

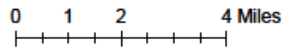


# Appendix

## 1 foot of Sea Level Rise Upper Township

### Legend

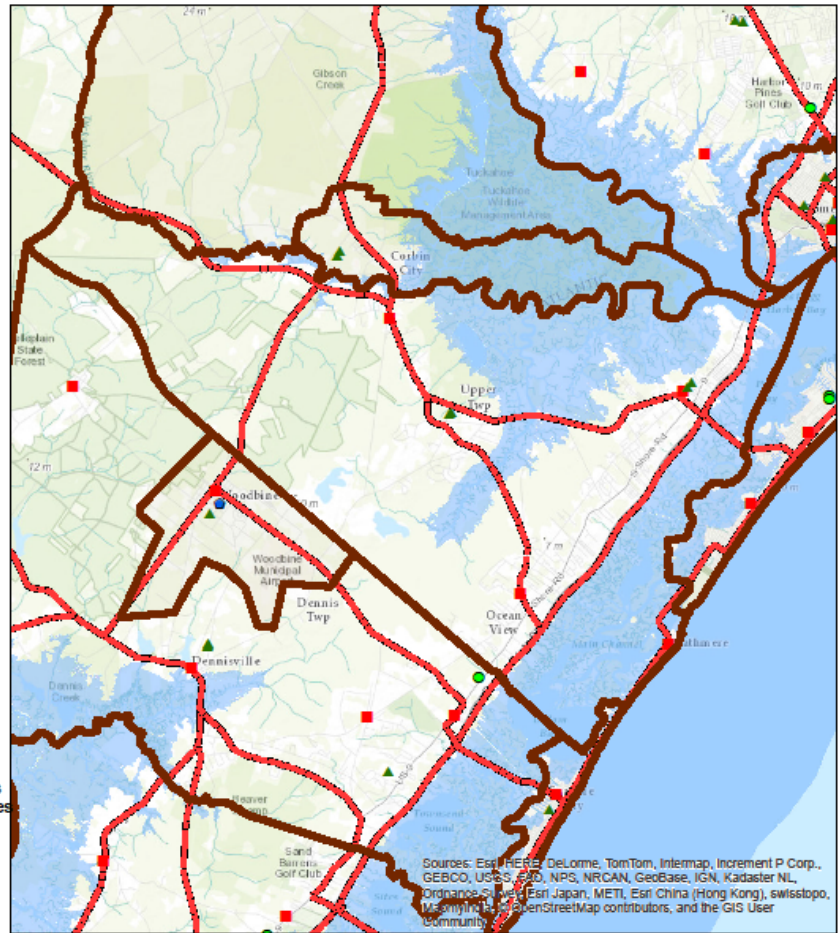
-  Municipality
-  Schools
-  Fire Stations
-  Law Enforcement
-  Assisted Living
-  Hospitals
-  Evacuation Routes
-  1ft SLR



Year 2010 Population: 12373

According to Kenneth G. Miller et al. in the 2013 study "A Geological Perspective on Sea-Level Rise and its Impacts Along the U.S. Mid-Atlantic Coast" a probable threat is the 1ft sea level rise condition that could be expected by 2050. This map depicts that sea level rise as well as the proceeding projections thereafter and is centered on target municipalities






Map Authors: Rachael Sacatelli and Bryan Serino  
Rutgers, New Brunswick  
Center for Remote Sensing  
and Spatial Analysis

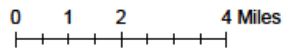


Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, Mapbox, Swisstopo, OpenStreetMap contributors, and the GIS User Community

## 2 feet of Sea Level Rise Upper Township

### Legend

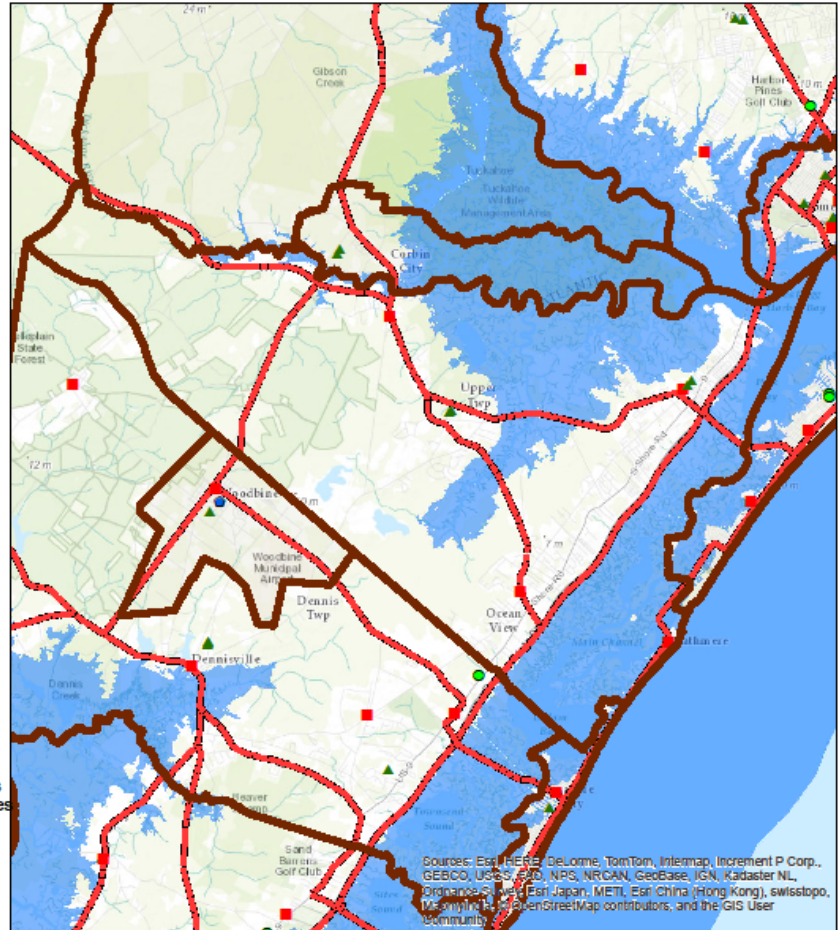
-  Municipality
-  Schools
-  Fire Stations
-  Law Enforcement
-  Assisted Living
-  Hospitals
-  Evacuation Routes
-  2ft SLR



Year 2010 Population: 12373

According to Kenneth G. Miller et al. in the 2013 study "A Geological Perspective on Sea-Level Rise and its Impacts Along the U.S. Mid-Atlantic Coast" a probable threat is the 1ft sea level rise condition that could be expected by 2050. This map depicts that sea level rise as well as the proceeding projections thereafter and is centered on target municipalities







Map Authors: Rachael Sacatelli and Bryan Serino  
Rutgers, New Brunswick  
Center for Remote Sensing  
and Spatial Analysis

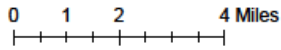


Sources: Esri, DeLorme, TomTom, Intermap, Incentiv P Corp., GEBCO, USGS, NOAA, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, Mapbox, Swisstopo, OpenStreetMap contributors, and the GIS User Community

### 3 feet of Sea Level Rise Upper Township

#### Legend

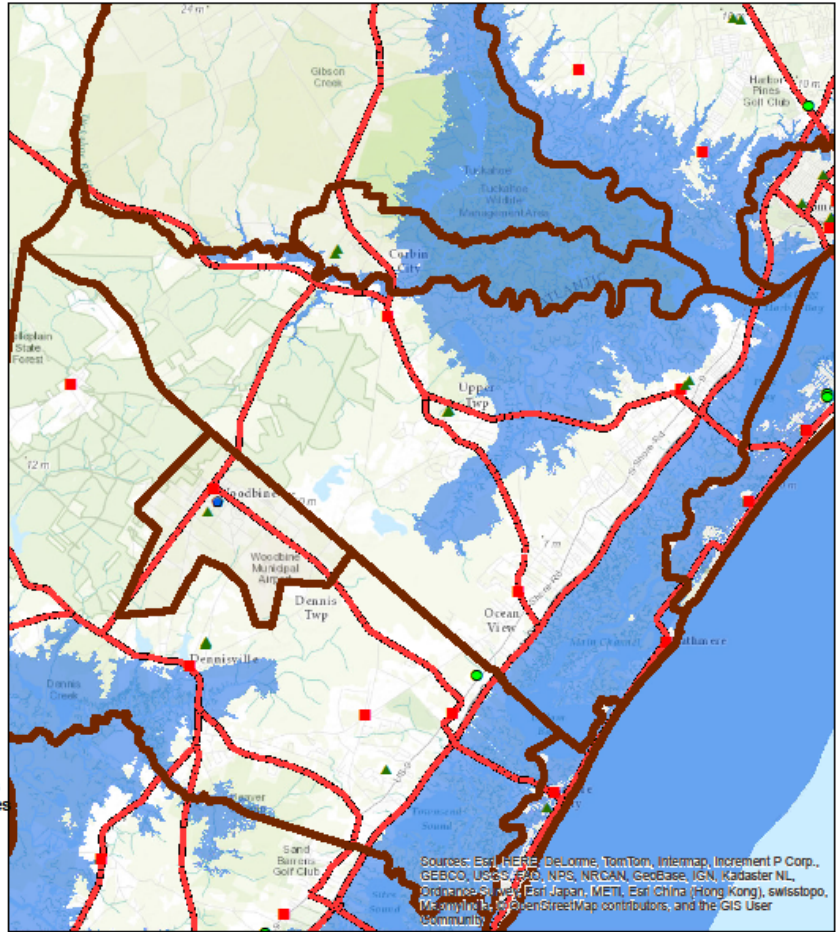
-  Municipality
-  Schools
-  Fire Stations
-  Law Enforcement
-  Assisted Living
-  Hospitals
-  Evacuation Routes
-  3ft SLR



Year 2010 Population: 12373

According to Kenneth G. Miller et al. in the 2013 study "A Geological Perspective on Sea-Level Rise and its Impacts Along the U.S. Mid-Atlantic Coast" a probable threat is the 1ft sea level rise condition that could be expected by 2050. This map depicts that sea level rise as well as the proceeding projections thereafter and is centered on target municipalities

Map Authors: Rachael Sacatelli and Bryan Serino  
Rutgers, New Brunswick  
Center for Remote Sensing  
and Spatial Analysis










Sources: Esri, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, NOAA, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), Swisstopo, Mapbox, OpenStreetMap contributors, and the GIS User Community







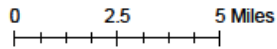
**Category 1 SLOSH Model  
Upper Township**

**Legend**

-  Municipality
-  Schools
-  Assisted Living
-  Law Enforcement
-  Hospitals
-  Fire Stations
-  Evacuation Routes

**Category 1 SLOSH**

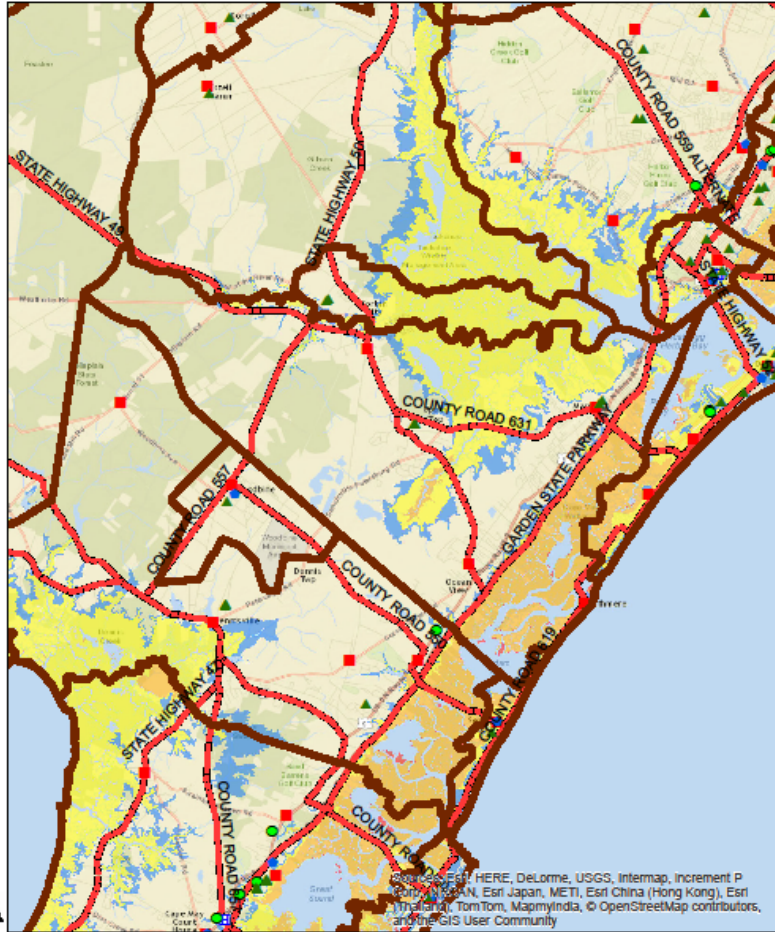
-  0 - 3 Feet Above Ground Level
-  3 - 6
-  6 - 9
-  > 9



Year 2010 Population: 12373

This map depicts the SLOSH model extents provided by NOAA. The depths are ranged from 0-9 or greater feet of inundation above ground level and are categorized in the legend above.







