National Park Service
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Natural Resource Stewardship and Science

Northeast Coastal and Barrier Network Coastal Topographic Change Monitoring

2010-2011 Annual Data Summary Report for Gateway National Recreation Area

Natural Resource Data Series NPS/NCBN/NRDS—2015/993



ON THE COVER
Severe erosion of beach, dune, and multi-use path, near comfort station, sand bags attempting to stabilize upper beach, Plumb Beach, Jamaica Bay Unit, Gateway National Recreation Area, May 21, 2010.
Photograph by Dr. Norbert P. Psuty.

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The Natural Resource Data Series is intended for the timely release of basic data sets and data summaries. Care has been taken to assure accuracy of raw data values, but a thorough analysis and interpretation of the data has not been completed. Consequently, the initial analyses of data in this report are provisional and subject to change.

All manuscripts in the series receive the appropriate level of peer review to ensure that the information is scientifically credible, technically accurate, appropriately written for the intended audience, and designed and published in a professional manner.

Data in this report were collected and analyzed using methods based on established, peer-reviewed protocols and were analyzed and interpreted within the guidelines of the protocols.

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Contents

Page

Contents iii
Figures v
Appendices ix
Executive Summary xi
Acknowledgments xiii
Introduction 1
Site and Situation 3
Timing of Dune/Beach Profile Surveys 5
Defining Water Level 7
Results of Monitoring Efforts 9
    Sandy Hook 10
    Breezy Point 20
    Plumb Beach 27
    Great Kills 30
    Miller Field 36
    Ft. Wadsworth 38
Spatial Association – an Example 41
Conclusions 43

Figures

Page

Figure 1. Location of coastal areas in Gateway NRA monitored with the dune/beach profile protocol.....3

Figure 2. Team installing PVC monument for 2D profile line 4

Figure 3. Collecting 2D dune/beach profile with geodetic GPS equipment. 4

Figure 4. Survey dates and tidal position in the park areas.....5

Figure 5. Water level variation and survey dates in the several parts of GATE during seasons. 6

Figure 6. Relationship of 1983-2001 tidal epoch water levels to the North American Vertical Datum of 1988, to the 1929 National Geodetic Vertical Datum, and to a representative beach profile at Sandy Hook 7

Figure 7. Location of 16 monuments and their accompanying azimuths (red lines) on Sandy Hook used in running the 2D beach/dune profiles.....10

Figure 8. Profiles SH1 and SH2, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys 11

Figure 9. Profiles SH3 and SH4, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys. 12

Figure 10. Profiles SH5 and SH6, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys. 13

Figure 11. Profiles SH7 and SH8, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys. 14

Figure 12. Profiles SH9.1 and SH9.2, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys. 15

Figure 13. Profiles SH10 and SH11, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys. 16

Figure 14. Profiles SH12 and SH13, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys. 17

Figure 15. Profiles SH14 and SH15, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys. 18

Figure 16. Profile SH16, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys. 19

Figure 17. Location of 11 monuments and their accompanying azimuths (red lines) on Breezy Point used in running the 2D beach/dune profiles.....20

Figures (continued)

Page

Figure 18. Profiles BP1 and BP2, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys. 21

Figure 19. Profiles BP3 and BP4, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys. 22

Figure 20. Profiles BP5 and BP6, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys. 23

Figure 21. Profiles BP7 and BP8, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys. 24

Figure 22. Profiles BP9 and BP10, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys. 25

Figure 23. Profile BP11, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys. 26

Figure 24. Location of five monuments and their accompanying azimuths (red lines) at Plumb Beach used in running the 2D beach/dune profiles. 27

Figure 25. Profiles PB1, PB2, and PB3, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys. 28

Figure 26. Profiles PB4 and PB5, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys. 29

Figure 27. Location of nine monuments and their accompanying azimuths at Great Kills used in running the 2D beach/dune profiles..... 30

Figure 28. Profiles GK1 and GK2, features are labeled, cross-sectional area is calculated for beach and dune for each of the two spring surveys..... 31

Figure 29. Profiles GK3 and GK4, features are labeled, cross-sectional area is calculated for beach and dune for each of the two spring surveys..... 32

Figure 30. Profiles GK5 and GK6, features are labeled, cross-sectional area is calculated for beach and dune for each of the two spring surveys..... 33

Figure 31. Profiles GK8 and GK9.1, features are labeled, cross-sectional area is calculated for beach and dune for each of the two spring surveys..... 34

Figure 32. Profile GK9.2, features are labeled, cross-sectional area is calculated for beach and dune for each of the two spring surveys. 35

Figure 33. Location of two monuments and their accompanying azimuths (red lines) at Miller Field used in running the 2D beach/dune profiles. 36

Figure 34. Profiles MF1 and MF2, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys. 37

Figures (continued)

Page

Figure 35. Location of 3 monuments and their accompanying azimuths (red lines) at Fort Wadsworth used in running the 2D beach/dune profiles. 38

Figure 36. Profiles FW1 and FW2, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys. 39

Figure 37. Profile FW3, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys. 40

Figure 38. Alongshore dimensions of selected topographical variables at Sandy Hook, incorporating dune/beach profile sites along the ocean side, inlet, and bay side situations. 42

Appendices

Page

Appendix A: Dimensions of Distance and Area, GATE Profiles 47

Appendix B: Dimensions of Change, GATE Profiles 51

Executive Summary

This is the first Annual Report on dune/beach profile changes in Gateway National Recreation Area. It establishes the distribution of profile locations and first series of profiles. Although too early to identify trends of change, the data do provide the first series of dimensions of linear distances of profile features and cross-sectional areas of beach and dune features on the profiles. Synthesis Appendices list the dimensions of each of the seasonal surveys and the differences among the seasonal surveys. Detailed analyses will await the Trend Report

Acknowledgments

Installation of the monuments and collection of the profile data involved a team effort that spanned the contributions of Tanya Silveira, William Hudacek, Michael Towle, Jake McDermott, Dan Soda, Peter Shipton, and Peter Dennehy from the Rutgers University group at Sandy Hook; Mark Christiano, Tony Luscombe, and Bruce Lane from Gateway National Recreation Area; and Joe Petrocelli, and Keith Noonan from the State of New Jersey group at SandyHook. Their cooperation and assistance over an extended period was of great value in bringing the many pieces of this project together to produce this report.

Introduction

The National Park Service is committed to creating and maintaining a data base on coastal changes within the parks in the Northeast Coastal and Barrier Network (Stevens, et al. 2005). As described in the document on 'vital signs' (Allen 2000), information on shoreline change and on coastal topographical change (dune/beach profiles) are among the most important and most beneficial data sets to support basic knowledge of the vectors of evolution at the coast and are fundamental to the establishment of resource management decisions in the coastal parks. And, as established in the foundation document on monitoring coastal morphological changes in Psuty et al. (2010b), there are specific protocols to be followed in tracking shoreline position as well as dune/beach profiles in the coastal parks.

This is the first Annual Report on the changes to dune/beach profiles in the coastal units in Gateway National Recreation Area. The collection of the profiles and their representation in this report follows the protocol on two-dimensional changes established in Psuty, et al. (2012). They were applied throughout Gateway in a consistent manner starting in the spring of 2010, followed by surveys in the fall of 2010 and the spring of 2011. The temporal span of the three surveys from Spring 2010 to Spring 2011 forms the basis of this annual report.

The goal of the annual report is to document the collection of profile data and to describe the short-term variation that has occurred. The changes in the profile configuration are generally descriptive of the seasonal contrasts (lower energetics in the summer period versus higher energetics in the winter period) that support accumulation during summer and erosion during the winter. However, there are many other variables that affect the gains and losses of sediment and the changes to the profiles. Therefore, the short-term annual report is but the first step in the understanding of the conditions that characterize the coastal components of the Gateway units and is meant to establish a baseline of information for subsequent characterizations and analyses. Discussions and analyses of vectors of profile change and likely associations will be the theme of the longer-term (5 years) Trend Reports.

Site and Situation

The portion of Gateway National Recreation Area (GATE) covered in this report is composed of two coastal areas exposed to the ocean processes (Sandy Hook and Breezy Point), and four other areas shielded to various degrees from the direct exposure to ocean conditions (Great Kills, Miller Field, Fort Wadsworth, and Plumb Beach) (Fig. 1). They each respond to the relative intensity of the energetics associated with their position and to the sediment supply reaching their position, as described in Psuty et al. (2010a). Within each of the areas, a series of monuments are installed (Fig. 2) that establish control points from which the survey lines are run. The profiles are surveyed with geodetic quality GPS equipment along predetermined azimuths from the monument (Fig. 3) and repeated at seasonal intervals.

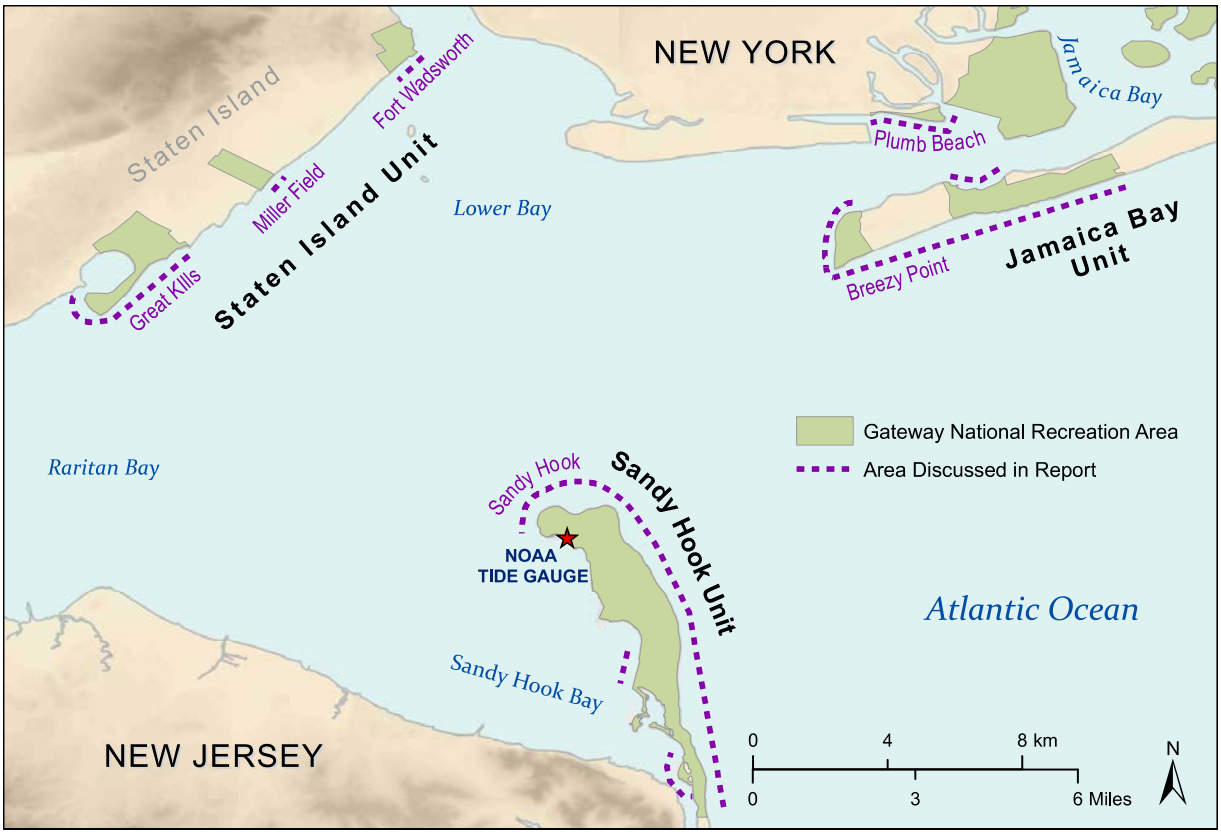


Figure 1. Location of coastal areas in Gateway NRA monitored with the dune/beach profile protocol.



Figure 2. Team installing PVC monument for 2D profile line. PVC (1.5 m length) at far left, coring at location of monument at right. Geodetic GPS unit for position determination in back.



Figure 3. Collecting 2D dune/beach profile with geodetic GPS equipment.

Timing of Dune/Beach Profile Surveys

The surveys are conducted during spring tide conditions to expose as much of the beach profile as possible and to facilitate the collection of the profile to at least the NAVD88 datum position (near mean sea level). On the basis of the protocol, the surveys occur at the end of the winter stormy period and at the end of the summer calm period, recording the seasonal variation of the dune/beach geomorphological system. As depicted in Figures 4 and 5, the surveys in the several units of GATE conform fairly well to the intended contrast of storminess. The first of the surveys was after a series of winter storms and was succeeded by a relatively stormless summer period, leading to the fall survey. Following the fall surveys, a succession of storms ensued until just about the spring 2011 surveys. Thus, the seasonal contrasts in storminess are consistent with the objectives of monitoring the changes in the dune/beach profiles associated with contrasts in energetics at the shoreline.

Season / Park	Date of survey	Low Tide	
		Height* (m)	Time
Spring 2010			
Sandy Hook	22 Apr 2010	0.255	08:00 AM
Great Kills	28 Apr 2010	-0.127	01:42 PM
Miller Field	27 Apr 2010	0.301	12:48 PM
Fort Wadsworth	27 Apr 2010	0.301	12:48 PM
Plumb Beach	28 May 2010	0.155	01:42 PM
Breezy Point	23 Apr 2010	0.097	09:12 AM
Fall 2010			
Sandy Hook	7 Oct 2010	-0.163	01:18 PM
Great Kills	25 Oct 2010	0.160	03:12 PM
Miller Field	25 Oct 2010	0.160	03:12 PM
Fort Wadsworth	25 Oct 2010	0.160	03:12 PM
Plumb Beach	8 Nov 2010	-0.213	03:00 PM
Breezy Point	22 Nov 2010	0.123	02:06 PM
Spring 2011			
Sandy Hook	29 Apr 2011	0.283	11:12 AM
Great Kills	21 Apr 2011	-0.030	04:18 PM
Miller Field	21 Apr 2011	-0.030	04:18 PM
Fort Wadsworth	21 Apr 2011	-0.030	04:18 PM
Plumb Beach	28 Apr 2011	0.382	10:24 AM
Breezy Point	26 May 2011	0.362	08:42 AM

* Tide elevation values are referenced to Mean Lower Low Water (MLLW)

Figure 4. Survey dates and tidal position in the park areas.

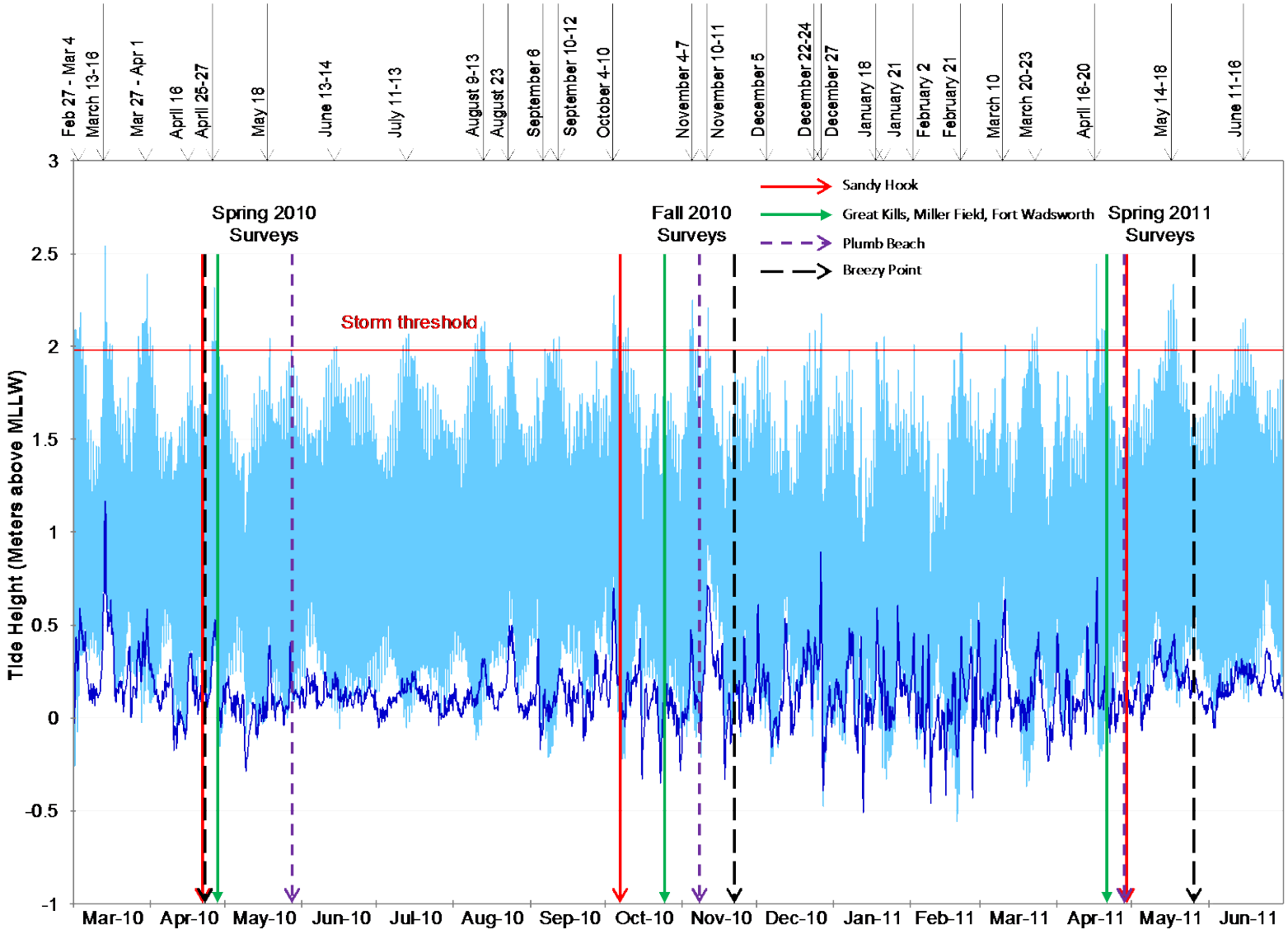


Figure 5. Water level variation and survey dates in the several parts of GATE during seasons. Dark blue line is a measure of surge (difference of actual water level compared to predicted). Water level data are derived from tne Sandy Hook tide gauge (web site).

