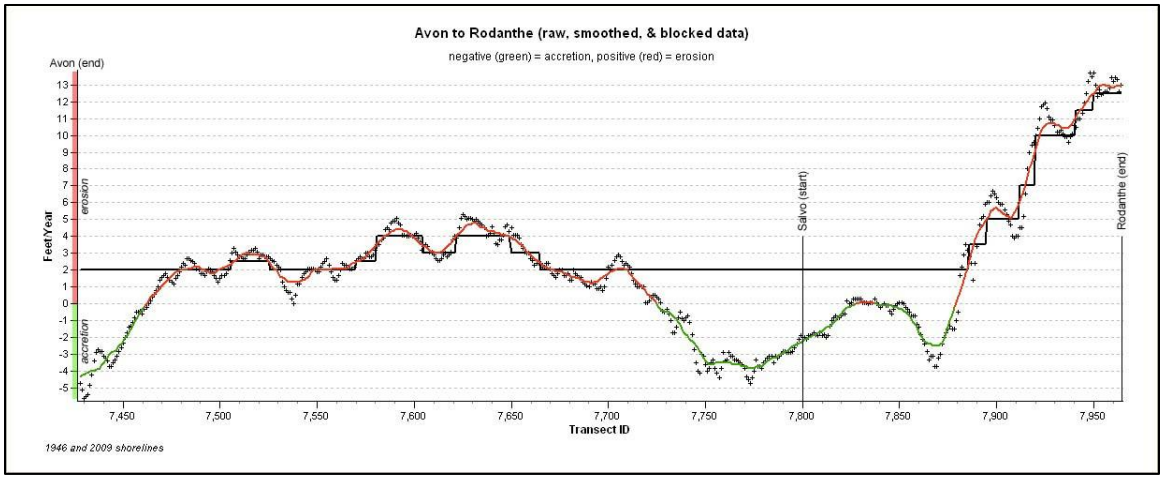

Figure 35. Avon to Rodanthe data summary

The Outer Banks from Rodanthe to Oregon Inlet, or Pea Island National Seashore, is an east facing beach with approximately 11.7 miles of oceanfront shoreline. Approximately 9.8 miles (83.8 percent) of this shoreline segment is characterized as eroding based on results, while the remaining 1.9 miles (16.2 percent) of shoreline is accreting. The average blocked erosion rate is 5.3 feet per year, maximum is 16.5 feet per year, and minimum is two feet per year (Figure 36).

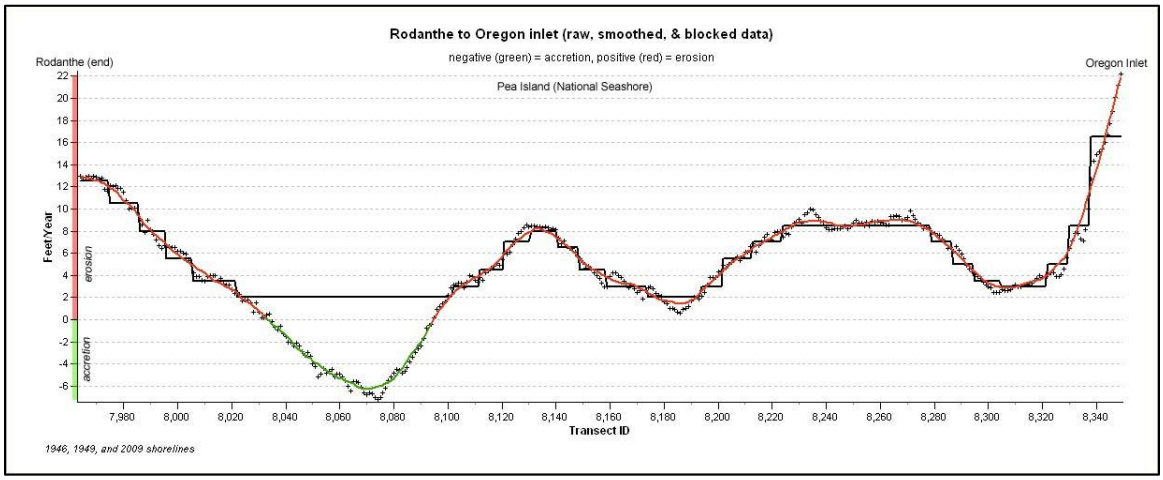

Figure 36. Rodanthe to Oregon Inlet data summary

The Outer Banks from Oregon Inlet to Nags Head is an east facing portion of shoreline and is approximately 15.9 miles long. The region between Oregon Inlet and Nags Head (Bodie Island) make up approximately 4.6 miles (approximately 29 percent) of this

segment of shoreline. Approximately 4.0 miles (86.6 percent) of this shoreline segment is characterized as eroding based on results, while the remaining 0.6 of a mile (13.4 percent) of shoreline is accreting. The average blocked erosion rate is 6.3 feet per year, the maximum is 10 feet per year, and the minimum is two feet per year (Figure 37).

Nags Head makes up 11.3 miles (71 percent) of this portion of shoreline. Approximately 11.0 miles (97.5 percent) of this shoreline segment is characterized as eroding based on results, while the remaining 0.2 mile (2.5 percent) of shoreline is accreting. The average blocked erosion rate is 3 feet per year, the maximum is 7.5 feet per year, and the minimum is two feet per year (Figure 37).

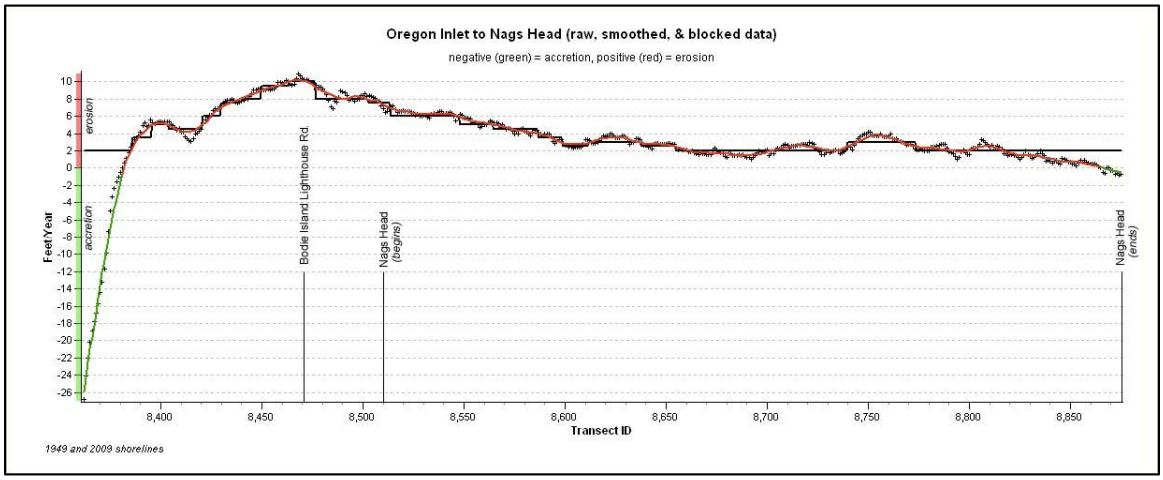

Figure 37. Oregon Inlet to Nags Head data summary

The Outer Banks beaches that include Kill Devil Hills, Kitty Hawk, and Southern Shores to the Dare/Currituck County line are all east facing with a combined shoreline of 17.8 miles. The shoreline at Kill Devil Hills represents approximately 4.6 miles (26.4 percent) of the total for this segment of shoreline. Approximately 2.4 miles (50.3 percent) of this shoreline segment is characterized as eroding based on results, while the remaining 2.3 miles (49.7 percent) of shoreline is accreting. The average blocked erosion rate is 2.1 feet per year, the maximum is 2.5 feet per year, and the minimum is two feet per year (Figure 38).

The shoreline at Kitty Hawk represents approximately 3.5 miles (19.7 percent) of the total for this segment of shoreline. Based on calculations, 100 percent of this shoreline segment is characterized as eroding. Approximately 50.4 percent is eroding less than two feet per year and remaining 49.6 percent is eroding between two and 2.5 feet per year. The average blocked erosion rate is 2.1 feet per year, the maximum is 2.5 feet per year, and the minimum is two feet per year (Figure 38).

The shoreline at Southern Shores represents approximately 3.7 miles (20.8 percent) of the total for this segment of shoreline. Approximately 2.1 miles (56.3 percent) of this shoreline segment is characterized as eroding less than two feet per year based on results, while the remaining 1.6 miles (43.7 percent) of shoreline is accreting. The average, maximum, and minimum blocked erosion rate is two feet per year (Figure 38).

The remaining shoreline between Southern Shores and the Dare/Currituck County line accounts for 5.9 miles (33.1 percent) of the total for this segment of shoreline. Approximately 4.6 miles (78.1 percent) of this shoreline segment is characterized as eroding based on results, while the remaining 1.3 miles (21.9 percent) of shoreline is accreting. The average, maximum, and minimum blocked erosion rate is two feet per year (Figure 38).

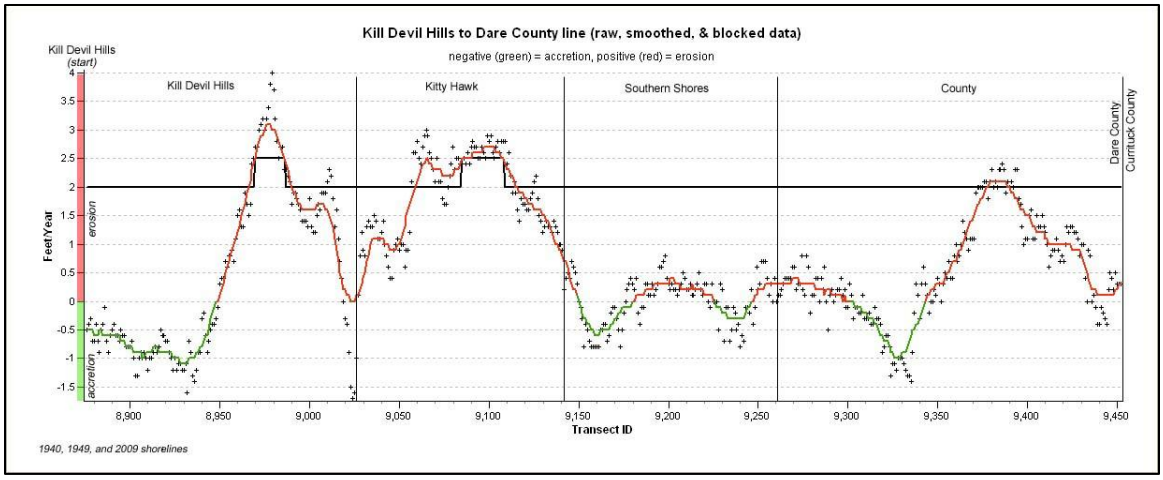

Figure 38. Kill Devil Hills, Kitty Hawk, & Southern Shores data summary

The shoreline in Currituck County accounts for approximately 22.7 miles (7.4 percent) of the state's total oceanfront shoreline. Approximately 19.0 miles (83.6percent) of this shoreline segment is characterized as eroding based on results, while the remaining 3.7 miles (16.4 percent) of shoreline is accreting. The average blocked erosion rate is 3.1 feet per year, the maximum is 7.0 feet per year, and the minimum is two feet per year (Figure 39).

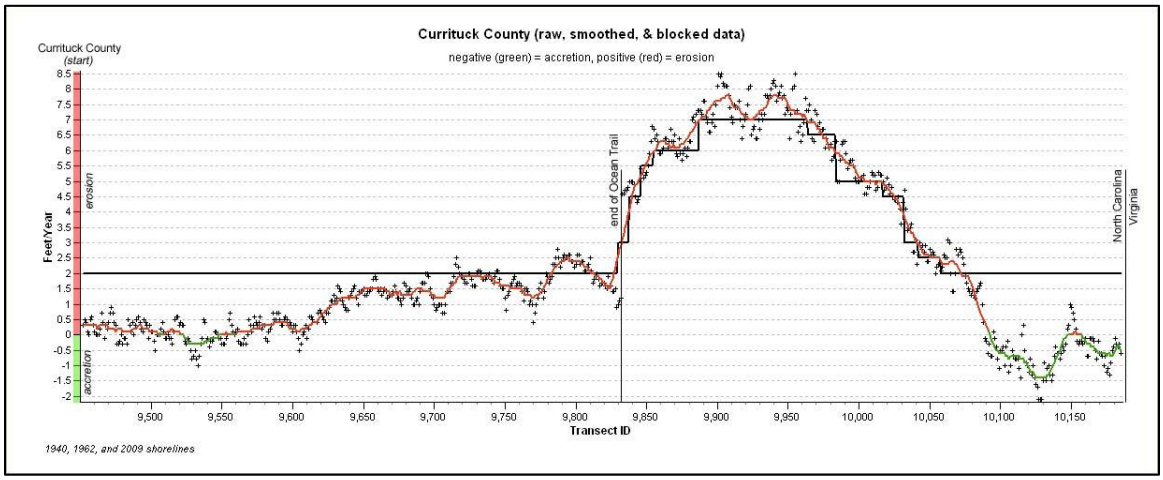

Figure 39. Currituck County data summary

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APPENDIX A: Data Summary Tables

Sunset Beach (including Bird Island)	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**108**	**5350**	**17553.4**	**3.3**	**100.0%**	**-6.2 ft/yr (accretion)**	**2 ft/yr (erosion)**	**-23.4 ft/yr (accretion)**
Erosion	15	700	2296.7	0.4	13.9%			
Accretion	90	4450	14600.5	2.8	83.3%			
Data Gap/Missing Data	*3*	*100*	*328.1*	*0.1*	*2.8%*			
Eroding 2ft/Year or Less (>0, <=2)	15	700	2296.7	0.4	13.9%			
Eroding 2 to 5 Feet/Year (>2, <=5)	0							
Eroding 5 to 8 Feet Year (>5, <=8)	0							
Eroding More Than 8 Feet/Year	0							
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	4	150	492.2	0.1	3.7%			
Increased Accretion (1998 - 2009)	0				0.0%			
No Change	104	5150	16897.2	3.2	96.3%			
Blocking (Setback Factor) Changes per Transect						**2.0**	**2.0**	**2.0**
Block value (setback factor) increase	0							
Block value (setback factor) decrease	0							
Block value (setback factor) No Change	108	5350	17553.4	3.3	100.0%			

Table A 1. Sunset Beach data summary

Ocean Isle	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**186**	**9250**	**30349.3**	**5.7**	**100.0%**	**-0.49 ft/yr (accretion)**	**12.3 ft/yr (erosion)**	**-3.9 ft/yr (accretion)**
Erosion	40	1950	6398.0	1.2	21.5%			
Accretion	146	7250	23787.3	4.5	78.5%			
Data Gap/Missing Data	*5*	*200*	*656.2*	*0.1*	*2.7%*			
Eroding 2ft/Year or Less (>0, <=2)	5	200	656.2	0.1	2.7%			
Eroding 2 to 5 Feet/Year (>2, <=5)	5	200	656.2	0.1	2.7%			
Eroding 5 to 8 Feet Year (>5, <=8)	27	1300	4265.3	0.8	14.5%			
Eroding More Than 8 Feet/Year	3	100	328.1	0.1	1.6%			
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	0				0.0%			
Increased Accretion (1998 - 2009)	13	600	1968.6	0.4	7.0%			
No Change	173	8600	28216.6	5.3	93.0%			
Blocking (Setback Factor) Changes per Transect						**2.7**	**2.0**	**6.5**
Block value (setback factor) increase	25	1200	3937.2	0.7	13.4%	2.0	2.0	2.0
Block value (setback factor) decrease	0							
Block value (setback factor) No Change	161	8000	26248.0	5.0	86.6%			

Table A 2. Ocean Isle data summary

Holden Beach	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**258**	**12850**	**42160.9**	**8.0**	**100.0%**	**0.45 ft/yr (erosion)**	**9.3 ft/yr (erosion)**	**-12.9 ft/yr (accretion)**
Erosion	204	10150	33302.2	6.3	79.1%			
Accretion	54	2650	8694.7	1.6	20.9%			
Data Gap/Missing Data	0				0.0%			
Eroding 2ft/Year or Less (>0, <=2)	152	7550	24771.6	4.7	58.9%			
Eroding 2 to 5 Feet/Year (>2, <=5)	23	1100	3609.1	0.7	8.9%			
Eroding 5 to 8 Feet Year (>5, <=8)	7	300	984.3	0.2	2.7%			
Eroding More Than 8 Feet/Year	0							
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	3	100	328.1	0.1	1.2%			
Increased Accretion (1998 - 2009)	0				0.0%			
No Change	0	-50	-164.1	0.0	0.0%			
Blocking (Setback Factor) Changes per Transect						**2.6**	**2.0**	**8.5**
Block value (setback factor) increase	13	600	1968.6	0.4	5.0%	1.0	1.0	1.0
Block value (setback factor) decrease	80	3950	12960.0	2.5	31.0%	1.3	0.5	3.0
Block value (setback factor) No Change	165	8200	26904.2	5.1	64.0%			

Table A 3. Holden Beach data summary

Oak Island	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**300**	**14950**	**49051.0**	**9.3**	**100.0%**	**-0.95 ft/yr (accretion)**	**1.5 ft/yr (erosion)**	**-7.7 ft/yr (accretion)**
Erosion	47	2300	7546.3	1.4	15.7%			
Accretion	253	12600	41340.6	7.8	84.3%			
Data Gap/Missing Data	*0*							
Eroding 2ft/Year or Less (>0, <=2)	47	2300	7546.3	1.4	15.7%			
Eroding 2 to 5 Feet/Year (>2, <=5)	0							
Eroding 5 to 8 Feet Year (>5, <=8)	0							
Eroding More Than 8 Feet/Year	0							
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	0							
Increased Accretion (1998 - 2009)	139	6900	22638.9	4.3	46.3%			
No Change	161	8000	26248.0	5.0	53.7%			
Blocking (Setback Factor) Changes per Transect						**2.0**	**2.0**	**2.0**
Block value (setback factor) increase	0							
Block value (setback factor) decrease	274	13650	44785.7	8.5	91.3%	2.5	1.0	3.5
Block value (setback factor) No Change	26	1250	4101.3	0.8	8.7%			

Table A 4. Oak Island data summary

Caswell Beach (including Ft. Caswell)	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**113**	**5600**	**18373.6**	**3.5**	**100.0%**	**-2.5 ft/yr (accretion)**	**1.4 ft/yr (erosion)**	**-26.8 ft/yr (accretion)**
Erosion	31	1500	4921.5	0.9	27.4%			
Accretion	82	4050	13288.1	2.5	72.6%			
Data Gap/Missing Data	*0*							
Eroding 2ft/Year or Less (>0, <=2)	31	1500	4921.5	0.9	27.4%			
Eroding 2 to 5 Feet/Year (>2, <=5)	0							
Eroding 5 to 8 Feet Year (>5, <=8)	0							
Eroding More Than 8 Feet/Year	0							
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	0							
Increased Accretion (1998 - 2009)	16	750	2460.8	0.5	14.2%			
No Change	97	4800	15748.8	3.0	85.8%			
Blocking (Setback Factor) Changes per Transect						**2.0**	**2.0**	**2.0**
Block value (setback factor) increase	0							
Block value (setback factor) decrease	37	1800	5905.8	1.1	32.7%	2.9	1.5	3.5
Block value (setback factor) No Change	76	3750	12303.8	2.3	67.3%			

Table A 5. Caswell Beach data summary

Bald Head Island (south beach)	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**103**	**5100**	**16733.1**	**3.2**	**100.0%**	**5.3 ft/yr (erosion)**	**11.4 ft/yr (erosion)**	**No Accretion**
Erosion	113	5600	18373.6	3.5	109.7%			
Accretion	0	-50	-164.1	0.0	0.0%			
Data Gap/Missing Data	*2*	*50*	*164.1*	*0.0*	*1.9%*			
Eroding 2ft/Year or Less (>0, <=2)	23	1100	3609.1	0.7	22.3%			
Eroding 2 to 5 Feet/Year (>2, <=5)	30	1450	4757.5	0.9	29.1%			
Eroding 5 to 8 Feet Year (>5, <=8)	22	1050	3445.1	0.7	21.4%			
Eroding More Than 8 Feet/Year	28	1350	4429.4	0.8	27.2%			
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	0							
Increased Accretion (1998 - 2009)	0							
No Change	103	5100	16733.1	3.2	100.0%			
Blocking (Setback Factor) Changes per Transect						**5.3**	**2.0**	**10.5**
Block value (setback factor) increase	7	300	984.3	0.2	6.8%	1.1	0.5	2.0
Block value (setback factor) decrease	74	3650	11975.7	2.3	71.8%	2.6	1.0	4.5
Block value (setback factor) No Change	22	1050	3445.1	0.7	21.4%			

Table A 6. Bald Head Island ("south beach") data summary

Bald Head Island (east beach)	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**27**	**1300**	**4265.3**	**0.8**	**100.0%**	**-2 ft/yr (accretion)**	**1.9 ft/yr (erosion)**	**-6.1 ft/yr (accretion)**
Erosion	8	350	1148.4	0.2	29.6%			
Accretion	19	900	2952.9	0.6	70.4%			
Data Gap/Missing Data	*0*							
Eroding 2ft/Year or Less (>0, <=2)	8	350	1148.4	0.2	29.6%			
Eroding 2 to 5 Feet/Year (>2, <=5)	0							
Eroding 5 to 8 Feet Year (>5, <=8)	0							
Eroding More Than 8 Feet/Year	0							
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	8	350	1148.4	0.2	29.6%			
Increased Accretion (1998 - 2009)	0							
No Change	19	900	2952.9	0.6	70.4%			
Blocking (Setback Factor) Changes per Transect						**2.0**	**2.0**	**2.0**
Block value (setback factor) increase	0							
Block value (setback factor) decrease	0							
Block value (setback factor) No Change	27	1300	4265.3	0.8	100.0%			