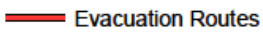
Map Authors: Rachael Sacatelli and Bryan Serino  
Rutgers, New Brunswick  
Center for Remote Sensing  
and Spatial Analysis









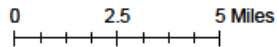
**Category 2 SLOSH Model  
Upper Township**

**Legend**

-  Municipality
-  Schools
-  Assisted Living
-  Law Enforcement
-  Hospitals
-  Fire Stations
-  Evacuation Routes

**Category 2 SLOSH**

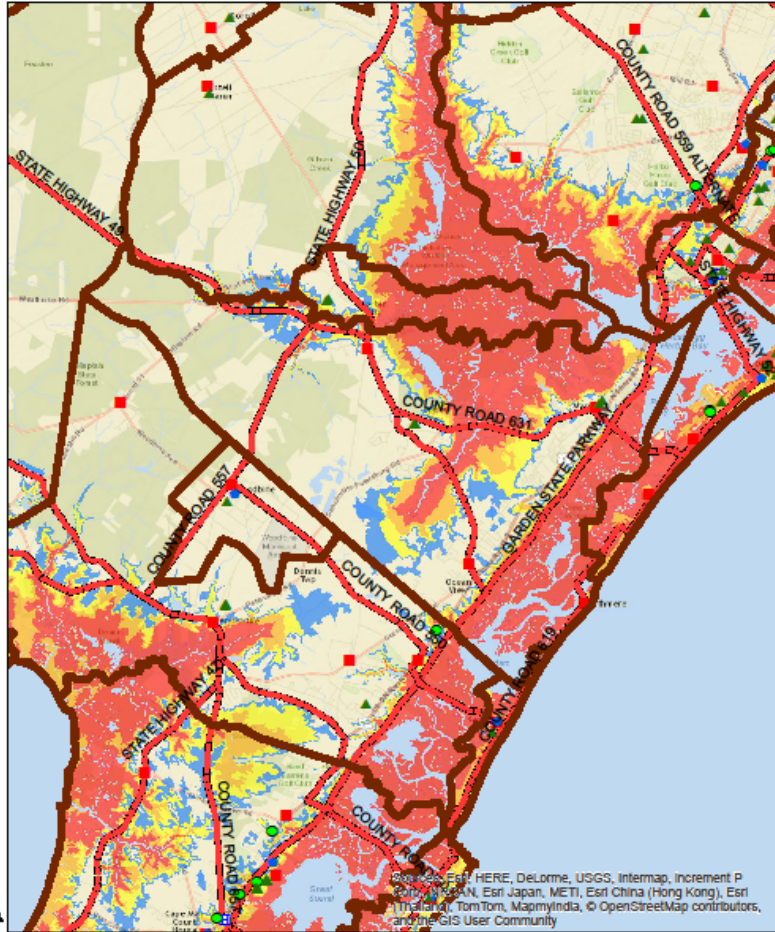
-  0 - 3 Feet Above Ground Level
-  3 - 6
-  6 - 9
-  > 9



Year 2010 Population: 12373

This map depicts the SLOSH model extents provided by NOAA. The depths are ranged from 0-9 or greater feet of inundation above ground level and are categorized in the legend above.

Map Authors: Rachael Sacatelli and Bryan Serino  
Rutgers, New Brunswick  
Center for Remote Sensing  
and Spatial Analysis



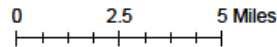
**Category 3 SLOSH Model  
Upper Township**

**Legend**

- Municipality
- ▲ Schools
- Assisted Living
- Law Enforcement
- Hospitals
- Fire Stations
- Evacuation Routes

**Category 3 SLOSH**

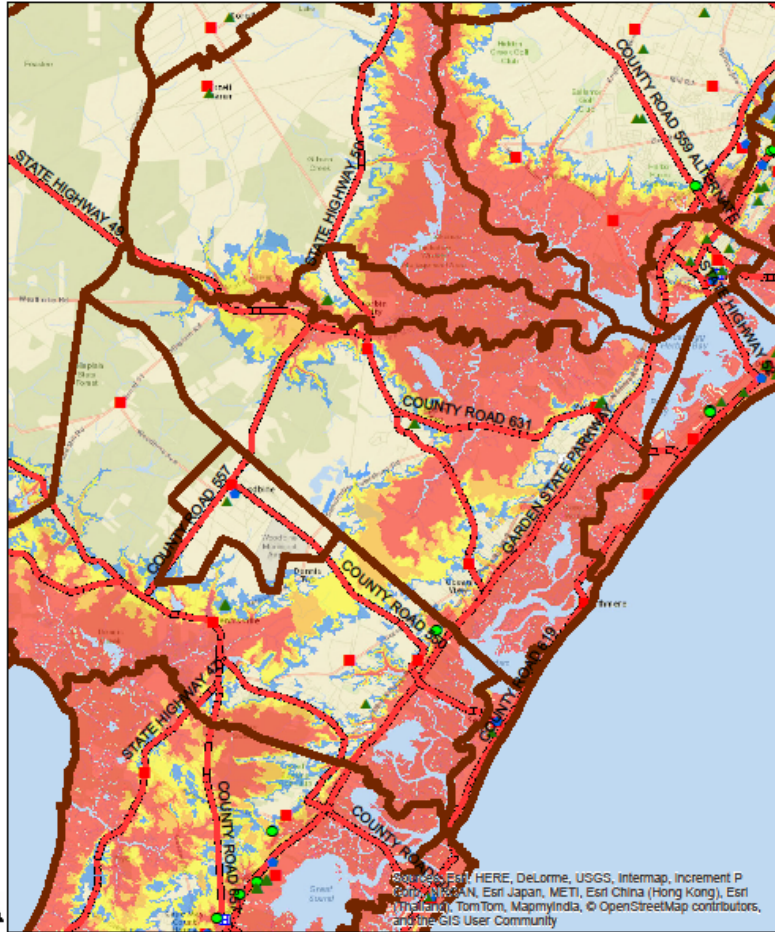
- 0 - 3 Feet Above Ground Level
- 3 - 6
- 6 - 9
- > 9



Year 2010 Population: 12373

This map depicts the SLOSH model extents provided by NOAA. The depths are ranged from 0-9 or greater feet of inundation above ground level and are categorized in the legend above.

Map Authors: Rachael Sacatelli and Bryan Serino  
Rutgers, New Brunswick  
Center for Remote Sensing  
and Spatial Analysis



Source: Esri, HERE, DeLorme, USGS, Intermap, increment P  
Corp., Swissson, Esri Japan, METI, Esri China (Hong Kong), Esri  
Italy, Swisstopo, TomTom, MapmyIndia, © OpenStreetMap contributors,  
and the GIS User Community

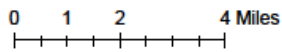
## Marsh Retreat at 1 feet of Sea Level Rise Upper Township

### Legend

- Municipality
- ▲ Schools
- Fire Stations
- Law Enforcement
- Assisted Living
- Hospitals
- Evacuation Routes

### Marsh Retreat at 1ft SLR

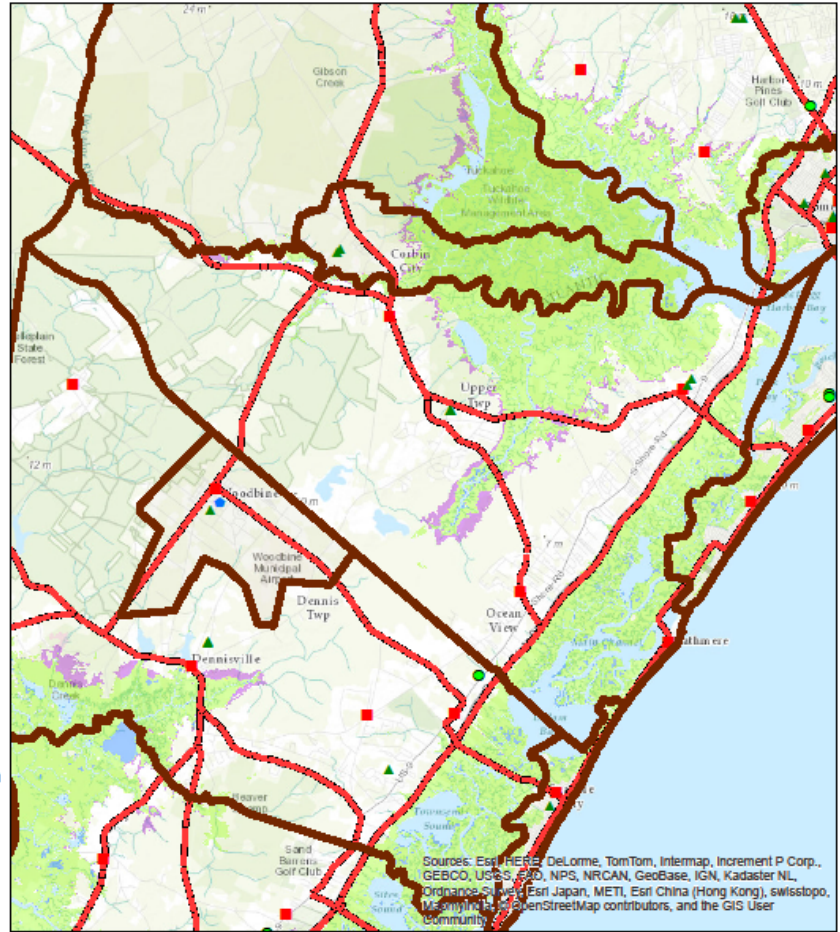
- Unimpeded Marsh Retreat Zone
- Impeded Marsh Retreat Zone
- Marsh Conversion: Unconsolidated Shore
- Marsh Conversion: Open Water
- Unchanged Tidal Marsh



Year 2010 Population: 12373

According to Kenneth G. Miller et al. in the 2013 study "A Geological Perspective on Sea-Level Rise and its Impacts Along the U.S. Mid-Atlantic Coast" a probable threat is the 1ft sea level rise condition that could be expected by 2050. This map depicts the marsh retreat caused by sea level rise centered on target municipalities.