Defining Water Level

In 2003, the National Ocean Service (NOS) changed the basis for referencing water levels at the tidal gauges by switching to the 1983-2001 tidal epoch. This 19-year period incorporates all of the water level variations caused by the cyclic planetary attraction of the earth, moon, and sun and establishes a new reference base for such measures as Mean Sea Level, Mean Low Water, Mean Higher High Water, etc. All of the predicted measures of water level are now related to this tidal epoch and all of the predicted elevations will be related to the Mean Lower Low Water derived from this period. All of the water level elevations in Figure 6 are depicted relative to MLLW as the 0.0 datum relative to the 1983-2001 tidal epoch. However, the absolute elevation of MLLW has changed because the world's oceans are rising and encroaching on the adjacent shores. The absolute elevations of the stationary features, such as the tide gauges, the roads, the Park infrastructure, etc. are affected by this global sea-level rise.

The dune/beach profiles are surveyed and recorded relative to a fixed datum, the North American Vertical Datum of 1988 (NAVD88). At the present time, NAVD88 and mean sea level are at similar elevations and the dune/beach topography has a similar relationship to these two elevations. However, as sea level rises through time, the topography will adjust and variation will increase. Referencing a constant elevation and position with a fixed monument will permit the monitoring of spatial and elevational evolution as the profile responds to changes in sediment supply and increased water level.

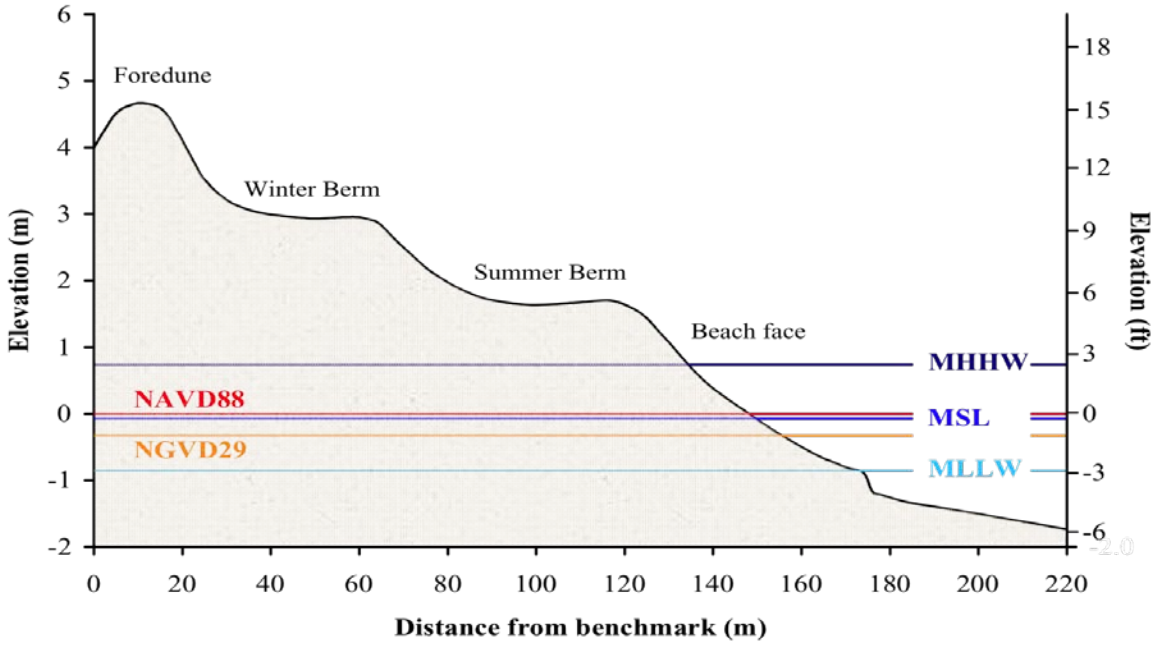


Figure 6. Relationship of 1983-2001 tidal epoch water levels to the North American Vertical Datum of 1988, to the 1929 National Geodetic Vertical Datum, and to a representative beach profile at Sandy Hook. All values are portrayed relative to NAVD88. Other terms are: MLLW = mean lower low water; NGVD29 = National Geodetic Vertical Datum of 1929; MSL = mean sea level; and MHHW = mean higher high water.

A comparison of the mean water elevation measured in the new tidal epoch and the mean water elevation in the previous tidal epoch indicates that the Sandy Hook tide gauge has undergone a relative sea-level rise of 7.92 cm (0.26 ft) in the interim. This relative sea-level rise includes the depression of the land as well as the increase of the water in the ocean. Together, these values constitute the relative increase of the water surface at the coast.

The tide gauge data shown in Figure 6 are themselves unaffected by the change in tidal epoch. They are portraying the water level elevations relative to the mean lower low water condition, and that is a statistical datum for the 19-year time span. But, the mean lower low water elevation (MLLW) has changed compared to a stationary level, such as NGVD29 as well as NAVD88. The increase in sea level is causing a slow but continuous change in the position of the beach profile as it elevates and shifts inland to maintain its topographical features that are, in turn, related to water level. Additionally, all of the permanent facilities in the coastal portions of GATE are increasingly exposed to storm surge and flooding because of the higher water surface upon which storms are developing.

Results of Monitoring Efforts

The short-term changes depicted in one year of monitoring are not indicative of the trends of the changes, but they do depict the type of information that is derived from the surveys. The intent herein is to portray the elements of the dune/beach profiles and to present some of the numerical data that can be derived. This presentation is a simple catalog of the dimensional changes described as possible outcomes in the Protocol document (Psuty et al. 2012). It is not meant to be all inclusive. Further, only some of the spatial results are presented, as examples, because of the limitations of one year of data. Each component of the GATE topographical monitoring effort is presented to depict its situation and the seasonal changes at each of the sites. Dimensions of change are incorporated on each of the Profile figures and in summary tables in Appendix A and Appendix B.

Sandy Hook

Sixteen monuments have been established along the ocean and bay shoreline of Sandy Hook (Fig. 7). They may be tied to some pre-existing item, such as a concrete pad, or they may be tied to a newly-installed PVC pipe filled with concrete. The location, description, coordinates of the Sandy Hook monuments are detailed in a booklet prepared for this purpose (Psuty, et al., 2010g).

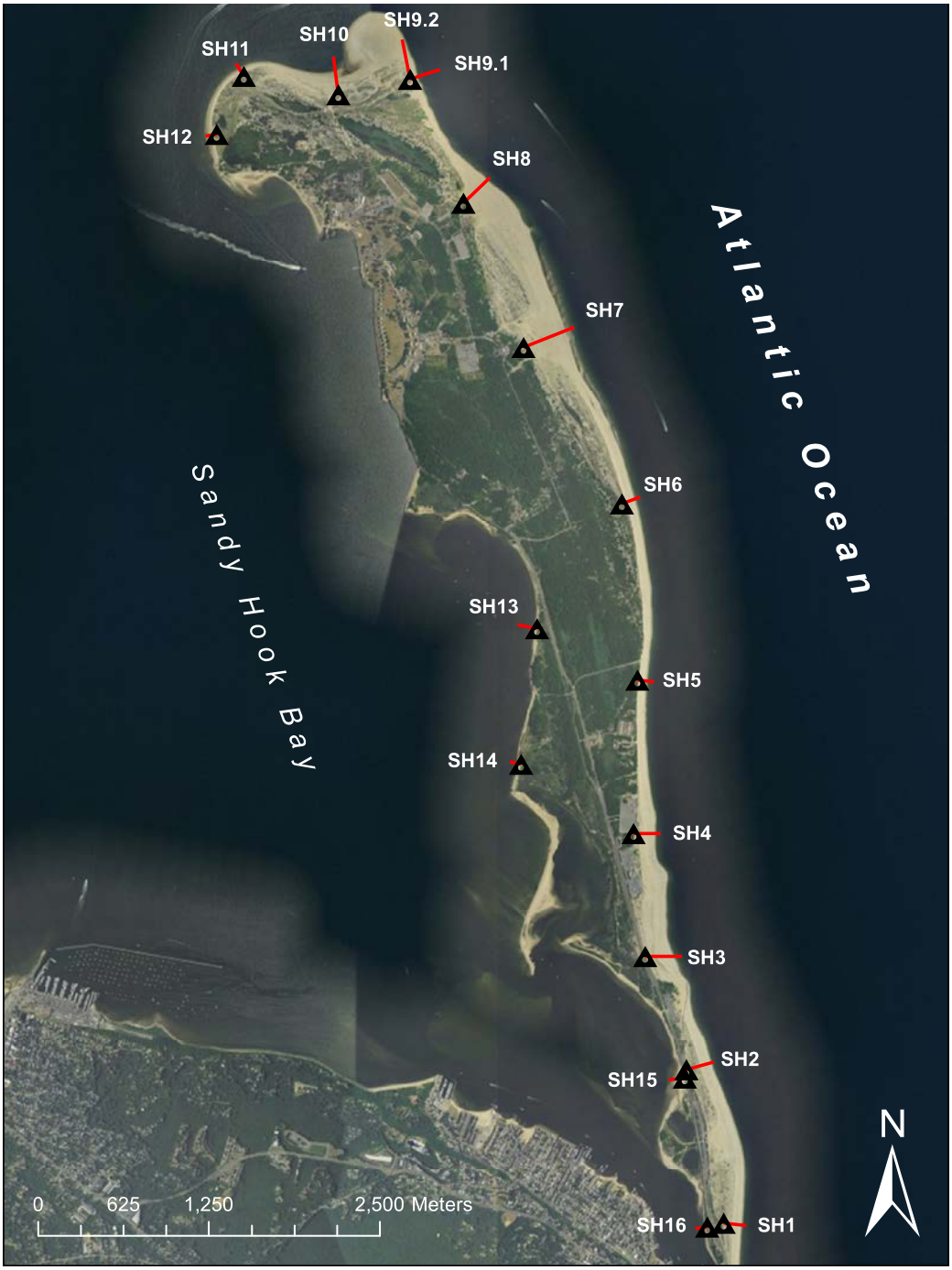


Figure 7. Location of 16 monuments and their accompanying azimuths (red lines) on Sandy Hook used in running the 2D beach/dune profiles.

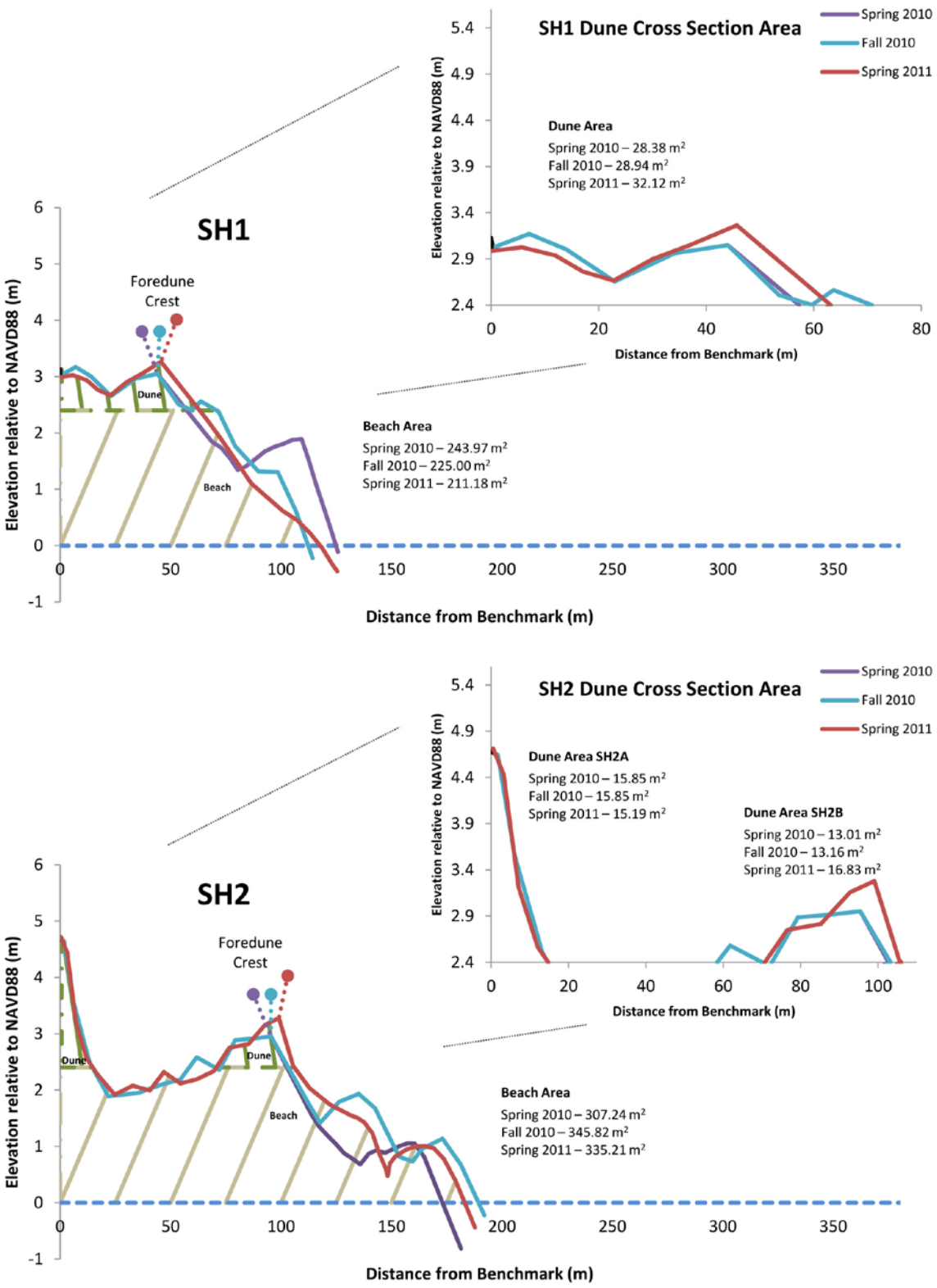


Figure 8. Profiles SH1 and SH2, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys. In addition, an inland portion of the SH2 profile near the monument is labeled fill (above the upper level of the beach) and a cross-section area is calculated.

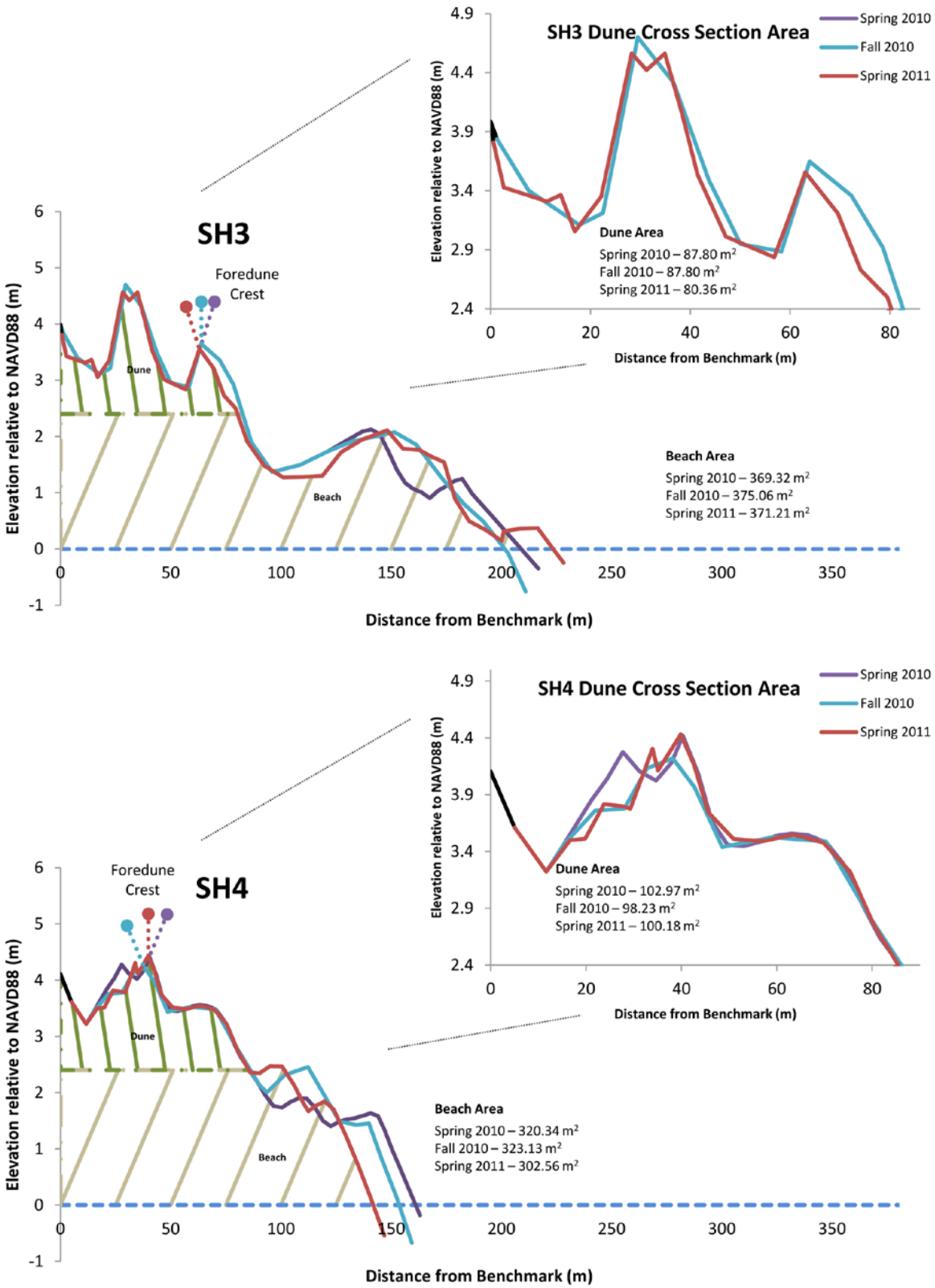


Figure 9. Profiles SH3 and SH4, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys.