Table A 7. Bald Head Island ("east beach") data summary

Bald Head - Fort Fisher (including Zeke's Island)	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**275**	**13700**	**44949.7**	**8.5**	**100.0%**	**1.8 ft/yr (erosion)**	**9.6 ft/yr (erosion)**	**-8.2 ft/yr (accretion)**
Erosion	164	8150	26740.2	5.1	59.6%			
Accretion	106	5250	17225.3	3.3	38.5%			
Data Gap/Missing Data	*5*	*200*	*656.2*	*0.1*	*1.8%*			
Eroding 2ft/Year or Less (>0, <=2)	11	500	1640.5	0.3	4.0%			
Eroding 2 to 5 Feet/Year (>2, <=5)	41	2000	6562.0	1.2	14.9%			
Eroding 5 to 8 Feet Year (>5, <=8)	58	2850	9350.9	1.8	21.1%			
Eroding More Than 8 Feet/Year	54	2650	8694.7	1.6	19.6%			
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)								
Increased Accretion (1998 - 2009)	1	0	0.0	0.0	0.4%			
No Change	274	13650	44785.7	8.5	99.6%			
Blocking (Setback Factor) Changes per Transect						**4.3**	**2.0**	**9.0**
Block value (setback factor) increase	40	1950	6398.0	1.2	14.5%			
Block value (setback factor) decrease	118	5850	19193.9	3.6	42.9%			
Block value (setback factor) No Change	116	5750	18865.8	3.6	42.2%			

Table A 8. From Bald Head Island to Fort Fisher data summary

Kure Beach	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**94**	**4650**	**15256.7**	**2.9**	**100.0%**	**0.2 ft/yr (erosion)**	**5.2 ft/yr (erosion)**	**-1.4 ft/yr (accretion)**
Erosion	32	1550	5085.6	1.0	34.0%			
Accretion	62	3050	10007.1	1.9	66.0%			
Data Gap/Missing Data	*0*							
Eroding 2ft/Year or Less (>0, <=2)	16	750	2460.8	0.5	17.0%			
Eroding 2 to 5 Feet/Year (>2, <=5)	13	600	1968.6	0.4	13.8%			
Eroding 5 to 8 Feet Year (>5, <=8)	2	50	164.1	0.0	2.1%			
Eroding More Than 8 Feet/Year	0							
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	19	900	2952.9	0.6	20.2%			
Increased Accretion (1998 - 2009)	0							
No Change	75	3700	12139.7	2.3	79.8%			
Blocking (Setback Factor) Changes per Transect						**2.3**	**2.0**	**5.5**
Block value (setback factor) increase	8	350	1148.4	0.2	8.5%	1.7	1.5	2.0
Block value (setback factor) decrease	0							
Block value (setback factor) No Change	86	4250	13944.3	2.6	91.5%			

Table A 9. Kure Beach data summary

Carolina Beach	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**127**	**6300**	**20670.3**	**3.9**	**100.0%**	**-0.5 ft/yr (accretion)**	**5.7 ft/yr (erosion)**	**-2.3 ft/yr (accretion)**
Erosion	43	2100	6890.1	1.3	33.9%			
Accretion	84	4150	13616.2	2.6	66.1%			
Data Gap/Missing Data	*0*							
Eroding 2ft/Year or Less (>0, <=2)	15	700	2296.7	0.4	11.8%			
Eroding 2 to 5 Feet/Year (>2, <=5)	13	600	1968.6	0.4	10.2%			
Eroding 5 to 8 Feet Year (>5, <=8)	4	150	492.2	0.1	3.1%			
Eroding More Than 8 Feet/Year	0							
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	16	750	2460.8	0.5	12.6%			
Increased Accretion (1998 - 2009)	0							
No Change	111	5500	18045.5	3.4	87.4%			
Blocking (Setback Factor) Changes per Transect						**3.0**	**2.0**	**5.0**
Block value (setback factor) increase	20	950	3117.0	0.6	15.7%	2.6	1.0	5.0
Block value (setback factor) decrease	6	250	820.3	0.2	4.7%	1.3	1.0	1.5
Block value (setback factor) No Change	101	5000	16405.0	3.1	79.5%			

Table A 10. Carolina Beach data summary

Masonboro Island	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**253**	**12600**	**41340.6**	**7.8**	**100.0%**	**6.9 ft/yr (erosion)**	**36.1 ft/yr (erosion)**	**-11.5 ft/yr (accretion)**
Erosion	243	12100	39700.1	7.5	96.0%			
Accretion	9	400	1312.4	0.2	3.6%			
Data Gap/Missing Data	*1*	*0*	*0.0*	*0.0*	*0.4%*			
Eroding 2ft/Year or Less (>0, <=2)	19	900	2952.9	0.6	7.5%			
Eroding 2 to 5 Feet/Year (>2, <=5)	82	4050	13288.1	2.5	32.4%			
Eroding 5 to 8 Feet Year (>5, <=8)	53	2600	8530.6	1.6	20.9%			
Eroding More Than 8 Feet/Year	89	4400	14436.4	2.7	35.2%			
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	5	200	656.2	0.1	2.0%			
Increased Accretion (1998 - 2009)	0							
No Change	248	12350	40520.4	7.7	98.0%			
Blocking (Setback Factor) Changes per Transect						**7.0**	**2.0**	**28.0**
Block value (setback factor) increase	151	7500	24607.5	4.7	59.7%	2.3	0.5	16.0
Block value (setback factor) decrease	37	1800	5905.8	1.1	14.6%	0.9	0.5	1.5
Block value (setback factor) No Change	65	3200	10499.2	2.0	25.7%			

Table A 11. Masonboro Island data summary

Wrightsville Beach	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**145**	**7200**	**23623.2**	**4.5**	**100.0%**	**-3.2 ft/yr (accretion)**	**4.5 ft/yr (erosion)**	**-6.7 ft/yr (accretion)**
Erosion	3	100	328.1	0.1	2.1%			
Accretion	132	6550	21490.6	4.1	91.0%			
Data Gap/Missing Data	*10*	*450*	*1476.5*	*0.3*	*6.9%*			
Eroding 2ft/Year or Less (>0, <=2)	1	0	0.0	0.0	0.7%			
Eroding 2 to 5 Feet/Year (>2, <=5)	2	50	164.1	0.0	1.4%			
Eroding 5 to 8 Feet Year (>5, <=8)	0							
Eroding More Than 8 Feet/Year	0							
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	3	100	328.1	0.1	2.1%			
Increased Accretion (1998 - 2009)	0							
No Change	142	7050	23131.1	4.4	97.9%			
Blocking (Setback Factor) Changes per Transect						**2.0**	**2.0**	**2.0**
Block value (setback factor) increase	0							
Block value (setback factor) decrease	0							
Block value (setback factor) No Change	145	7200	23623.2	4.5	100.0%			

Table A 12. Wrightsville Beach data summary

Figure Eight Island	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**118**	**5850**	**19193.9**	**3.6**	**100.0%**	**-1.6 ft/yr (accretion)**	**3.4 ft/yr (erosion)**	**-4.5 ft/yr (accretion)**
Erosion	26	1250	4101.3	0.8	22.0%			
Accretion	92	4550	14928.6	2.8	78.0%			
Data Gap/Missing Data	*0*							
Eroding 2ft/Year or Less (>0, <=2)	24	1150	3773.2	0.7	20.3%			
Eroding 2 to 5 Feet/Year (>2, <=5)	2	50	164.1	0.0	1.7%			
Eroding 5 to 8 Feet Year (>5, <=8)	0							
Eroding More Than 8 Feet/Year	0							
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	0							
Increased Accretion (1998 - 2009)	3	100	328.1	0.1	2.5%			
No Change	115	5700	18701.7	3.5	97.5%			
Blocking (Setback Factor) Changes per Transect						**2.0**	**2.0**	**2.0**
Block value (setback factor) increase	0							
Block value (setback factor) decrease	0							
Block value (setback factor) No Change	118	5850	19193.9	3.6	100.0%			

Table A 13. Figure Eight Island data summary

Lee-Hutaff Island	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**117**	**5800**	**19029.8**	**3.6**	**100.0%**	**5.8 ft/yr (erosion)**	**15.1 ft/yr (erosion)**	**No Accretion**
Erosion	103	5100	16733.1	3.2	88.0%			
Accretion	0	-50	-164.1	0.0	0.0%			
Data Gap/Missing Data	*14*	*650*	*2132.7*	*0.4*	*12.0%*			
Eroding 2ft/Year or Less (>0, <=2)	13	600	1968.6	0.4	11.1%			
Eroding 2 to 5 Feet/Year (>2, <=5)	22	1050	3445.1	0.7	18.8%			
Eroding 5 to 8 Feet Year (>5, <=8)	25	1200	3937.2	0.7	21.4%			
Eroding More Than 8 Feet/Year	43	2100	6890.1	1.3	36.8%			
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	4	150	492.2	0.1	3.4%			
Increased Accretion (1998 - 2009)	0							
No Change	113	5600	18373.6	3.5	96.6%			
Blocking (Setback Factor) Changes per Transect						**5.7**	**2.0**	**10.0**
Block value (setback factor) increase	67	3300	10827.3	2.1	57.3%	3.5	0.5	8.0
Block value (setback factor) decrease	14	650	2132.7	0.4	12.0%	1.1	0.5	1.5
Block value (setback factor) No Change	36	1750	5741.8	1.1	30.8%			

Table A 14. Lee-Hutaff Island data summary

Topsail Beach	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**155**	**7700**	**25263.7**	**4.8**	**100.0%**	**-2.5 ft/yr (accretion)**	**1.8 ft/yr (erosion)**	**-19.5 ft/yr (accretion)**
Erosion	21	1000	3281.0	0.6	13.5%			
Accretion	127	6300	20670.3	3.9	81.9%			
Data Gap/Missing Data	*7*	*300*	*984.3*	*0.2*	*4.5%*			
Eroding 2ft/Year or Less (>0, <=2)	21	1000	3281.0	0.6	13.5%			
Eroding 2 to 5 Feet/Year (>2, <=5)	0							
Eroding 5 to 8 Feet Year (>5, <=8)	0							
Eroding More Than 8 Feet/Year	0							
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	21	1000	3281.0	0.6	13.5%			
Increased Accretion (1998 - 2009)	0							
No Change	127	6300	20670.3	3.9	81.9%			
Blocking (Setback Factor) Changes per Transect						**2.0**	**2.0**	**2.0**
Block value (setback factor) increase	0							
Block value (setback factor) decrease	0							
Block value (setback factor) No Change	155	7700	25263.7	4.8	100.0%			

Table A 15. Topsail Beach data summary

Surf City	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**194**	**9650**	**31661.7**	**6.0**	**100.0%**	**-0.3 ft/yr (accretion)**	**0.5 ft/yr (erosion)**	**-0.8 ft/yr (accretion)**
Erosion	25	1200	3937.2	0.7	12.9%			
Accretion	167	8300	27232.3	5.2	86.1%			
Data Gap/Missing Data	*2*	*50*	*164.1*	*0.0*	*1.0%*			
Eroding 2ft/Year or Less (>0, <=2)	25	1200	3937.2	0.7	12.9%			
Eroding 2 to 5 Feet/Year (>2, <=5)	0							
Eroding 5 to 8 Feet Year (>5, <=8)	0							
Eroding More Than 8 Feet/Year	0							
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	2	50	164.1	0.0	1.0%			
Increased Accretion (1998 - 2009)	0							
No Change	192	9550	31333.6	5.9	99.0%			
Blocking (Setback Factor) Changes per Transect						**2.0**	**2.0**	**2.0**
Block value (setback factor) increase	0							
Block value (setback factor) decrease	0							
Block value (setback factor) No Change	194	9650	31661.7	6.0	100.0%			

Table A 16. Surf City data summary

North Topsail Beach	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**359**	**17900**	**58729.9**	**11.1**	**100.0%**	**1.2 ft/yr (erosion)**	**37.6 ft/yr (erosion)**	**-0.6 ft/yr (accretion)**
Erosion	318	15850	52003.9	9.8	88.6%			
Accretion	41	2000	6562.0	1.2	11.4%			
Data Gap/Missing Data								
Eroding 2ft/Year or Less (>0, <=2)	270	13450	44129.5	8.4	75.2%			
Eroding 2 to 5 Feet/Year (>2, <=5)	39	1900	6233.9	1.2	10.9%			
Eroding 5 to 8 Feet Year (>5, <=8)	3	100	328.1	0.1	0.8%			
Eroding More Than 8 Feet/Year	6	250	820.3	0.2	1.7%			
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	61	3000	9843.0	1.9	17.0%			
Increased Accretion (1998 - 2009)	0							
No Change	298	14850	48722.9	9.2	83.0%			
Blocking (Setback Factor) Changes per Transect						**2.3**	**2.0**	**14.0**
Block value (setback factor) increase	11	500	1640.5	0.3	3.1%	7.7	2.0	12.0
Block value (setback factor) decrease	40	1950	6398.0	1.2	11.1%	0.7	0.5	1.0
Block value (setback factor) No Change	308	15350	50363.4	9.5	85.8%			

Table A 17. North Topsail Beach data summary

Onslow Beach	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**236**	**11750**	**38551.8**	**7.3**	**100.0%**	**3 ft/yr (erosion)**	**11.5 ft/yr (erosion)**	**-4.2 (accretion)**
Erosion	154	7650	25099.7	4.8	65.3%			
Accretion	82	4050	13288.1	2.5	34.7%			
Data Gap/Missing Data	*0*							
Eroding 2ft/Year or Less (>0, <=2)	29	1400	4593.4	0.9	12.3%			
Eroding 2 to 5 Feet/Year (>2, <=5)	50	2450	8038.5	1.5	21.2%			
Eroding 5 to 8 Feet Year (>5, <=8)	36	1750	5741.8	1.1	15.3%			
Eroding More Than 8 Feet/Year	39	1900	6233.9	1.2	16.5%			
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	0							
Increased Accretion (1998 - 2009)	48	2350	7710.4	1.5	20.3%			
No Change	188	9350	30677.4	5.8	79.7%			
Blocking (Setback Factor) Changes per Transect						**4.1**	**2.0**	**11.0**
Block value (setback factor) increase	70	3450	11319.5	2.1	29.7%	1.2	0.5	4.0
Block value (setback factor) decrease	37	1800	5905.8	1.1	15.7%	4.6	1.0	9.0
Block value (setback factor) No Change	129	6400	20998.4	4.0	54.7%			

Table A 18. Onslow Beach data summary

Brown's Island	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**106**	**5250**	**17225.3**	**3.3**	**100.0%**	**2.7 ft/yr (erosion)**	**12 ft/yr (erosion)**	**-11.5 ft/yr (accretion)**
Erosion	98	4850	15912.9	3.0	92.5%			
Accretion	8	350	1148.4	0.2	7.5%			
Data Gap/Missing Data	*0*							
Eroding 2ft/Year or Less (>0, <=2)	4	150	492.2	0.1	3.8%			
Eroding 2 to 5 Feet/Year (>2, <=5)	84	4150	13616.2	2.6	79.2%			
Eroding 5 to 8 Feet Year (>5, <=8)	8	350	1148.4	0.2	7.5%			
Eroding More Than 8 Feet/Year	2	50	164.1	0.0	1.9%			
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	6	250	820.3	0.2	5.7%			
Increased Accretion (1998 - 2009)	0							
No Change	100	4950	16241.0	3.1	94.3%			
Blocking (Setback Factor) Changes per Transect						**3.0**	**2.0**	**6.0**
Block value (setback factor) increase	29	1400	4593.4	0.9	27.4%	1.4	0.5	6.0
Block value (setback factor) decrease	26	1250	4101.3	0.8	24.5%	1.0	0.5	2.5
Block value (setback factor) No Change	51	2500	8202.5	1.6	48.1%			

Table A 19. Brown's Island data summary

Bear Island (Hammocks Beach State Park)	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**98**	**4850**	**15912.9**	**3.0**	**100.0%**	**-2.2 ft/yr (accretion)**	**6.6 ft/yr (erosion)**	**-30.6 ft/yr (accretion)**
Erosion	68	3350	10991.4	2.1	69.4%			
Accretion	30	1450	4757.5	0.9	30.6%			
Data Gap/Missing Data	*0*							
Eroding 2ft/Year or Less (>0, <=2)	43	2100	6890.1	1.3	43.9%			
Eroding 2 to 5 Feet/Year (>2, <=5)	14	650	2132.7	0.4	14.3%			
Eroding 5 to 8 Feet Year (>5, <=8)	11	500	1640.5	0.3	11.2%			
Eroding More Than 8 Feet/Year	0							
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	28	1350	4429.4	0.8	28.6%			
Increased Accretion (1998 - 2009)	0							
No Change	70	3450	11319.5	2.1	71.4%			
Blocking (Setback Factor) Changes per Transect						**2.6**	**2.0**	**5.5**
Block value (setback factor) increase	7	300	984.3	0.2	7.1%	1.5	1.5	1.5
Block value (setback factor) decrease	36	1750	5741.8	1.1	36.7%	1.5	0.5	3.0
Block value (setback factor) No Change	55	2700	8858.7	1.7	56.1%			

Table A 20. Bear Island data summary

Emerald Isle	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**362**	**18050**	**59222.1**	**11.2**	**100.0%**	**-0.1 ft/yr (accretion)**	**19 ft/yr (erosion)**	**-4.2 ft/yr (accretion)**
Erosion	113	5600	18373.6	3.5	31.2%			
Accretion	249	12400	40684.4	7.7	68.8%			
Data Gap/Missing Data	0							
Eroding 2ft/Year or Less (>0, <=2)	102	5050	16569.1	3.1	28.2%			
Eroding 2 to 5 Feet/Year (>2, <=5)	2	50	164.1	0.0	0.6%			
Eroding 5 to 8 Feet Year (>5, <=8)	2	50	164.1	0.0	0.6%			
Eroding More Than 8 Feet/Year	7	300	984.3	0.2	1.9%			
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	0							
Increased Accretion (1998 - 2009)	63	3100	10171.1	1.9	17.4%			
No Change	299	14900	48886.9	9.3	82.6%			
Blocking (Setback Factor) Changes per Transect						**2.2**	**2.0**	**12.5**
Block value (setback factor) increase	16	750	2460.8	0.5	4.4%	5.5	0.5	10.5
Block value (setback factor) decrease	21	1000	3281.0	0.6	5.8%	0.5	0.5	0.5
Block value (setback factor) No Change	325	16200	53152.2	10.1	89.8%			

Table A 21. Emerald Isle data summary

Indian Beach	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**56**	**2750**	**9022.8**	**1.7**	**100.0%**	**0.3 ft/yr (erosion)**	**0.6 ft/yr (erosion)**	**-0.1 ft/yr (accretion)**
Erosion	50	2450	8038.5	1.5	89.3%			
Accretion	6	250	820.3	0.2	10.7%			
Data Gap/Missing Data	*0*							
Eroding 2ft/Year or Less (>0, <=2)	50	2450	8038.5	1.5	89.3%			
Eroding 2 to 5 Feet/Year (>2, <=5)	0							
Eroding 5 to 8 Feet Year (>5, <=8)	0							
Eroding More Than 8 Feet/Year	0							
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	0							
Increased Accretion (1998 - 2009)	6	250	820.3	0.2	10.7%			
No Change	50	2450	8038.5	1.5	89.3%			
Blocking (Setback Factor) Changes per Transect						**2.0**	**2.0**	**2.0**
Block value (setback factor) increase	0							
Block value (setback factor) decrease	0							
Block value (setback factor) No Change	56	2750	9022.8	1.7	100.0%			

Table A 22. Indian Beach data summary

Salter Path	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**26**	**1250**	**4101.3**	**0.8**	**100.0%**	**0.4 ft/yr (erosion)**	**0.7 ft/yr (erosion)**	**No Accretion**
Erosion	26	1250	4101.3	0.8	100.0%			
Accretion	0	-50	-164.1	0.0	0.0%			
Data Gap/Missing Data	0							
Eroding 2ft/Year or Less (>0, <=2)	26	1250	4101.3	0.8	100.0%			
Eroding 2 to 5 Feet/Year (>2, <=5)	0							
Eroding 5 to 8 Feet Year (>5, <=8)	0							
Eroding More Than 8 Feet/Year	0							
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	0							
Increased Accretion (1998 - 2009)	0							
No Change	26	1250	4101.3	0.8	100.0%			
Blocking (Setback Factor) Changes per Transect						**2.0**	**2.0**	**2.0**
Block value (setback factor) increase	0							
Block value (setback factor) decrease	0							
Block value (setback factor) No Change	26	1250	4101.3	0.8	100.0%			

Table A 23. Salter Path data summary

Pine Knoll Shores	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**155**	**7700**	**25263.7**	**4.8**	**100.0%**	**-0.3 ft/yr (accretion)**	**0.8 ft/yr (erosion)**	**-1.4 ft/yr (accretion)**
Erosion	68	3350	10991.4	2.1	43.9%			
Accretion	87	4300	14108.3	2.7	56.1%			
Data Gap/Missing Data	0							
Eroding 2ft/Year or Less (>0, <=2)	68	3350	10991.4	2.1	43.9%			
Eroding 2 to 5 Feet/Year (>2, <=5)	0							
Eroding 5 to 8 Feet Year (>5, <=8)	0							
Eroding More Than 8 Feet/Year	0							
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	0							
Increased Accretion (1998 - 2009)	75	3700	12139.7	2.3	48.4%			
No Change	80	3950	12960.0	2.5	51.6%			
Blocking (Setback Factor) Changes per Transect						**2.0**	**2.0**	**2.0**
Block value (setback factor) increase	0							
Block value (setback factor) decrease	0							
Block value (setback factor) No Change	155	7700	25263.7	4.8	100.0%			