Map Author: Rachael Sacatelli  
Rutgers, New Brunswick  
Center for Remote Sensing  
and Spatial Analysis



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, NOAA, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, Mapbox, Swisstopo, OpenStreetMap contributors, and the GIS User Community



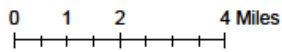
## Marsh Retreat at 2 feet of Sea Level Rise Upper Township

### Legend

- Municipality
- ▲ Schools
- Fire Stations
- Law Enforcement
- Assisted Living
- Hospitals
- Evacuation Routes

### Marsh Retreat at 2ft SLR

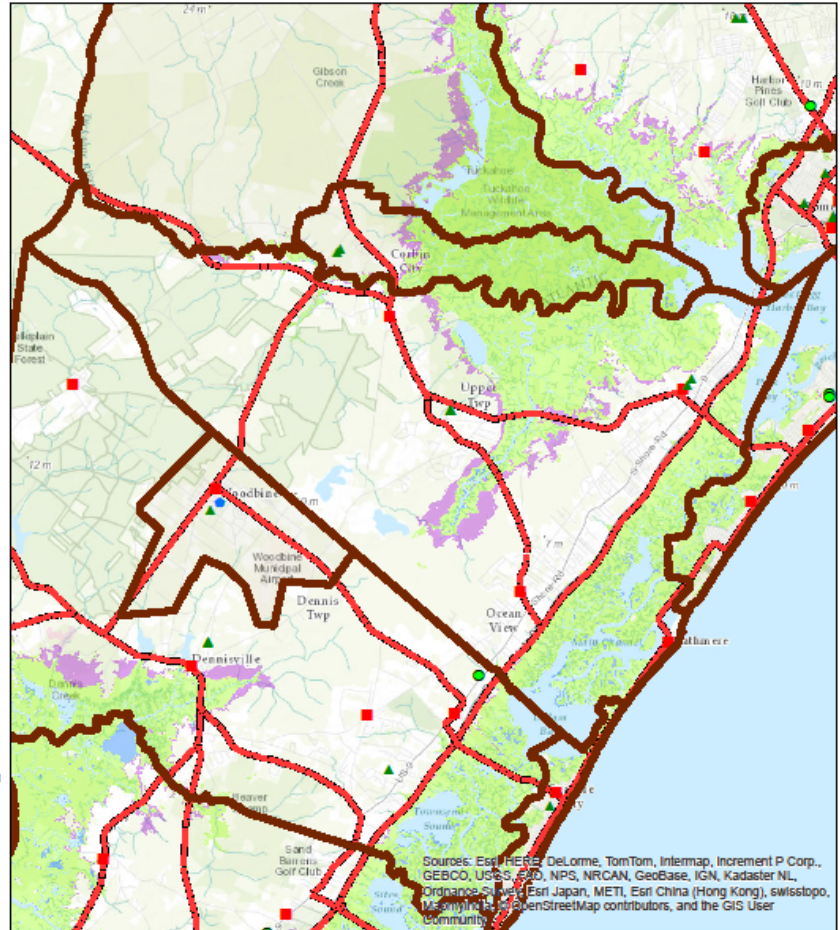
- Unimpeded Marsh Retreat Zone
- Impeded Marsh Retreat Zone
- Marsh Conversion: Unconsolidated Shore
- Marsh Conversion: Open Water
- Unchanged Tidal Marsh



Year 2010 Population: 12373

According to Kenneth G. Miller et al. in the 2013 study "A Geological Perspective on Sea-Level Rise and its Impacts Along the U.S. Mid-Atlantic Coast" a probable threat is the 1ft sea level rise condition that could be expected by 2050. This map depicts the marsh retreat caused by sea level rise centered on target municipalities.

Map Author: Rachael Sacatelli  
Rutgers, New Brunswick  
Center for Remote Sensing  
and Spatial Analysis



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, NOAA, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, Mapbox, Swisstopo, OpenStreetMap contributors, and the GIS User Community

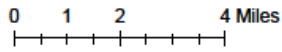
## Marsh Retreat at 3 feet of Sea Level Rise Upper Township

### Legend

- Municipality
- ▲ Schools
- Fire Stations
- Law Enforcement
- Assisted Living
- Hospitals
- Evacuation Routes

### Marsh Retreat at 3ft SLR

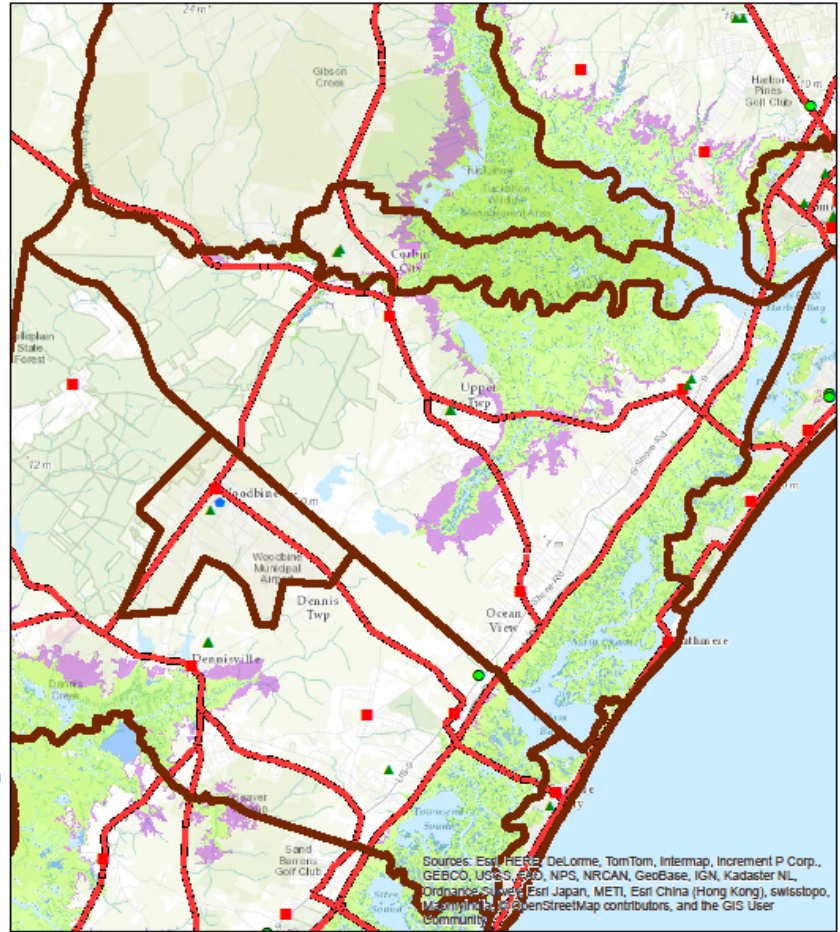
- Unimpeded Marsh Retreat Zone
- Impeded Marsh Retreat Zone
- Marsh Conversion: Unconsolidated Shore
- Marsh Conversion: Open Water
- Unchanged Tidal Marsh



Year 2010 Population: 12373

According to Kenneth G. Miller et al. in the 2013 study "A Geological Perspective on Sea-Level Rise and its Impacts Along the U.S. Mid-Atlantic Coast" a probable threat is the 1ft sea level rise condition that could be expected by 2050. This map depicts the marsh retreat caused by sea level rise centered on target municipalities.








Map Author: Rachael Sacatelli  
Rutgers, New Brunswick  
Center for Remote Sensing  
and Spatial Analysis









Sources: Esri, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, NOAA, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, Mapbox, Swisstopo, OpenStreetMap contributors, and the GIS User Community

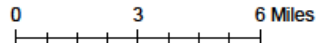
**FEMA's PFIRM Flood  
Zones for New Jersey  
Upper Township**

**Legend**

-  Municipality
-  Schools
-  Assisted Living
-  Law Enforcement
-  Hospitals
-  Fire Stations
-  Evacuation Routes

**PFIRM**

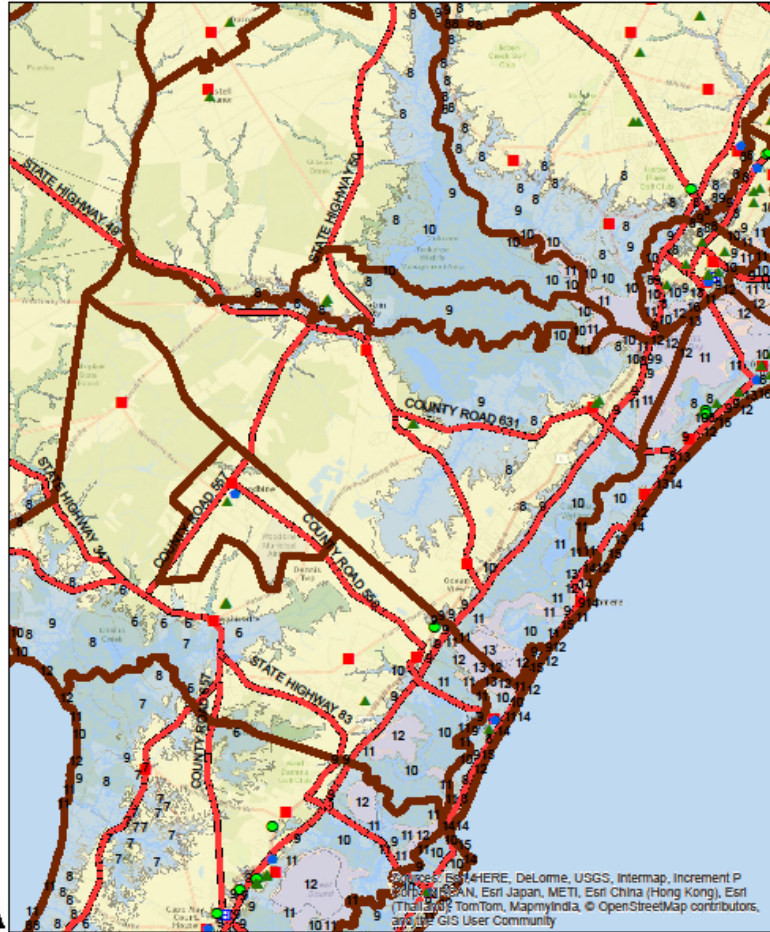
-  Zone X - 0.2% Annual Chance
-  A
-  AE
-  AO
-  D
-  VE



Year 2010 Population: 12373

This map shows the extents of FEMA's latest flood insurance rate maps for the state of New Jersey. The numerical label in the zones portrays the static ABFE zone. Please refer to the index for more information.

Map Authors: Rachael Sacatelli and Bryan Serino  
Rutgers, New Brunswick  
Center for Remote Sensing  
and Spatial Analysis



Map Sources: ESRI, HERE, DeLorme, USGS, Intermap, Increment P, Swisstopo, GEBCO, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

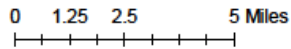
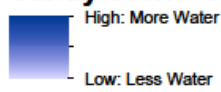


# Sandy Storm Surge Upper Township

## Legend

-  Municipality
-  Schools
-  Fire Stations
-  Law Enforcement
-  Assisted Living
-  Hospitals
-  Evacuation Routes


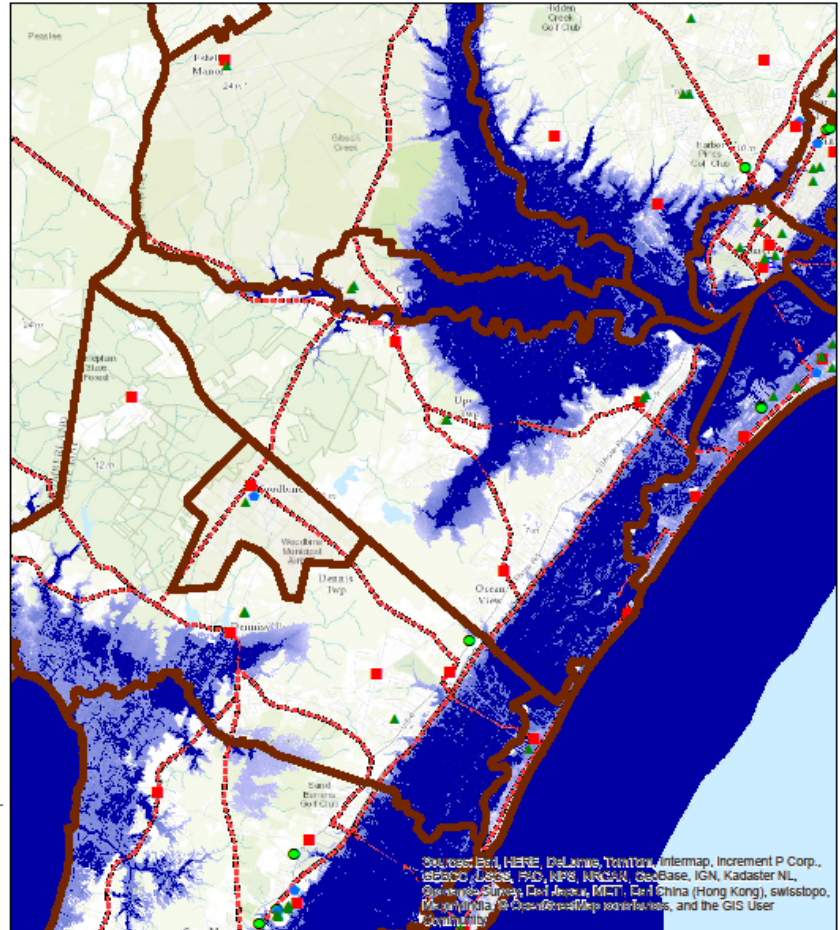
## Sandy Storm Surge



Year 2010 Population: 12373

This map depicts the Sandy Storm Surge extents provided by FEMA. The depths are ranged in meters of inundation above ground level and are categorized in the legend above.