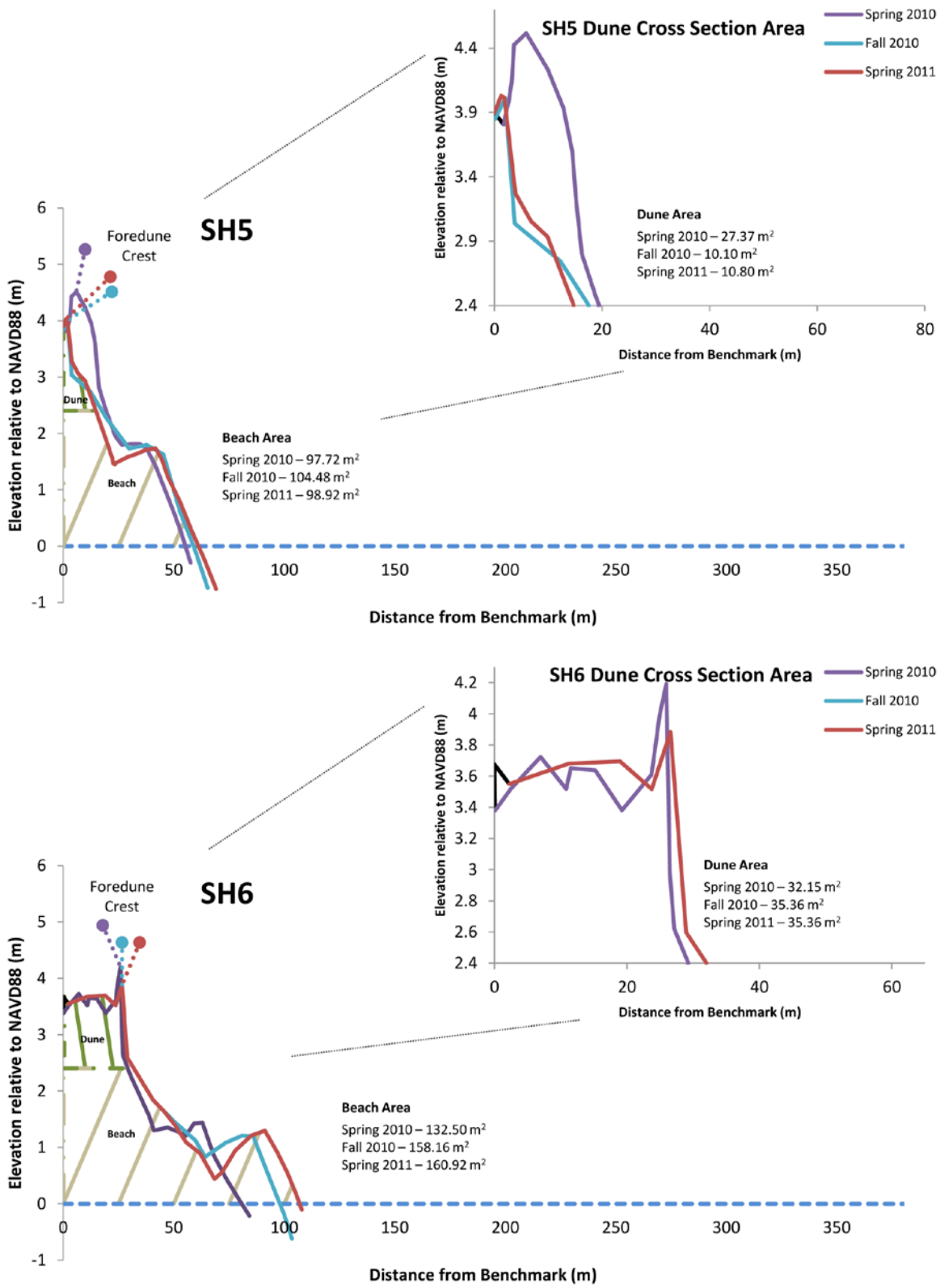


Figure 10. Profiles SH5 and SH6, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys.

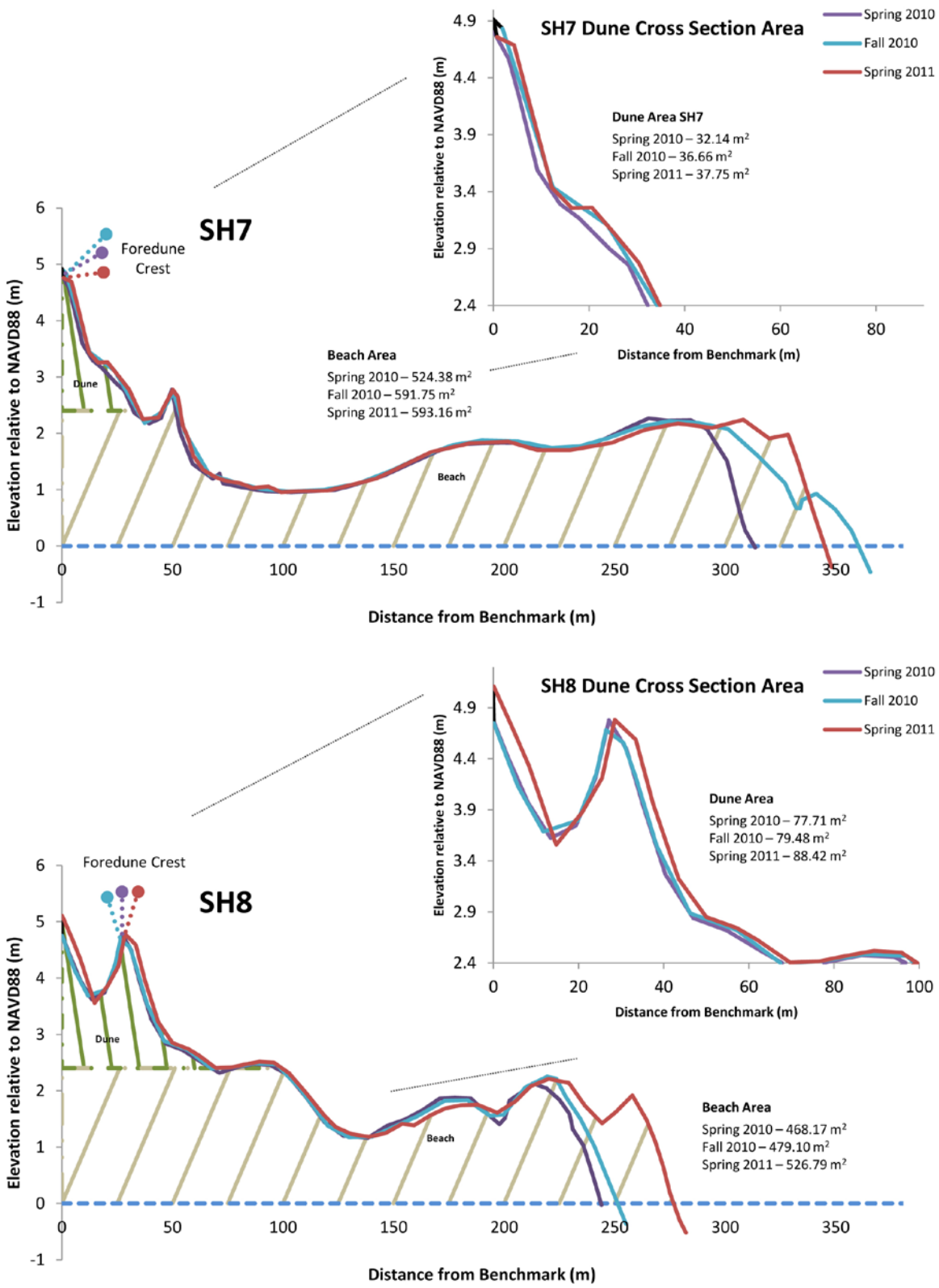


Figure 11. Profiles SH7 and SH8, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys.

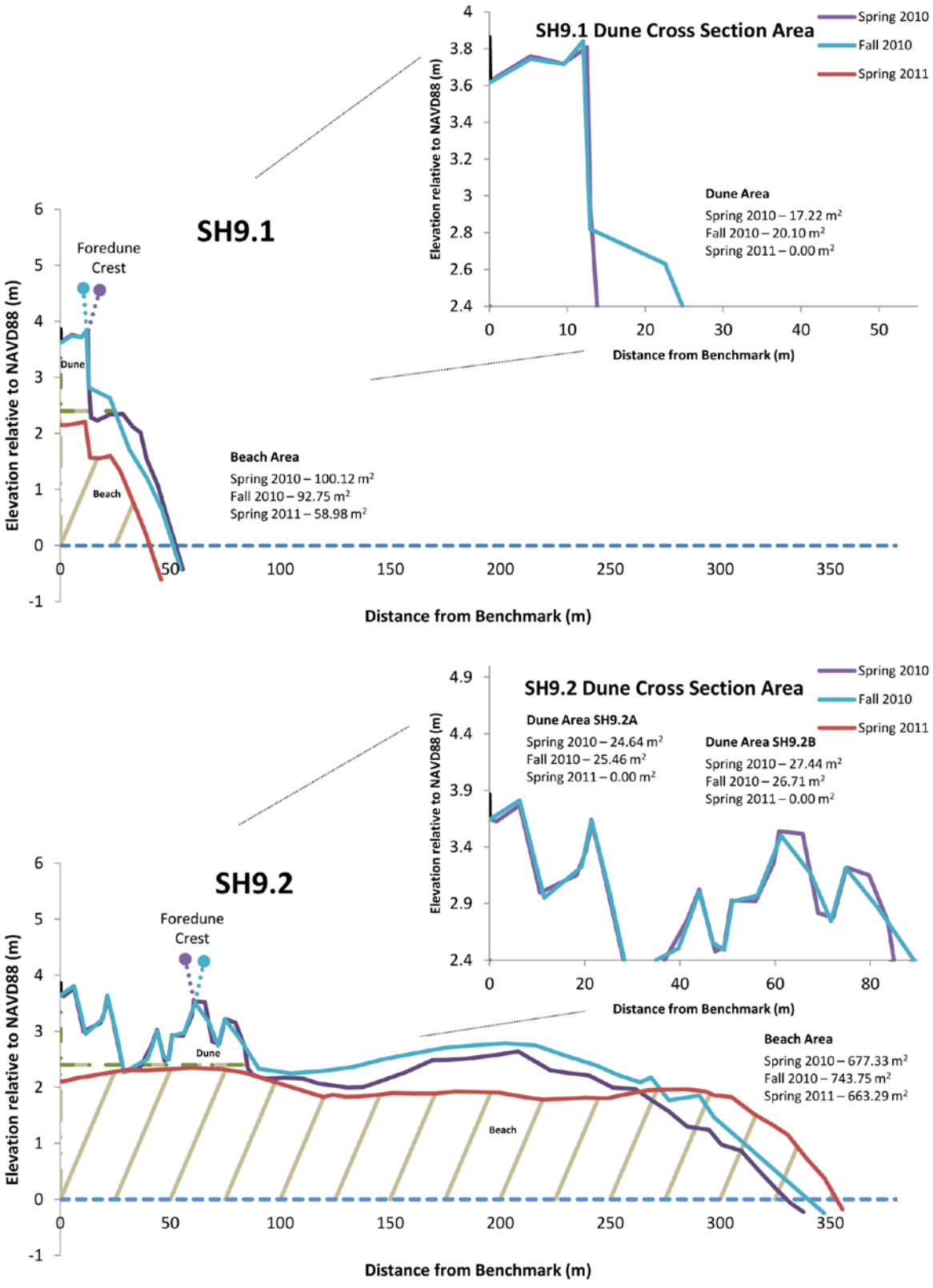


Figure 12. Profiles SH9.1 and SH9.2, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys.

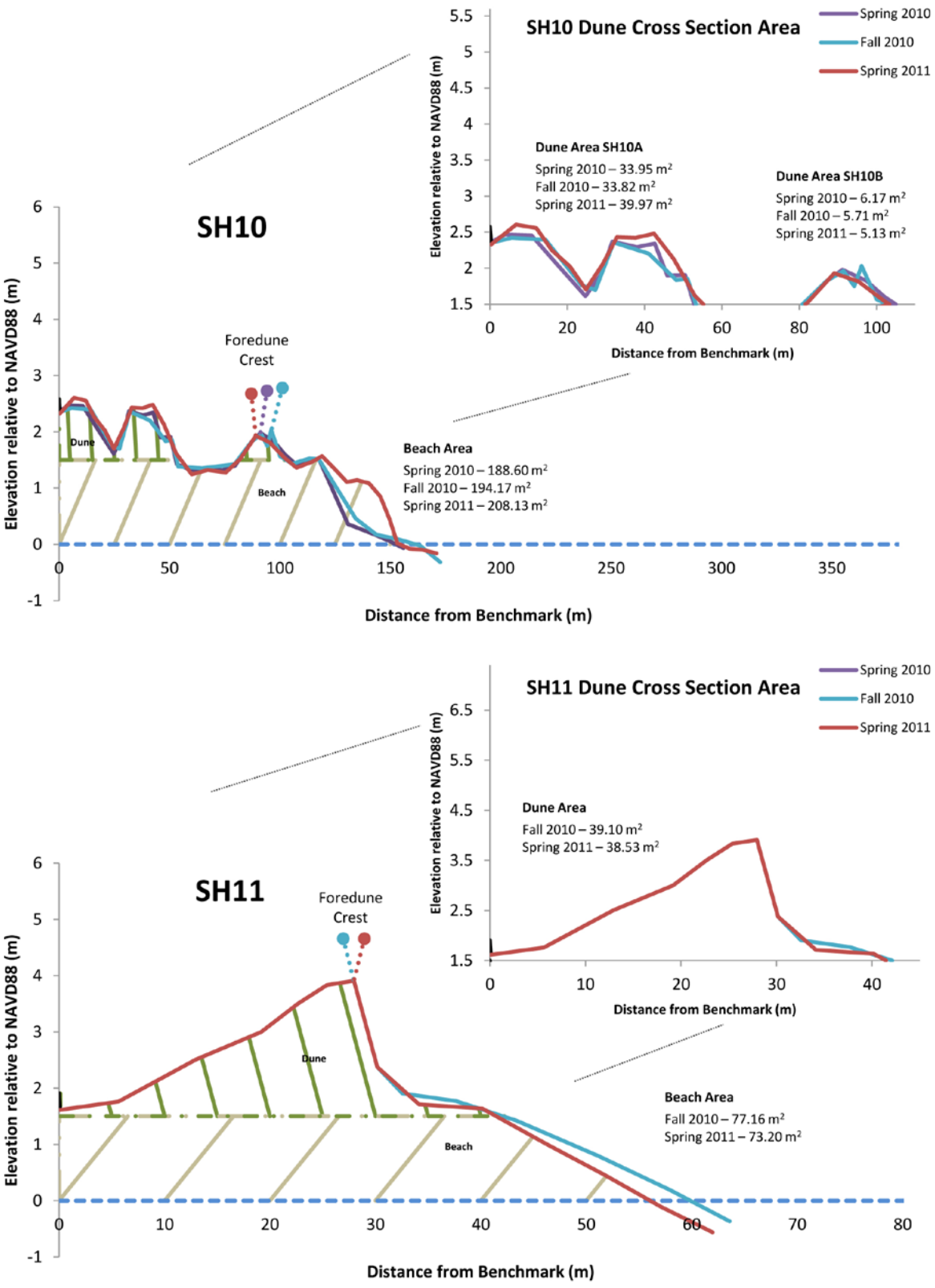


Figure 13. Profiles SH10 and SH11, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys.

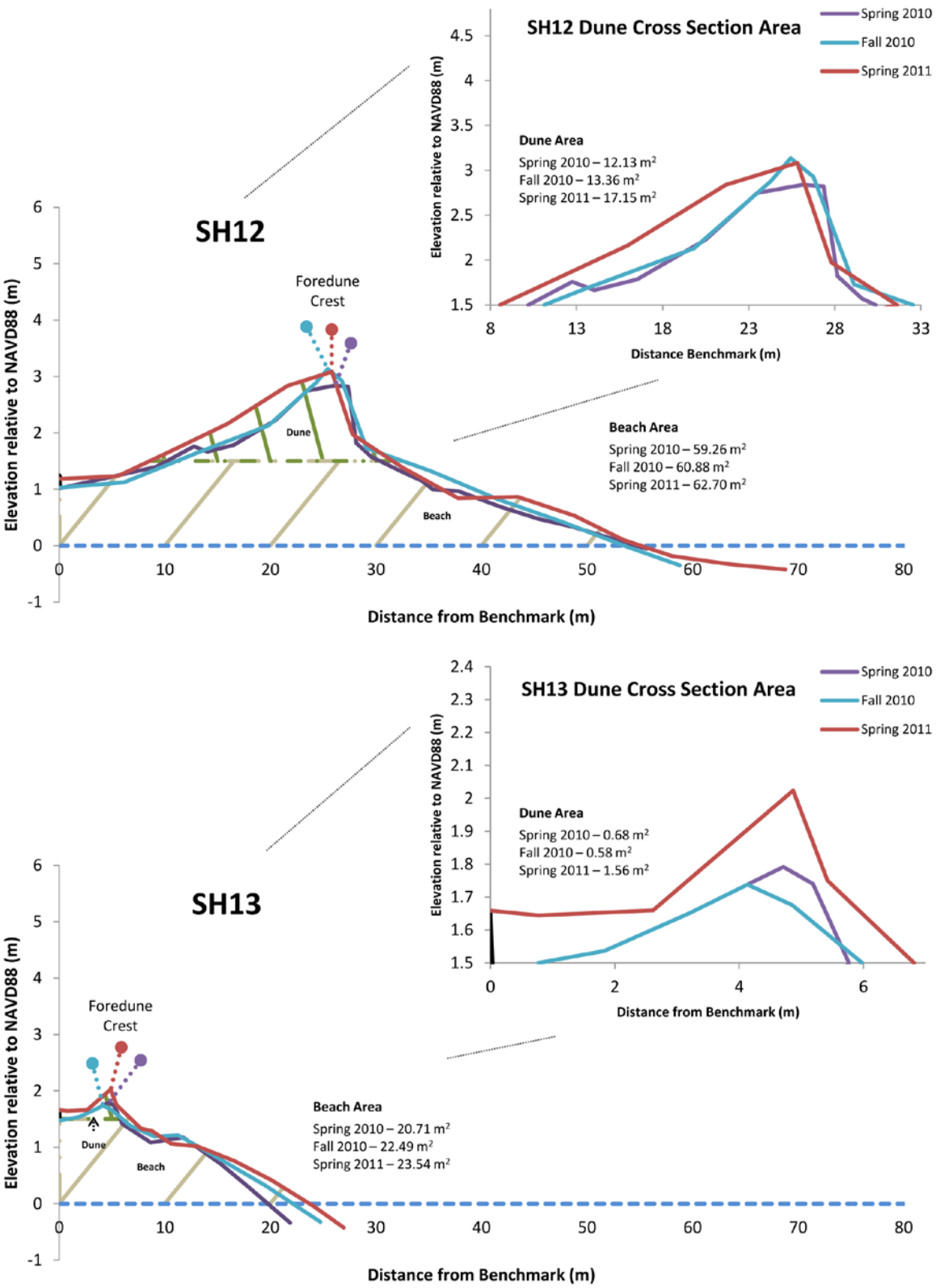


Figure 14. Profiles SH12 and SH13, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys.