Table A 24. Pine Knoll Shores data summary

Atlantic Beach (including Fort Macon State Park)	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**196**	**9750**	**31989.8**	**6.1**	**100.0%**	**-1.3 ft/yr (accretion)**	**3 ft/yr (erosion)**	**-4 ft/yr (accretion)**
Erosion	36	1750	5741.8	1.1	18.4%			
Accretion	160	7950	26084.0	4.9	81.6%			
Data Gap/Missing Data	*0*							
Eroding 2ft/Year or Less (>0, <=2)	18	850	2788.9	0.5	9.2%			
Eroding 2 to 5 Feet/Year (>2, <=5)	18	850	2788.9	0.5	9.2%			
Eroding 5 to 8 Feet Year (>5, <=8)	0							
Eroding More Than 8 Feet/Year	0							
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	0							
Increased Accretion (1998 - 2009)	6	250	820.3	0.2	3.1%			
No Change	190	9450	31005.5	5.9	96.9%			
Blocking (Setback Factor) Changes per Transect						**2.0**	**2.0**	**2.5**
Block value (setback factor) increase	2	50	164.1	0.0	1.0%	1.3	0.5	2.0
Block value (setback factor) decrease	2	50	164.1	0.0	1.0%	0.5	0.5	0.5
Block value (setback factor) No Change	192	9550	31333.6	5.9	98.0%			

Table A 25. Atlantic Beach data summary

Shackleford Banks	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**262**	**13050**	**42817.1**	**8.1**	**100.0%**	**1.2 ft/yr (erosion)**	**5.8 ft/yr (erosion)**	**-19.4 ft/yr (accretion)**
Erosion	188	9350	30677.4	5.8	71.8%			
Accretion	74	3650	11975.7	2.3	28.2%			
Data Gap/Missing Data	*0*							
Eroding 2ft/Year or Less (>0, <=2)	35	1700	5577.7	1.1	13.4%			
Eroding 2 to 5 Feet/Year (>2, <=5)	80	3950	12960.0	2.5	30.5%			
Eroding 5 to 8 Feet Year (>5, <=8)	73	3600	11811.6	2.2	27.9%			
Eroding More Than 8 Feet/Year	0							
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	4	150	492.2	0.1	1.5%			
Increased Accretion (1998 - 2009)	0							
No Change	258	12850	42160.9	8.0	98.5%			
Blocking (Setback Factor) Changes per Transect						**3.4**	**2.0**	**5.5**
Block value (setback factor) increase	64	3150	10335.2	2.0	24.4%	0.6	0.5	1.5
Block value (setback factor) decrease	67	3300	10827.3	2.1	25.6%	0.6	0.5	1.5
Block value (setback factor) No Change	131	6500	21326.5	4.0	50.0%			

Table A 26. Shackleford Banks data summary

Cape Lookout (Bardens Inlet to point at cape)	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**77**	**3800**	**12467.8**	**2.4**	**100.0%**	**4.2 ft/yr (erosion)**	**11.3 ft/yr (erosion)**	**-6.6 ft/yr (accretion)**
Erosion	14	650	2132.7	0.4	18.2%			
Accretion	63	3100	10171.1	1.9	81.8%			
Data Gap/Missing Data	0							
Eroding 2ft/Year or Less (>0, <=2)	19	900	2952.9	0.6	24.7%			
Eroding 2 to 5 Feet/Year (>2, <=5)	10	450	1476.5	0.3	13.0%			
Eroding 5 to 8 Feet Year (>5, <=8)	10	450	1476.5	0.3	13.0%			
Eroding More Than 8 Feet/Year	24	1150	3773.2	0.7	31.2%			
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	0							
Increased Accretion (1998 - 2009)	44	2150	7054.2	1.3	57.1%			
No Change	33	1600	5249.6	1.0	42.9%			
Blocking (Setback Factor) Changes per Transect						**5.2**	**2.0**	**11.0**
Block value (setback factor) increase	5	200	656.2	0.1	6.5%	0.5	0.5	0.5
Block value (setback factor) decrease	44	2150	7054.2	1.3	57.1%	3.7	0.5	8.0
Block value (setback factor) No Change	28	1350	4429.4	0.8	36.4%			

Table A 27. Cape Lookout (Barden Inlet to cape) data summary

Cape Lookout (Cape to Drum inlet)	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**674**	**33650**	**110405.7**	**20.9**	**100.0%**	**3.9 ft/yr (erosion)**	**29.6 ft/yr (erosion)**	**-3.1 ft/yr (accretion)**
Erosion	603	30100	98758.1	18.7	89.5%			
Accretion	71	3500	11483.5	2.2	10.5%			
Data Gap/Missing Data	*0*							
Eroding 2ft/Year or Less (>0, <=2)	111	5500	18045.5	3.4	16.5%			
Eroding 2 to 5 Feet/Year (>2, <=5)	332	16550	54300.6	10.3	49.3%			
Eroding 5 to 8 Feet Year (>5, <=8)	96	4750	15584.8	3.0	14.2%			
Eroding More Than 8 Feet/Year	64	3150	10335.2	2.0	9.5%			
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	0							
Increased Accretion (1998 - 2009)	2	50	164.1	0.0	0.3%			
No Change	672	33550	110077.6	20.8	99.7%			
Blocking (Setback Factor) Changes per Transect						**4.2**	**2.0**	**18.0**
Block value (setback factor) increase	196	9750	31989.8	6.1	29.1%	1.0	0.5	4.0
Block value (setback factor) decrease	179	8900	29200.9	5.5	26.6%	0.8	0.5	1.0
Block value (setback factor) No Change	299	14900	48886.9	9.3	44.4%			

Table A 28. Cape Lookout (cape to Drum Inlet) data summary

Core Banks (Drum inlet to Ocracoke inlet)	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**693**	**34600**	**113522.6**	**21.5**	**100.0%**	**2.8 ft/yr (erosion)**	**9.2 ft/yr (erosion)**	**-12.1 ft/yr (accretion)**
Erosion	603	30100	98758.1	18.7	87.0%			
Accretion	90	4450	14600.5	2.8	13.0%			
Data Gap/Missing Data	*0*							
Eroding 2ft/Year or Less (>0, <=2)	105	5200	17061.2	3.2	15.2%			
Eroding 2 to 5 Feet/Year (>2, <=5)	306	15250	50035.3	9.5	44.2%			
Eroding 5 to 8 Feet Year (>5, <=8)	128	6350	20834.4	3.9	18.5%			
Eroding More Than 8 Feet/Year	34	1650	5413.7	1.0	4.9%			
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	12	550	1804.6	0.3	1.7%			
Increased Accretion (1998 - 2009)	0							
No Change	681	34000	111554.0	21.1	98.3%			
Blocking (Setback Factor) Changes per Transect						**3.7**	**2.0**	**8.5**
Block value (setback factor) increase	91	4500	14764.5	2.8	13.1%	0.9	0.5	6.5
Block value (setback factor) decrease	358	17850	58565.9	11.1	51.7%	1.7	0.5	7.0
Block value (setback factor) No Change	244	12150	39864.2	7.6	35.2%			

Table A 29. Core Banks (Drum Inlet to Ocracoke Inlet) data summary

Ocracoke	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**525**	**26200**	**85962.2**	**16.3**	**100.0%**	**2.4 ft/yr (erosion)**	**9 ft/yr (erosion)**	**-17.4 ft/yr (accretion)**
Erosion	366	18250	59878.3	11.3	69.7%			
Accretion	159	7900	25919.9	4.9	30.3%			
Data Gap/Missing Data	*0*							
Eroding 2ft/Year or Less (>0, <=2)	88	4350	14272.4	2.7	16.8%			
Eroding 2 to 5 Feet/Year (>2, <=5)	129	6400	20998.4	4.0	24.6%			
Eroding 5 to 8 Feet Year (>5, <=8)	102	5050	16569.1	3.1	19.4%			
Eroding More Than 8 Feet/Year	47	2300	7546.3	1.4	9.0%			
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	22	1050	3445.1	0.7	4.2%			
Increased Accretion (1998 - 2009)	0							
No Change	503	25100	82353.1	15.6	95.8%			
Blocking (Setback Factor) Changes per Transect						**3.8**	**2.0**	**8.5**
Block value (setback factor) increase	115	5700	18701.7	3.5	21.9%	0.9	0.5	4.5
Block value (setback factor) decrease	136	6750	22146.8	4.2	25.9%	5.3	0.5	21.0
Block value (setback factor) No Change	274	13650	44785.7	8.5	52.2%			

Table A 30. Ocracoke data summary

Hatteras (Hatteras inlet to cape)	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**415**	**20700**	**67916.7**	**12.9**	**100.0%**	**-3.3 ft/yr (accretion)**	**12.4 ft/yr (erosion)**	**-54.3 ft/yr (accretion)**
Erosion	200	9950	32646.0	6.2	48.2%			
Accretion	212	10550	34614.6	6.6	51.1%			
Data Gap/Missing Data	*3*	*100*	*328.1*	*0.1*	*0.7%*			
Eroding 2ft/Year or Less (>0, <=2)	74	3650	11975.7	2.3	17.8%			
Eroding 2 to 5 Feet/Year (>2, <=5)	90	4450	14600.5	2.8	21.7%			
Eroding 5 to 8 Feet Year (>5, <=8)	11	500	1640.5	0.3	2.7%			
Eroding More Than 8 Feet/Year	25	1200	3937.2	0.7	6.0%			
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	17	800	2624.8	0.5	4.1%			
Increased Accretion (1998 - 2009)	0							
No Change	395	19700	64635.7	12.2	95.2%			
Blocking (Setback Factor) Changes per Transect						**2.9**	**2.0**	**11.5**
Block value (setback factor) increase	25	1200	3937.2	0.7	6.0%	1.2	0.5	3.5
Block value (setback factor) decrease	61	3000	9843.0	1.9	14.7%	4.9	0.5	11.5
Block value (setback factor) No Change	329	16400	53808.4	10.2	79.3%			

Table A 31. Hatteras (Hatteras Inlet to cape) data summary

Cape Hatteras (Cape to Avon)	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**230**	**11450**	**37567.5**	**7.1**	**100.0%**	**6.3 ft/yr (erosion)**	**11.5 ft/yr (erosion)**	**No Accretion**
Erosion	213	10600	34778.6	6.6	92.6%			
Accretion	0	-50	-164.1	0.0	0.0%			
Data Gap/Missing Data	*17*	*800*	*2624.8*	*0.5*	*7.4%*			
Eroding 2ft/Year or Less (>0, <=2)	8	350	1148.4	0.2	3.5%			
Eroding 2 to 5 Feet/Year (>2, <=5)	60	2950	9679.0	1.8	26.1%			
Eroding 5 to 8 Feet Year (>5, <=8)	51	2500	8202.5	1.6	22.2%			
Eroding More Than 8 Feet/Year	94	4650	15256.7	2.9	40.9%			
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	7	300	984.3	0.2	3.0%			
Increased Accretion (1998 - 2009)	0							
No Change	223	11100	36419.1	6.9	97.0%			
Blocking (Setback Factor) Changes per Transect						**6.2**	**2.0**	**11.0**
Block value (setback factor) increase	25	1200	3937.2	0.7	10.9%	0.9	0.5	1.5
Block value (setback factor) decrease	115	5700	18701.7	3.5	50.0%	2.0	0.5	6.5
Block value (setback factor) No Change	90	4450	14600.5	2.8	39.1%			

Table A 32. Outer Banks - Cape Hatteras to Avon data summary

Outer Banks (Avon)	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**114**	**5650**	**18537.7**	**3.5**	**100.0%**	**1.4 ft/yr (erosion)**	**5 ft/yr (erosion)**	**-4.3 ft/yr (accretion)**
Erosion	73	3600	11811.6	2.2	64.0%			
Accretion	41	2000	6562.0	1.2	36.0%			
Data Gap/Missing Data	*0*							
Eroding 2ft/Year or Less (>0, <=2)	13	600	1968.6	0.4	11.4%			
Eroding 2 to 5 Feet/Year (>2, <=5)	60	2950	9679.0	1.8	52.6%			
Eroding 5 to 8 Feet Year (>5, <=8)	0							
Eroding More Than 8 Feet/Year	0							
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	23	1100	3609.1	0.7	20.2%			
Increased Accretion (1998 - 2009)	0							
No Change	91	4500	14764.5	2.8	79.8%			
Blocking (Setback Factor) Changes per Transect						**2.9**	**2.0**	**4.5**
Block value (setback factor) increase	26	1250	4101.3	0.8	22.8%	1.2	0.5	2.0
Block value (setback factor) decrease	1	0	0.0	0.0	0.9%			
Block value (setback factor) No Change	87	4300	14108.3	2.7	76.3%			

Table A 33. Outer Banks - Avon data summary

Outer Banks (Avon to Salvo)	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**372**	**18550**	**60862.6**	**11.5**	**100.0%**	**1 ft/yr (erosion)**	**4.8 ft/yr (erosion)**	**-4.3 ft/yr (accretion)**
Erosion	263	13100	42981.1	8.1	70.7%			
Accretion	109	5400	17717.4	3.4	29.3%			
Data Gap/Missing Data	*0*							
Eroding 2ft/Year or Less (>0, <=2)	91	4500	14764.5	2.8	24.5%			
Eroding 2 to 5 Feet/Year (>2, <=5)	172	8550	28052.6	5.3	46.2%			
Eroding 5 to 8 Feet Year (>5, <=8)	0							
Eroding More Than 8 Feet/Year	0							
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	38	1850	6069.9	1.1	10.2%			
Increased Accretion (1998 - 2009)	0							
No Change	334	16650	54628.7	10.3	89.8%			
Blocking (Setback Factor) Changes per Transect						**2.4**	**2.0**	**4.0**
Block value (setback factor) increase	37	1800	5905.8	1.1	9.9%	0.5	0.5	0.5
Block value (setback factor) decrease	55	2700	8858.7	1.7	14.8%	0.9	0.5	1.5
Block value (setback factor) No Change	280	13950	45770.0	8.7	75.3%			

Table A 34. Outer Banks - Avon to Salvo data summary

Outer Banks (Salvo, Waves, Rodanthe)	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**175**	**8700**	**28544.7**	**5.4**	**100.0%**	**4.3 ft/yr (erosion)**	**13 ft/yr (erosion)**	**-2.5 ft/yr (accretion)**
Erosion	105	5200	17061.2	3.2	60.0%			
Accretion	70	3450	11319.5	2.1	40.0%			
Data Gap/Missing Data	*0*							
Eroding 2ft/Year or Less (>0, <=2)	16	750	2460.8	0.5	9.1%			
Eroding 2 to 5 Feet/Year (>2, <=5)	10	450	1476.5	0.3	5.7%			
Eroding 5 to 8 Feet Year (>5, <=8)	23	1100	3609.1	0.7	13.1%			
Eroding More Than 8 Feet/Year	56	2750	9022.8	1.7	32.0%			
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	16	750	2460.8	0.5	9.1%			
Increased Accretion (1998 - 2009)	0							
No Change	159	7900	25919.9	4.9	90.9%			
Blocking (Setback Factor) Changes per Transect						**5.5**	**2.0**	**12.5**
Block value (setback factor) increase	47	2300	7546.3	1.4	26.9%	1.1	0.5	1.5
Block value (setback factor) decrease	28	1350	4429.4	0.8	16.0%	1.4	0.5	2.5
Block value (setback factor) No Change	100	4950	16241.0	3.1	57.1%			

Table A 35. Outer Banks - Salvo, Waves, and Rodanthe data summary

Outer Banks (Rodanthe to Oregon Inlet)	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**376**	**18750**	**61518.8**	**11.7**	**100.0%**	**4.4 ft/yr (erosion)**	**21.9 ft/yr (erosion)**	**-6.3 ft/yr (accretion)**
Erosion	315	15700	51511.7	9.8	83.8%			
Accretion	61	3000	9843.0	1.9	16.2%			
Data Gap/Missing Data	*0*							
Eroding 2ft/Year or Less (>0, <=2)	30	1450	4757.5	0.9	8.0%			
Eroding 2 to 5 Feet/Year (>2, <=5)	108	5350	17553.4	3.3	28.7%			
Eroding 5 to 8 Feet Year (>5, <=8)	82	4050	13288.1	2.5	21.8%			
Eroding More Than 8 Feet/Year	95	4700	15420.7	2.9	25.3%			
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	10	450	1476.5	0.3	2.7%			
Increased Accretion (1998 - 2009)	0							
No Change	366	18250	59878.3	11.3	97.3%			
Blocking (Setback Factor) Changes per Transect						**5.3**	**2.0**	**16.5**
Block value (setback factor) increase	99	4900	16076.9	3.0	26.3%	1.2	0.5	2.5
Block value (setback factor) decrease	146	7250	23787.3	4.5	38.8%	3.3	0.5	8.0
Block value (setback factor) No Change	131	6500	21326.5	4.0	34.8%			

Table A 36. Outer Banks - Rodanthe to Oregon Inlet data summary

Outer Banks (Oregon Inlet to Nags Head)	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**149**	**7400**	**24279.4**	**4.6**	**100.0%**	**4.5 ft/yr (erosion)**	**10.1 ft/yr (erosion)**	**-25.6 ft/yr (accretion)**
Erosion	129	6400	20998.4	4.0	86.6%			
Accretion	20	950	3117.0	0.6	13.4%			
Data Gap/Missing Data	*0*							
Eroding 2ft/Year or Less (>0, <=2)	4	150	492.2	0.1	2.7%			
Eroding 2 to 5 Feet/Year (>2, <=5)	28	1350	4429.4	0.8	18.8%			
Eroding 5 to 8 Feet Year (>5, <=8)	34	1650	5413.7	1.0	22.8%			
Eroding More Than 8 Feet/Year	63	3100	10171.1	1.9	42.3%			
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	36	1750	5741.8	1.1	24.2%			
Increased Accretion (1998 - 2009)	0							
No Change	113	5600	18373.6	3.5	75.8%			
Blocking (Setback Factor) Changes per Transect						**6.3**	**2.0**	**10.0**
Block value (setback factor) increase	67	3300	10827.3	2.1	45.0%	2.2	0.5	4.0
Block value (setback factor) decrease	31	1500	4921.5	0.9	20.8%	0.8	0.5	2.0
Block value (setback factor) No Change	51	2500	8202.5	1.6	34.2%			

Table A 37. Outer Banks - Oregon Inlet to Nags Head data summary

Outer Banks (Nags Head)	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**364**	**18150**	**59550.2**	**11.3**	**100.0%**	**2.9 ft/yr (erosion)**	**7.2 ft/yr (erosion)**	**-0.5 ft/yr (accretion)**
Erosion	355	17700	58073.7	11.0	97.5%			
Accretion	9	400	1312.4	0.2	2.5%			
Data Gap/Missing Data	*0*							
Eroding 2ft/Year or Less (>0, <=2)	101	5000	16405.0	3.1	27.7%			
Eroding 2 to 5 Feet/Year (>2, <=5)	201	10000	32810.0	6.2	55.2%			
Eroding 5 to 8 Feet Year (>5, <=8)	53	2600	8530.6	1.6	14.6%			
Eroding More Than 8 Feet/Year	0							
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	0							
Increased Accretion (1998 - 2009)	0							
No Change	364	18150	59550.2	11.3	100.0%			
Blocking (Setback Factor) Changes per Transect						**3.0**	**2.0**	**7.5**
Block value (setback factor) increase	121	6000	19686.0	3.7	33.2%	-0.8	0.5	2.0
Block value (setback factor) decrease	54	2650	8694.7	1.6	14.8%	0.8	0.5	1.0
Block value (setback factor) No Change	189	9400	30841.4	5.8	51.9%			

Table A 38. Outer Banks - Nags Head data summary

Outer Banks (Kill Devil Hills)	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**153**	**7600**	**24935.6**	**4.7**	**100.0%**	**0.4 ft/yr (erosion)**	**3.1 ft/yr (erosion)**	**-1.1 ft/yr (accretion)**
Erosion	77	3800	12467.8	2.4	50.3%			
Accretion	76	3750	12303.8	2.3	49.7%			
Data Gap/Missing Data	*0*							
Eroding 2ft/Year or Less (>0, <=2)	53	2600	8530.6	1.6	34.6%			
Eroding 2 to 5 Feet/Year (>2, <=5)	24	1150	3773.2	0.7	15.7%			
Eroding 5 to 8 Feet Year (>5, <=8)	0							
Eroding More Than 8 Feet/Year	0							
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	7	300	984.3	0.2	4.6%			
Increased Accretion (1998 - 2009)	0							
No Change	146	7250	23787.3	4.5	95.4%			
Blocking (Setback Factor) Changes per Transect						**2.1**	**2.0**	**2.5**
Block value (setback factor) increase	0							
Block value (setback factor) decrease	24	1150	3773.2	0.7	15.7%	0.8	0.5	1.0
Block value (setback factor) No Change	129	6400	20998.4	4.0	84.3%			

Table A 39. Outer Banks - Kill Devil Hills data summary

Outer Banks (Kitty Hawk)	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**115**	**5700**	**18701.7**	**3.5**	**100.0%**	**1.8 ft/yr (erosion)**	**2.7 ft/yr (erosion)**	**No Accretion**
Erosion	115	5700	18701.7	3.5	100.0%			
Accretion	0	-50	-164.1	0.0	0.0%			
Data Gap/Missing Data	*0*							
Eroding 2ft/Year or Less (>0, <=2)	58	2850	9350.9	1.8	50.4%			
Eroding 2 to 5 Feet/Year (>2, <=5)	57	2800	9186.8	1.7	49.6%			
Eroding 5 to 8 Feet Year (>5, <=8)	0							
Eroding More Than 8 Feet/Year	0							
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	0							
Increased Accretion (1998 - 2009)	0							
No Change	115	5700	18701.7	3.5	100.0%			
Blocking (Setback Factor) Changes per Transect						**2.1**	**0.5**	**2.5**
Block value (setback factor) increase	0							
Block value (setback factor) decrease	49	2400	7874.4	1.5	42.6%	1.1	0.5	2.0
Block value (setback factor) No Change	66	3250	10663.3	2.0	57.4%			