Map Authors: Rachael Sacatelli and Bryan Serino  
Rutgers, New Brunswick  
Center for Remote Sensing  
and Spatial Analysis

385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000

## **Upper Township/Strathmere Historical Erosion Data**

### **An Assessment of Cape May County Beaches at the New Jersey Beach Profile Network (NJBPN) Sites After Hurricane Sandy Related to (DR-NJ 4086)**

#### Introduction:

The Richard Stockton College of NJ Coastal Research Center (CRC) has initiated a post-storm survey and assessment of the New Jersey shoreline in response to severe beach erosion resulting from the impact and landfall of Hurricane Sandy October 29, 2012. Declared a Federal Disaster by President Obama on October 31, 2012, this information is being prepared to show the general trend of beach/dune loss between the Delaware Bay on the west shore of Cape May County around the Point, and up the coast to Ocean City. The analysis for the 31 survey sites starting at Reeds Beach, moving around Cape May Point and up the oceanfront to Ocean City, NJ was completed November 26, 2012. Beachfront clean up work was all but complete in most locations because all of Cape May County was south of the point of landfall for the storm. The consequence was that the second high tide was opposed by the southwest wind on the back side of the storm; therefore the surge was up to 10 feet lower than documented in Long Branch. This initial report is focused on the impact to municipal dunes and beaches from Hurricane Sandy. All of the Cape May NJBPN sites were surveyed earlier in the fall, so site was re-surveyed to wading depth to get as much information as fast as possible. In the spring of 2013, the normal long profiles will be run to see longer term comparisons with the spring of 2012 conditions.

#### Beach/Dune Damage Assessment by Municipal and Island Segment:

To measure the erosion, pre-existing New Jersey Beach Profile Network (NJBPN) monitoring sites were used to provide an accurate comparison and assessment of storm related shoreline and beach volume changes. Using the data from the fall 2012 NJBPN survey, completed in Cape May County by October 19, 2012, provides a good baseline for damages that occurred during the hurricane. Data collected at the 31 beach profile locations was done between November 12 and 26, 2012 using RTK GPS and extended from the reference location, across the dunes, beach and into the surf to wader depth. By Nov. 12th, it was clear that sand recovery was well under way as a berm had been deposited on the erosional surface generated by Sandy with a substantial offshore bar present in water less than 5 feet deep offshore. Very little sand in the oceanfront locations had been washed inland beyond the dunes. Exceptions were found in Ocean City, Sea Isle City, and at the Reeds Beach site. A gap in the dunes at the point where Cape May City borders the Nature Conservancy lands also saw wave damage to a few structures.

Profile Locations: The following sites were surveyed during September and October 2012 and post-Sandy by November 26, 2012 (Figure 1).

NJBPN 100 Reeds Beach, Middle Township NJBPN 115 35th St., Avalon  
NJBPN 201 Pacific Ave. Villas NJBPN 116 23rd St., Avalon  
NJBPN 102 Whitter Ave. No. Cape May NJBPN 216 9th St., Avalon  
NJBPN 103 Higbee Beach State Park NJBPN 117 80th St., Sea Isle City  
NJBPN 104 Lake Dr. Cape May Point NJBPN 118 57th St., Sea Isle City  
NJBPN 105 Nature Conservancy, Cape May NJBPN 119 25th St., Sea Isle City  
NJBPN 206 Broadway Ave. Cape May NJBPN 120 1st St., Sea Isle City  
NJBPN 107 Baltimore Ave. Cape May NJBPN 121 Williams Road, Strathmere  
NJBPN 108 Cape May Beach Club NJBPN 221 Corson's Inlet Park, Ocean City  
NJBPN 208 USCG Base, Lower Township NJBPN 222 59th St., Ocean City  
NJBPN 109 Raleigh Ave., Lower Township NJBPN 122 56th St., Ocean City  
NJBPN 110 Cresse Ave., Wildwood NJBPN 223 34th St., Ocean City  
NJBPN 111 15th Ave., North Wildwood NJBPN 124 20th St., Ocean City  
NJBPN 212 121st St., Stone Harbor NJBPN 125 6th St., Ocean City  
NJBPN 113 90th St., Stone Harbor NJBPN 225 Gardens Road, Ocean City  
NJBPN 114 70th St., Avalon

\*Below is a map showing the location of each profile.

Western Delaware Bay Shoreline of Cape May County;

Between Reeds Beach and Cape May Point, the western shoreline of Cape May County suffered from the backside of Hurricane Sandy after the storm made landfall on the New Jersey shoreline. The wind direction reversed and came across the storm-surge flooded Delaware Bay with 4-foot waves with very short periods. Due to the high water levels these waves pounded dunes and made low-lying areas subject to inundation, wave damage and loss of some structures. Reeds Beach was hit hard because there was no bluff, and a minimal dune system. The region is basically a narrow sand beach, low dune all as a barrier on and seaward of the salt marshes. Sand was pushed across the service road to Bidwell Creek and the majority of the dredge material pumped from the creek project two years ago was moved inland onto the salt marsh lying between Reeds Beach homes and the Cape May County mainland. To the south, the bluff of the county uplands is mantled with dune sand and made a better barrier. Erosion took some dune and moved the zero elevation position toward the bay because the beach/dune slope was reduced in gradient allowing sand to deposit on the terrace that extends over 1,000 feet into the Delaware Bay from Villas and North Cape May. This wide terrace is the geological result of long, slow erosion of the bluff by bay waves. Higbee Beach, a natural area, suffered bluff erosion and beach retreat, but on a minimal scale. Cape May Point had sand moved up



onto the highest parts of the dry beach and suffered minimal dune losses from the bay side around to the oceanfront beach.

#### Cape May City;

The approach direction of the ocean waves, deflected somewhat by Cold Springs Inlet jetties and the south, southwest orientation of the shoreline acted to pile sand from the beachface landward onto the backshore beach into the dune vegetation. The Cape May beaches all gained berm sand at the expense of beachface retreat. Only the short segment between the Third Avenue groin and the Nature Conservancy suffered inundation largely because building a decent sized dune was resisted by the adjacent property owners.

#### The Wildwoods;

The same process appeared to be working at 3 of 4 cross sections between the natural area and North Wildwood, with the 15th Street site not performing as did the Wildwood site at Cresse Avenue. The Cresse berm became 2 feet higher with a ridge over 100 feet wide created from beachface sand pushed up on top of the back berm region of the beach. At the 15th Avenue site in North Wildwood another signature result from Sandy appeared with the deposition of a sand ramp deposited up the seaward slope of the primary dune. It appears that when the dry beach is deeply flooded by a storm surge, the waves break on the submerged beachface slope, excavating abundant sand that the broken wave bores transport across the berm, and deposit it where they run up the dune slope. If the waves do not breach the dunes, they deposit beach sand as a ramp at the seaward toe of the dune. Where a hard structure presents an effective wave barrier, this ramp was likewise deposited and in some cases effectively enabled the waves to run-up and over the hard structure. The example of this was seen at the Sea Bright seawall in Monmouth County.

#### Avalon & Stone Harbor;

These two communities have been leaders in shore protection by having successfully managed to have Federal shore protection projects constructed and have for years, promoted wider, higher dunes with coordinated development of pedestrian access pathways that do not make a breach easier at street end access points. No instance of dune breaching occurred in either Borough; no waves washed sand into streets or under homes. Dune erosion did occur, but in some cases, the extraordinary width of the dune area allowed Sandy's wave energy to be absorbed within the swales and vegetation of the foredunes arrayed along the mid-section of the barrier island. Elsewhere a wide, relatively high primary dune blocked wave over-topping by just enough to be successful. A major hard structure improvement to the Townsend's Inlet shoreline in Avalon paid dividends by reducing the damage from Sandy to considerably less that was incurred during the December 1992 northeast storm. The worst wave damage occurred to the highway leading to the Townsend's Inlet draw bridge to Sea Isle City.

Sea Isle City & Strathmere;

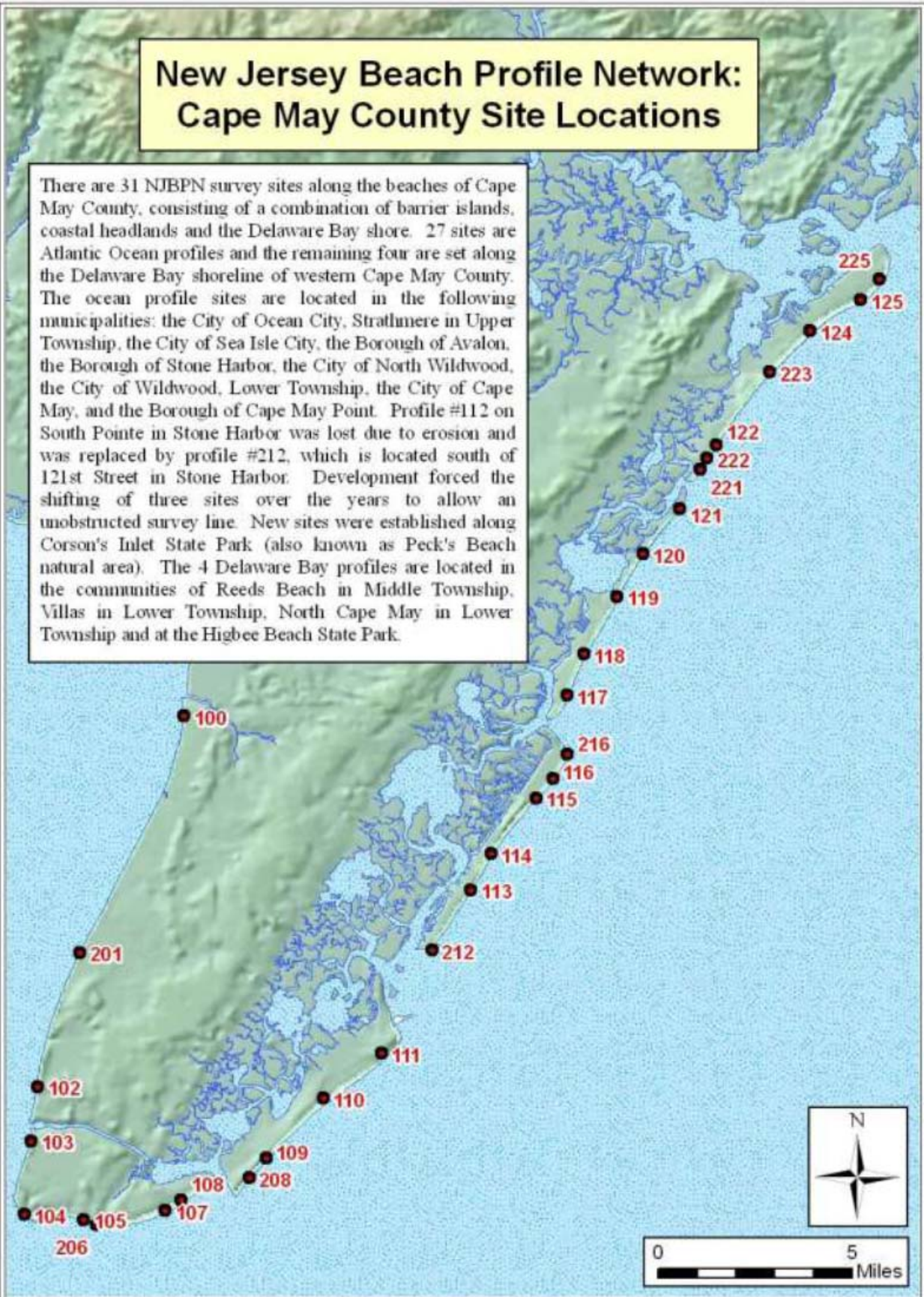
A 2009 NJ State and locally sponsored shore protection project saved these two communities substantial damage expense as well. Previous storms of far less intensity had made a shambles out of the Commonwealth Avenue highway leading through northern Sea Isle City into Strathmere. Sandy produced minor breaching and over-topping, but not nearly the extent of overwash seen previously (1998 for example). There were instances of dune breaching in Sea Isle City, extensive tidal flooding, but no catastrophic structural damage. The project protected Strathmere only allowing a couple of minor instances of waves cresting the dunes. The Corson's Inlet shoreline, a crisis situation in 2008, was un-damaged in spite of being flooded by tidal surge.