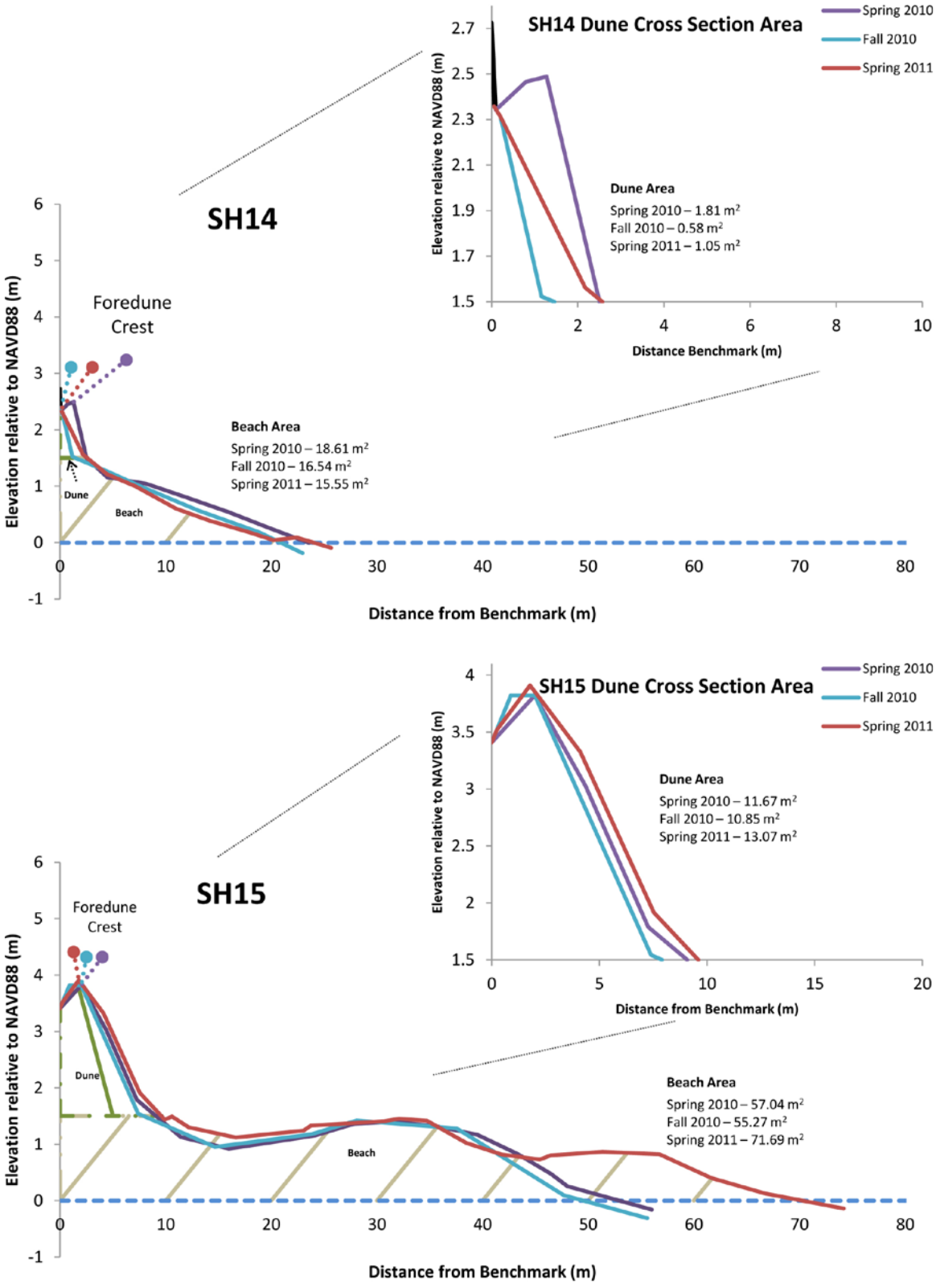


Figure 15. Profiles SH14 and SH15, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys.

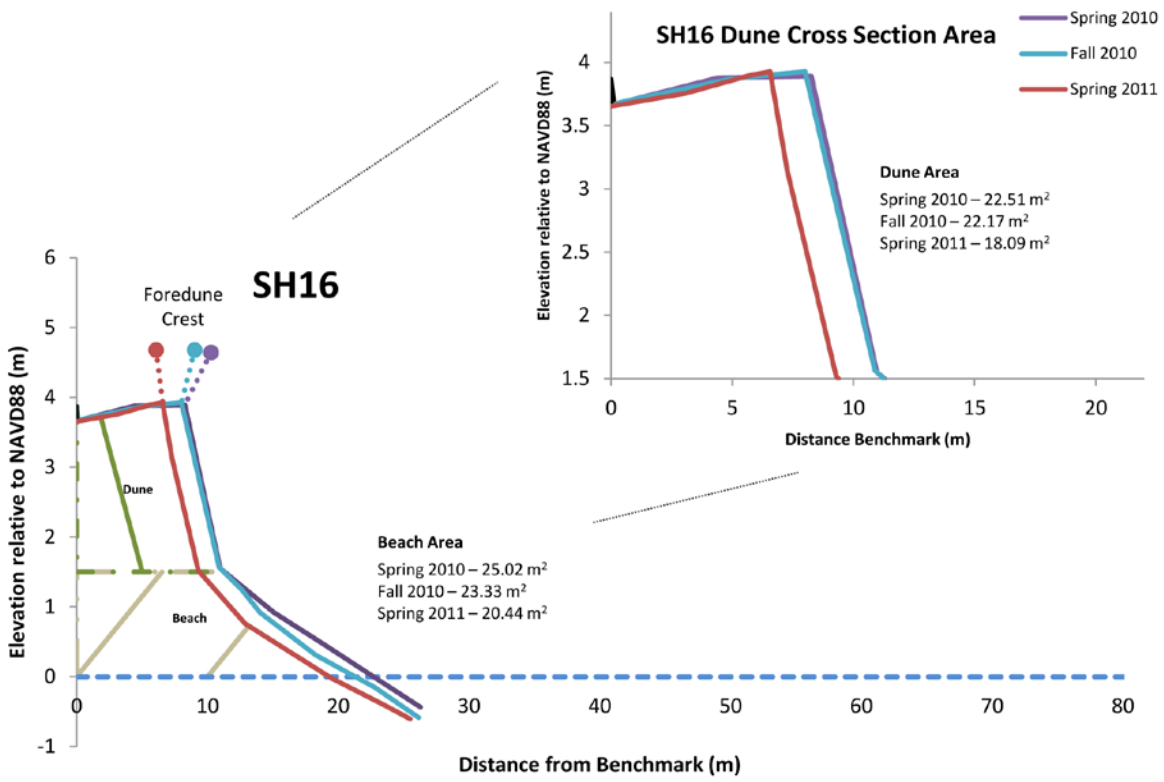


Figure 16. Profile SH16, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys.

Breezy Point

Eleven monuments have been established along the ocean and bay shoreline of Breezy Point (Fig. 17). They may be tied to some pre-existing item, such as a concrete pad, or they may be tied to a newly-installed PVC pipe filled with concrete. The location, description, coordinates of the Breezy Point monuments are detailed in a booklet prepared for this purpose (Psuty, et al., 2010c).



Figure 17. Location of 11 monuments and their accompanying azimuths (red lines) on Breezy Point used in running the 2D beach/dune profiles.

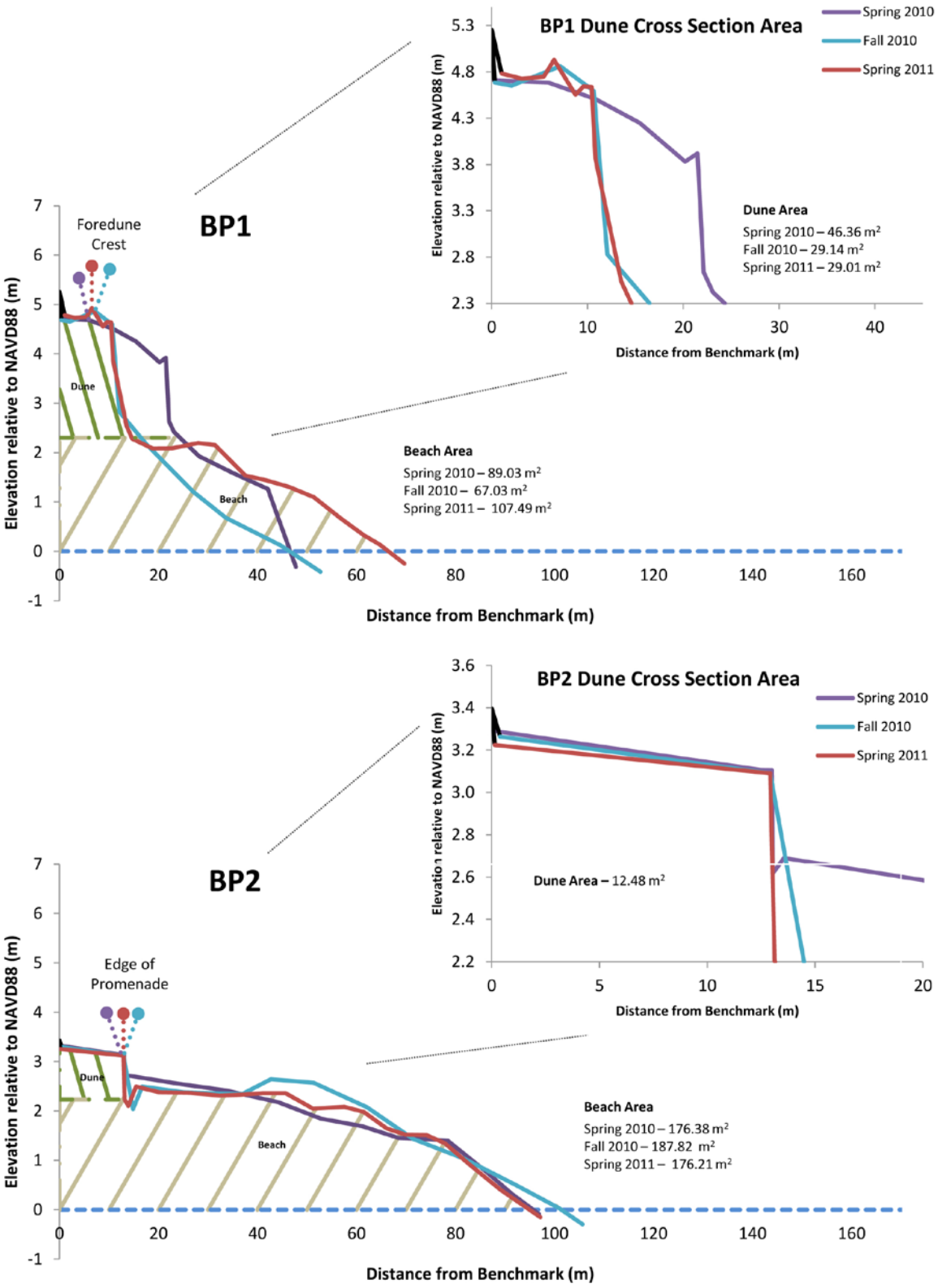


Figure 18. Profiles BP1 and BP2, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys.

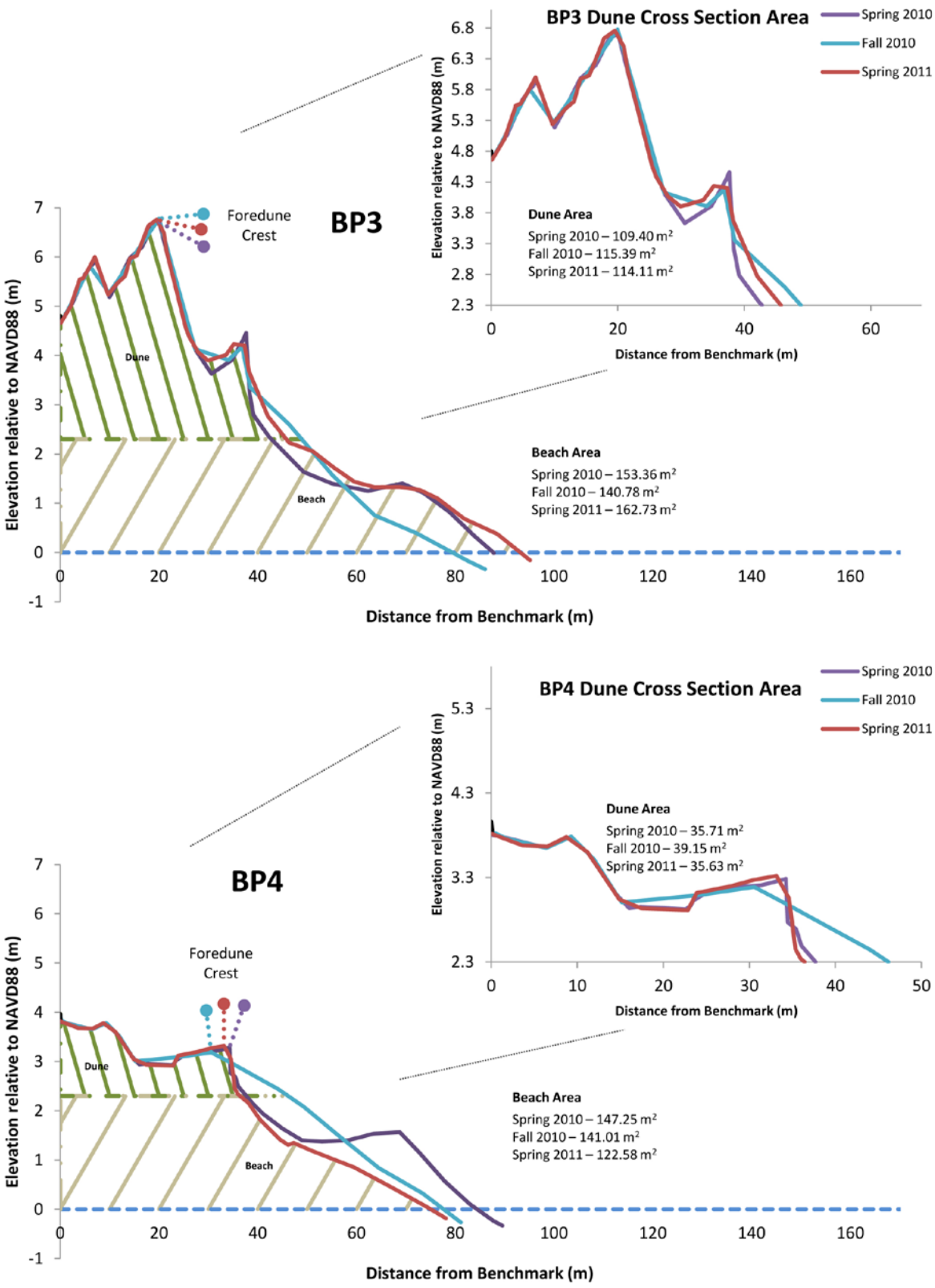


Figure 19. Profiles BP3 and BP4, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys.

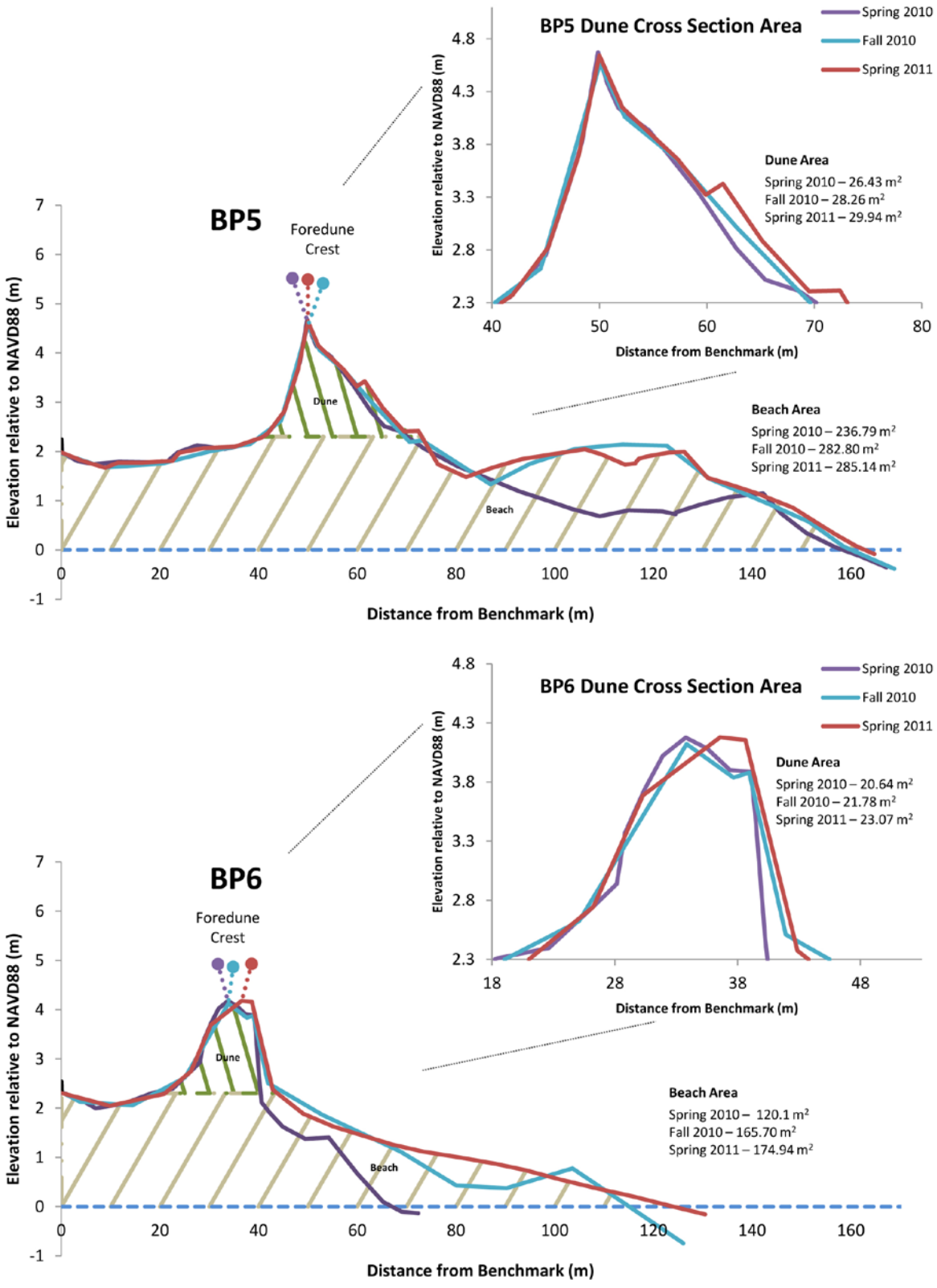


Figure 20. Profiles BP5 and BP6, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys.