Table A 40. Outer Banks - Kitty Hawk data summary

Outer Banks (Southern Shores)	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**119**	**5900**	**19357.9**	**3.7**	**100.0%**	**0 ft/yr (erosion)**	**0.7 ft/yr (erosion)**	**-0.6 ft/yr (accretion)**
Erosion	67	3300	10827.3	2.1	56.3%			
Accretion	52	2550	8366.6	1.6	43.7%			
Data Gap/Missing Data	*0*							
Eroding 2ft/Year or Less (>0, <=2)	67	3300	10827.3	2.1	56.3%			
Eroding 2 to 5 Feet/Year (>2, <=5)	0							
Eroding 5 to 8 Feet Year (>5, <=8)	0							
Eroding More Than 8 Feet/Year	0							
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	0							
Increased Accretion (1998 - 2009)	35	1700	5577.7	1.1	29.4%			
No Change	84	4150	13616.2	2.6	70.6%			
Blocking (Setback Factor) Changes per Transect						**2.0**	**2.0**	**2.0**
Block value (setback factor) increase	0							
Block value (setback factor) decrease	0							
Block value (setback factor) No Change	119	5900	19357.9	3.7	100.0%			

Table A 41. Outer Banks - Southern Shores data summary

Outer Banks (Southern Shores to County Line)	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**192**	**9550**	**31333.6**	**5.9**	**100.0%**	**0.5 ft/yr (erosion)**	**2.1 ft/yr (erosion)**	**-1 ft/yr (accretion)**
Erosion	150	7450	24443.5	4.6	78.1%			
Accretion	42	2050	6726.1	1.3	21.9%			
Data Gap/Missing Data	*0*							
Eroding 2ft/Year or Less (>0, <=2)	138	6850	22474.9	4.3	71.9%			
Eroding 2 to 5 Feet/Year (>2, <=5)	12	550	1804.6	0.3	6.3%			
Eroding 5 to 8 Feet Year (>5, <=8)	0							
Eroding More Than 8 Feet/Year	0							
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	11	500	1640.5	0.3	5.7%			
Increased Accretion (1998 - 2009)	0							
No Change	181	9000	29529.0	5.6	94.3%			
Blocking (Setback Factor) Changes per Transect						**2.0**	**2.0**	**2.0**
Block value (setback factor) increase	0							
Block value (setback factor) decrease	27	1300	4265.3	0.8	14.1%	1.0	1.0	1.0
Block value (setback factor) No Change	165	8200	26904.2	5.1	85.9%			

Table A 42. Outer Banks - Southern Shores to Dare County Line data summary

Outer Banks (Currituck County)	Transects	Meters	Feet	Miles	%	Mean Rate Value (ft/yr)	Minimum Rate Value (ft/yr)	Maximum Rate Value (ft/yr)
Shoreline Analyzed	**732**	**36550**	**119920.6**	**22.7**	**100.0%**	**2.3 ft/yr (erosion)**	**7.8 ft/yr (erosion)**	**-1.4 ft/yr (accretion)**
Erosion	612	30550	100234.6	19.0	83.6%			
Accretion	120	5950	19522.0	3.7	16.4%			
Data Gap/Missing Data	*0*							
Eroding 2ft/Year or Less (>0, <=2)	336	16750	54956.8	10.4	45.9%			
Eroding 2 to 5 Feet/Year (>2, <=5)	115	5700	18701.7	3.5	15.7%			
Eroding 5 to 8 Feet Year (>5, <=8)	161	8000	26248.0	5.0	22.0%			
Eroding More Than 8 Feet/Year	0							
Smoothed Rate Changes per Transect								
Increased Erosion (1998 - 2009)	111	5500	18045.5	3.4	15.2%			
Increased Accretion (1998 - 2009)	0							
No Change	621	31000	101711.0	19.3	84.8%			
Blocking (Setback Factor) Changes per Transect						**3.1**	**2.0**	**7.0**
Block value (setback factor) increase	138	6850	22474.9	4.3	18.9%	1.5	0.5	3.0
Block value (setback factor) decrease	44	2150	7054.2	1.3	6.0%	1.1	0.5	1.5
Block value (setback factor) No Change	550	27450	90063.5	17.1	75.1%			

Table A 43. Currituck County data summary

APPENDIX B: Erosion Rate Setback Factor Maps

2011 Long-Term Average Annual Erosion Rate Update

at Sunset Beach (including Bird Island), North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:20,000

0 1,500 3,000 6,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

The information presented here is not predictive, nor does it reflect short-term erosion potential. This map may not be suitable for property specific determination of erosion rate factors near rate transition boundaries due to its small scale. For site specific determinations contact your CAMA Local Permit Official, or regional Division of Coastal Management field office.

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Map No. Sunset Beach - 1 of 1

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Figure B 1. Sunset Beach Erosion Rate - Setback Factors

2011 Long-Term Average Annual Erosion Rate Update
at Ocean Isle, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:24,000

0 2,000 4,000 8,000 Feet

0 0.5 1 2 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Figure B 2. Ocean Isle Erosion Rate - Setback Factors

2011 Long-Term Average Annual Erosion Rate Update

at Holden Beach, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:20,000

0 1,500 3,000 6,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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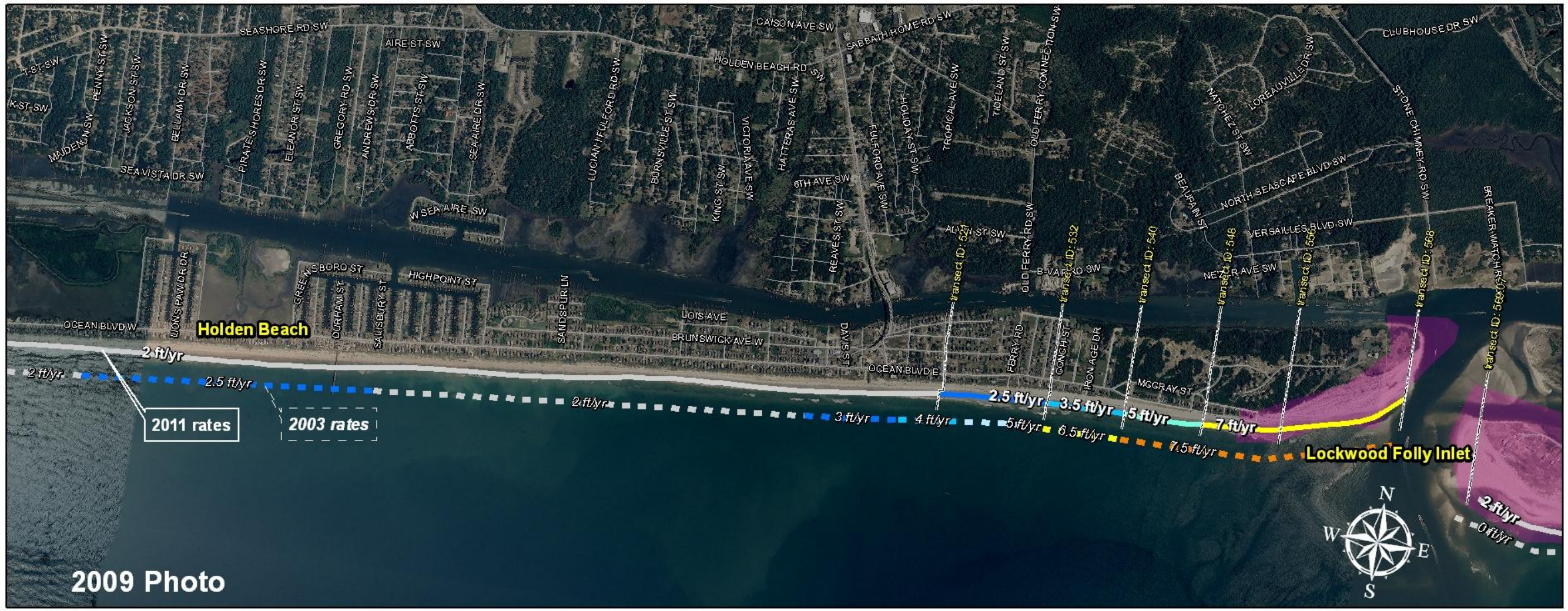
Figure B 3. Holden Beach (1 of 2) Erosion Rate - Setback Factors



2011 Long-Term Average Annual Erosion Rate Update

at Holden Beach, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:20,000

0 1,500 3,000 6,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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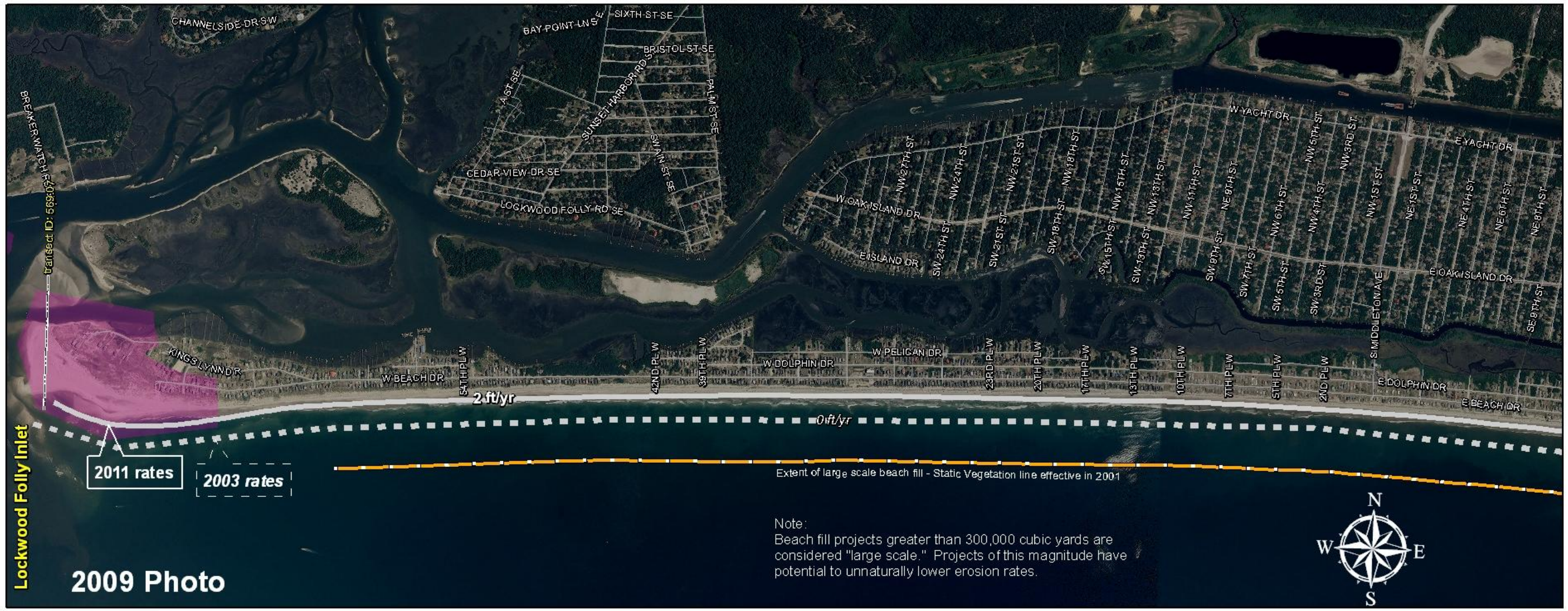
Figure B 4. Holden Beach (2 of 2) Erosion Rate - Setback Factors



2011 Long-Term Average Annual Erosion Rate Update
at Oak Island, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:20,000

0 1,500 3,000 6,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Oak Island - 1 of 2

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Figure B 5. Oak Island (1 of 2) Erosion Rate - Setback Factors

2011 Long-Term Average Annual Erosion Rate Update

at Oak Island, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Map Scale: 1:20,000

0 1,500 3,000 6,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Oak Island - 2 of 2

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Figure B 6. Oak Island (2 of 2) Erosion Rate - Setback Factors

2011 Long-Term Average Annual Erosion Rate Update

at Caswell Beach (including Fort Caswell), North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Map Scale: 1:20,000

0 1,500 3,000 6,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Caswell Beach - 1 of 1

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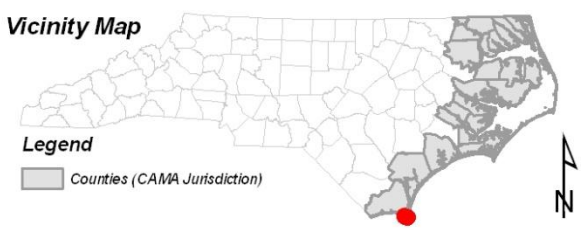
Figure B 7. Caswell Beach Erosion Rate - Setback Factors

2011 Long-Term Average Annual Erosion Rate Update
at Bald Head Island, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	**Photo: 2009 USDA NAIP**



Map Scale: 1:20,000

0 2,050 4,100 8,200 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Bald Head Island - 1 of 1

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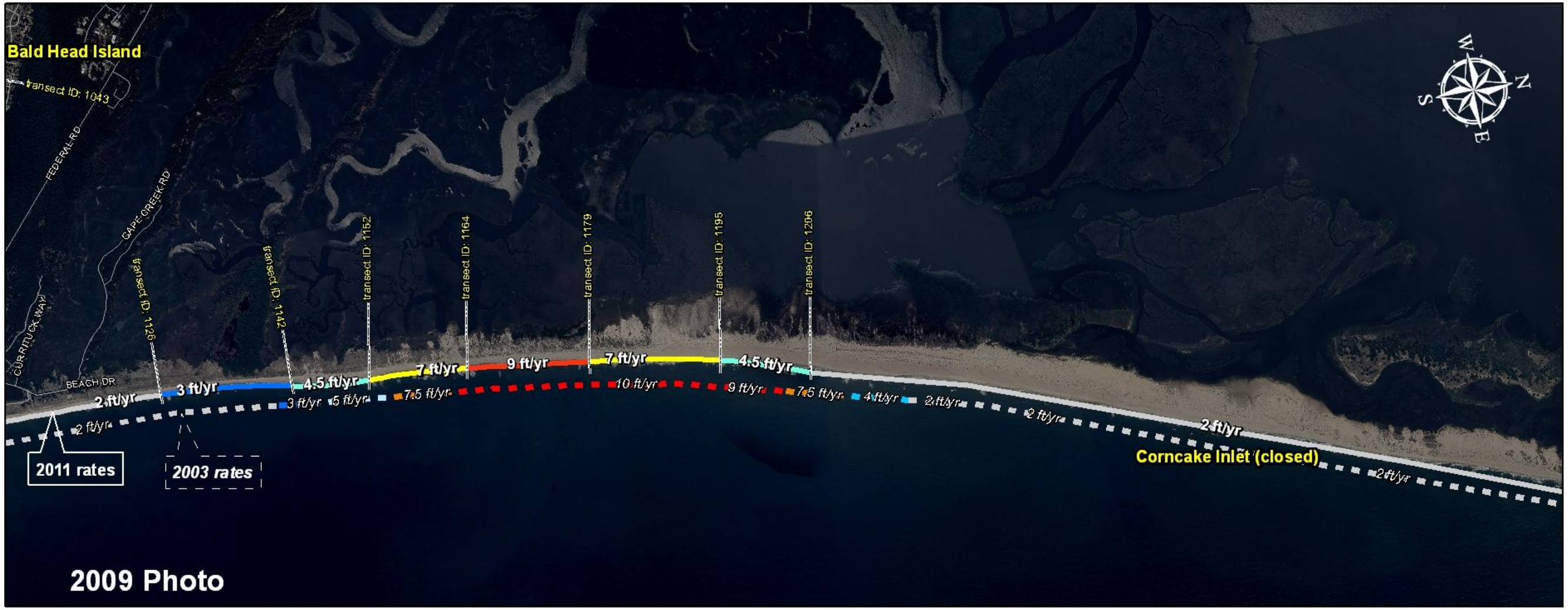
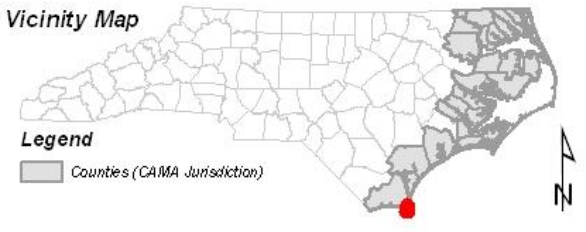
Figure B 8. Bald Head Island Erosion Rate - Setback Factors



2011 Long-Term Average Annual Erosion Rate Update
at Zeke's Island, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP



Map Scale: 1:24,000

0 2,000 4,000 8,000 Feet

0 0.5 1 2 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Zeke's Island - 1 of 2

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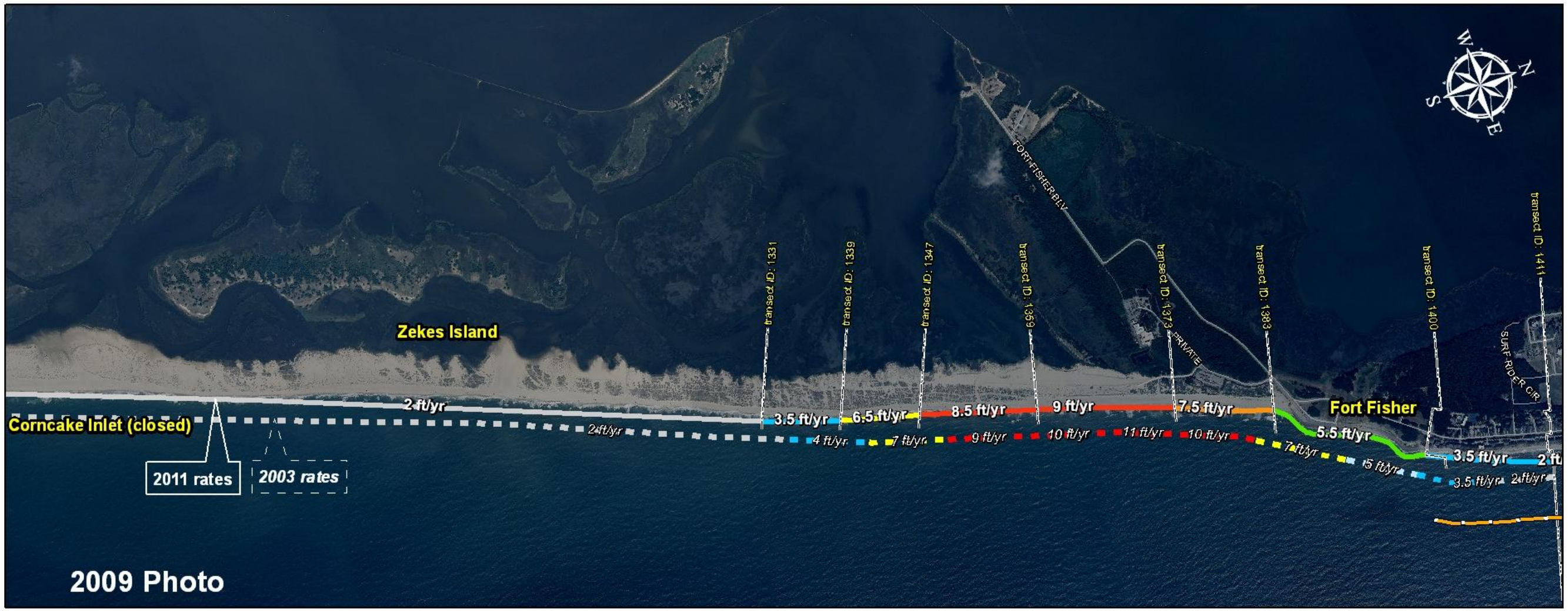
Figure B 9. Bald Head Island to Zeke's Island Erosion Rate - Setback Factors



2011 Long-Term Average Annual Erosion Rate Update
at Fort Fisher, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:20,000

0 1,500 3,000 6,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Fort Fisher - 1 of 1

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Figure B 10. Zeke's Island to Fort Fisher Erosion Rate - Setback Factors

2011 Long-Term Average Annual Erosion Rate Update

at Kure and Carolina Beaches, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Map Scale: 1:20,000

0 1,500 3,000 6,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Kure & Carolina Beaches - 1 of 2

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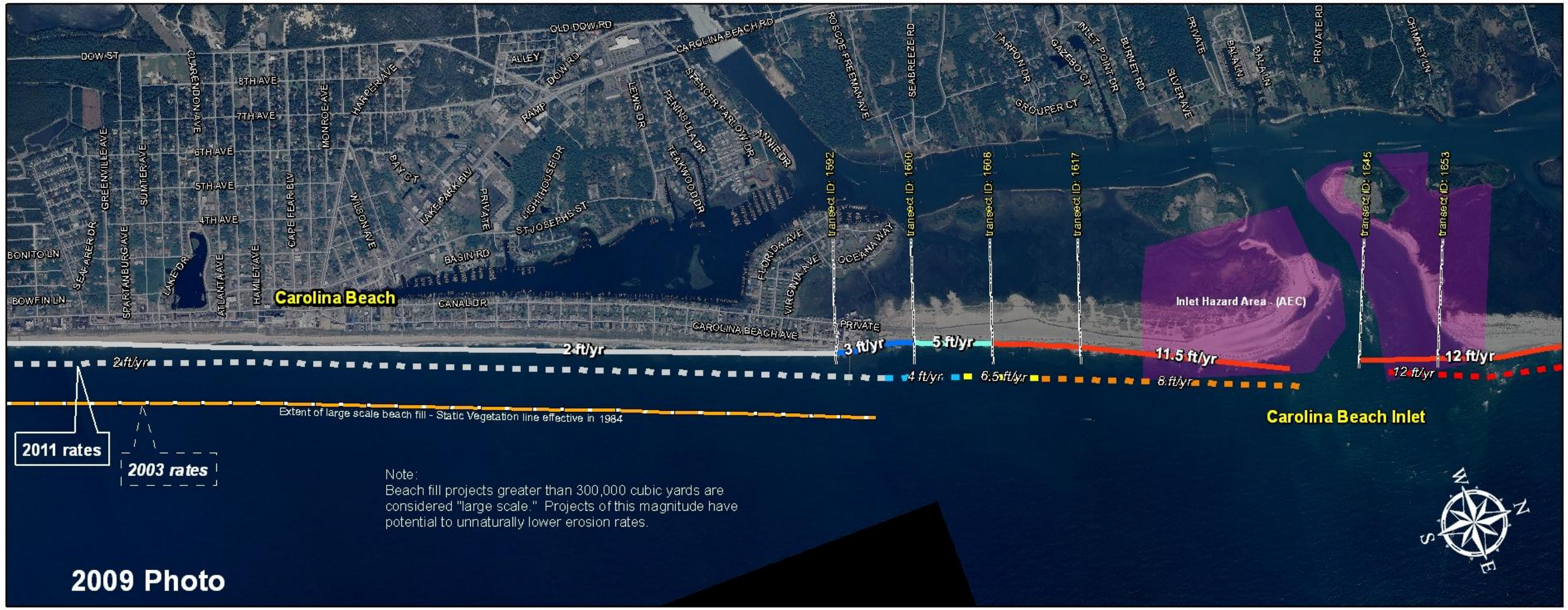
Figure B 11. Kure Beach to Carolina Beach Erosion Rate - Setback Factors