Ocean City;

The shore protection was a Federal project (Great Egg Inlet to 34th Street) and a local/State partnership (34th Street to the Corson's Inlet State Park). Two decades of sand redistribution produced results ranging from fantastic through fair to poor. The mid-section of the island had vegetation covering 450 feet of dunes before reaching the dry beach. These areas saw absolutely no wave damage with the storm's energy totally absorbed within the foredune region lying seaward of the primary dune. This was a welcome change from the October 1991 northeast storm where just the boardwalk suffered \$4 million in damage in the 15th to 20th Street region. There has been no damage to this structure since (the initial fill was completed in the summer of 1992 and resulted in no damage in December of 1992 when a worse event than 1991 hit Ocean City). To the north the recently maintained Federal project had a narrow beach between a dune system and the direct frontal assault of the northeast waves during Sandy. With little or no beach to break on, and roll across, the waves pounded with full fury on the dunes immediately. Eroding at rates up to 12 feet horizontally per hour, many sections lost the protection the dune afforded. Sand was washed into the streets; storm surge flooding was made worse by every wave crossing into the city. Structural damage occurred, but not at catastrophic levels. At the southern end of development, the beach had not been maintained as frequently and there was only one fairly narrow line of dunes protecting property. Sandy crossed this line easily and waves flowed against, around and beneath 10 blocks of homes. Damage was considerable with early clean-up focused on moving thousands of cubic yards of sand back to the beach in early November. The Corson's Inlet State Park shoreline south of development in Ocean City suffered dune loss of considerable magnitude. These losses were major increases in loss that had commenced in 2011 with the series of modest northeast storms that commenced in November 2009. The beach had been narrow with spring high tides reaching the near-vertical scarp in the dunes. This slow rate of retreat was greatly accelerated during Hurricane Sandy.

## New Jersey Beach Profile Network: Cape May County Site Locations

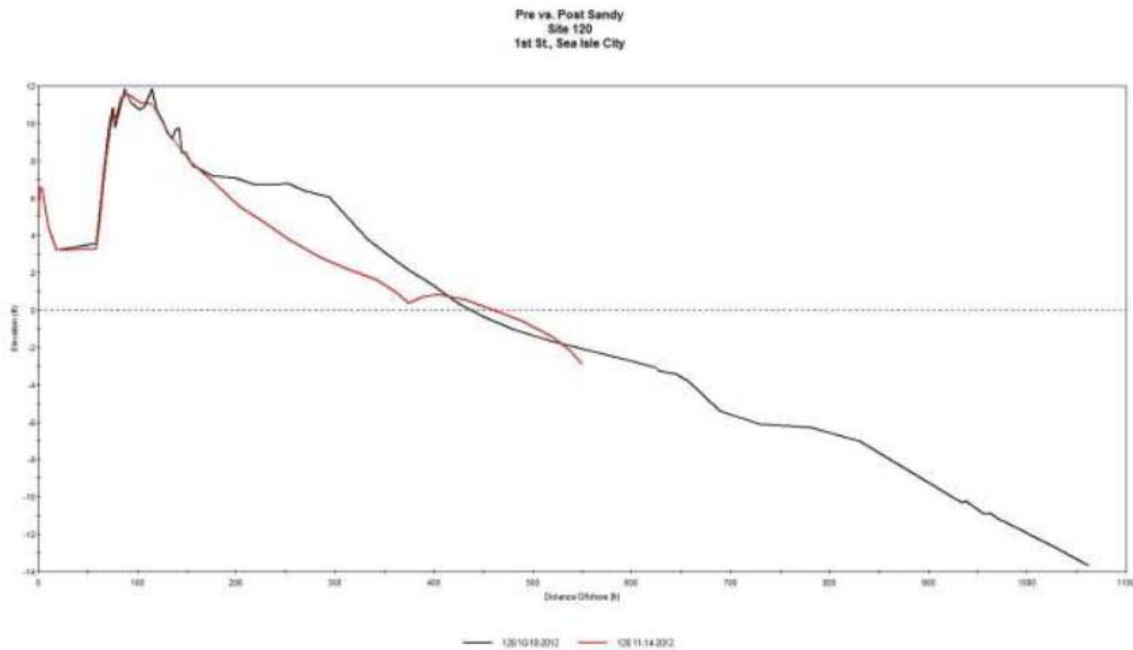
There are 31 NJBPN survey sites along the beaches of Cape May County, consisting of a combination of barrier islands, coastal headlands and the Delaware Bay shore. 27 sites are Atlantic Ocean profiles and the remaining four are set along the Delaware Bay shoreline of western Cape May County. The ocean profile sites are located in the following municipalities: the City of Ocean City, Stratlunere in Upper Township, the City of Sea Isle City, the Borough of Avalon, the Borough of Stone Harbor, the City of North Wildwood, the City of Wildwood, Lower Township, the City of Cape May, and the Borough of Cape May Point. Profile #112 on South Pointe in Stone Harbor was lost due to erosion and was replaced by profile #212, which is located south of 121st Street in Stone Harbor. Development forced the shifting of three sites over the years to allow an unobstructed survey line. New sites were established along Corson's Inlet State Park (also known as Peck's Beach natural area). The 4 Delaware Bay profiles are located in the communities of Reeds Beach in Middle Township, Villas in Lower Township, North Cape May in Lower Township and at the Higbee Beach State Park.



**1<sup>st</sup> Street, Sea Isle City, Cape May County, Site #120;**



This location is on the boundary between Sea Isle City and Strathmere along the main (and only) road parallel to the ocean. The sand transported into the dune by October 17, 2012 was washed across by Sandy as seen on the right picture on November 14, 2012. Some minor breaching occurred along Commonwealth Avenue, but the dune remained relatively in tact.



**Figure 24.** The beach was scoured, removing the berm and a large amount of sand that was transported offshore and carried south along the coast. The dunes were just high enough to withstand the wave onslaught without failure.



**Williams Road, Strathmere, Cape May County, Site #121;**



The left picture was taken October 17, 2012 looking across the wide dune zone area seaward of the primary feature. On November 5, 2012 the same view following Sandy shows that the area was flooded by waves that knocked down the highest primary dune, but did not flood the immediate landward area. The beach was flattened by the storm surge. The dune removed was only three feet higher than the post-storm feature however.

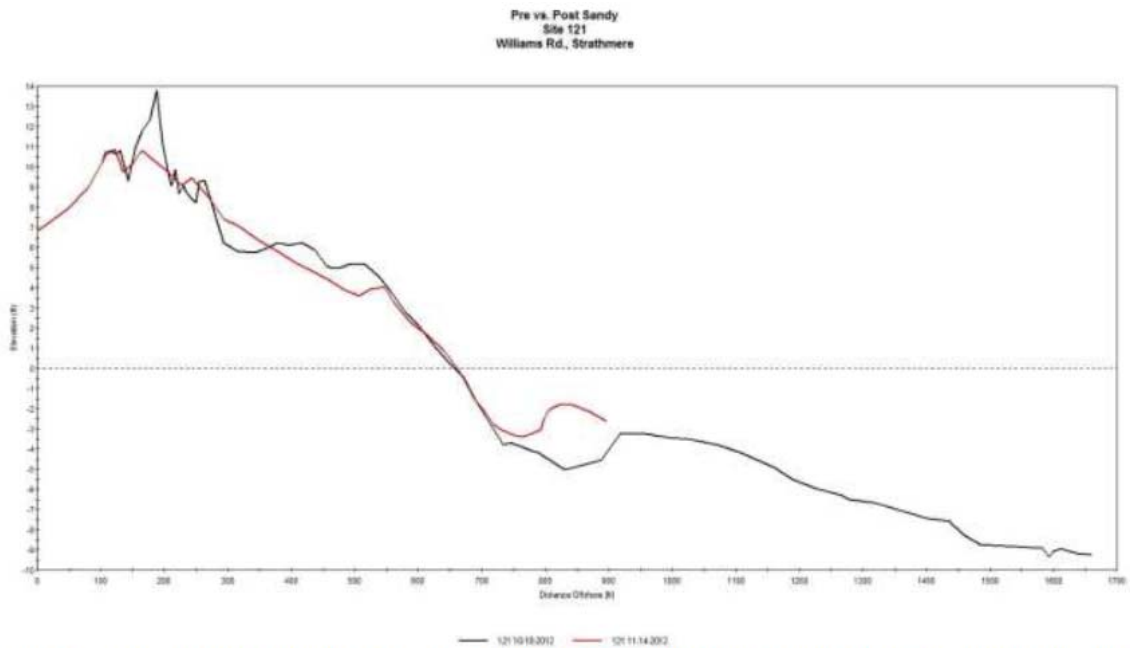


Figure 25. The cross sections do show the transport of sand offshore as well as the extensive flattening of the beach surface all the way into the dunes. The graph is extremely vertically exaggerated and the dune removed was only 3 feet higher than the surroundings.

### **Summary of Cape May County’s Sandy impacts:**

Cape May County’s good fortune was greatly assisted by being located south of where the center of Sandy’s rotation came ashore in New Jersey. The “eye” passed over northern Atlantic County about 9pm Monday night and produced a rapid change in the wind direction from the north-northeast to southwest. This acted to blunt the impact of the second high tide and reduce the wave height somewhat. Values of the elevation for wave run up on dunes were between 13.5 and 14.5 feet NAVD 88 elevation. This was ten feet lower than similar measurements made in Long Branch, Monmouth County. In addition, many of the Cape May communities had been participants in the Philadelphia Army Corps Shore Protection projects starting in 1989 in Cape May City. Wide beaches with in-depth dune protection provided all the storm-stopping power needed to prevent wave damage and the flooding of the oceanfront streets with sand. A few places suffered mostly due to narrow beaches unable to limit wave impacts on the dunes. The horizontal erosion rates during Sandy were sufficient to cut through and produce overwash into Ocean City in spots, Sea Isle City in a few places, and in Wildwood where there was no dune to stop the water in spite of having the widest municipal beach in New Jersey. In 2009 a dune was incorporated into a beach restoration design for a NJ State – locally sponsored project with the City of North Wildwood. This dune served to demonstrate the difference in wave damage dunes yield even for a community with an extremely wide natural beach.

The table below shows the sand volume change between either the earlier fall survey at each site or the spring 2012 survey (natural sites) and the post-Hurricane Sandy survey.

*Cape May County Post-Sandy Site Volume Changes*

Site Location and Number	NJBPN Site #	Site Sand Volume Change (cu yds/ft)	Dune Failure (Y or N)	Date of Recent Beach Fill
Ocean City	225	-31.39	Y	2010
Ocean City	125	-37.19	Y	2010
Ocean City	124	-15.25	N	2010
Ocean City	223	-18.24	N	2010
Ocean City	122	-27.45	Y	1995
Ocean City	222	-40.81	Y	1995
Corson's Inlet S Park	221	26.11	Y-Partial	Never
Strathmere	121	5.70	N	2012
Sea Isle City	120	-16.46	N	2012
Sea Isle City	119	-29.57	N	2012
Sea Isle City	118	-31.43	Y-partial	2009
Sea Isle City	117	-33.99	N	2009
Avalon	216	-26.79	N	2011
Avalon	116	-21.38	N	2012
Avalon	115	-6.95	N	Never
Avalon	114	-15.26	N	2011
Stone Harbor	113	-24.37	N	2011
Stone Harbor	212	-17.41	N	2011
North Wildwood	111	-18.94	N	2011
Wildwood	110	-1.34	No Dune	Never
Lower Township	109	-10.83	N	Never
Lower Township	208	29.08	N	Never
Cape May City	108	22.47	N	2010
Cape May City	107	15.34	N	2010
Cape May City	206	-3.34	N	2010
Cape May Nature Con	105	-16.04	N	2011
Cape May Point	104	-5.08	N	2010
Higbee Beach S Park	103	3.91	N	Never
North Cape May	102	-8.74	N	Never
Villas	201	3.57	N	Never
Reeds Beach	100	-3.56	Y	2010