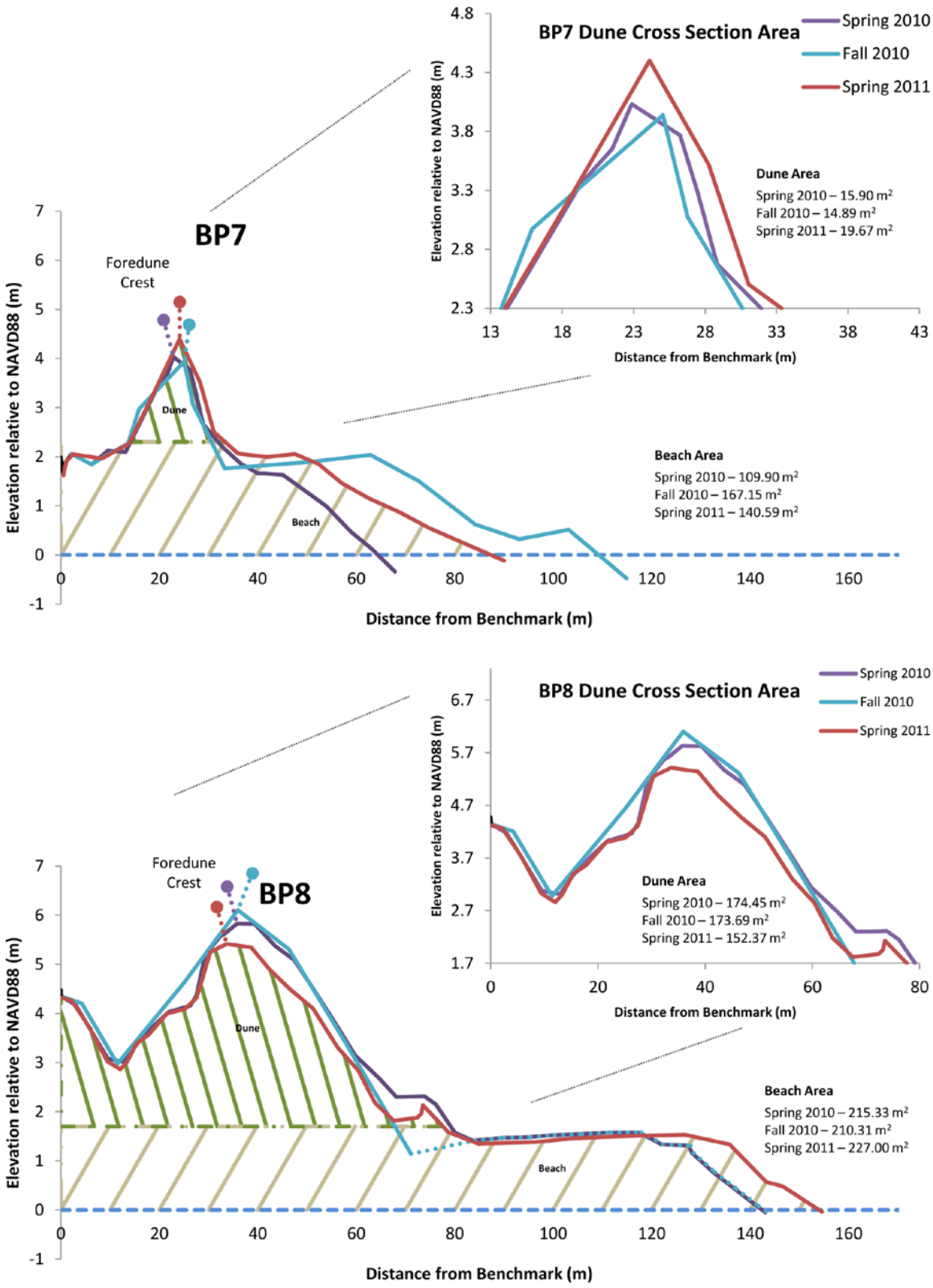


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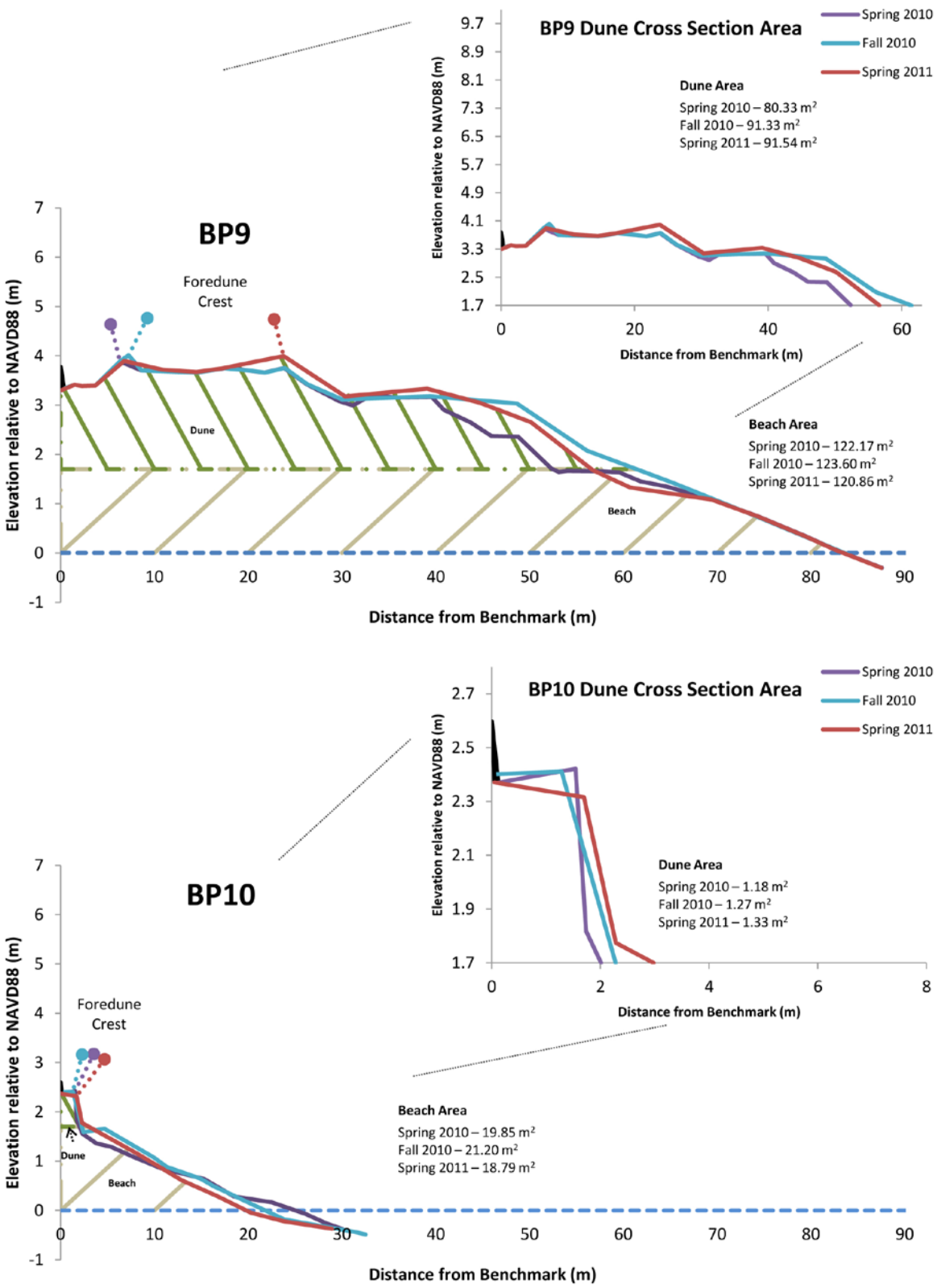


Figure 22. Profiles BP9 and BP10, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys.

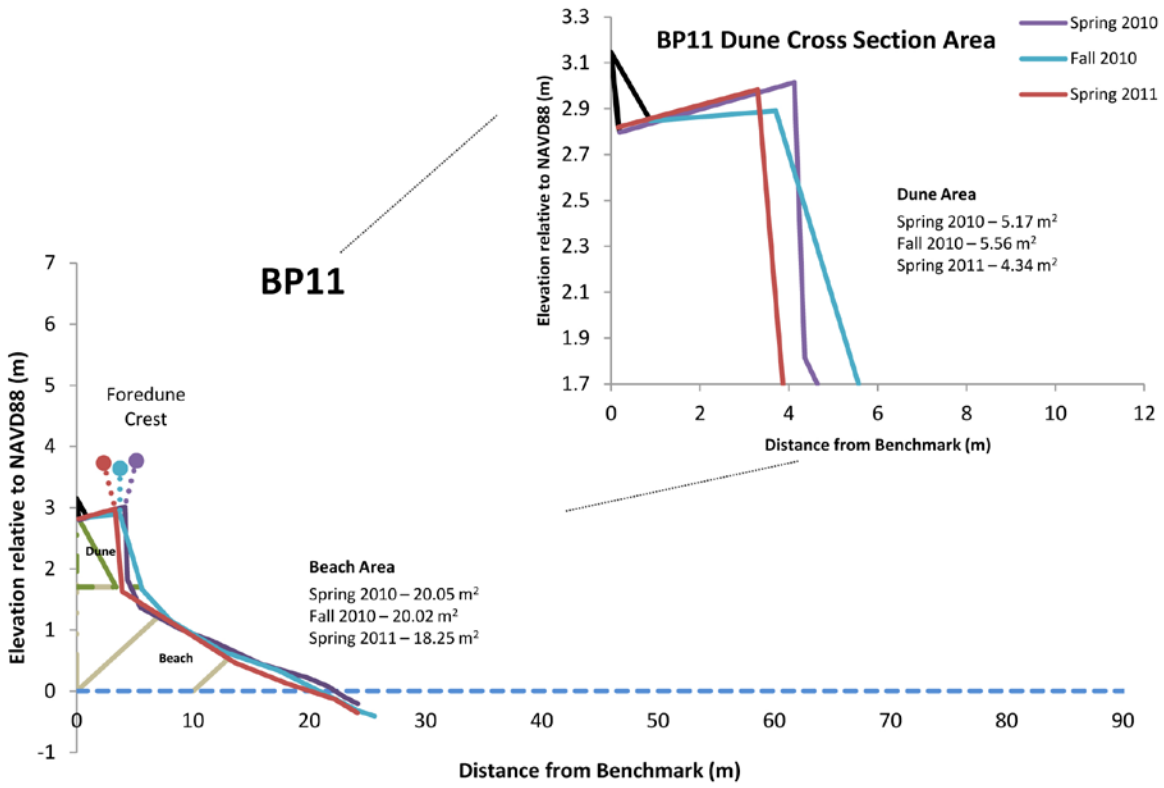


Figure 23. Profile BP11, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys.

Plumb Beach

Five monuments have been established along the ocean-facing shoreline of Plumb Beach (Fig. 24). They may be tied to some pre-existing item, such as a concrete curb, or they may be tied to a newly-installed PVC pipe filled with concrete. The location, description, coordinates of the Plumb Beach monuments are detailed in a booklet prepared for this purpose (Psuty, et al., 2010f). Profiles PB1, PB2, and PB3 are largely depicting the remnant fill materials with a small residual dune and/or beach surficial layer. PB4 and PB5 are part of the beach and dune spit projection that has been extending easterly

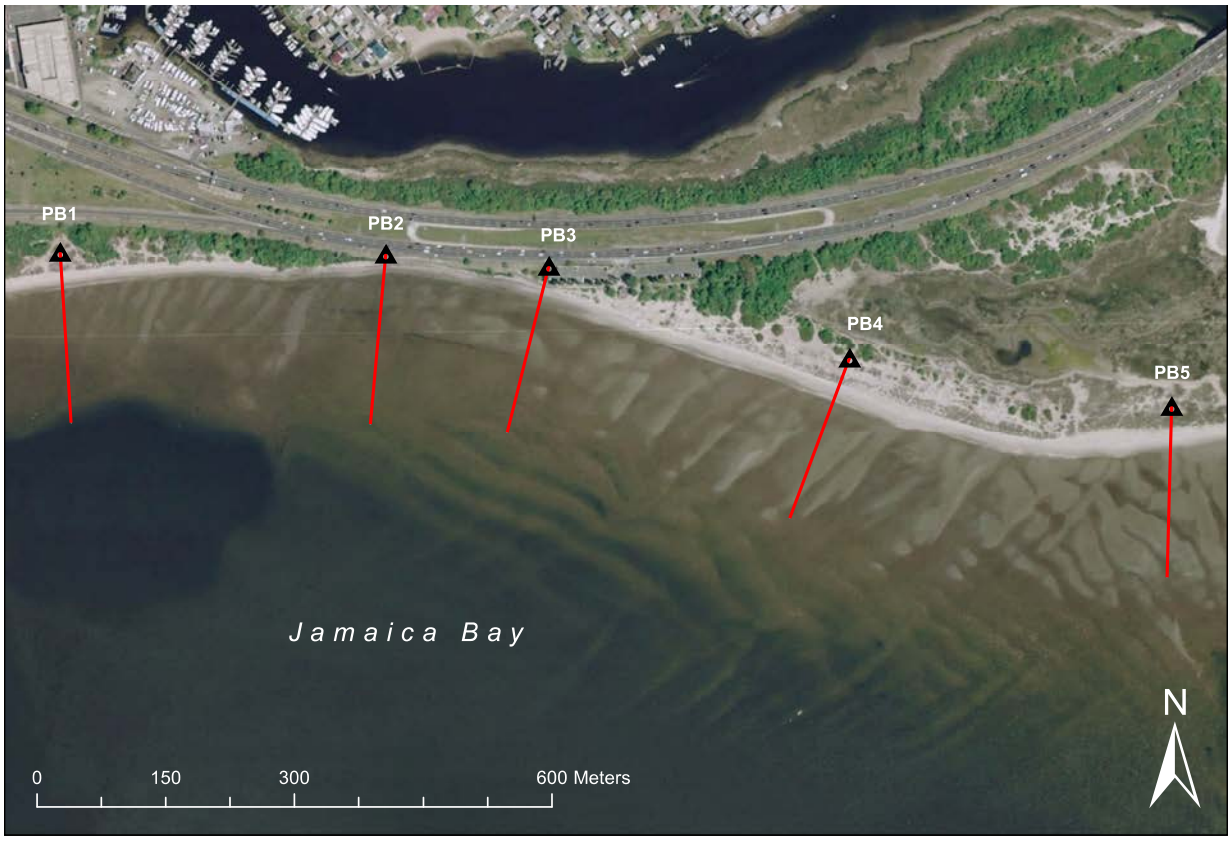


Figure 24. Location of five monuments and their accompanying azimuths (red lines) at Plumb Beach used in running the 2D beach/dune profiles.

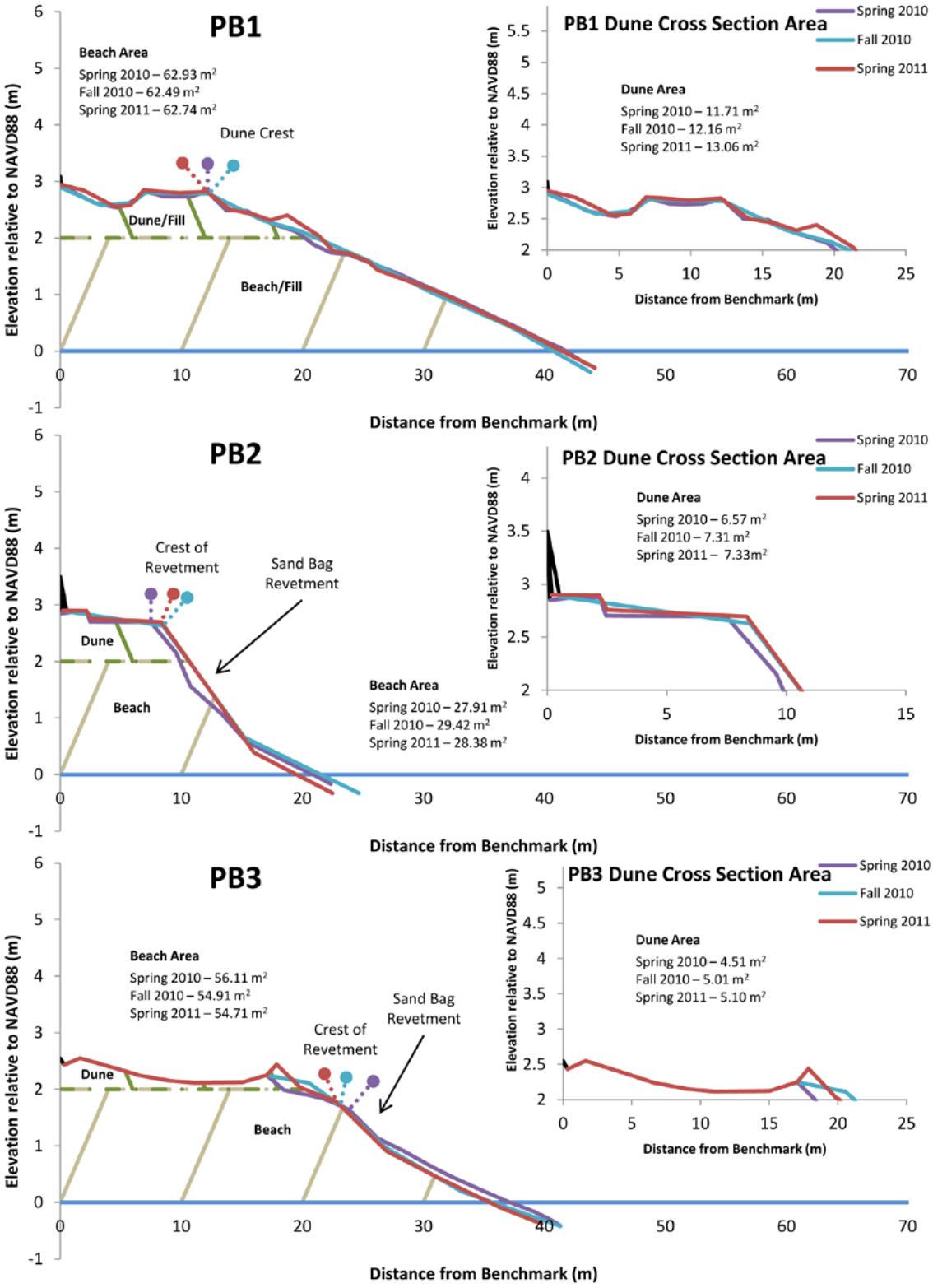


Figure 25. Profiles PB1, PB2, and PB3, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys.