2011 Long-Term Average Annual Erosion Rate Update

at Carolina Beach, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Map Scale: 1:20,000

0 1,500 3,000 6,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Kure & Carolina Beaches - 2 of 2

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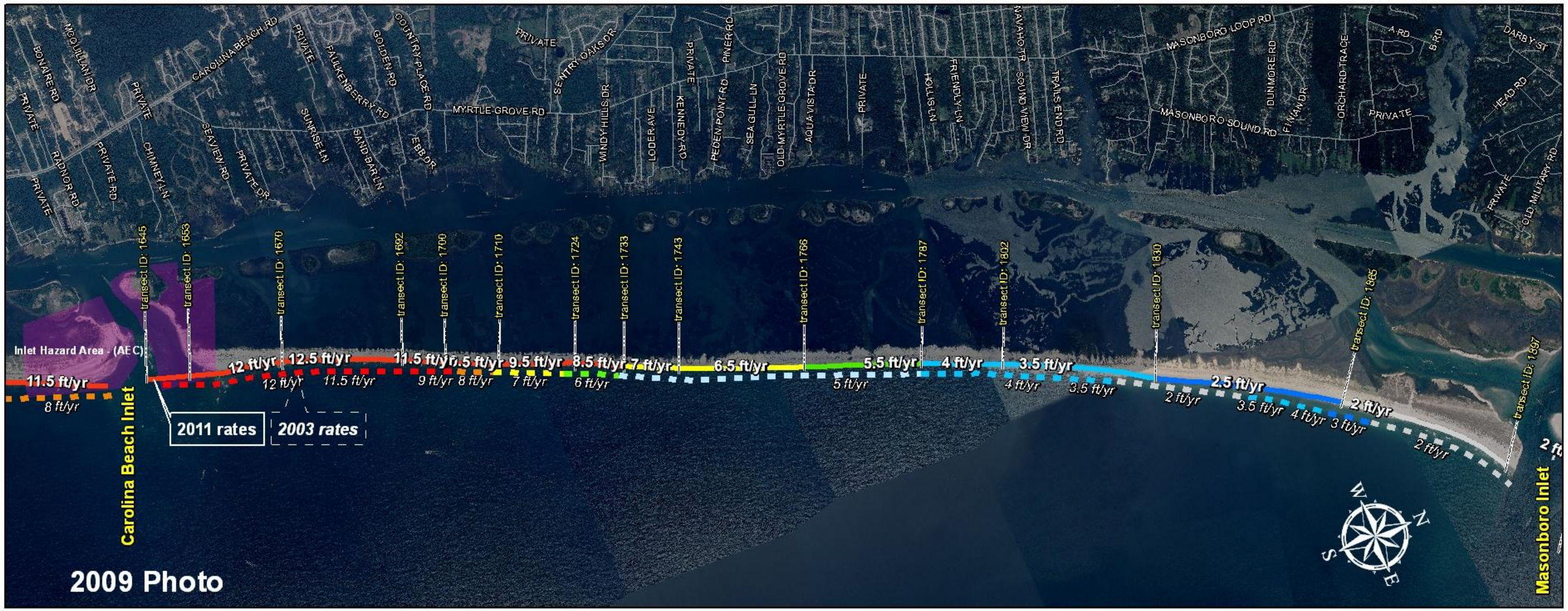
Figure B 12. Carolina Beach Erosion Rate - Setback Factors



2011 Long-Term Average Annual Erosion Rate Update

at Masonboro Island, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:36,000

0 2,500 5,000 10,000 Feet

0 0.5 1 2 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Masonboro Island - 1 of 1

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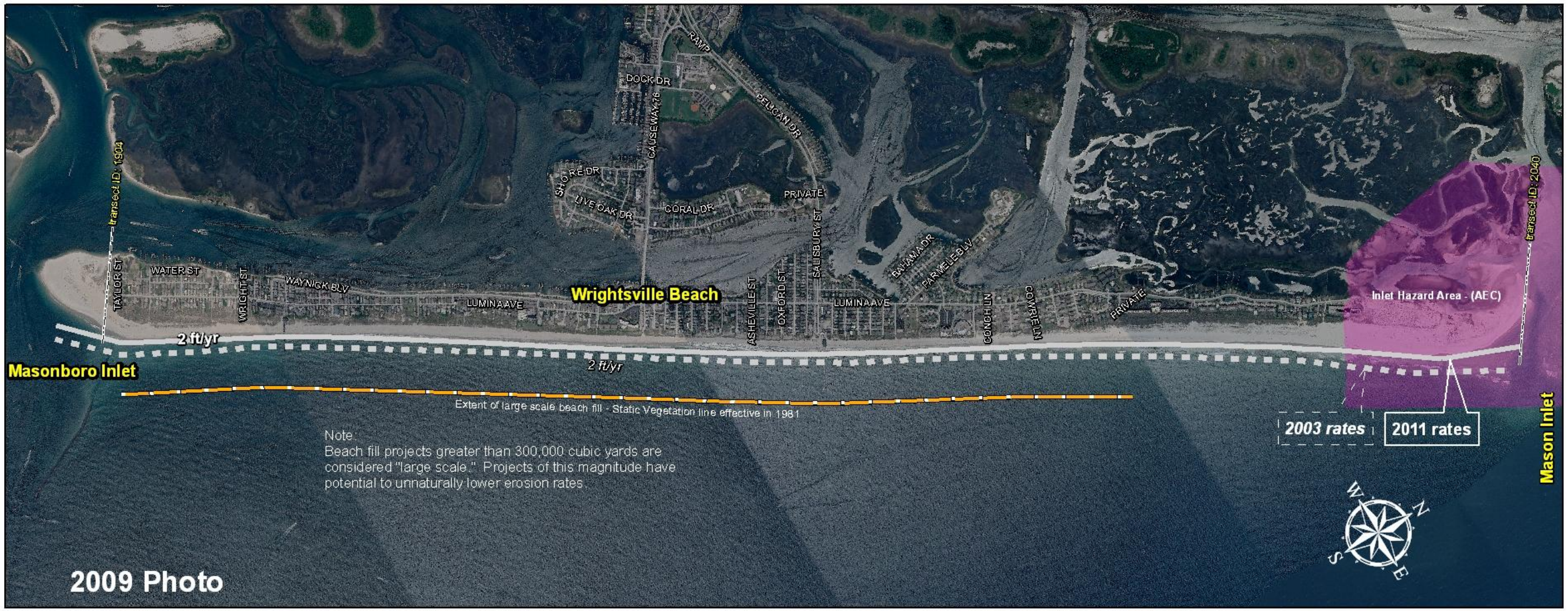
Figure B 13. Masonboro Island Erosion Rate - Setback Factors



2011 Long-Term Average Annual Erosion Rate Update

at Wrightsville Beach, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Map Scale: 1:20,000

0 1,000 2,000 4,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

The information presented here is not predictive, nor does it reflect short-term erosion potential. This map may not be suitable for property specific determination of erosion rate factors near rate transition boundaries due to its small scale. For site specific determinations contact your CAMA Local Permit Official, or regional Division of Coastal Management field office.

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Map No. Wrightsville Beach - 1 of 1

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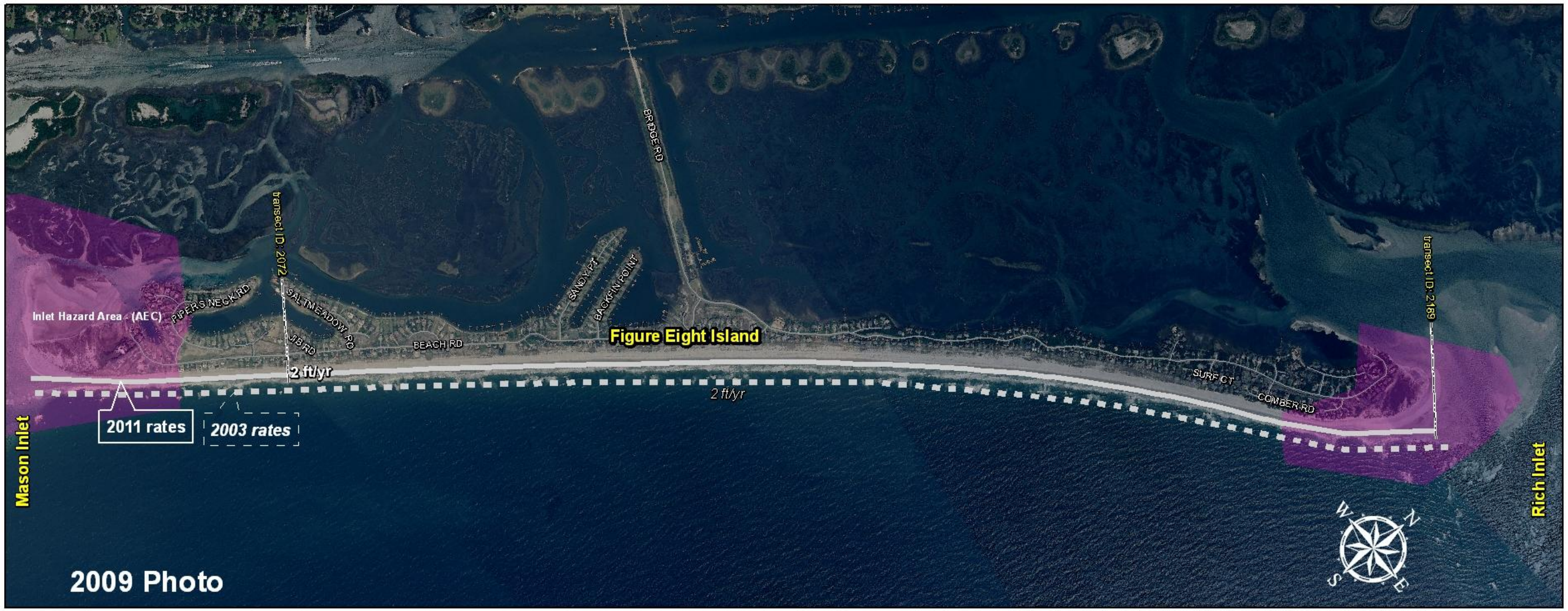
Figure B 14. Wrightsville Beach Erosion Rate - Setback Factors



2011 Long-Term Average Annual Erosion Rate Update

at Figure Eight Island, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:20,000

0 1,000 2,000 4,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Figure Eight Island - 1 of 1

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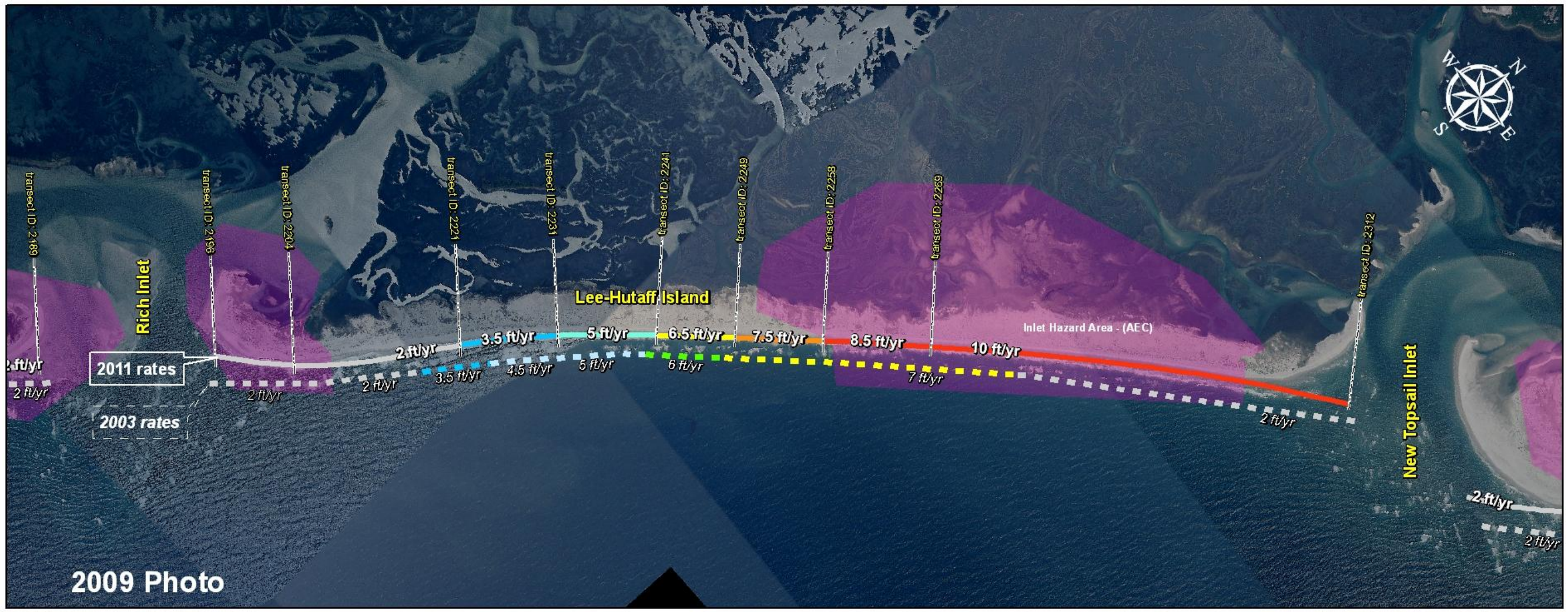
Figure B 15. Figure Eight Island Erosion Rate - Setback Factors



2011 Long-Term Average Annual Erosion Rate Update

at Lee-Hutaff Island, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:20,000

0 1,000 2,000 4,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Figure B 16. Lee-Hutaff Island Erosion Rate - Setback Factors

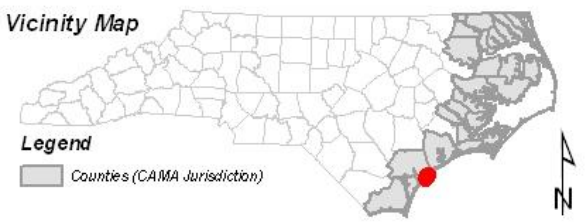
2011 Long-Term Average Annual Erosion Rate Update

at Topsail Beach, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map



Map Scale: 1:24,000

0 1,200 2,400 4,800 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Topsail Beach - 1 of 1

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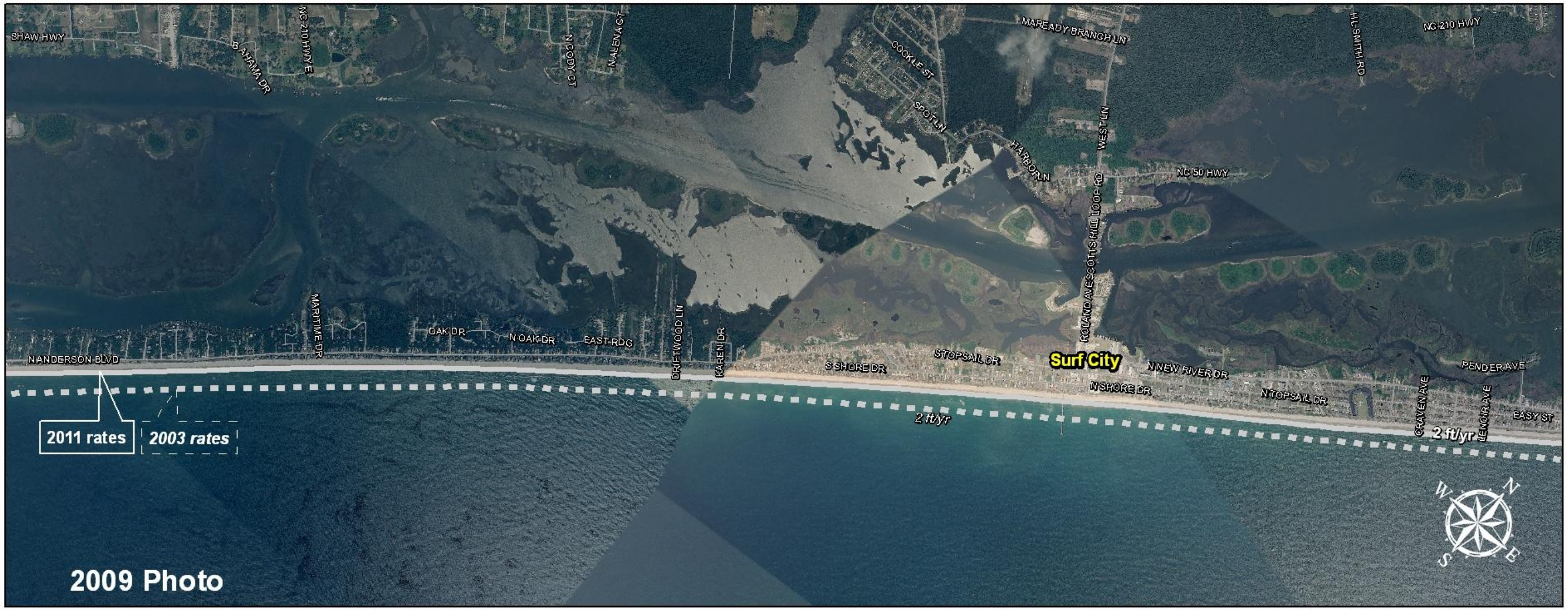
Figure B 17. Topsail Beach Erosion Rate - Setback Factors

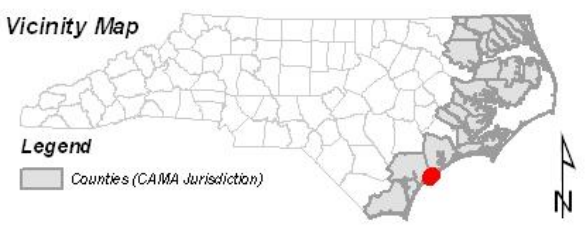


2011 Long-Term Average Annual Erosion Rate Update

at Surf City, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP



Map Scale: 1:24,000

0 1,200 2,400 4,800 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Surf City - 1 of 1

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Figure B 18. Surf City Erosion Rate - Setback Factors

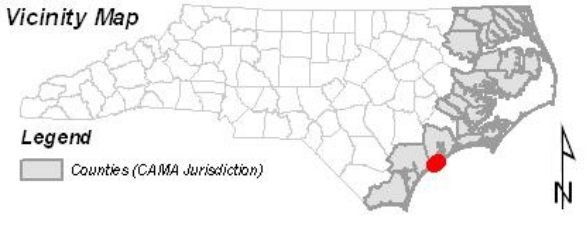
2011 Long-Term Average Annual Erosion Rate Update

at North Topsail Beach, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map



Map Scale: 1:24,000

0 1,200 2,400 4,800 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. North Topsail Beach - 1 of 2

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Figure B 19. Surf City to North Topsail Beach Erosion Rate - Setback Factors

2011 Long-Term Average Annual Erosion Rate Update

at North Topsail Beach, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:24,000

0 1,200 2,400 4,800 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. North Topsail Beach - 2 of 2

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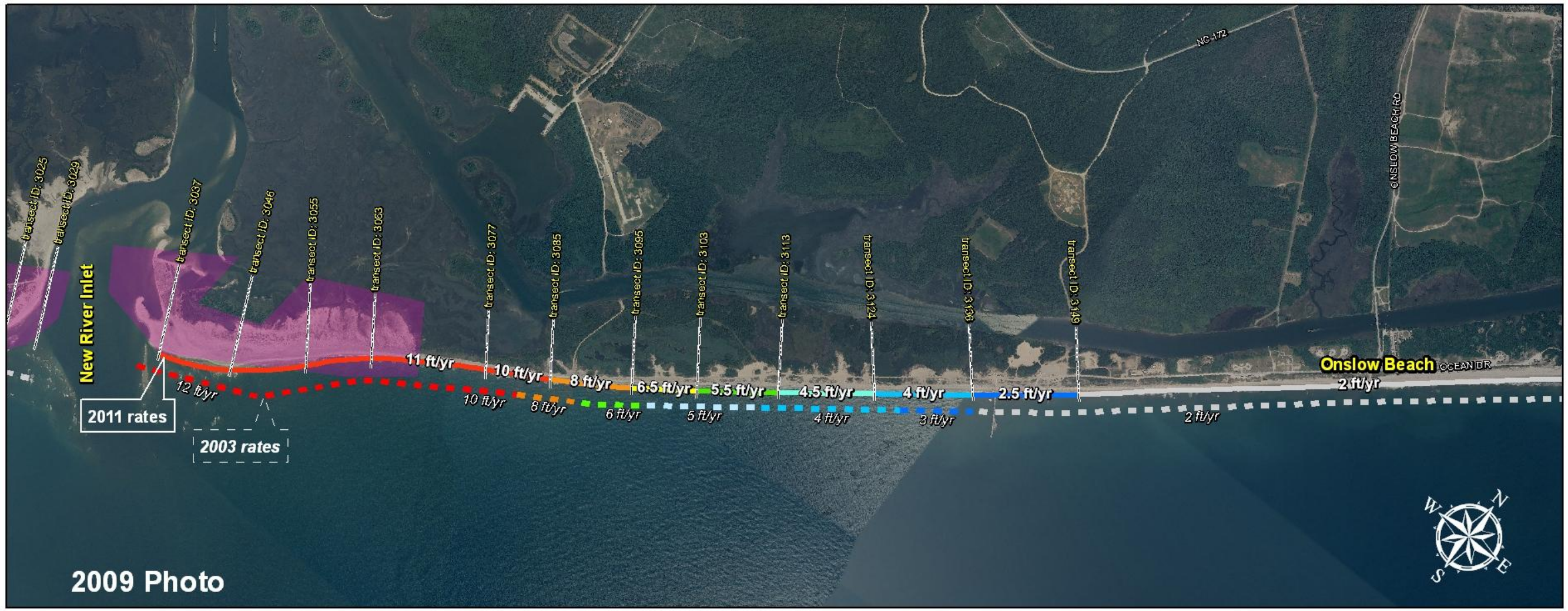
Figure B 20. North Topsail Beach Erosion Rate - Setback Factors