Cape May County Post Sandy Volume Changes

MUNICIPALITY	NJBPN Site#	Vol Change cu yds per ft	Average of Sand Loss Between Adjacent Sites (cy/ft)	Dune Failure	Recent Beach Fill	Distance Between Sites (FEET)	Vol Change - Cubic Yards Between Profiles (South to North)	Cumulative Volume Change - Cubic Yards (South to North)
Ocean City	225	-31.39	To Inlet	Y	2010	1,006	-31,578	-31,578
Ocean City	125	-37.19	-34.29	Y	2010	3,820	-130,997	-162,576
Ocean City	124	-15.25	-26.22	N	2010	8,108	-212,591	-375,166
Ocean City	223	-18.24	-16.74	N	2010	7,885	-132,027	-507,193
Ocean City	122	-27.45	-22.85	Y	1995	12,271	-280,328	-787,521
Ocean City	222	-40.81	-34.13	Y	1995	2,264	-77,287	-864,808
Corson's Inlet S Park	221	26.11	-7.35	Y-Partial	Never	1,739	-12,786	-877,593
Strathmere	121	5.70	15.90	N	2012	1,241	19,733	-857,861
Sea Isle City	120	-16.46	-5.38	N	2012	7,961	-42,834	-900,694
Sea Isle City	119	-29.57	-23.02	N	2012	6,824	-157,057	-1,057,752
Sea Isle City	118	-31.43	-30.50	Y-partial	2009	9,078	-276,889	-1,334,641
Sea Isle City	117	-33.99	-32.71	N	2009	6,087	-199,107	-1,533,747
Avalon	216	-26.79	-30.39	N	2011	500	-15,195	-1,548,942
Avalon	116	-21.38	-24.08	N	2012	3,921	-94,442	-1,643,385
Avalon	115	-6.95	-14.16	N	Never	3,482	-49,314	-1,692,699
Avalon	114	-15.26	-11.10	N	2011	9,780	-108,606	-1,801,305
Stone Harbor	113	-24.37	-19.81	N	2011	5,633	-111,605	-1,912,910
Stone Harbor	212	-17.41	-20.89	N	2011	9,833	-205,405	-2,118,315
North Wildwood	111	-18.94	-18.17	N	2011	3,582	-65,099	-2,183,414
Wildwood	110	-1.34	-10.14	No Dune	Never	9,987	-101,239	-2,284,653
Lower Township	109	-10.83	-6.08	N	Never	11,296	-68,718	-2,353,371
Lower Township	208	29.08	9.12	N	Never	3,638	33,198	-2,320,174
Cape May City	108	22.47	25.78	N	2010	5,757	148,387	-2,171,787
Cape May City	107	15.34	18.91	N	2010	2,667	50,424	-2,121,363
Cape May City	206	-3.34	6.00	N	2010	9,470	56,841	-2,064,522
Cape May Nature Con	105	-16.04	-9.69	N	2011	1,736	-16,819	-2,081,341
Cape May Point	104	-5.08	-10.56	N	2010	8,393	-88,616	-2,169,957
Higbee Beach S Park	103	3.91	-0.58	N	Never	9,934	-5,801	-2,175,758
North Cape May	102	-8.74	-2.41	N	Never	7,008	-16,914	-2,192,672
Villas	201	3.57	-2.58	N	Never	19,154	-49,484	-2,242,156
Reeds Beach	100	-3.56	0.01	Y	2010	35,265	282	-2,241,874

Figure 33. This table illustrates the changes in sand volume for the 31 Cape May County beach sites with the sand volume for the beach/dune part of the profile in cubic yards of sand per foot of shoreline at that site. The distance between sites (not counting inlets) allows an estimate of sand volume lost between profile locations that are compiled for the entire county in the right-hand column. Local site sand volumes in RED denote locations where Sandy added sand to the beaches and dunes.



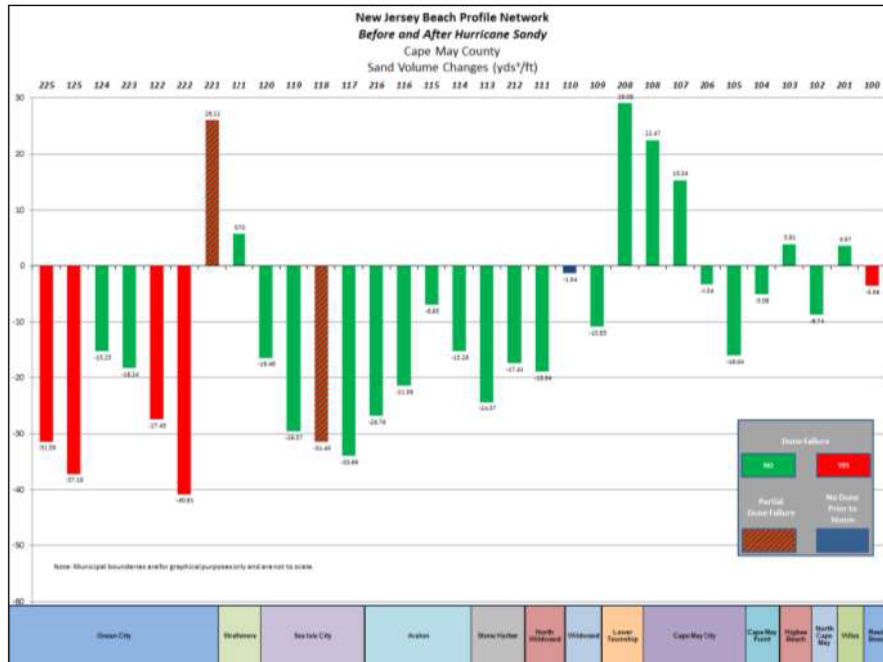


Figure 34. This graphic shows the sand volume loss figures for each of the communities within the developed sections of the Cape May County shoreline. Federal shore protection projects have occurred along this portion of the New Jersey shoreline in Ocean City, Strathmere, Sea Isle City, Avalon, Stone Harbor, North Wildwood, Cape May City, and Reeds Beach. The engineered beach and dune systems have been maintained by the USACE recently and withheld the storm generated waves from breaching the dunes. All sites experienced berm erosion and dune losses except for site 221 Corson's Inlet State Park, which is undeveloped, site 121 in Strathmere, which recently completed a beach nourishment project, sites 208 Cape May National Wildlife Refuge, sites 108 and 107 in Cape May City, where the orientation of the storm and location of landfall actually created long period swell waves that built up the beach. There were also moderate gains at site 103 in Higbee Beach State Park and site 201 in the Villas, which is located in the Delaware Bay. True dune failures occurred in Ocean City, where the greatest sand volume losses also occurred and overwhelm of waves transported sand landward of the beach.

## Cape May County 25 Year Report

### CAPE MAY COUNTY -- SUMMARY

Hurricane Irene was the first hurricane to cross the NJ coastline since 1903 (not counting Hurricane Gloria in 1985 that passed from west to east). A post-storm re-evaluation of the wind field showed that Irene's maximum sustained winds had just dropped below 75 MPH as she crossed the shoreline, making her a Tropical Storm at the point of coastal transit. While the storm impacts were less than everyone anticipated, evacuation efforts were instituted for all of Cape May County residents with 90% compliance. Beach damage was evident, but confined to the summer berm and dry beach and some dune toe loss, but no breaches or overwash occurred.

Hurricane Irene had some impact on Cape May County beaches, but not nearly as severe as the winter northeast storms of 2009 and 2010. A storm in November 2009 started a series of events leading to three Federal disaster declarations, and when two major NJ State and locally sponsored beach restoration projects became eligible for Category "G" disaster assistance funding. In fact the 2009 project in the City of North Wildwood was not quite finished when the November 2009 storm occurred. The other site was the Strathmere and Sea Isle City shoreline on Ludlam Island. Several blocks in the Borough of Avalon also qualified for damage relief for dune loss. FEMA funds are not allowed for any of the federally authorized shore protection projects, so Ocean City, most of Avalon and Stone Harbor, and Cape May City were not eligible for FEMA disaster relief funds.

The US Army Corps found funds from several Coastal Recovery sources to return to their projects in Ocean City, Avalon, Stone Harbor, and Cape May City to add sand between 2009 and 2012. The Corps also completed a reconstruction of the Avalon Townsend's Inlet seawall in the past 5 years. The State provided assistance for the Hereford Inlet seawall in the City of North Wildwood.

Many of the beach changes in the past 18 months were positive in Cape May County with the average profile sand volume change amounting to 15.37 yds<sup>3</sup>/ft. and a shoreline average change of a 34.5-foot advance seaward for the zero elevation position. These changes result from the placement of sand in Ocean City (ACOE maintenance), Upper Township & Sea Isle City (NJ State/local maintenance with FEMA reimbursement), Avalon (sand back-passing), Stone Harbor (ACOE emergency maintenance), North Wildwood (FEMA reimbursed restoration from Hurricane Irene damage as back-passing) and in Cape May City as emergency ACOE maintenance. This nearly county-wide work effort shows in the averages for the entire shoreline.

Beach nourishment derived from inlet shoals, truck-haul from quarries or offshore borrow sites has resulted in Cape May County having the most highly modified coastline along the New Jersey coast. There are five coastal projects involving Federal cooperation with the State of New Jersey and the local municipality. These are Ocean City (northern two thirds of the island), Avalon, Stone Harbor, Cape May City, and Cape May Meadows/Cape May Point. The balance of Peck's Beach (Ocean City) is a NJ State/local project. The State also concluded beach nourishments in the City of North Wildwood, the Township of Upper, and Sea Isle City in 2009. Reeds Beach on Delaware Bay was a State project creating beach restoration as a side benefit from a navigation improvement at Bidwell Creek. The Federal Cape May western shoreline project (29,000 feet Villas & Vicinity) is an ecological restoration project primarily to benefit migratory shorebirds and horseshoe crab egg-laying with a one-time beach restoration. This project continues to wait for sufficient funding.

Storm damages inflicted on the Cape May County shoreline between October 2009 and March of 2010 were addressed with restoration projects in North Wildwood, Avalon, Sea Isle City and Upper Township (Strathmere). Hurricane Irene impacts were remedied with two novel efforts at back-passing surplus sand from zones where accretion dominates the processes in the Borough of Avalon and the City of North Wildwood. Avalon acquired permits to move 63,000 cubic yards of sand from two segments of the island between 70th and 31st Streets with a substantial exclusion zone between two sites where permits allowed excavation. The exclusion zone was required by the US Fish & Wildlife service to preclude any impact on nesting or foraging by piping plovers, an endangered species both State and Federally. The City of North Wildwood cooperated with the Borough of Wildwood Crest (by agreement with the City of Wildwood) to excavate up to 96,000 cubic yards of sand from the berm along the Borough oceanfront and truck this surplus north through Wildwood and deposit it within a footprint where Hurricane Irene-generated erosion had produced that quantity of documented loss. Ninety-three thousand (93,000) cubic yards of sand were moved by mid-May 2012 and graded into a dune toe deposit and a wider recreational beach between 3rd and 7th Avenues. The North Wildwood project required permits from the Army Corps plus modifications to State permits held by the two municipalities allowing beach nourishment and surplus sand removal to the dunes. The permit modifications revolved around an alternative sand source and means of placement (trucks) in North Wildwood and an alternative disposal site in the case of Wildwood Crest (moving it to North Wildwood instead of into the dune system in Wildwood Crest).

Two new survey sites were established in Cape May County to improve the oceanfront coverage. They were placed in the Peck's Beach natural area, known as Corson's Inlet State Park to follow changes to the southern mile of the barrier island shore. (Site #'s 222 and 221 were located south of the fishing pier (#222) and closer to Corson's Inlet (#221)). These sites

have not been included in the long-term trend analysis since only two years of record exist thus far.

Other notable municipal projects include the efforts by the Borough of Avalon which completed a 650,000 cubic yard restoration of the beach between 10th and 28th Streets using Townsend's Inlet sand. Sand was pumped onto the Ocean City beaches in 2009. In early 2011 450,000 cubic yards of sand was distributed among the City of Cape May (120,000 cy), Cape May Meadows (165,000 cy), and 50,000 cy for two beach cells in the Borough of Cape May Point. This laundry list of projects makes this county the most varied and diverse in the State in terms of beach restoration and maintenance. Most of the sediment supply comes from four of the five tidal inlets in Cape May Co., with the offshore supplying Cape May City and Cape May Point.

The US Army Corps of Engineers returned to Cape May County twice during 2010 and provided maintenance beach sand on the shorelines of Cape May City (120,000 cu. yds.), Cape May Meadows (165,000 cu. yds.) and Cape May Point (55,000 cu yds.). Ocean City received 1.4 million cubic yards of additional sand by March 2010. The passage of a new Water Resources Development Act in 2007 included authorization for the continuation of existing projects and the implementation of two new ocean beach projects in Cape May County, but Congress did not appropriate the money to fund the work in FY 08, FY 09, or FY 10, which ended September 30, 2010. "Stimulus money" cannot be spent in FY 10 for beach restoration work without special Congressional budgetary "Add-ons" for such work. The ACOE has funding to continue monitoring of existing projects and to up-date studies (Limited Re-evaluation Report) of designs, costs and benefits for proposed projects. In 2011 the Corps added 625,000 cubic yards of sand to the Avalon and Stone Harbor project. As the chart below indicates, this effort since 1989 has produced a net gain of over 16.5 million cubic yards of sand along the Cape May County shoreline.