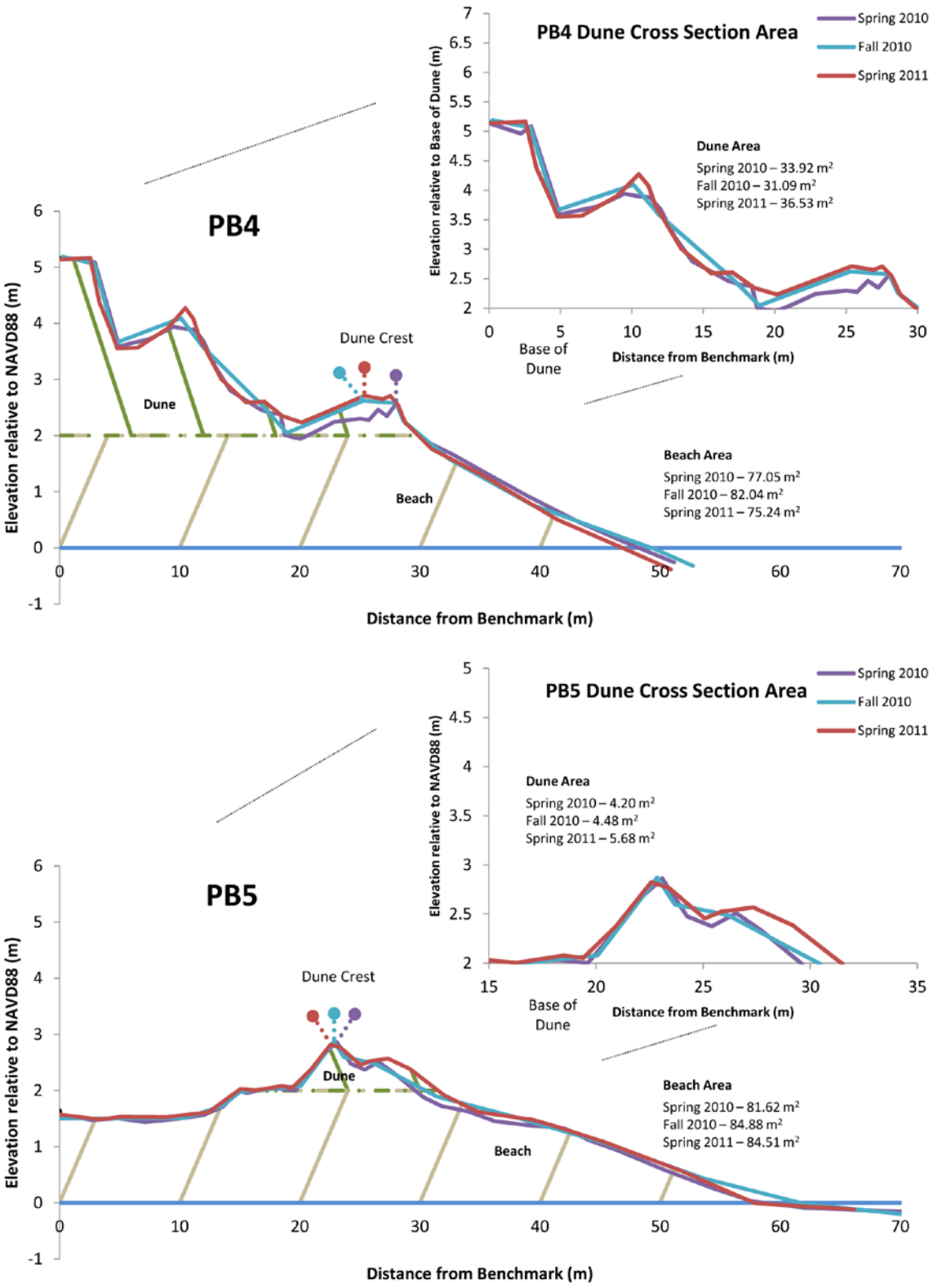


Figure 26. Profiles PB4 and PB5, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys.

Great Kills

Nine monuments have been established along the ocean-facing shoreline of Great Kills (Fig. 27). They may be tied to some pre-existing item, such as a concrete curb, or they may be tied to a newly-installed PVC pipe filled with concrete. The location, description, coordinates of the Great Kills monuments are detailed in a booklet prepared for this purpose (Psuty, et al., 2010d).

The Great Kills surveys have two data gaps. One gap consists of a loss of the Fall 2010 survey data for each of the profile areas. Several databases are being examined to determine if the surveys were mislabeled. In addition, the memories of several GPS units are being reviewed to determine if the survey datasets exist within the units. A second gap pertains to the collection of GK7 profile. There is an apparent issue with radio reception from the base station that is affecting the ability to receive a signal in this area. GK8 is relatively nearby, and it does capture the conditions along this portion of Great Kills.



Figure 27. Location of nine monuments and their accompanying azimuths at Great Kills used in running the 2D beach/dune profiles.

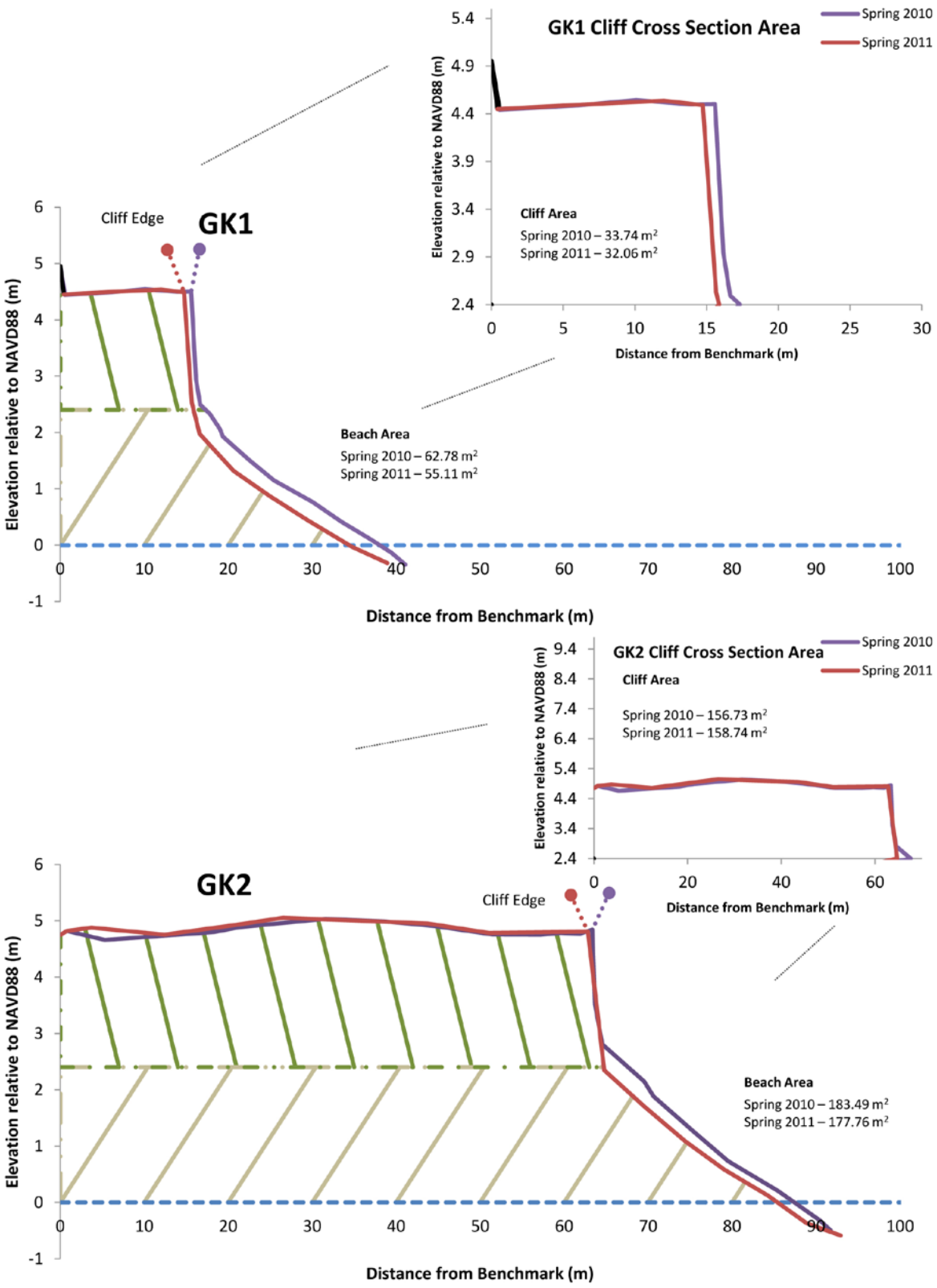


Figure 28. Profiles GK1 and GK2, features are labeled, cross-sectional area is calculated for beach and dune for each of the two spring surveys.

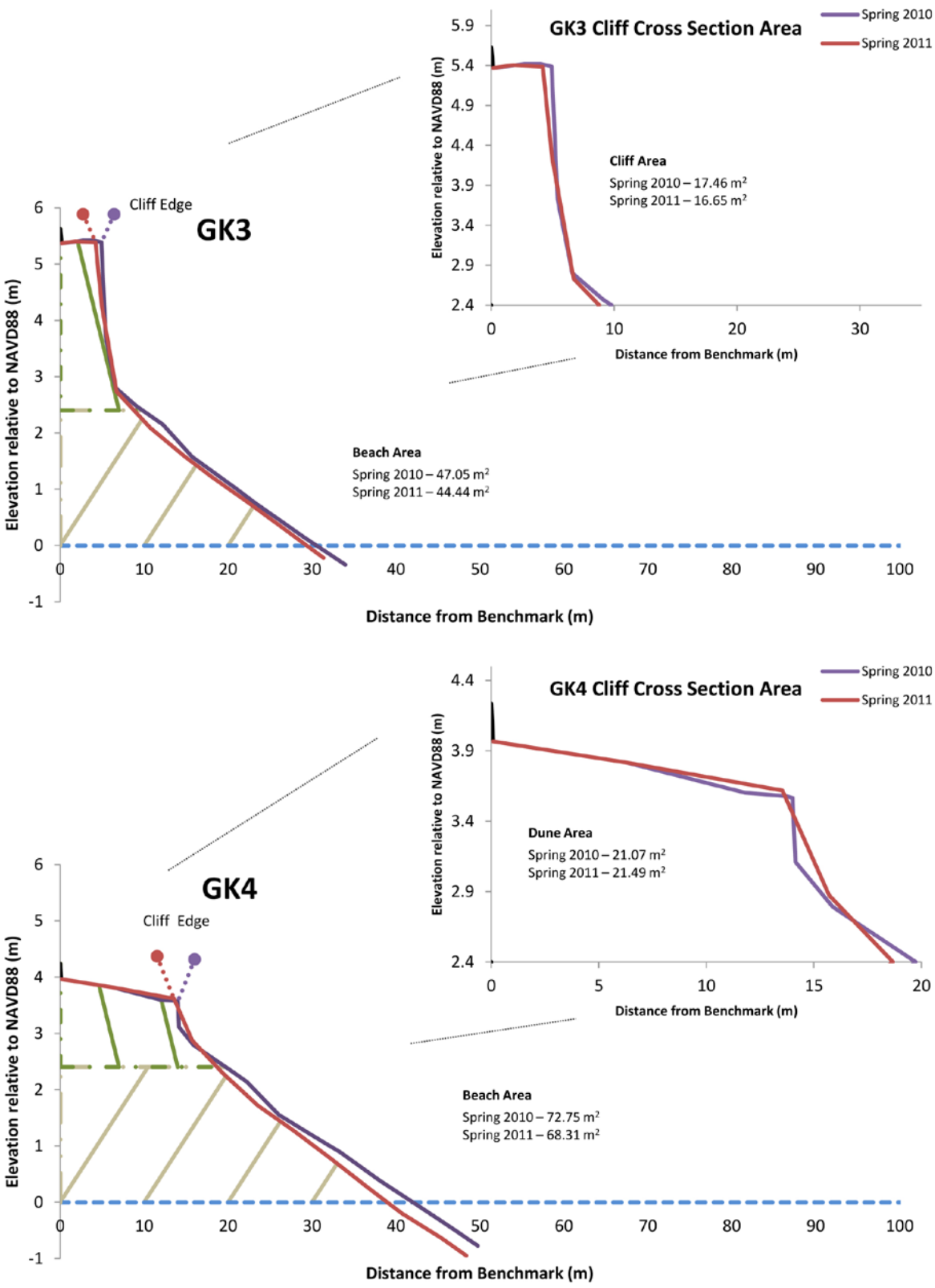


Figure 29. Profiles GK3 and GK4, features are labeled, cross-sectional area is calculated for beach and dune for each of the two spring surveys.

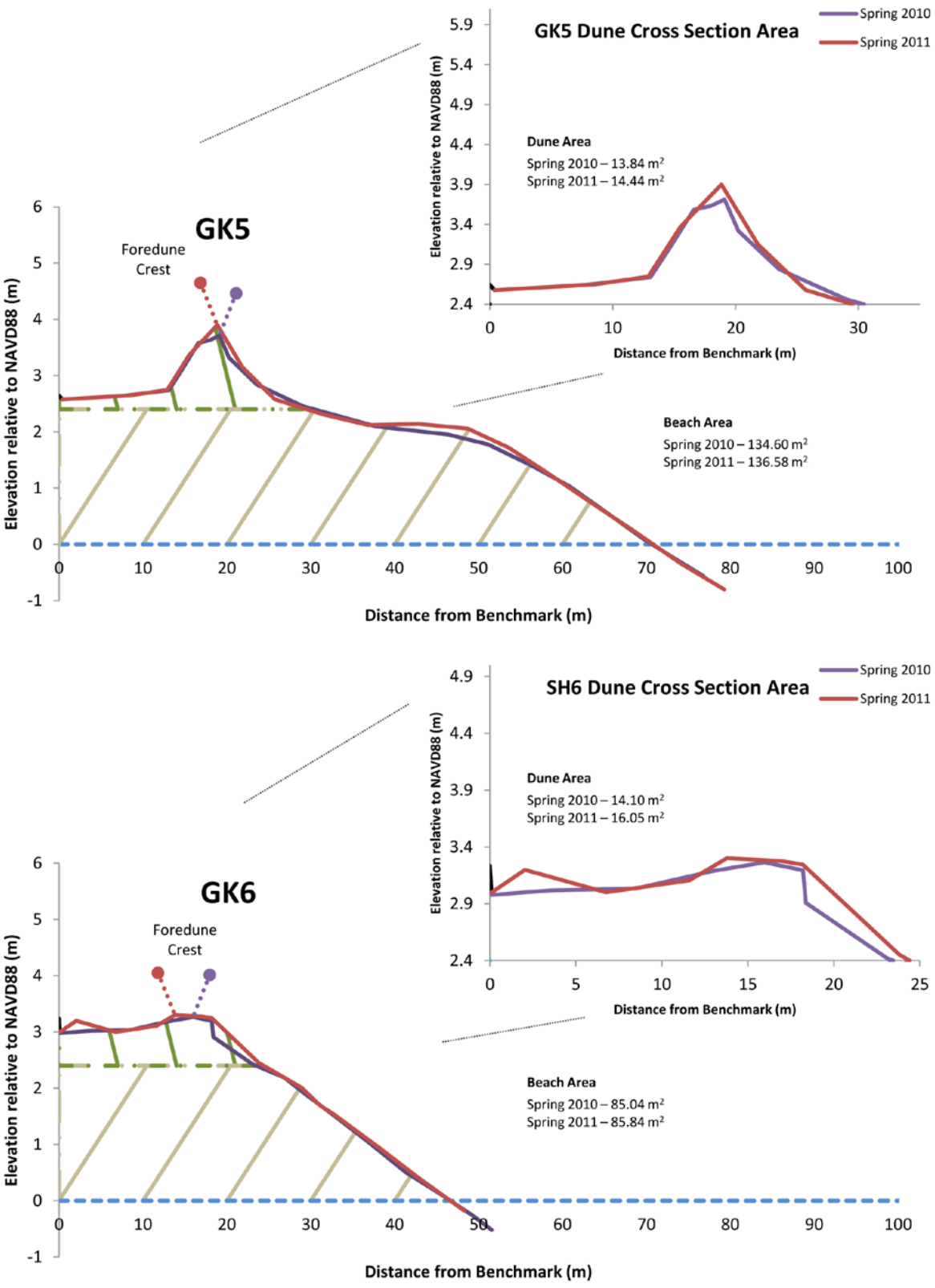


Figure 30. Profiles GK5 and GK6, features are labeled, cross-sectional area is calculated for beach and dune for each of the two spring surveys.

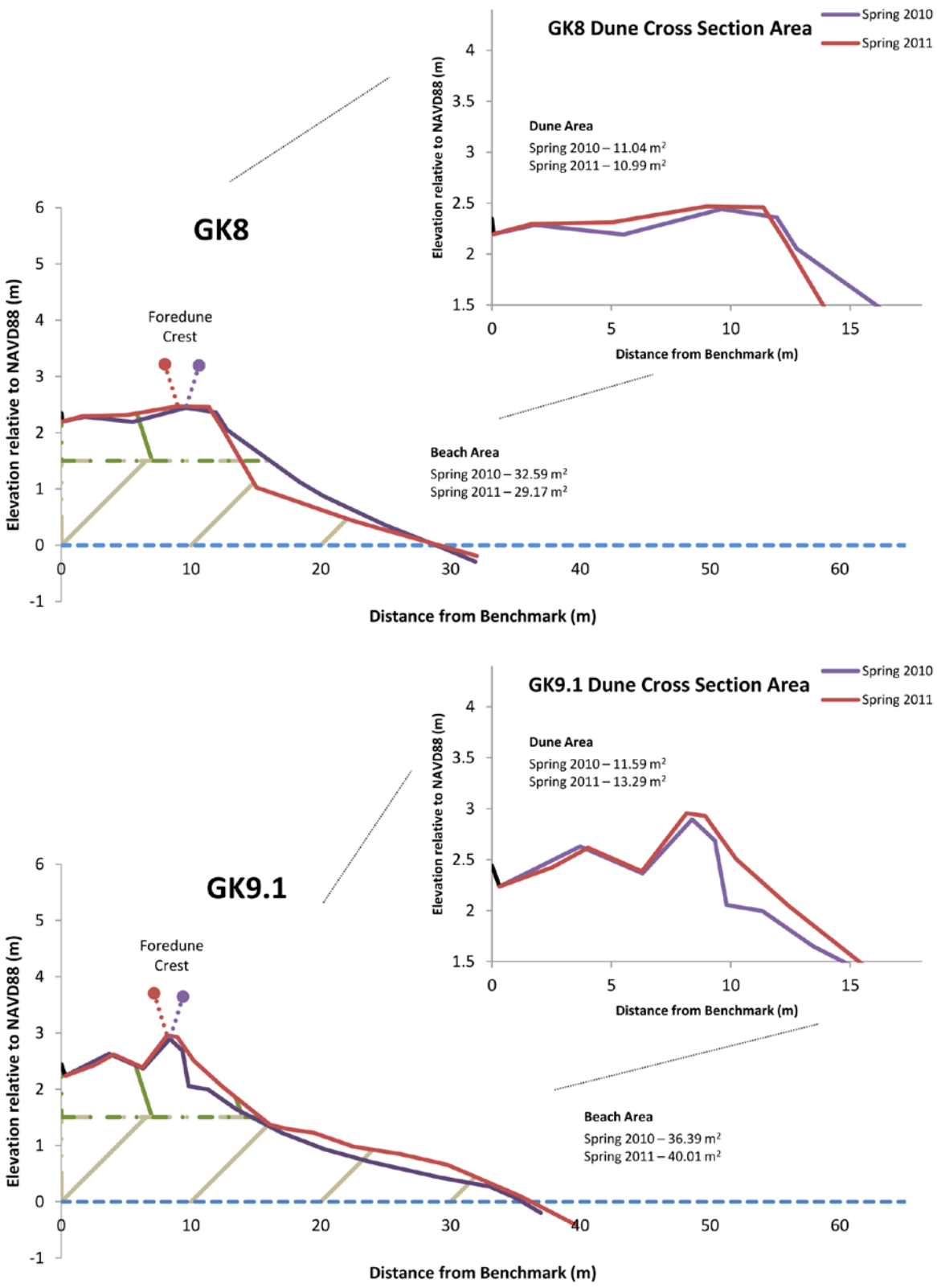


Figure 31. Profiles GK8 and GK9.1, features are labeled, cross-sectional area is calculated for beach and dune for each of the two spring surveys.