2011 Long-Term Average Annual Erosion Rate Update

at Onslow Beach, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Map Scale: 1:24,000

0 1,200 2,400 4,800 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Onslow Beach - 1 of 2

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Division of Coastal Management - 2011

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Figure B 21. Onslow Beach (1 of 2) Erosion Rate - Setback Factors

2011 Long-Term Average Annual Erosion Rate Update

at Onslow Beach, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:24,000

0 1,200 2,400 4,800 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Onslow Beach - 2 of 2

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Figure B 22. Onslow Beach (2 of 2) Erosion Rate - Setback Factors

2011 Long-Term Average Annual Erosion Rate Update

at Brown's Island, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:20,000

0 1,000 2,000 4,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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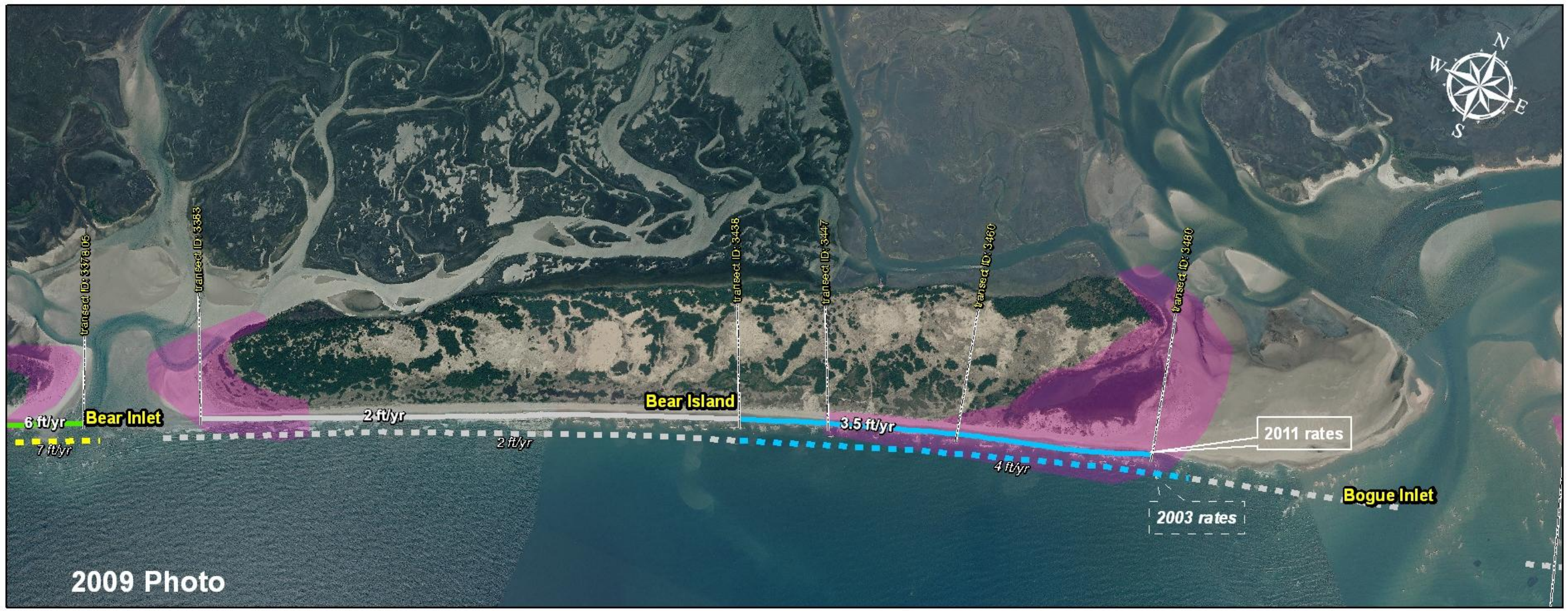
Figure B 23. Brown's Island Erosion Rate - Setback Factors



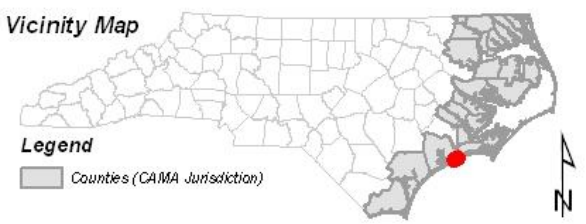
2011 Long-Term Average Annual Erosion Rate Update

at Bear Island (Hammocks Beach State Park), North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map



Map Scale: 1:20,000

0 1,000 2,000 4,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Bear Island - 1 of 1

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Division of Coastal Management - 2011

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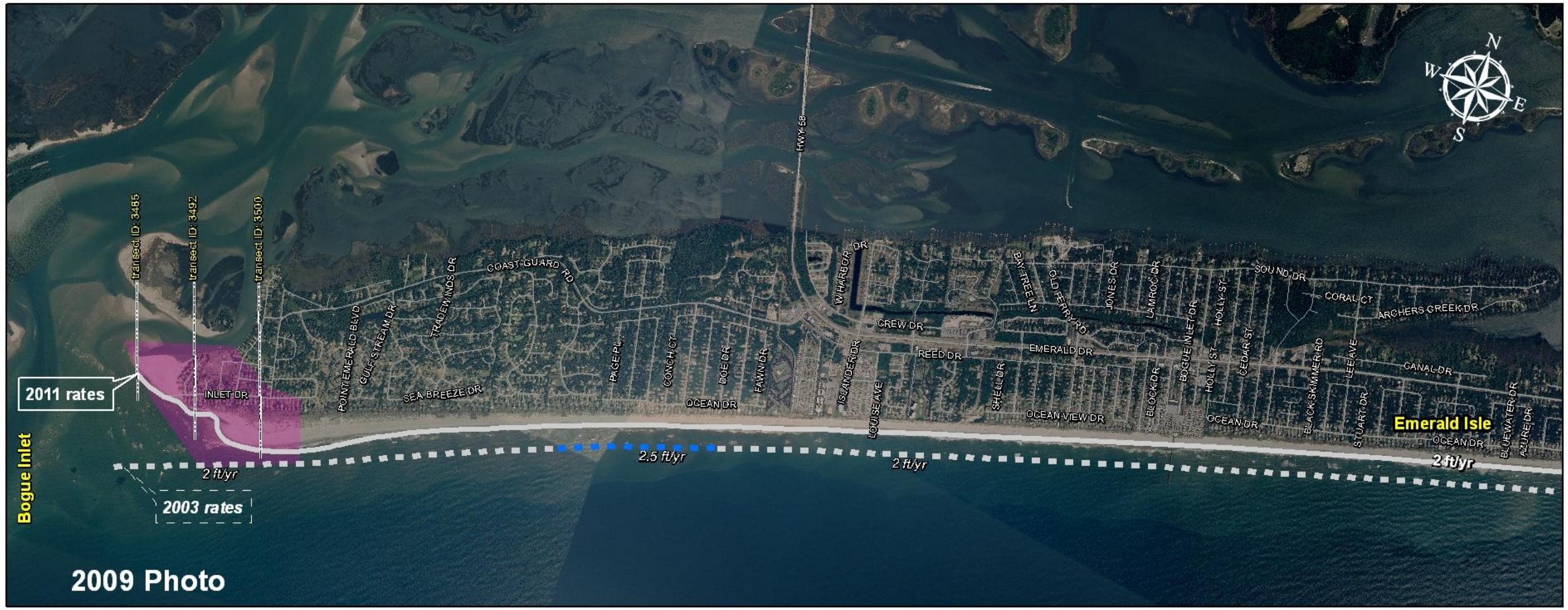
Figure B 24. Bear Island (Hammocks Beach State Park) Erosion Rate - Setback Factors



2011 Long-Term Average Annual Erosion Rate Update

at Emerald Isle, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:24,000

0 1,200 2,400 4,800 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Emerald Isle - 1 of 2

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Division of Coastal Management - 2011

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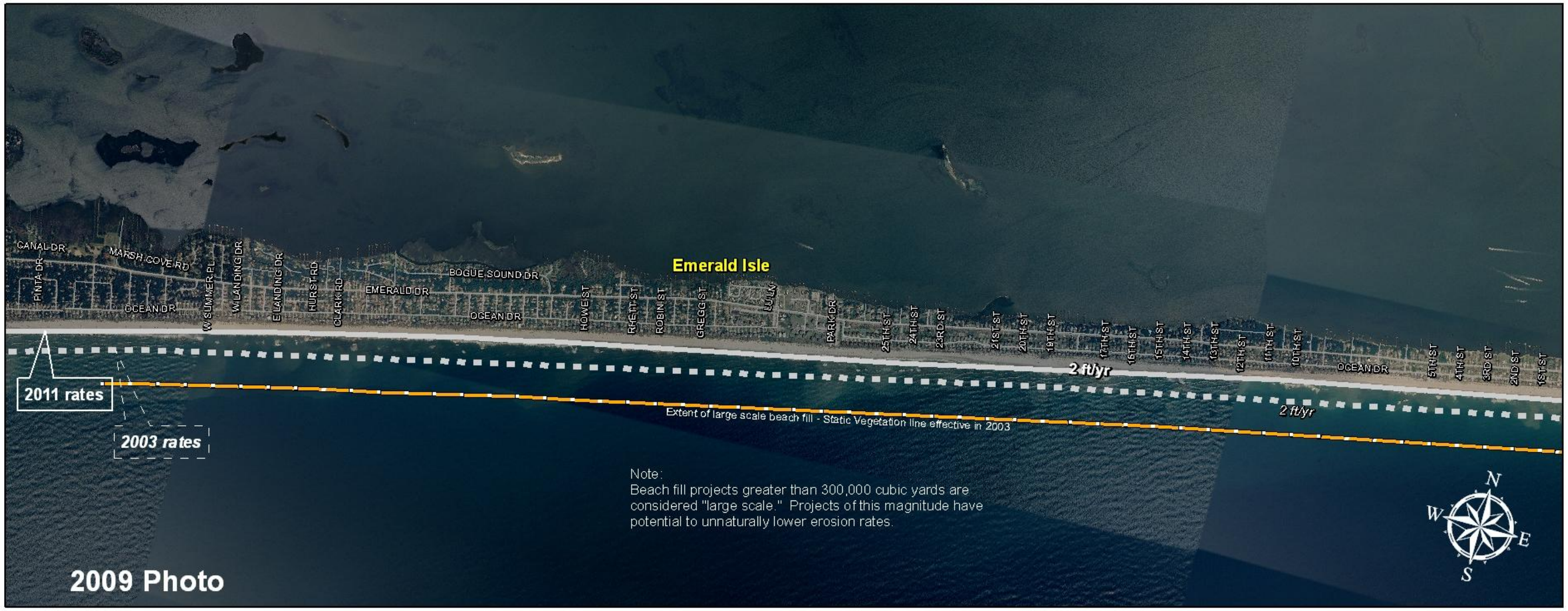
Figure B 25. Emerald Isle (1 of 2) Erosion Rate - Setback Factors



2011 Long-Term Average Annual Erosion Rate Update

at Emerald Isle, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Map Scale: 1:24,000

0 1,200 2,400 4,800 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Emerald Isle - 2 of 2

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Figure B 26. Emerald Isle (2 of 2) Erosion Rate - Setback Factors

2011 Long-Term Average Annual Erosion Rate Update

at Indian Beach & Salter Path, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Map Scale: 1:20,000

0 1,000 2,000 4,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. IB & SP - 1 of 1

North Carolina Department of Environment and Natural Resources

Division of Coastal Management - 2011

Ken Richardson - April, 2011

Figure B 27. Indian Beach & Salter Path Erosion Rate - Setback Factors

2011 Long-Term Average Annual Erosion Rate Update
at Pine Knoll Shores, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Map Scale: 1:20,000

0 1,000 2,000 4,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Pine Knoll Shores - 1 of 1

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Division of Coastal Management - 2011

Ken Richardson - April, 2011

Figure B 28. Pine Knoll Shores Erosion Rate - Setback Factors

2011 Long-Term Average Annual Erosion Rate Update
at Atlantic Beach, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Map Scale: 1:20,000

0 1,000 2,000 4,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Atlantic Beach - 1 of 2

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Ken Richardson - April, 2011

Figure B 29. Atlantic Beach (1 of 2) Erosion Rate - Setback Factors

2011 Long-Term Average Annual Erosion Rate Update

at Atlantic Beach, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:20,000

0 1,000 2,000 4,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Atlantic Beach - 2 of 2

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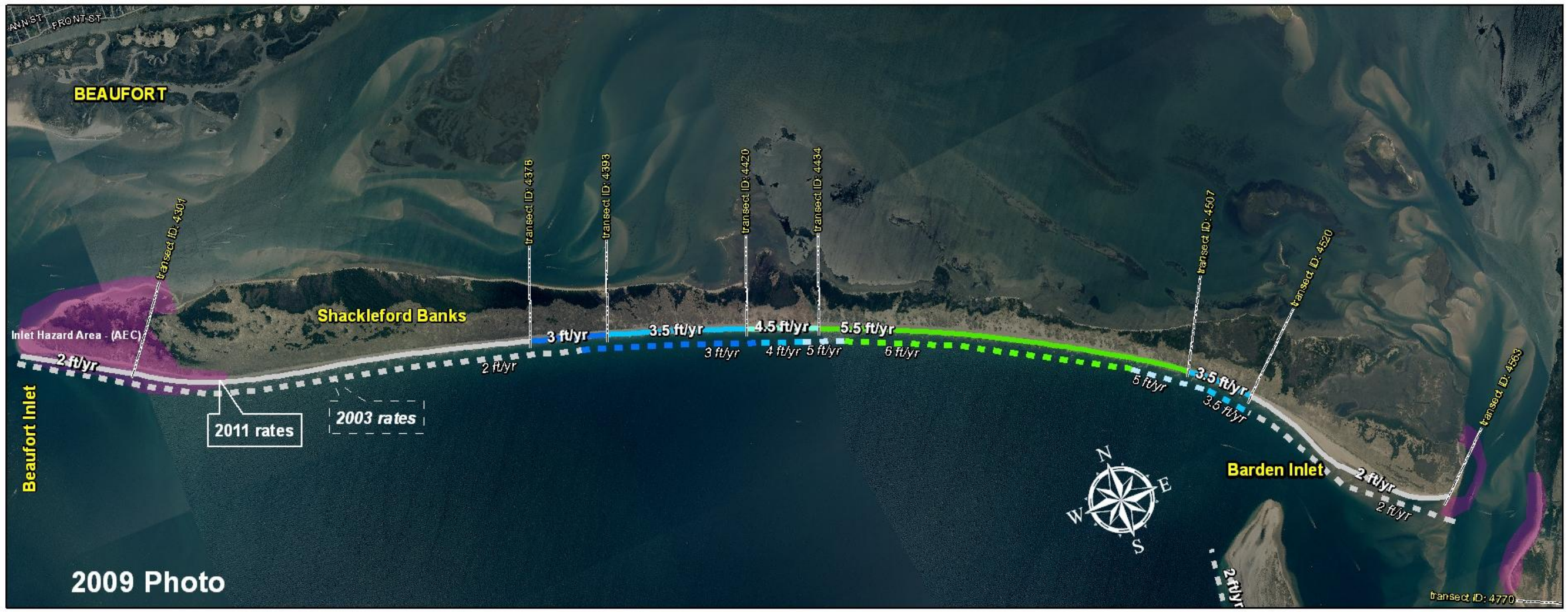
Ken Richardson - April, 2011

Figure B 30. Atlantic Beach (2 of 2) Erosion Rate - Setback Factors



2011 Long-Term Average Annual Erosion Rate Update

at Shackleford Banks, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:38,000

0 2,500 5,000 10,000 Feet

0 0.5 1 2 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Shackleford Banks - 1 of 1

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Figure B 31. Shackleford Banks Erosion Rate - Setback Factors

2011 Long-Term Average Annual Erosion Rate Update

at Cape Lookout, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:20,741

0 1,000 2,000 4,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Cape Lookout - 1 of 1

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Division of Coastal Management - 2011

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Figure B 32. Cape Lookout Erosion Rate - Setback Factors

2011 Long-Term Average Annual Erosion Rate Update
at Core Banks, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:50,000

0 2,500 5,000 10,000 Feet

0 0.5 1 2 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Core Banks - 1 of 4

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Division of Coastal Management - 2011

Ken Richardson - April, 2011

Figure B 33. Core Banks (1 of 4) Erosion Rate - Setback Factors

2011 Long-Term Average Annual Erosion Rate Update
at Core Banks, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:50,000

0 2,500 5,000 10,000 Feet

0 0.5 1 2 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Core Banks - 2 of 4

North Carolina Department of Environment and Natural Resources

Division of Coastal Management - 2011

Ken Richardson - April, 2011

Figure B 34. Core Banks (2 of 4) Erosion Rate - Setback Factors

2011 Long-Term Average Annual Erosion Rate Update
at Core Banks, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:50,000

0 2,500 5,000 10,000 Feet

0 0.5 1 2 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Core Banks - 3 of 4

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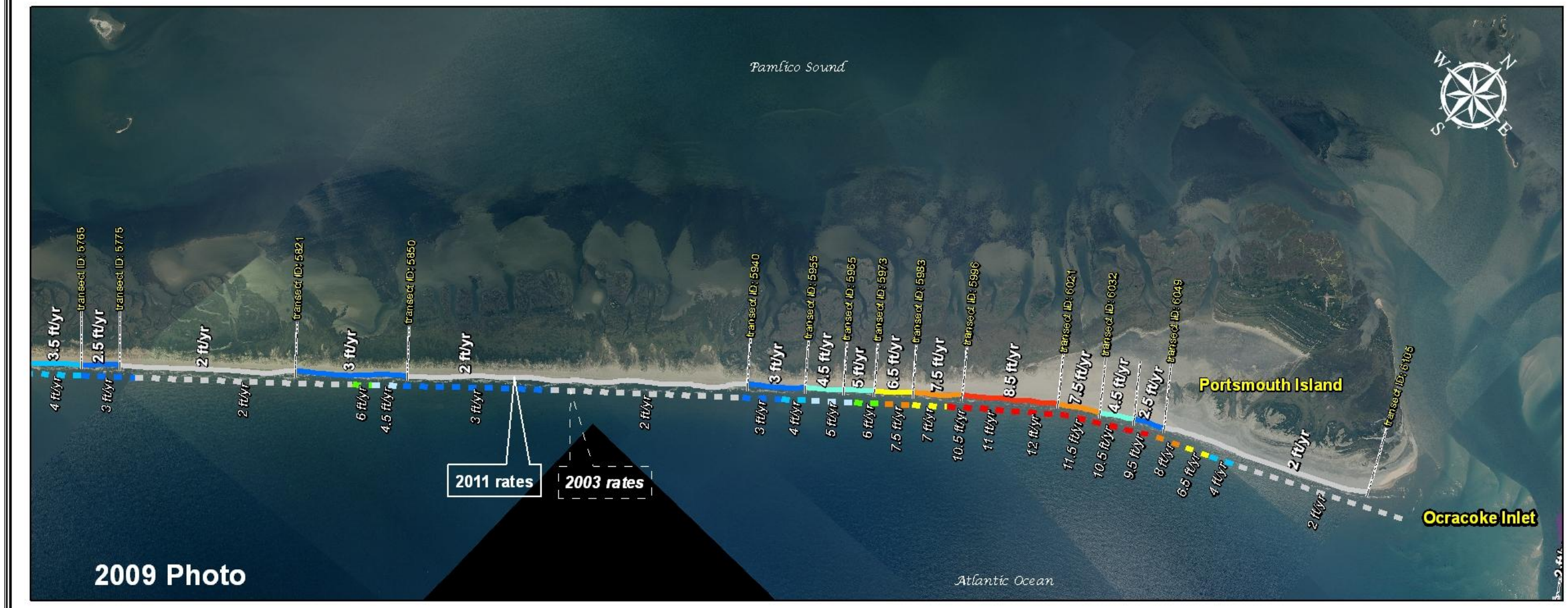
Division of Coastal Management - 2011

Figure B 35. Core Banks (3 of 4) Erosion Rate - Setback Factors



2011 Long-Term Average Annual Erosion Rate Update
at Core Banks, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:50,000

0 2,500 5,000 10,000 Feet

0 0.5 1 2 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

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Map No. Core Banks - 4 of 4

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Figure B 36. Core Banks (4 of 4) - Portsmouth Island Erosion Rate - Setback Factors

2011 Long-Term Average Annual Erosion Rate Update
at Ocracoke, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Map Scale: 1:38,000

0 2,500 5,000 10,000 Feet

0 0.45 0.9 1.8 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Ocracoke - 1 of 2