The success of using large-capacity, off-road trucks to haul sand from zones of documented surplus to more erosional sections of the coast has made this a new idea worthy of regional application. The mobilization for the job is less than a tenth of that for an ocean dredge and distribution pipeline. The sand hauling cost is equal to or less than the pumping rate from recent dredge projects (\$8.50/cubic yard). The borrow area impacts to the sea bed are eliminated. The issues appear to revolve around apprehension on the part of reviewers concerned with possible impacts to endangered species using the dry beach for nesting and the swash zone for foraging. The Borough of Avalon was required to repetitively sample the sand prior to and subsequent to the 2012 backpassing effort across the two borrow sites and the exclusion zone to see if any detriment came to the prey the endangered species feed on. The project received questions of concern from a small number of beachfront homeowners worried about impacts to the quality of the resulting beach and the impact of taking sand from in front



of their property would have on potential storm damage. Work was included in both the biological review and beach recovery surveys to address both of these issues for future use of this “sand recycling” methodology.

The 25-year assessment for Cape May County finds that the multiple episodes and variety of beach restoration projects has had a significant improvement on the quality, shore protection value and recreational use of the county beaches. The commercial boardwalk segment of Ocean City has undergone a major economic renaissance since 1992 with vast improvements to shore protection extending all the way to 56th Street. The profile site at 20th Street has seen the high tide line shifted from landward of the boardwalk in 1991 to over 600 feet seaward (450 feet to the toe of the dune vegetation) over the past 21 years.

The community of Strathmere was saved from serious structural loss in 2009 with the NJ State and local project and an extremely narrow and vulnerable shoreline section (Whale Beach) was reinforced with a much wider beach and dune system. Sea Isle City received sand from Corson’s Inlet in 2009 and as a restoration effort in 2011.

The Borough of Avalon continues a 25-year history of beach management employing multiple innovative concepts since the 1993 installation of a beach-saver reef system and inlet geo-textile submerged breakwaters. Cape May City is another example where the Federal project restored a shoreline to far greater economic stability and prosperity than existed in 1989. The Baltimore Avenue beach consisted of water at the seawall at low tide with no usable beach at all. Today there is a 350-foot wide beach and dune system the length of the City oceanfront. North Wildwood, with a 1,000-foot wide dry beach in 1994 found that erosion has many sources and forms, applied for and received NJ State assistance from the Shore Protection Act funds and restored approximately half the sand lost to the communities to the south and into Hereford Inlet. Very recent studies of Hereford Inlet indicate that significant changes to the main tidal channels cutting through the ebbtidal delta system could have profound impacts on the adjacent island shoreline associated with inlet processes. The traditional main ebb channel has competition from a new channel that exists between Stone Harbor’s South Point and a highly variable sand island locally called Champaign Island. If the new channel becomes dominant, the North Wildwood inlet shoreline and northern oceanfront beach will experience major sand accumulation in the next 18 months.

The Cape May Point 227 experimental reef project continued to have a positive impact on the shorelines of those cells where the concrete structures were placed between groins defining the two cells. Work for the Borough of Cape May Point has verified the sand retention properties of these structures in that type of installation. Sand has also migrated westward to

the two groin cells not involved in either breakwater installation or direct sand placement. This has been very beneficial for the Borough.

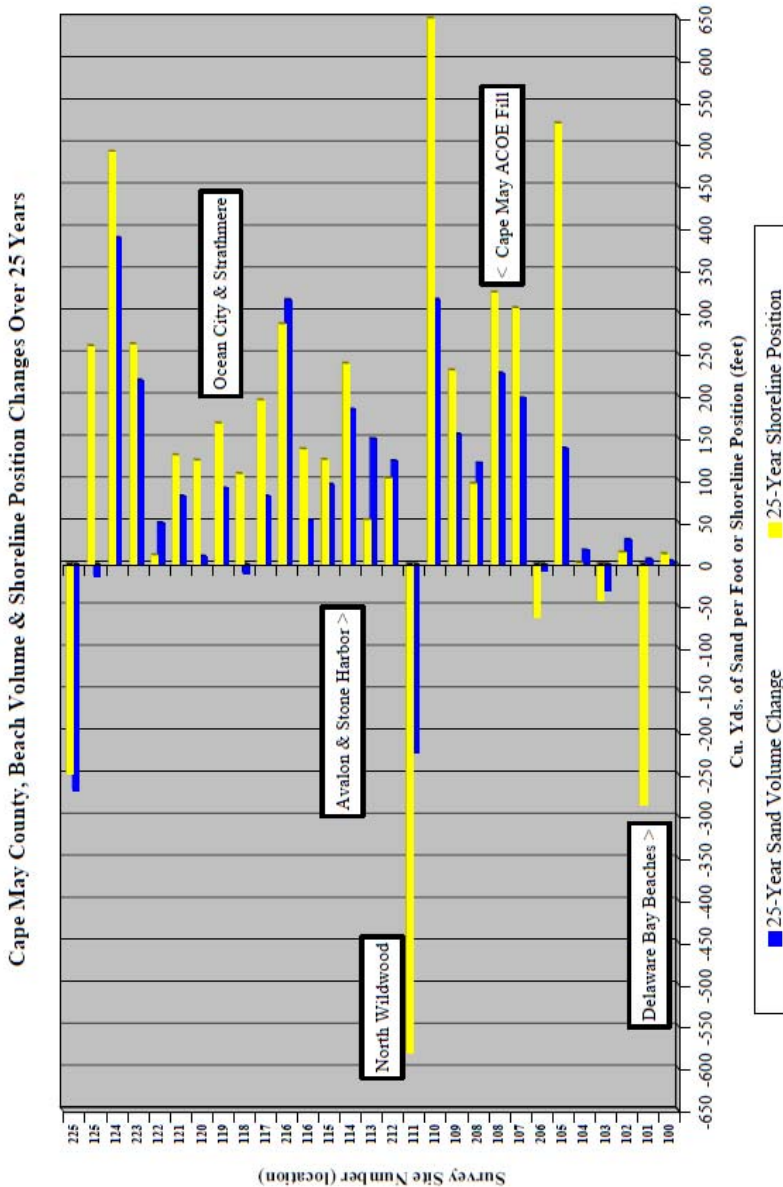


Figure 304.

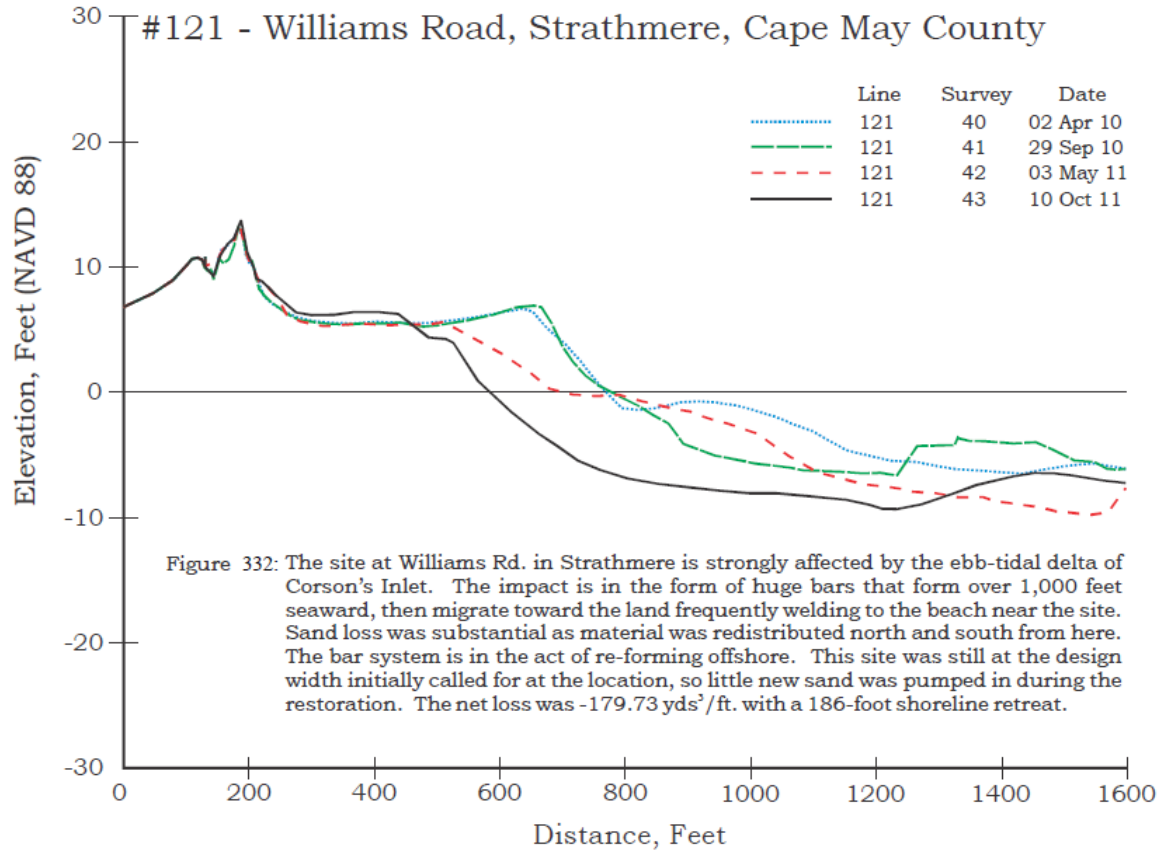
Summary of 25 years of beach research in Cape May County. The sites located on the north end of each barrier island have an erosional tendency (especially #111 in North Wildwood). Multiple beach nourishment projects have given Cape May County a strong positive change value in both sand volume and shoreline position. The 5 Delaware Bay cross sections have much smaller magnitude change rates.

Site 121, Williams Road, Strathmere, NJ – May 3, 2011



Figure 331. North view of the northern portions of the Strathmere beaches along the seaward dune slope.

## New Jersey Beach Profile Network





## WILLIAMS ROAD, STRATHMERE – SITE 121

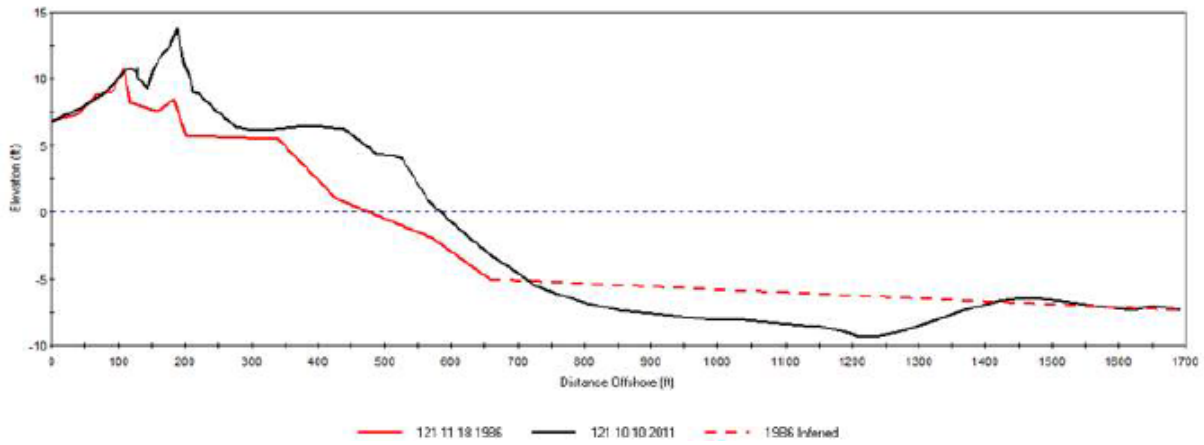


Figure 333: There have been three State/locally sponsored projects in Strathmere (1984, 2001, and 2009) that have enabled dune and beach growth for the 25 year period. Overall cumulative sand volume gains of 61.49 yds<sup>3</sup>/ft and a shoreline advance of 109 feet were recorded. Photo on left taken in 1988. View to the north. Photo on right taken October 10, 2011. View to the north.



25-Year Coastal Changes at Site 121, Williams Road, Strathmere, Cape May Co.