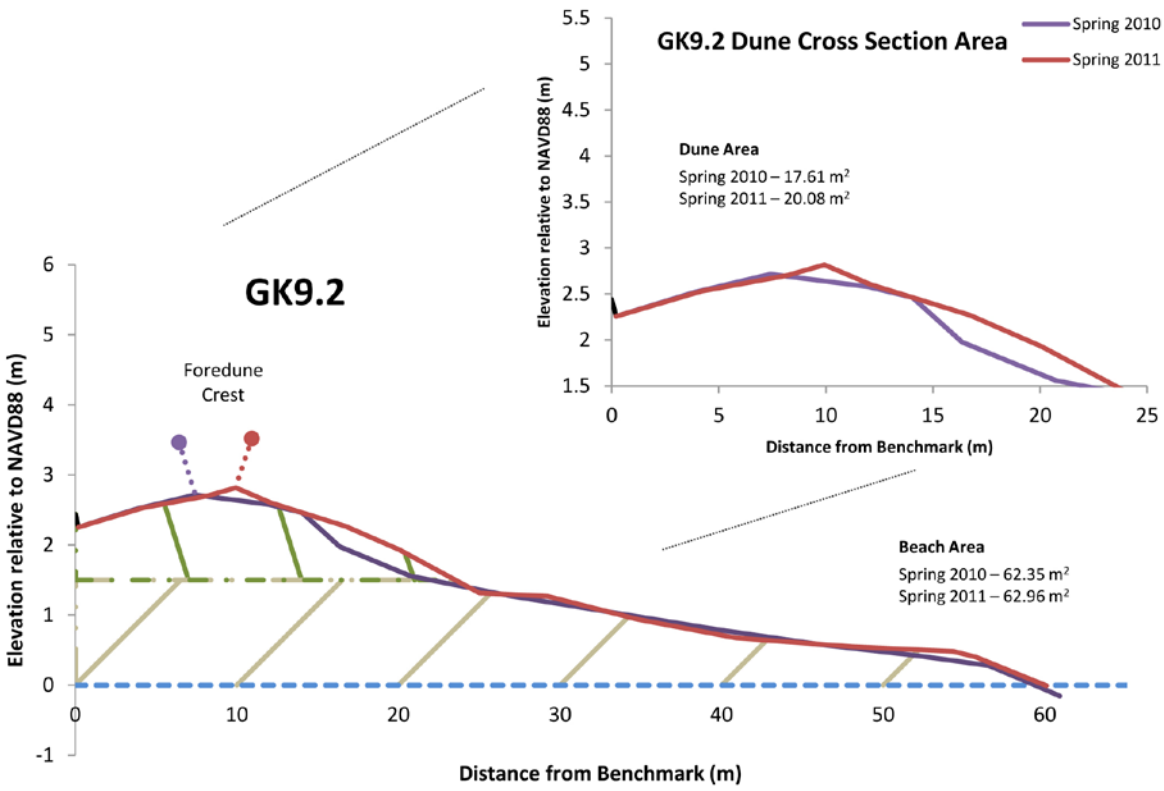


Figure 32. Profile GK9.2, features are labeled, cross-sectional area is calculated for beach and dune for each of the two spring surveys.

Miller Field

Two monuments have been established along the ocean-facing shoreline of Miller Field (Fig.33). They may be tied to some pre-existing item, such as a concrete step, or they may be tied to a newly-installed PVC pipe filled with concrete. The location, description, coordinates of the Miller Field monuments are detailed in a booklet prepared for this purpose (Psuty, et al., 2010e).



Figure 33. Location of two monuments and their accompanying azimuths (red lines) at Miller Field used in running the 2D beach/dune profiles.

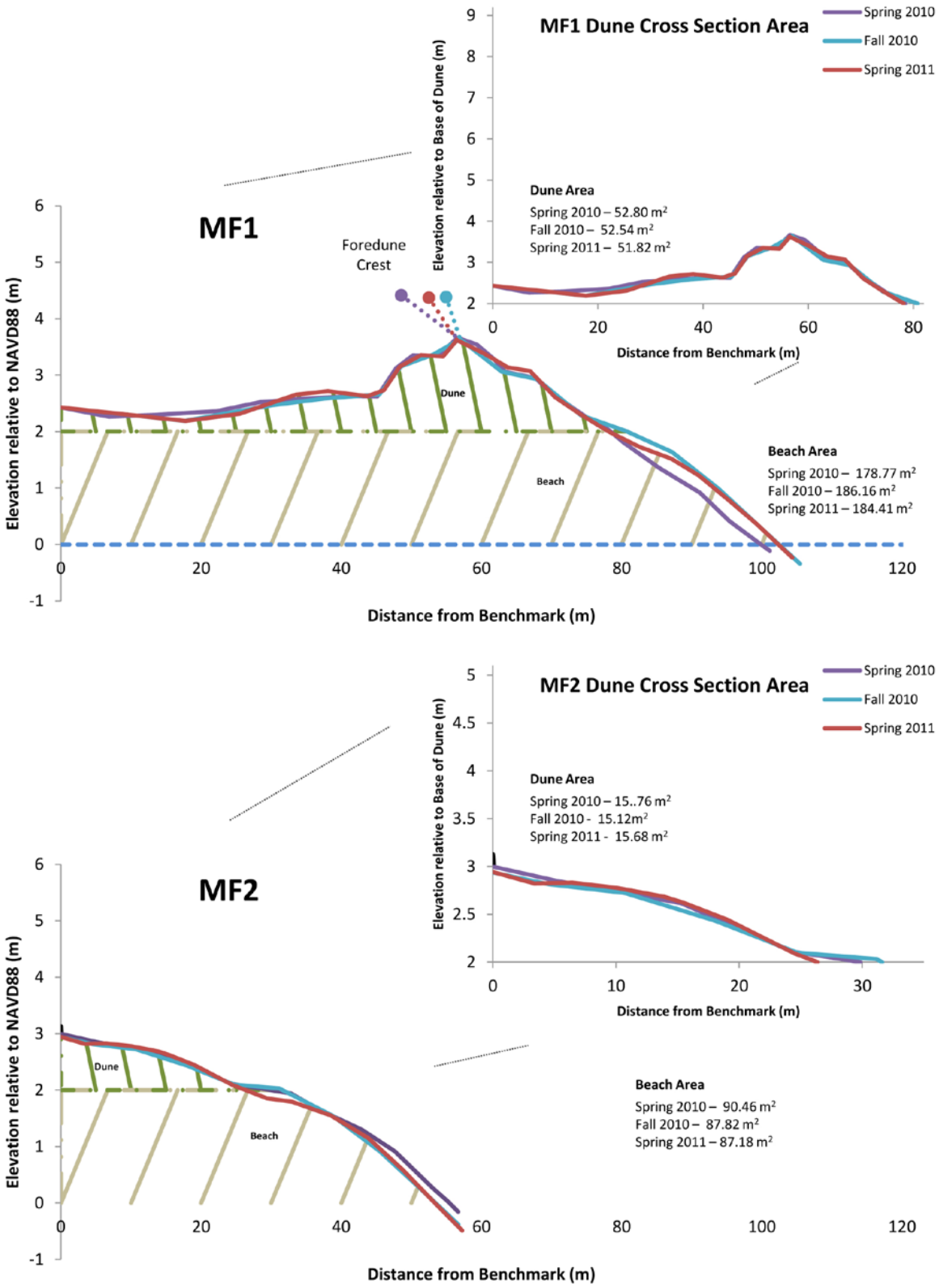


Figure 34. Profiles MF1 and MF2, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys.

Ft. Wadsworth

Three monuments have been established along the ocean-facing shoreline of Ft. Wadsworth (Fig. 35). They may be tied to some pre-existing item, such as a concrete pad, or they may be tied to a newly-installed PVC pipe filled with concrete. The location, description, coordinates of the Ft. Wadsworth monuments are detailed in a booklet prepared for this purpose (Psuty, et al., 2010e).



Figure 35. Location of 3 monuments and their accompanying azimuths (red lines) at Fort Wadsworth used in running the 2D beach/dune profiles.

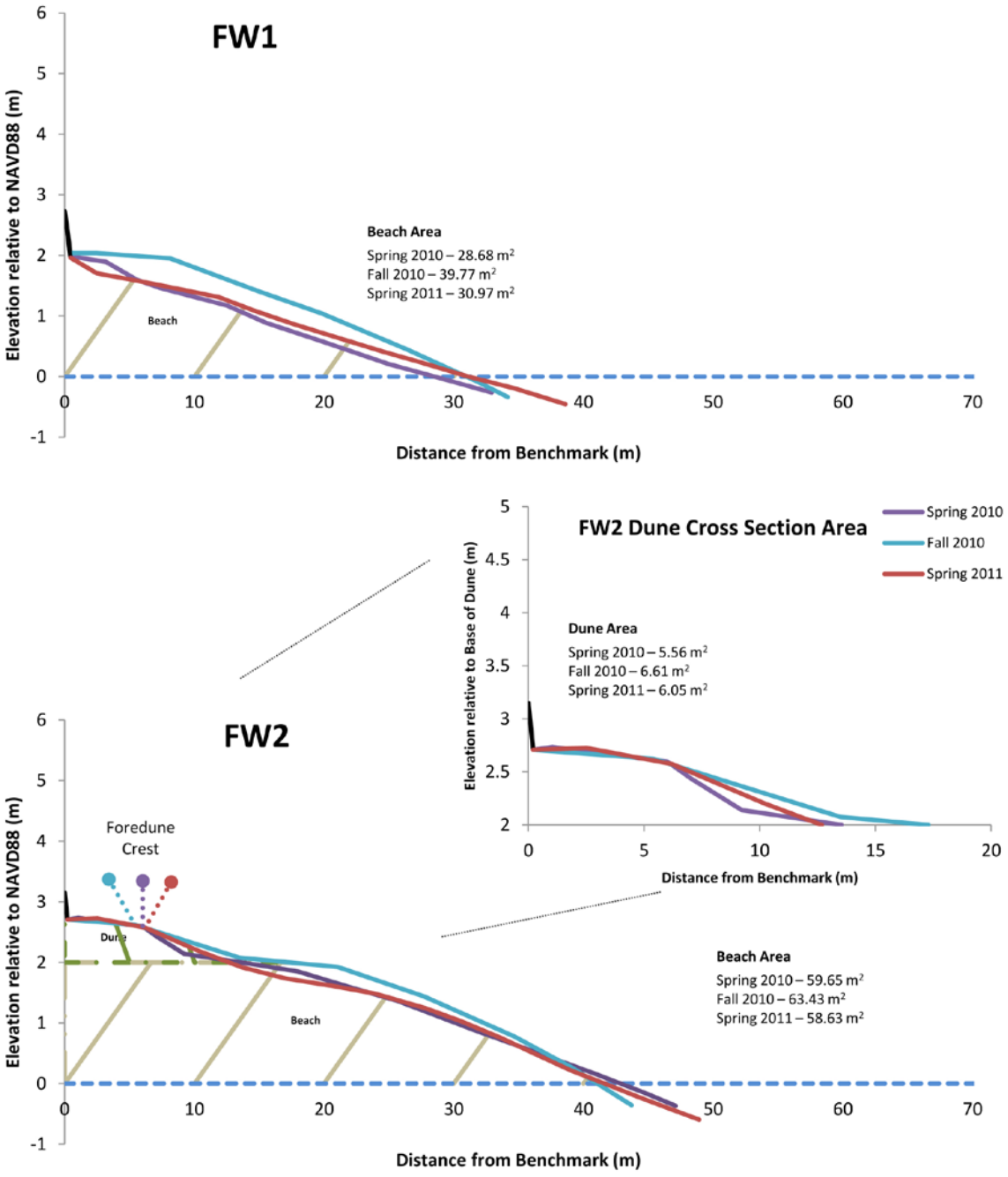


Figure 36. Profiles FW1 and FW2, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys.

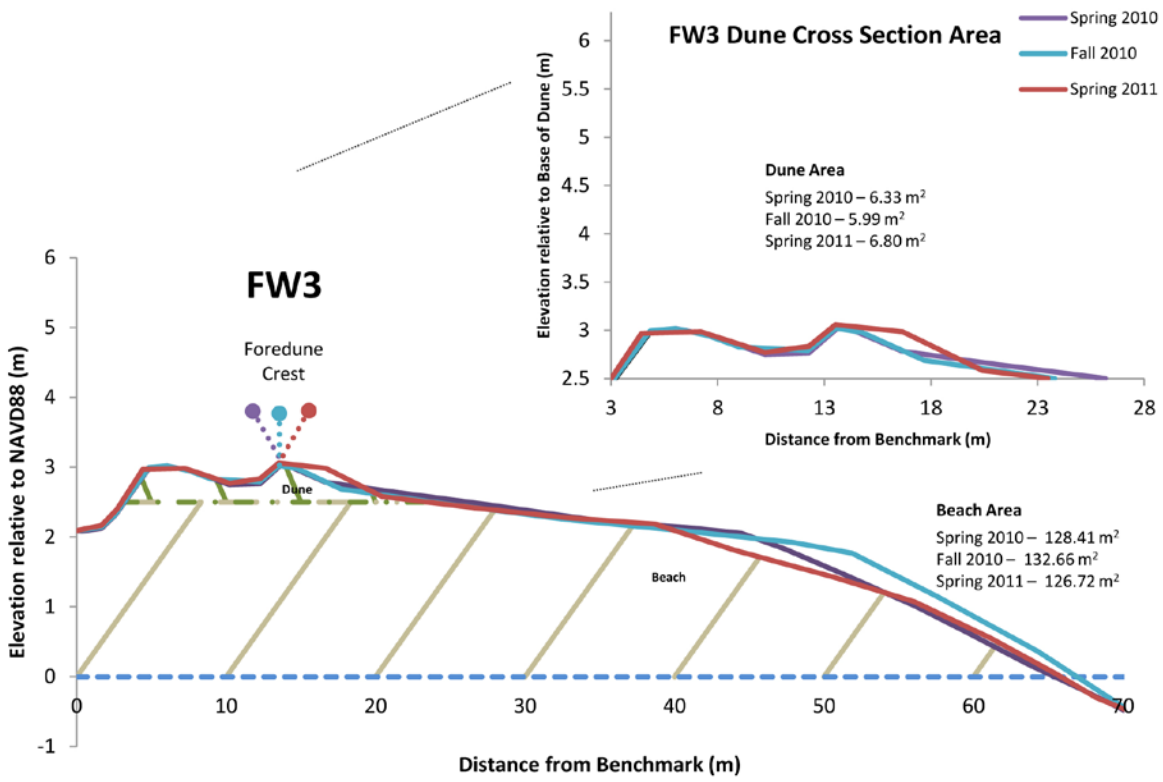


Figure 37. Profile FW3, features are labeled, cross-sectional area is calculated for beach and dune for each of the three seasonal surveys.

Spatial Association – an Example

By way of example, the spatial association of the data sets may be arrayed to portray the modifications of the profiles in the alongshore direction, relating the dimensions of change to the conditions of sediment availability and sediment budget. At Sandy Hook, the downdrift effect of beach nourishment outside of the Park and the changing exposure to the incident energies are represented by a general increase of area in the beach from south to north (Fig. 38), until reaching the northern extent of Sandy Hook. Then the changes are driven by relative exposure to the dominant winds and waves on the bayside. This is but one example of the type of information that is incorporated in the topographical data sets. A more complete presentation and interpretation will be part of the trend report.

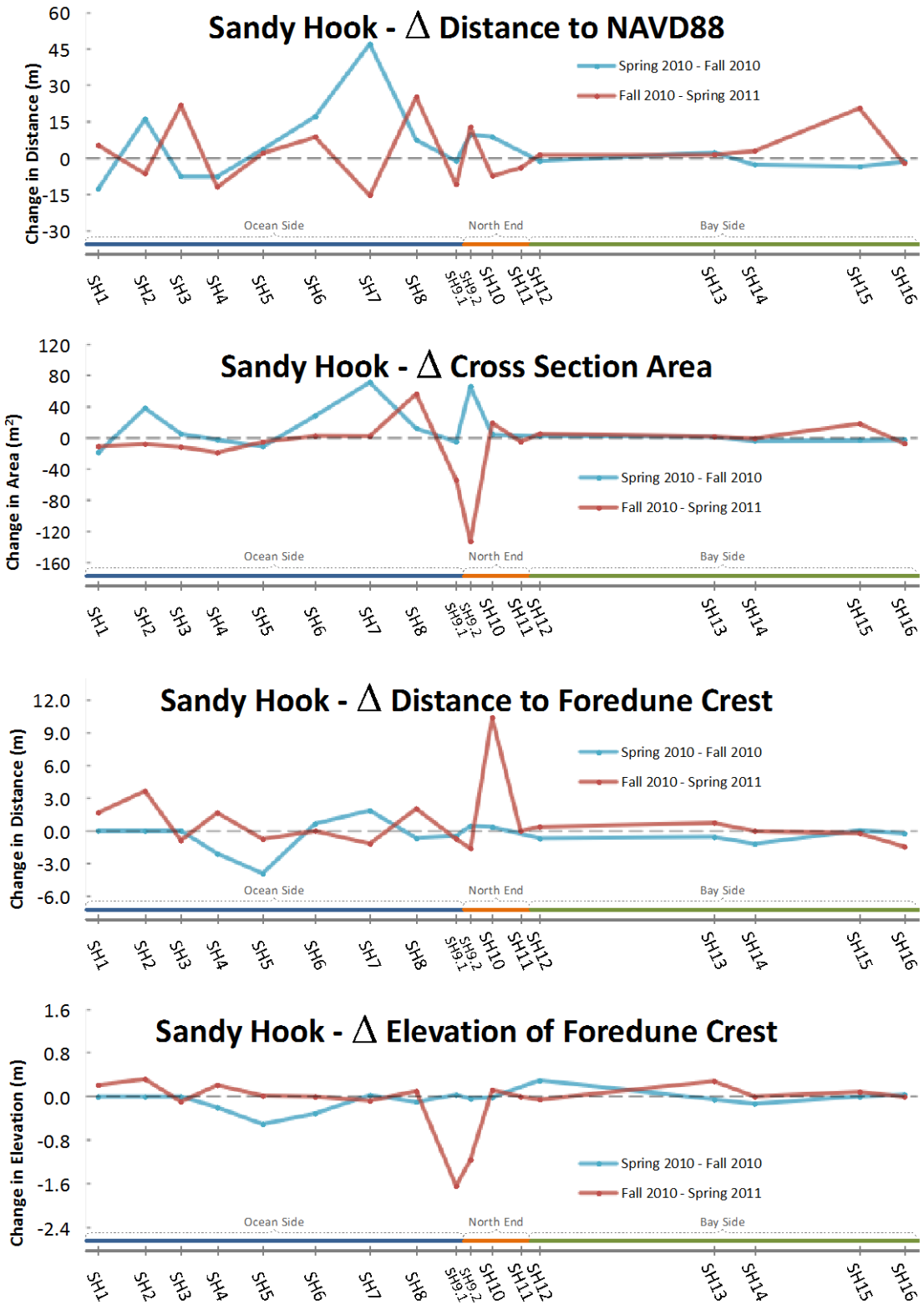


Figure 38. Alongshore dimensions of selected topographical variables at Sandy Hook, incorporating dune/beach profile sites along the ocean side, inlet, and bay side situations.