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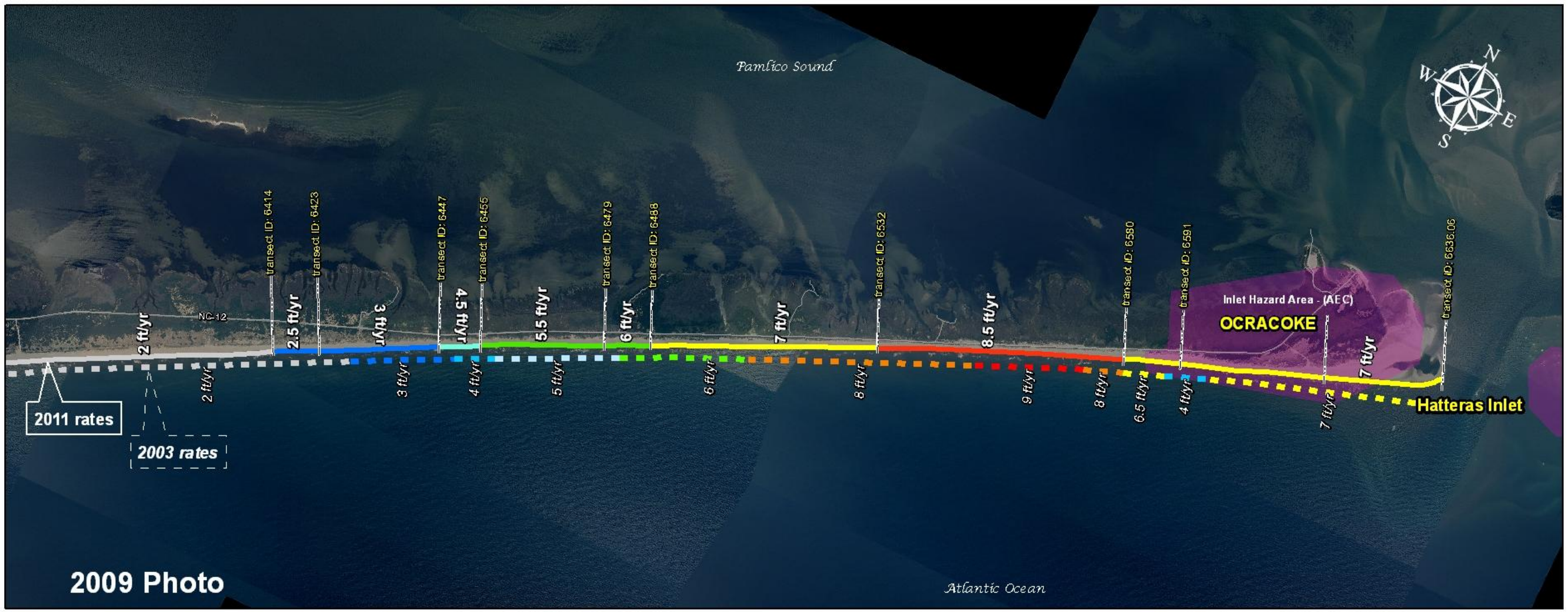
Division of Coastal Management - 2011

Ken Richardson - April, 2011

Figure B 37. Ocracoke (1 of 2) Erosion Rate - Setback Factors



2011 Long-Term Average Annual Erosion Rate Update

at Ocracoke, North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Map Scale: 1:38,000

0 2,500 5,000 10,000 Feet

0 0.45 0.9 1.8 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Ocracoke - 2 of 2

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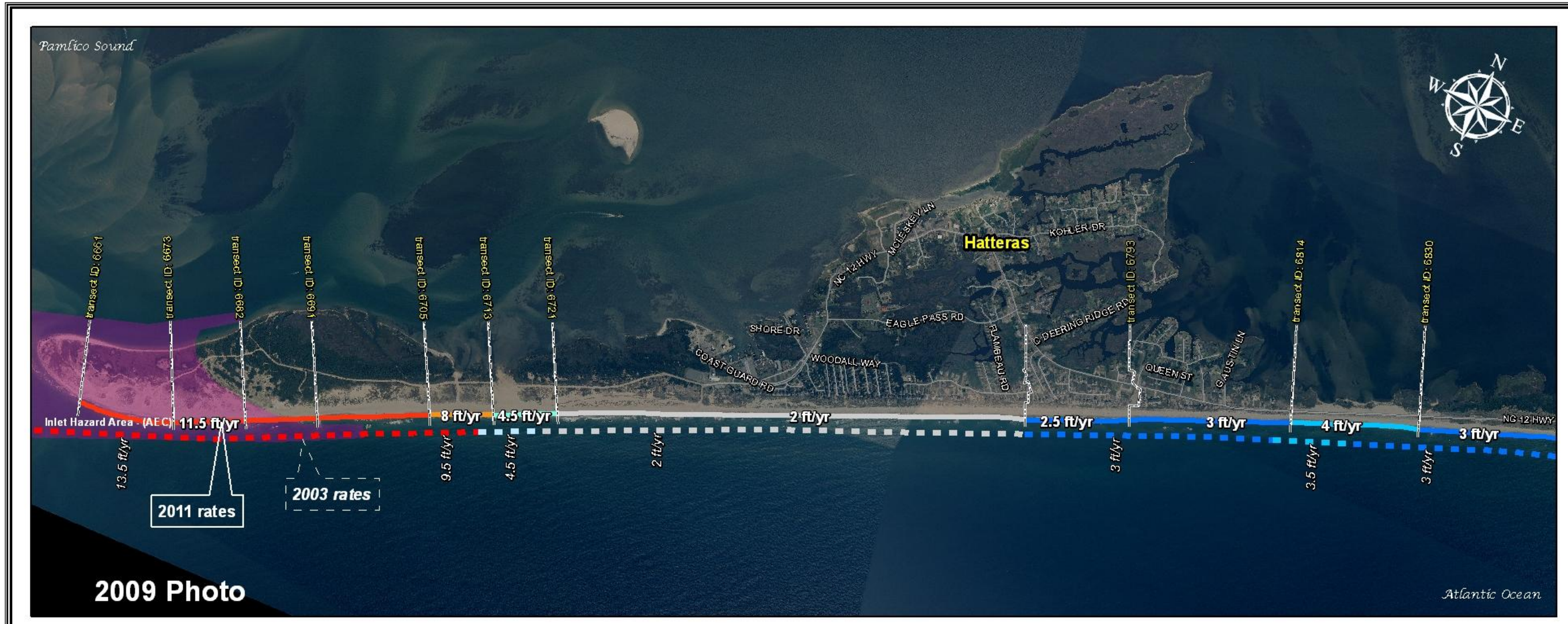
Figure B 38. Ocracoke (2 of 2) Erosion Rate - Setback Factors



2011 Long-Term Average Annual Erosion Rate Update
at Outer Banks (Hatteras), North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:24,000

0 1,000 2,000 4,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Outer Banks - 1 of 3

North Carolina Department of Environment and Natural Resources

Division of Coastal Management - 2011

Ken Richardson - April, 2011

Figure B 39. Outer Banks – Hatteras (1 of 3) Erosion Rate - Setback Factors

2011 Long-Term Average Annual Erosion Rate Update

at Outer Banks (Hatteras), North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:24,000

0 1,000 2,000 4,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Outer Banks-Hatteras - 2 of 3

North Carolina Department of Environment and Natural Resources

Division of Coastal Management - 2011

Ken Richardson - April, 2011

Figure B 40. Outer Banks - Hatteras (2 of 3) Erosion Rate - Setback Factors

2011 Long-Term Average Annual Erosion Rate Update

at Outer Banks (Hatteras), North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:24,000

0 1,000 2,000 4,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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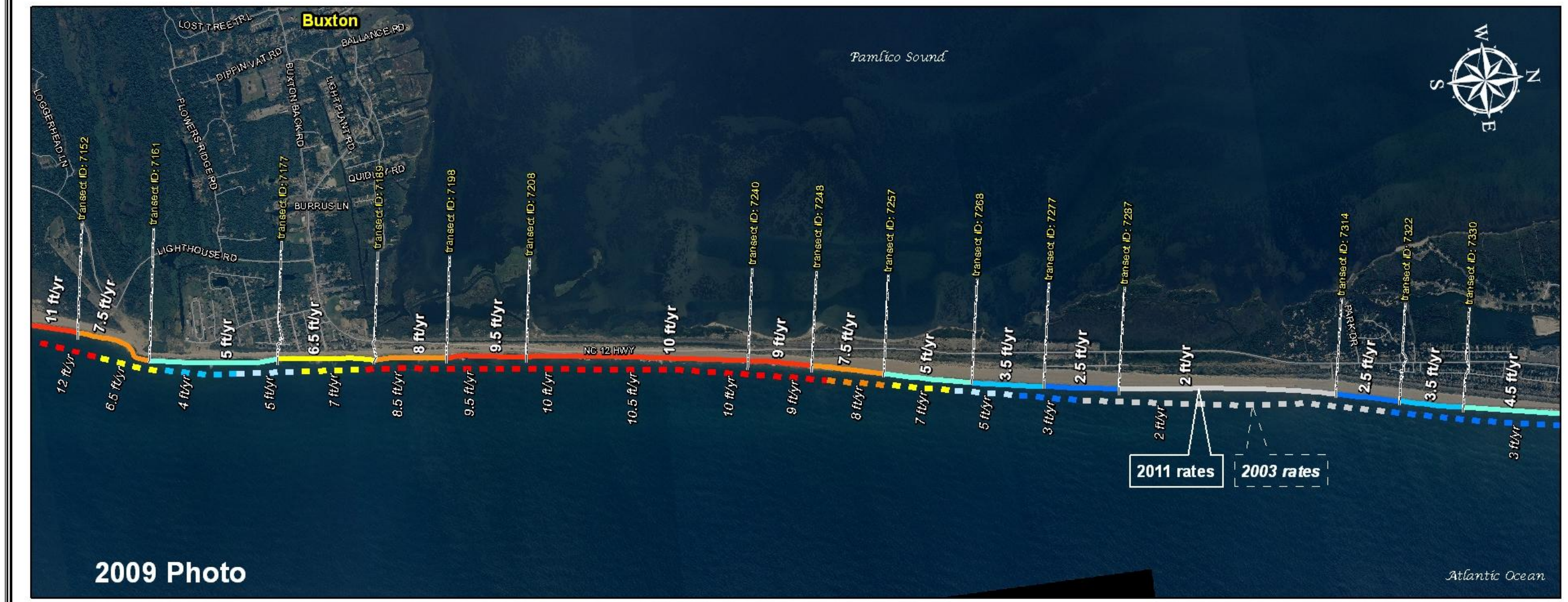
Map No. Outer Banks-Hatteras - 3 of 3

North Carolina Department of Environment and Natural Resources

Division of Coastal Management - 2011

Ken Richardson - April, 2011

Figure B 41. Outer Banks - Hatteras (3 of 3) Erosion Rate - Setback Factors



2011 Long-Term Average Annual Erosion Rate Update

at Outer Banks (Buxton), North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:24,000

0 1,000 2,000 4,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Outer Banks - Buxton - 1 of 1

North Carolina Department of Environment and Natural Resources

Division of Coastal Management - 2011

Ken Richardson - April, 2011

Figure B 42. Outer Banks – Buxton Erosion Rate - Setback Factors

2011 Long-Term Average Annual Erosion Rate Update

at Outer Banks (Avon), North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:24,000

0 1,000 2,000 4,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

The information presented here is not predictive, nor does it reflect short-term erosion potential. This map may not be suitable for property specific determination of erosion rate factors near rate transition boundaries due to its small scale. For site specific determinations contact your CAMA Local Permit Official, or regional Division of Coastal Management field office.

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Map No. Outer Banks - Avon - 1 of 1

North Carolina Department of Environment and Natural Resources

Division of Coastal Management - 2011

Ken Richardson - April, 2011

Figure B 43. Outer Banks - Avon Erosion Rate - Setback Factors

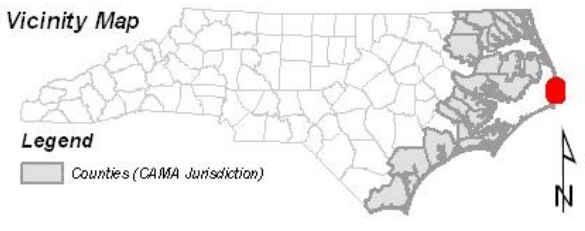
2011 Long-Term Average Annual Erosion Rate Update

at Outer Banks (National Seashore), North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map



Map Scale: 1:50,000

0 2,000 4,000 8,000 Feet

0 0.5 1 2 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Outer Banks - 1 of 4

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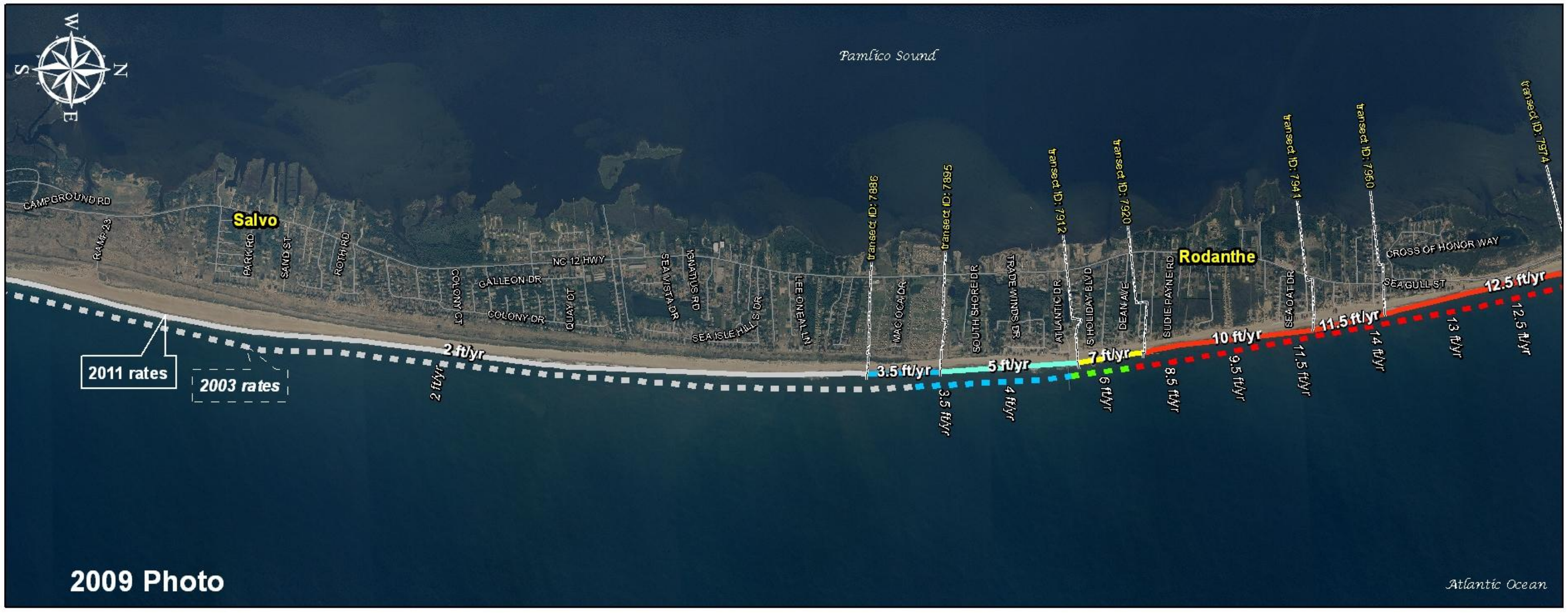
Division of Coastal Management - 2011

Figure B 44. Outer Banks (1 of 4) Erosion Rate - Setback Factors



2011 Long-Term Average Annual Erosion Rate Update
at Outer Banks (Salvo, Waves, & Rodanthe), North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Map Scale: 1:24,000

0 950 1,900 3,800 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Outer Banks - 2 of 4

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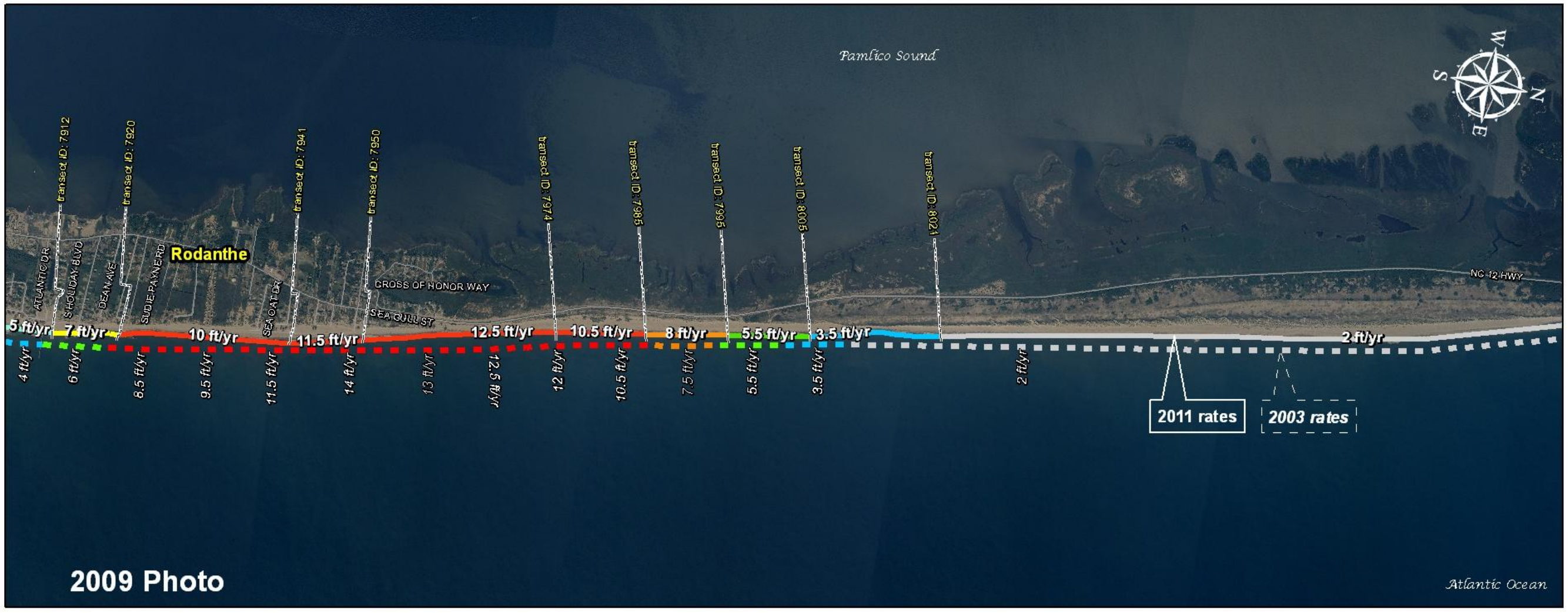
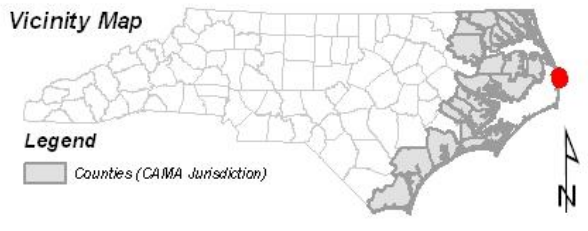
Figure B 45. Outer Banks (2 of 4) - Salvo to Rodanthe Erosion Rate - Setback Factors



2011 Long-Term Average Annual Erosion Rate Update
at Outer Banks (Rodanthe), North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP



Map Scale: 1:24,000

0 1,000 2,000 4,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Outer Banks - 3 of 4

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Division of Coastal Management - 2011

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Figure B 46. Outer Banks (3 of 4) Erosion Rate - Setback Factors

2011 Long-Term Average Annual Erosion Rate Update

at Outer Banks (Pea Island Nat'l Wildlife Refuge), North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Map Scale: 1:50,000

0 2,000 4,000 8,000 Feet

0 0.5 1 2 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Outer Banks - 4 of 4

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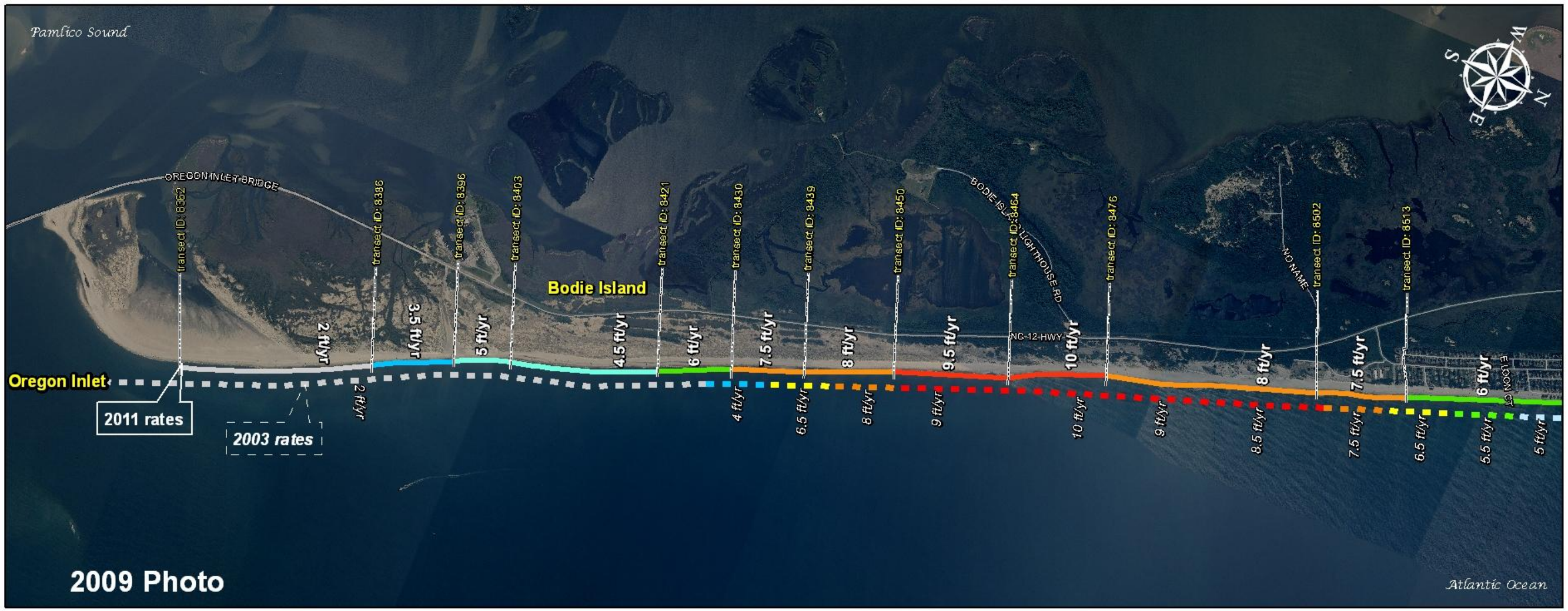
Division of Coastal Management - 2011