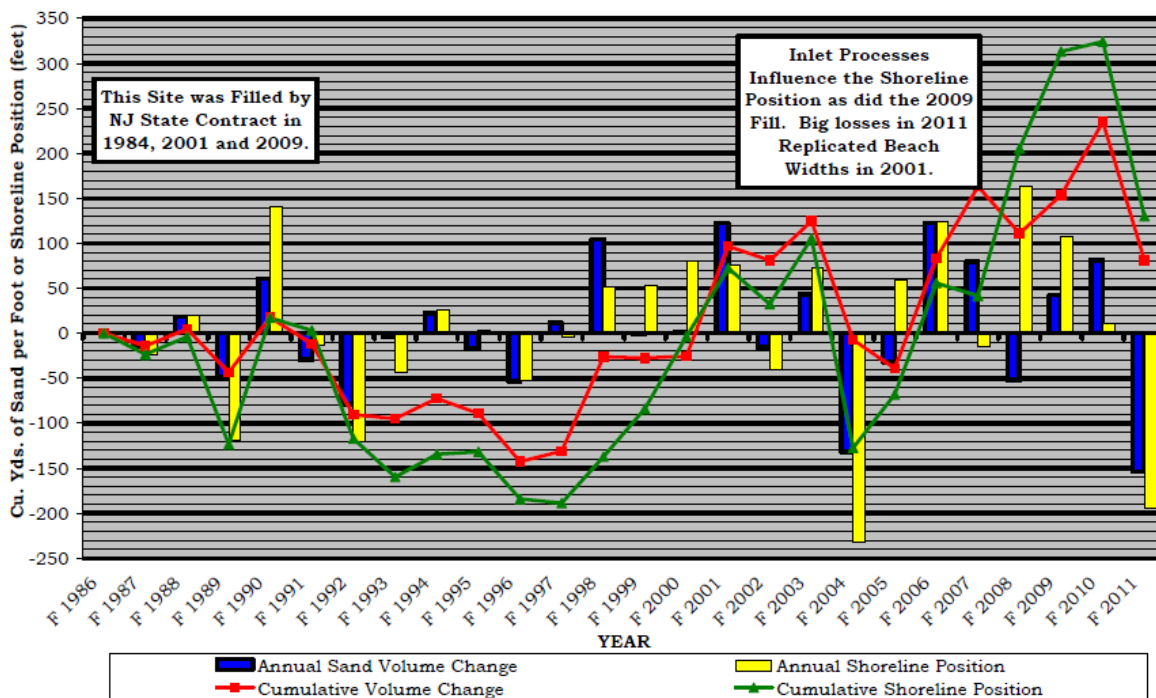


Figure 334. Very large magnitude changes occur at the northern shoreline of Ludlam Island. There have been three State/locally sponsored projects in Strathmere (1984, 2001, and 2009 plus repair in 2012). A shoreline position variation of 500 feet is due to enormous sand volumes within the Corson's Inlet ebb-tidal shoals which periodically migrate onto the beach. The spikes in 2001 and 2009 were fill related, but the loss in 2011 was due to sand transfer toward the inlet.

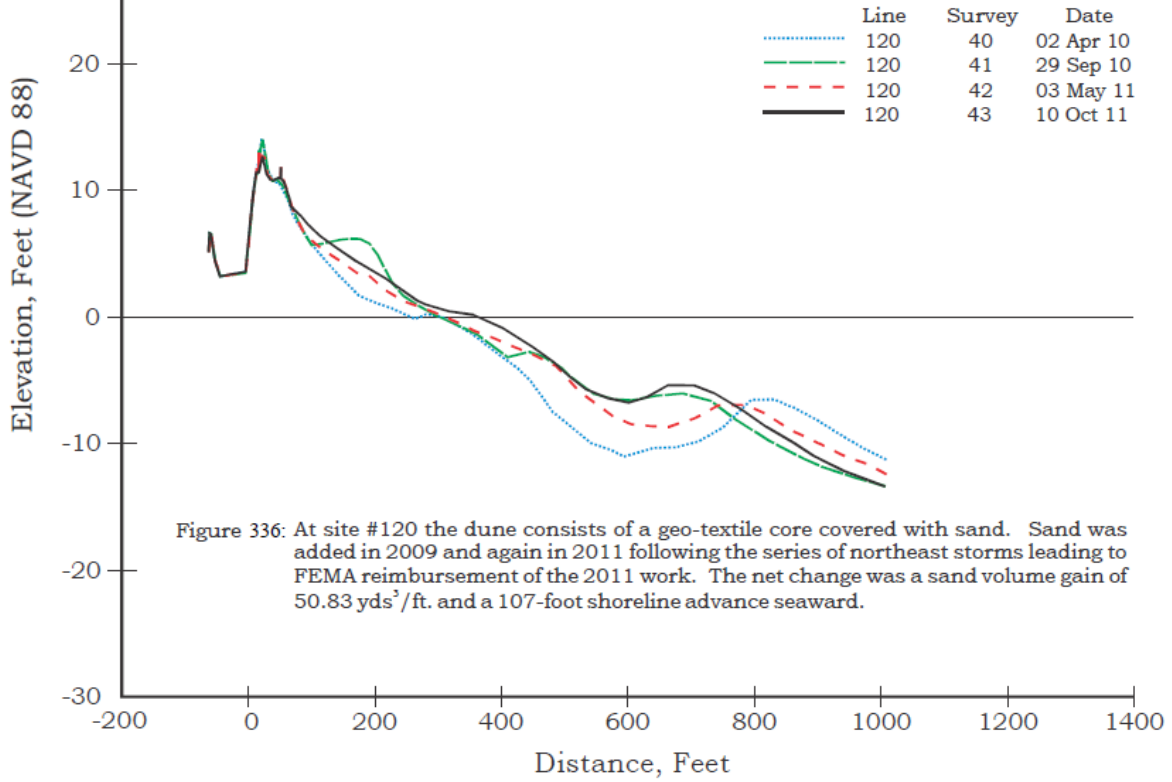
Site 120, 1<sup>st</sup> Street, Sea Isle City, NJ – May 3, 2011



Figure 335. View to the south along the dune crest along Sea Isle City beach.

# New Jersey Beach Profile Network

#120 - 1<sup>st</sup> Street, Sea Isle City, Cape May County





## 1<sup>st</sup> STREET, SEA ISLE CITY – SITE 120

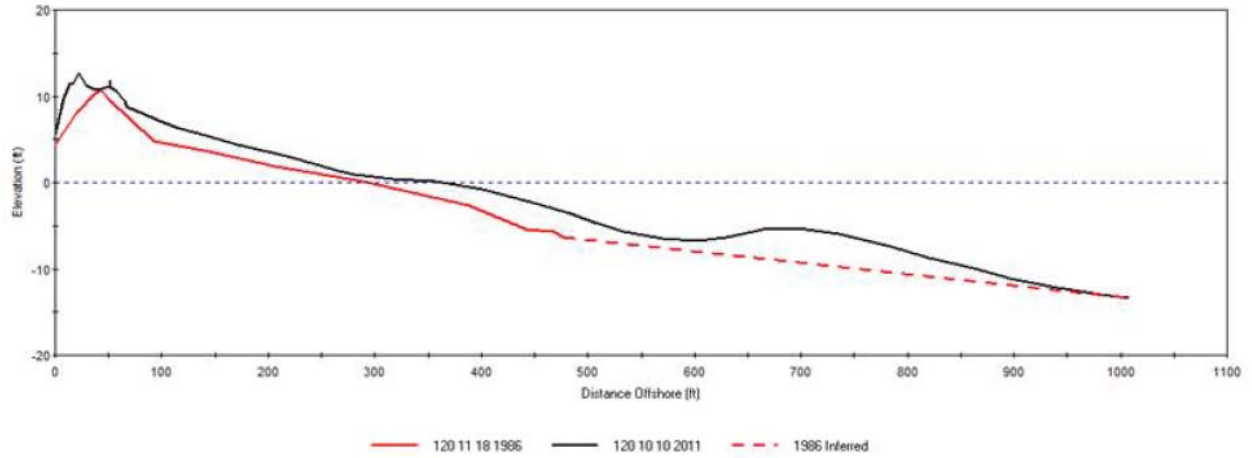


Figure 337: Historically, this site is known for its low elevation and narrow beach. The gradual decline in sand volume is evidence for a limited supply reflecting this low, narrow part of the barrier system. However, the 2009 replenishment sand has added 70 feet of shoreline as well as 32.95 yds<sup>3</sup>/ft of sand.

Photo on left taken October 4, 1991. View to the north.

Photo on right taken October 10, 2011. View to the north.



25-Year Coastal Changes at Site 120, 1<sup>st</sup> Street Sea Isle City, Cape May Co.

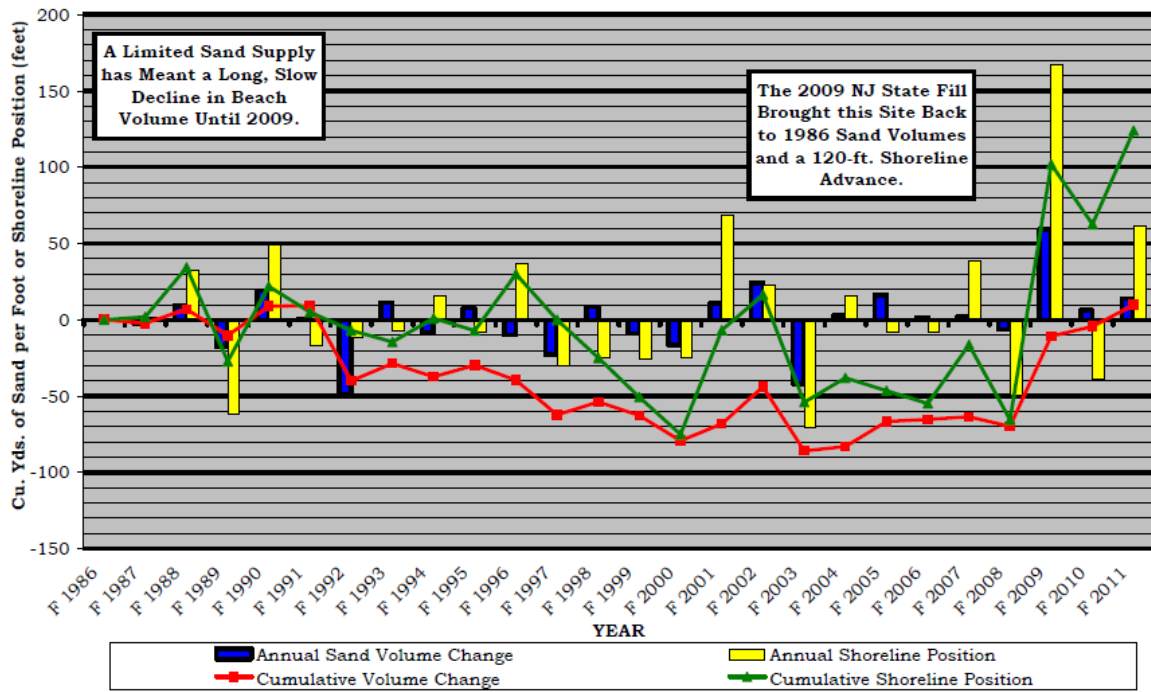


Figure 338. This site is located in the middle of Whale Beach, part of Ludlam Island known for its low elevation, narrow beach and minimal width. The gradual decline in sand volume is evidence for a limited supply reflecting this low, narrow part of the barrier system. The 2009 beach restoration plus the 2011 restoration of the storm losses in 2009 & 2010 have replaced the lost material seen following the 2008 survey.

### ***USGS Historical Shoreline Data***

For a longer look back at shoreline data for the Strathmere portion of Upper Township, the USGS has compiled a listing of the shoreline data for our area. You can access these different surveys at <http://marine.usgs.gov/dsasweb/#>

Zoom in on Strathmere and analyze the different shorelines. You can click on each for information about when that shoreline position was sampled. The earliest data appears to be for 1842. As you will see, the shoreline position has moved slowly over time, beginning roughly 500 feet further offshore than the present location. Over time, the shoreline has generally retreated further landward, reaching a minimum in 2000 at the southwest end of town and in 1977 in the northeast end of town. Replenishment projects have since helped to stabilize the shoreline.

Corson's Inlet appears to have migrated substantially over time. In 1842, the inlet was furthest southwest. If this position was to reestablish, several homes would be underwater. By 1852, the inlet had migrated over 2,000 feet to the northeast, an incredible shift in only a 10 year period. In 1885, it had reversed this trend again and nearly had returned to the 1842 position. The trend again reversed and the inlet migrated northeast to the point where in 1936 the south shore of the inlet was identical to the current northern shore. Yet again, the trend reversed to take the shoreline back to further southwest of the current shoreline until, predictably, the process reversed yet again after 1970. The 1977 shoreline mapping is closest to the current inlet location. However, Corson's Inlet has made it clear over the years that it is one of the most dynamic and unpredictable inlets in New Jersey and that dramatic shifts of shoreline can be expected.