Figure B 47. Outer Banks (4 of 4) - Pea Island National Wildlife Refuge Erosion Rate - Setback Factors



2011 Long-Term Average Annual Erosion Rate Update

at Outer Banks (Bodie Island), North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:24,000

0 1,000 2,000 4,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Bodie Island - 1 of 1

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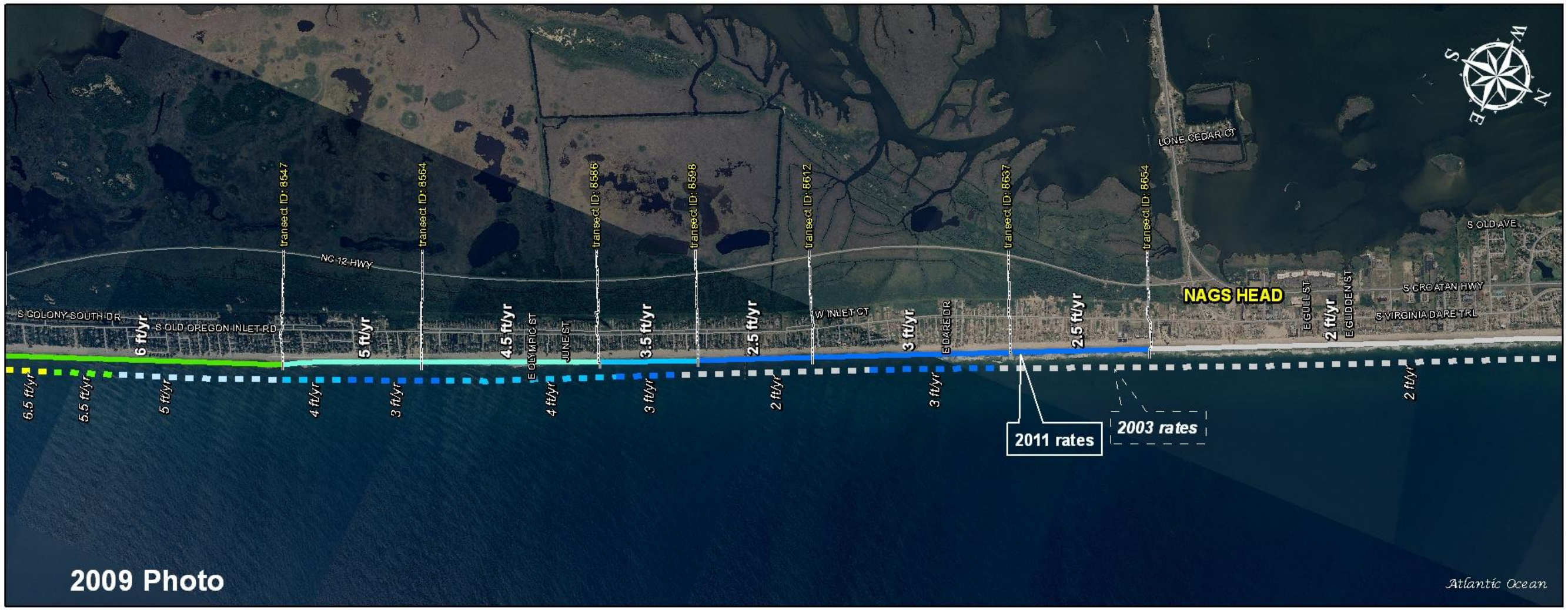
Figure B 48. Outer Banks - Bodie Island Erosion Rate - Setback Factors



2011 Long-Term Average Annual Erosion Rate Update
at Outer Banks (Nags Head), North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:24,000

0 1,000 2,000 4,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Nags Head - 1 of 1

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Figure B 49. Outer Banks - Nags Head Erosion Rate - Setback Factors

2011 Long-Term Average Annual Erosion Rate Update

at Outer Banks (Nags Head & Kill Devil Hills), North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:24,000

0 1,000 2,000 4,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Nags Head - KDH - 1 of 1

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Division of Coastal Management - 2011

Ken Richardson - April, 2011

Figure B 50. Outer Banks - Nags Head to Kill Devil Hills Erosion Rate - Setback Factors

2011 Long-Term Average Annual Erosion Rate Update
at Outer Banks (Kill Devil Hills), North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:24,000

0 1,000 2,000 4,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Kill Devil Hills - 1 of 1

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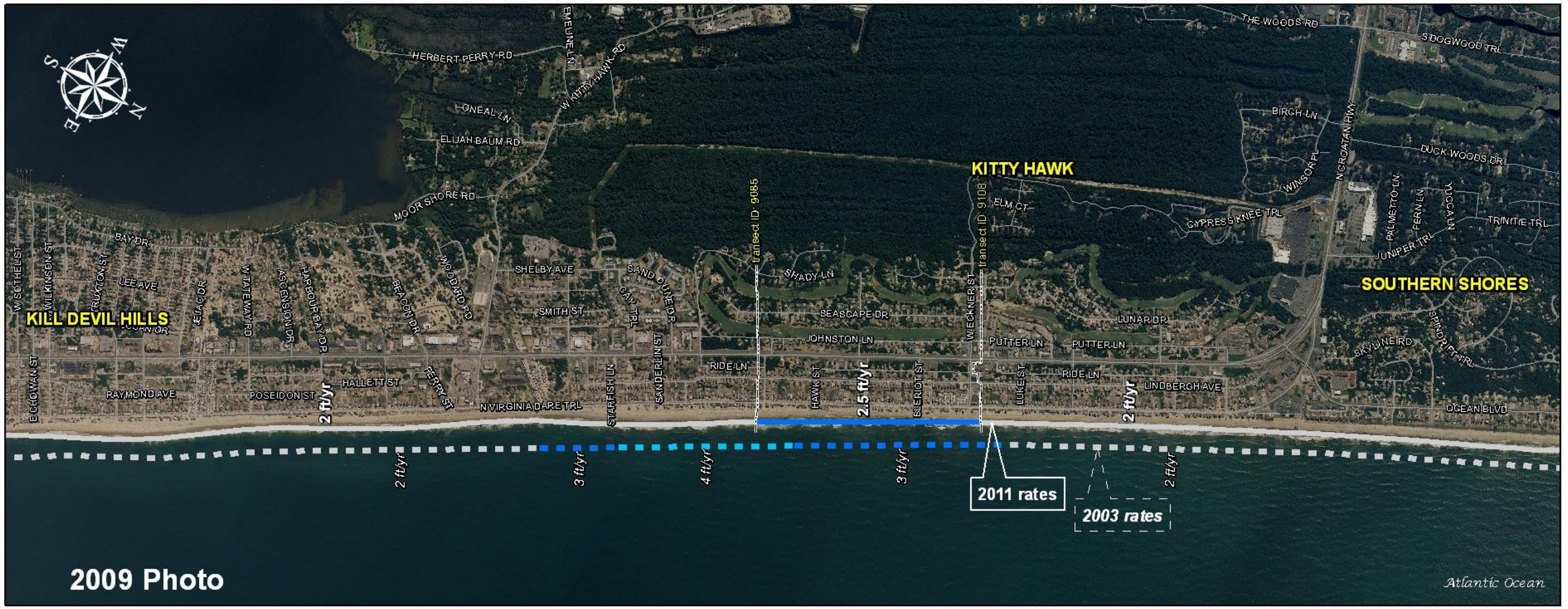
Figure B 51. Outer Banks - Kill Devil Hills Erosion Rate - Setback Factors



2011 Long-Term Average Annual Erosion Rate Update

at Outer Banks (Kitty Hawk), North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:20,000

0 1,000 2,000 4,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Kitty Hawk - 1 of 1

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Division of Coastal Management - 2011

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Figure B 52. Outer Banks - Kitty Hawk Erosion Rate - Setback Factors

2011 Long-Term Average Annual Erosion Rate Update

at Outer Banks (Southern Shores), North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Map Scale: 1:24,000

0 1,200 2,400 4,800 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Southern Shores - 1 of 2

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Division of Coastal Management - 2011

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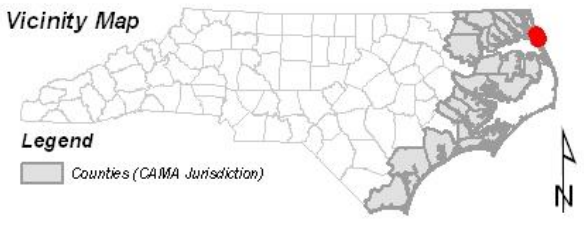
Figure B 53. Outer Banks - Southern Shores Erosion Rate - Setback Factors

2011 Long-Term Average Annual Erosion Rate Update
at Outer Banks (Southern Shores), North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map



Map Scale: 1:24,000

0 1,200 2,400 4,800 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Southern Shores - 2 of 2

North Carolina Department of Environment and Natural Resources

Division of Coastal Management - 2011

Ken Richardson - April, 2011

Figure B 54. Outer Banks - Southern Shores to Duck Erosion Rate - Setback Factors

2011 Long-Term Average Annual Erosion Rate Update

at Outer Banks (Duck), North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:24,000

0 1,000 2,000 4,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Duck - 1 of 1

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Division of Coastal Management - 2011

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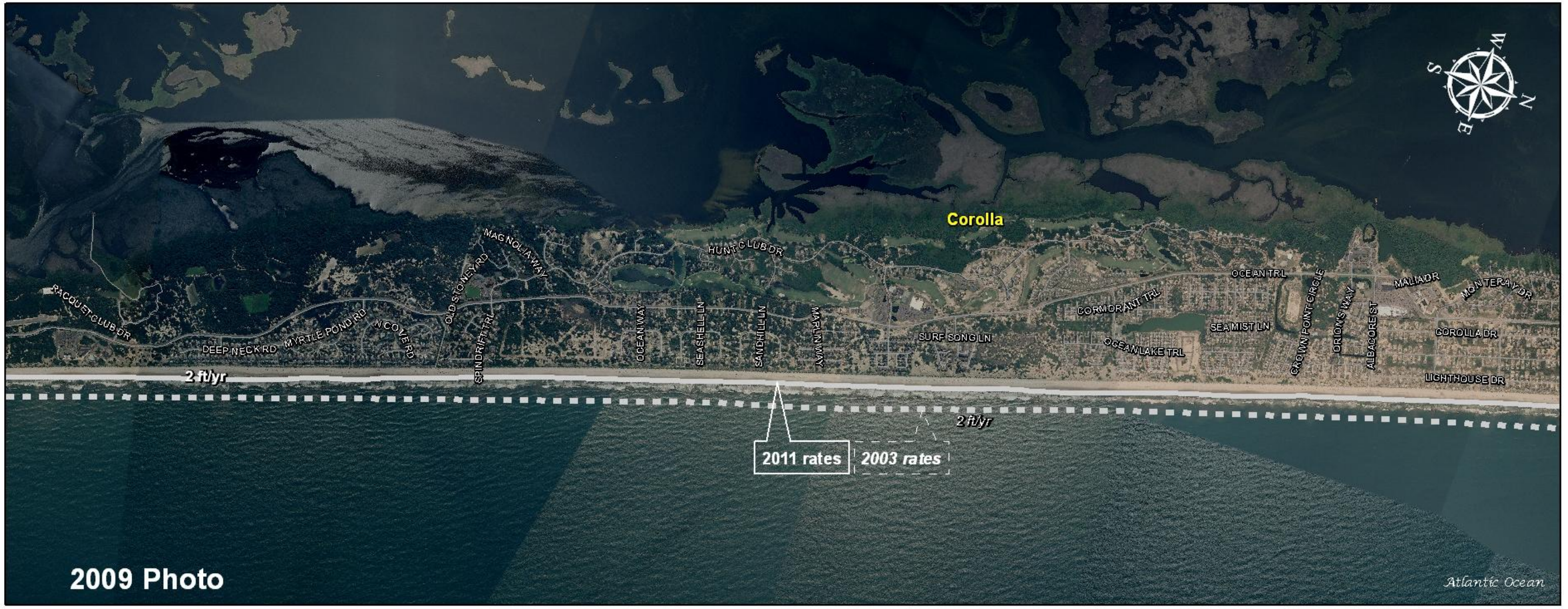
Figure B 55. Outer Banks - Duck Erosion Rate - Setback Factors



2011 Long-Term Average Annual Erosion Rate Update

at Outer Banks (Corolla), North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:24,000

0 1,000 2,000 4,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Corolla - 1 of 2

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Division of Coastal Management - 2011

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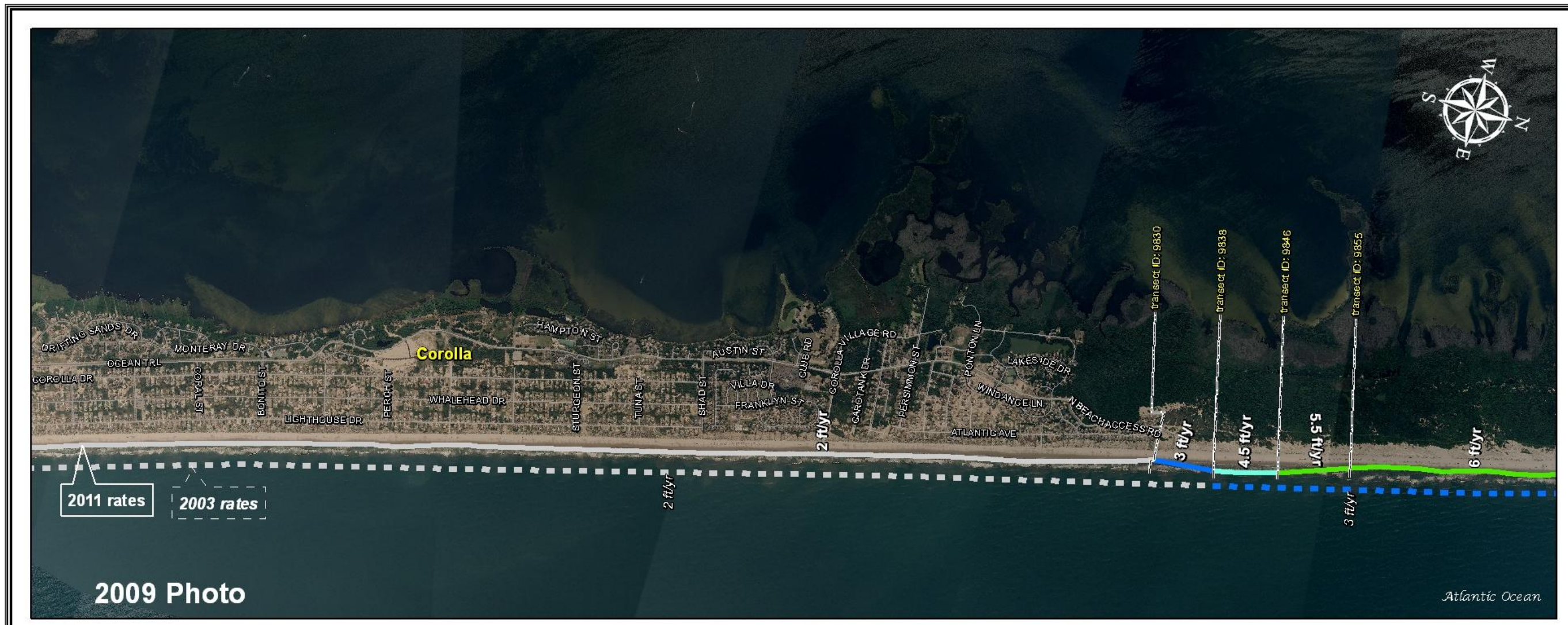
Figure B 56. Outer Banks (1 of 2) - Corolla Erosion Rate - Setback Factors



2011 Long-Term Average Annual Erosion Rate Update

at Outer Banks (Corolla), North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:24,000

0 1,000 2,000 4,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

The information presented here is not predictive, nor does it reflect short-term erosion potential. This map may not be suitable for property specific determination of erosion rate factors near rate transition boundaries due to its small scale. For site specific determinations contact your CAMA Local Permit Official, or regional Division of Coastal Management field office.

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Map No. Corolla - 2 of 2

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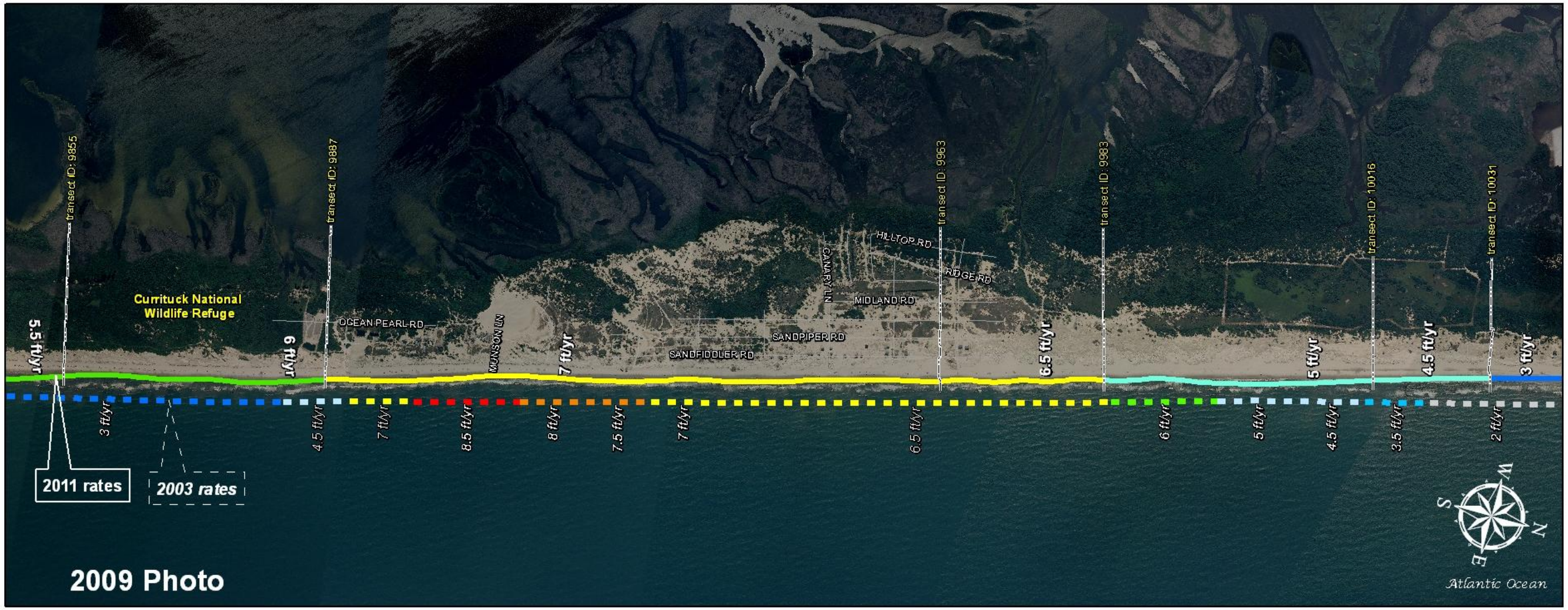
Division of Coastal Management - 2011

Figure B 57. Outer Banks (2 of 2) - Corolla Erosion Rate - Setback Factors



2011 Long-Term Average Annual Erosion Rate Update

at Outer Banks (Currituck Nat'l Wildlife Refuge & County), North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map

Map Scale: 1:24,000

0 1,000 2,000 4,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

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Map No. Currituck - 1 of 2

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Figure B 58. Outer Banks (1 of 2) – Currituck National Wildlife Refuge Erosion Rate - Setback Factors

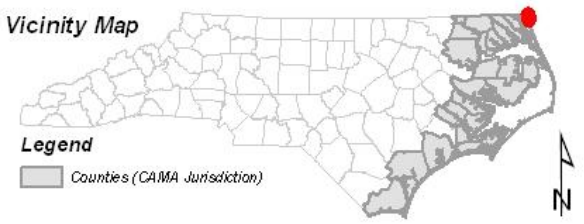
2011 Long-Term Average Annual Erosion Rate Update

at Outer Banks (Currituck Nat'l Wildlife Refuge & County), North Carolina

Legend

2011 Setback Factors (feet/year)	2003 Setback Factors (feet/year)
2.0	0.0 - 2.0
2.1 - 3.0	2.1 - 3.0
3.1 - 4.0	3.1 - 4.0
4.1 - 5.0	4.1 - 5.0
5.1 - 6.0	5.1 - 6.0
6.1 - 7.0	6.1 - 7.0
7.1 - 8.0	7.1 - 8.0
> 8.0	> 8.0
Erosion Rate Factor Transition Boundary	Inlet Hazard Area
Beach Fill Project > 300,000 cubic yards	Photo: 2009 USDA NAIP

Vicinity Map



Map Scale: 1:24,000

0 1,000 2,000 4,000 Feet

0 0.25 0.5 1 Miles

Horizontal Datum: NC State Plane NAD 83 Feet

Setback Factors on this map represents long-term average annual erosion rates measured in feet per year. Shoreline segments that are accreting or have erosion rates less than two feet per year receive a setback factor value equal to two.

The information presented here is not predictive, nor does it reflect short-term erosion potential. This map may not be suitable for property specific determination of erosion rate factors near rate transition boundaries due to its small scale. For site specific determinations contact your CAMA Local Permit Official, or regional Division of Coastal Management field office.

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Map No. Currituck - 2 of 2

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Figure B 59. Outer Banks (2 of 2) – Currituck National Wildlife Refuge Erosion Rate - Setback Factors