Conclusions

A wealth of information is available from the seasonal topographical surveys conducted throughout the coastal areas of GATE. The changes are seen in the individual profiles and in the comparison of profiles within the several parts of GATE. All of the profile data and the derived measures of change are compiled in a database for GATE and are deposited with the Data Manager of the Northeast Coastal and Barrier Network.

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Appendix A: Dimensions of Distance and Area, GATE Profiles

- Spring 2010
- Fall 2010
- Spring 2011

Spring 2010

Sandy Hook				Survey Date 4/22/2010		Low Tide 8:00 AM		Height 0.255 m	
ID	Distance (m)			Elevation (m)		Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
SH1	124.88	44.01	-	3.05	-	272.35	243.97	28.38	-
SH2	173.17	95.43	-	2.95	-	336.10	307.24	28.86	-
SH3	208.97	63.90	-	3.65	-	457.12	369.32	87.80	-
SH4	161.15	40.30	-	4.42	-	423.31	320.34	102.97	-
SH5	55.28	5.91	-	4.52	-	125.09	97.72	27.37	-
SH6	80.76	25.94	-	4.19	-	164.65	132.50	32.15	-
SH7	313.22	0.08	-	4.81	-	556.52	524.38	32.14	-
SH8	243.82	27.13	-	4.78	-	545.88	468.17	77.71	-
SH9.1	52.48	12.51	-	3.81	-	117.34	100.12	17.22	-
SH9.2	330.31	60.84	-	3.54	-	729.41	677.33	52.08	-
SH10	152.60	91.18	-	1.98	-	228.72	188.60	40.12	-
SH11	-	-	-	-	-	-	-	-	-
SH12	54.68	26.13	-	2.84	-	71.39	59.26	12.13	-
SH13	19.75	4.71	-	1.79	-	21.39	20.71	0.68	-
SH14	23.51	1.27	-	2.49	-	20.42	18.61	1.81	-
SH15	52.91	1.99	-	3.82	-	68.71	57.04	11.67	-
SH16	22.67	8.26	-	3.89	-	47.53	25.02	22.51	-

Breezy Point				Survey Date 4/23/2010		Low Tide 9:12 AM		Height 0.097 m	
ID	Distance (m)			Elevation (m)		Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
BP1	46.62	5.92	-	4.69	-	135.39	89.03	46.36	-
BP2	95.68	12.52	-	3.14	-	188.86	176.38	12.48	-
BP3	87.74	20.04	-	6.71	-	262.77	153.36	109.40	-
BP4	84.43	34.27	-	3.28	-	182.97	147.25	35.72	-
BP5	158.48	49.86	-	4.67	-	263.21	236.79	26.43	-
BP6	67.10	33.78	-	4.18	-	140.65	120.01	20.64	-
BP7	64.40	22.87	-	4.03	-	125.80	109.90	15.90	-
BP8	142.45	35.76	-	5.83	-	389.77	215.33	174.45	-
BP9	83.53	6.33	-	3.89	-	202.51	122.17	80.33	-
BP10	25.02	1.54	-	2.42	-	21.03	19.85	1.18	-
BP11	22.26	4.13	-	3.02	-	25.23	20.05	5.17	-

Plumb Beach				Survey Date 5/28/2010		Low Tide 1:42 PM		Height 0.155 m	
ID	Distance (m)			Elevation (m)		Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
PB1	41.77	12.18	-	2.82	-	74.65	62.94	11.71	-
PB2	20.90	7.50	-	2.69	-	34.55	27.98	6.57	-
PB3	37.12	23.87	-	1.64	-	60.62	56.11	4.51	-
PB4	48.20	28.03	-	2.57	-	110.92	77.06	33.93	-
PB5	58.62	23.09	-	2.86	-	85.83	81.62	4.21	-

Great Kills				Survey Date 4/28/2010		Low Tide 1:42 PM		Height -0.127 m	
ID	Distance (m)			Elevation (m)		Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
GK1	38.03	-	15.58	-	4.50	96.52	62.78	-	33.74
GK2	87.43	-	63.36	-	4.84	340.22	183.49	-	156.73
GK3	30.52	-	4.91	-	5.39	64.51	47.05	-	17.46
GK4	-30.52	-	14.02	-	3.56	93.82	72.75	-	21.07
GK5	70.68	19.10	-	3.71	-	148.44	134.60	13.84	-
GK6	46.64	15.96	-	3.26	-	99.14	85.04	14.10	-
GK7	-	-	-	-	-	-	-	-	-
GK8	28.88	9.62	-	2.44	-	43.63	32.59	11.04	-
GK9.1	35.51	8.38	-	2.90	-	47.99	36.39	11.59	-
GK9.2	59.40	7.42	-	2.72	-	79.96	62.35	17.61	-

Miller Field				Survey Date 4/27/2010		Low Tide 12:48 PM		Height 0.301 m	
ID	Distance (m)			Elevation (m)		Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
MF1	99.90	56.56	-	3.66	-	231.57	178.77	52.80	-
MF2	55.42	0.00	-	-	-	106.22	90.46	15.76	-

Fort Wadsworth				Surevy Date 4/27/2010		Low Tide 12:48 PM		Height 0.301 m	
ID	Distance (m)			Elevation (m)		Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
FW1	28.48	-	-	-	-	28.68	28.68	-	-
FW2	42.87	6.01	-	2.60	-	65.21	59.65	5.56	-
FW3	65.42	13.77	-	3.05	-	134.74	128.41	6.33	-

* Tide elevation values are referenced to Mean Lower Low Water (MLLW)

Fall 2010

Sandy Hook				Survey Date 10/7/2010		Low Tide 1:18 PM			Height -0.163 m
ID	Distance (m)			Elevation (m)		Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
SH1	112.32	44.01	-	3.05	-	253.94	225.00	28.94	-
SH2	189.41	95.43	-	2.95	-	374.84	345.82	29.01	-
SH3	201.56	63.90	-	3.65	-	462.86	375.06	87.80	-
SH4	153.69	40.30	-	4.22	-	421.37	323.13	98.23	-
SH5	58.92	1.98	-	4.01	-	114.58	104.48	10.10	-
SH6	98.00	26.59	-	3.88	-	193.51	158.16	35.36	-
SH7	360.34	1.94	-	4.83	-	628.41	591.75	36.66	-
SH8	251.37	26.45	-	4.68	-	558.58	479.10	79.48	-
SH9.1	51.36	12.03	-	3.84	-	112.84	92.75	20.10	-
SH9.2	340.09	61.28	-	3.50	-	795.92	743.75	52.17	-
SH10	161.45	96.15	-	2.03	-	233.70	194.17	39.53	-
SH11	59.87	27.95	-	3.91	-	116.25	77.16	39.10	-
SH12	53.52	25.44	-	3.13	-	74.24	60.88	13.36	-
SH13	22.14	4.13	-	1.74	-	23.06	22.49	0.58	-
SH14	20.89	0.06	-	2.36	-	17.12	16.54	0.58	-
SH15	49.56	2.00	-	3.82	-	66.12	55.27	10.85	-
SH16	21.29	8.01	-	3.93	-	45.51	23.33	22.17	-

Breezy Point				Survey Date 11/22/2010		Low Tide 2:06 PM			Height 0.123 m
ID	Distance (m)			Elevation (m)		Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
BP1	46.48	7.15	-	4.86	-	96.18	67.03	29.14	-
BP2	101.39	12.92	-	3.12	-	200.30	187.82	12.48	-
BP3	79.44	19.97	-	6.78	-	256.17	140.78	115.39	-
BP4	77.61	30.58	-	3.19	-	180.17	141.01	39.15	-
BP5	160.21	50.05	-	4.57	-	311.07	282.80	28.26	-
BP6	115.11	33.85	-	4.12	-	187.48	165.70	21.78	-
BP7	109.29	25.05	-	3.94	-	182.04	167.15	14.89	-
BP8	142.79	35.92	-	6.10	-	384.00	210.31	173.69	-
BP9	83.60	7.24	-	4.02	-	214.93	123.60	91.33	-
BP10	21.82	1.29	-	2.41	-	22.46	21.20	1.27	-
BP11	20.89	3.71	-	2.89	-	25.58	20.02	5.56	-

Plumb Beach				Survey Date 11/8/2010		Low Tide 3:00 PM			Height -0.213 m
ID	Distance (m)			Elevation (m)		Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
PB1	40.74	12.30	-	2.78	-	74.65	62.49	12.16	-
PB2	21.51	8.48	-	2.63	-	36.73	29.42	7.31	-
PB3	35.72	23.14	-	1.71	-	59.92	54.91	5.01	-
PB4	49.29	25.29	-	2.62	-	113.13	82.04	31.09	-
PB5	61.73	22.94	-	2.87	-	178.80	84.88	4.48	-

Great Kills				Survey Date		Low Tide			Height
ID	Distance (m)			Elevation (m)		Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
GK1	-	-	-	-	-	-	-	-	-
GK2	-	-	-	-	-	-	-	-	-
GK3	-	-	-	-	-	-	-	-	-
GK4	-	-	-	-	-	-	-	-	-
GK5	-	-	-	-	-	-	-	-	-
GK6	-	-	-	-	-	-	-	-	-
GK7	-	-	-	-	-	-	-	-	-
GK8	-	-	-	-	-	-	-	-	-
GK9.1	-	-	-	-	-	-	-	-	-
GK9.2	-	-	-	-	-	-	-	-	-

Miller Field				Survey Date 10/25/2010		Low Tide 3:12 PM			Height 0.16 m
ID	Distance (m)			Elevation (m)		Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
MF1	102.43	56.96	-	3.64	-	236.70	186.16	50.54	-
MF2	53.42	-	-	-	-	102.94	87.82	15.12	-

Fort Wadsworth				Survey Date 10/25/2010		Low Tide 3:12 PM			Height 0.16 m
ID	Distance (m)			Elevation (m)		Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
FW1	30.97	-	-	-	-	39.77	39.77	-	-
FW2	41.06	5.41	-	2.62	-	70.04	63.43	6.61	-
FW3	66.90	13.55	-	3.02	-	138.66	132.66	5.99	-

* Tide elevation values are referenced to Mean Lower Low Water (MLLW)

Spring 2011

Sandy Hook				Survey Date 4/29/2011		Low Tide 11:12 AM		Height 0.283 m	
ID	Distance (m)			Elevation (m)		Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
SH1	117.78	45.69	-	3.26	-	243.31	211.18	32.12	-
SH2	183.18	99.09	-	3.28	-	367.25	335.21	32.03	-
SH3	223.49	63.03	-	3.56	-	451.58	371.21	80.36	-
SH4	141.94	39.85	-	4.43	-	402.75	302.56	100.18	-
SH5	61.14	1.24	-	4.03	-	109.72	98.92	10.80	-
SH6	106.88	26.59	-	3.88	-	196.28	160.92	35.36	-
SH7	345.11	0.76	-	4.76	-	630.91	593.16	37.75	-
SH8	276.75	28.48	-	4.78	-	615.21	526.79	88.42	-
SH9.1	40.65	11.30	-	2.20	-	58.98	58.98	0.00	-
SH9.2	353.01	59.67	-	2.35	-	663.29	663.29	0.00	-
SH10	154.27	89.10	-	1.93	-	253.23	208.13	45.10	-
SH11	56.06	27.95	-	3.91	-	111.73	73.20	38.53	-
SH12	55.10	25.82	-	3.08	-	79.85	62.70	17.15	-
SH13	23.70	4.87	-	2.02	-	25.10	23.54	1.56	-
SH14	23.99	0.06	-	2.36	-	16.60	15.55	1.05	-
SH15	70.32	1.78	-	3.91	-	84.76	71.69	13.07	-
SH16	19.27	6.56	-	3.93	-	38.53	20.44	18.09	-

Breezy Point				Survey Date 5/26/2011		Low Tide 8:42 AM		Height 0.362 m	
ID	Distance (m)			Elevation (m)		Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
BP1	66.45	6.52	-	4.93	-	136.50	107.49	29.01	-
BP2	94.94	12.92	-	3.12	-	188.69	176.21	12.48	-
BP3	93.21	19.56	-	6.76	-	276.84	162.73	114.11	-
BP4	75.04	33.15	-	3.32	-	158.21	122.58	35.63	-
BP5	162.96	50.00	-	4.64	-	315.08	285.15	29.93	-
BP6	124.03	36.58	-	4.18	-	198.01	174.94	23.07	-
BP7	87.38	24.11	-	4.40	-	160.26	140.59	19.68	-
BP8	154.05	33.66	-	5.42	-	379.37	227.00	152.37	-
BP9	83.47	23.77	-	3.99	-	212.40	120.86	91.54	-
BP10	19.79	1.70	-	2.32	-	20.11	18.79	1.33	-
BP11	20.08	3.30	-	2.98	-	22.59	18.25	4.34	-

Plumb Beach				Survey Date 4/28/2011		Low Tide 10:24 AM		Height 0.382 m	
ID	Distance (m)			Elevation (m)		Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
PB1	41.47	12.10	-	2.83	-	75.81	62.74	13.06	-
PB2	19.52	8.35	-	2.69	-	35.71	28.38	7.33	-
PB3	35.47	22.85	-	1.77	-	59.81	54.71	5.10	-
PB4	46.85	25.40	-	2.71	-	111.79	75.24	36.53	-
PB5	57.82	22.58	-	2.82	-	90.20	84.51	5.68	-

Great Kills				Survey Date 4/21/2011		Low Tide 4:18 PM		Height -0.03 m	
ID	Distance (m)			Elevation (m)		Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
GK1	34.41	-	14.74	-	4.49	87.17	55.11	-	32.06
GK2	85.44	-	62.83	-	4.81	336.49	177.76	-	158.74
GK3	29.35	-	4.20	-	5.39	61.09	44.44	-	16.65
GK4	38.96	-	13.54	-	3.62	89.81	68.31	-	21.49
GK5	70.82	18.84		3.90	-	151.02	136.58	14.44	-
GK6	46.64	13.79		3.30	-	101.89	85.84	16.05	-
GK7	-	-		-	-	-	-	-	-
GK8	29.11	8.98		2.47	-	40.16	29.17	10.99	-
GK9.1	36.22	8.15		2.96	-	53.30	40.01	13.29	-
GK9.2	60.01	9.93		2.82	-	83.05	62.96	20.08	-

Miller Field				Survey Date 4/21/2011		Low Tide 4:18 PM		Height -0.03 m	
ID	Distance (m)			Elevation (m)		Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
MF1	102.38	56.48	-	3.62	-	236.23	184.41	51.82	-
MF2	53.36	-	-	-	-	102.85	87.18	15.68	-

Fort Wadsworth				Survey Date 4/21/2011		Low Tide 4:18 PM		Height -0.03 m	
ID	Distance (m)			Elevation (m)		Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
FW1	31.11	-	-	-	-	30.97	30.97	-	-
FW2	41.65	6.21	-	2.57	-	64.68	58.63	6.05	-
FW3	65.83	13.52	-	3.06	-	133.53	126.72	6.80	-

* Tide elevation values are referenced to Mean Lower Low Water (MLLW)

Appendix B: Dimensions of Change, GATE Profiles

- Spring 2010 – Fall 2010
- Fall 2010 – Spring 2011
- Spring 2010 – Spring 2011

Spring 2010 - Fall 2010

Sandy Hook

ID	Δ Distance (m)			Δ Elevation (m)		Δ Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
SH1	-12.56	0.00	-	0.00	-	-18.41	-18.97	0.56	-
SH2	16.24	0.00	-	0.00	-	38.73	38.58	0.15	-
SH3	-7.41	0.00	-	0.00	-	5.74	5.74	0.00	-
SH4	-7.46	0.00	-	-0.20	-	-1.94	2.79	-4.73	-
SH5	3.64	-3.94	-	-0.50	-	-10.51	6.76	-17.27	-
SH6	17.24	0.66	-	-0.31	-	28.86	25.66	3.20	-
SH7	47.12	1.86	-	0.03	-	71.89	67.38	4.51	-
SH8	7.54	-0.68	-	-0.10	-	12.70	10.92	1.78	-
SH9.1	-1.11	-0.48	-	0.03	-	-4.50	-7.37	2.87	-
SH9.2	9.77	0.44	-	-0.04	-	66.51	66.42	0.09	-
SH10	8.85	4.97	-	0.05	-	4.98	5.58	-0.59	-
SH11	-	-	-	-	-	-	-	-	-
SH12	-1.16	-0.70	-	0.30	-	2.85	1.62	1.23	-
SH13	2.38	-0.58	-	-0.05	-	1.67	1.78	-0.10	-
SH14	-2.62	-1.22	-	-0.13	-	-3.30	-2.08	-1.22	-
SH15	-3.36	0.01	-	0.00	-	-2.59	-1.77	-0.83	-
SH16	-1.38	-0.25	-	0.04	-	-2.02	-1.68	-0.34	-

Breezy Point

ID	Δ Distance (m)			Δ Elevation (m)		Δ Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
BP1	-0.14	1.23	-	0.18	-	-39.21	-22.00	-17.21	-
BP2	5.71	0.40	-	-0.02	-	11.44	11.44	-	-
BP3	-8.30	-0.07	-	0.06	-	-6.60	-12.58	5.98	-
BP4	-6.82	-3.69	-	-0.10	-	-2.81	-6.24	3.43	-
BP5	1.73	0.19	-	-0.10	-	47.85	46.02	1.83	-
BP6	48.01	0.08	-	-0.06	-	46.82	45.68	1.14	-
BP7	44.88	2.18	-	-0.09	-	56.24	57.25	-1.01	-
BP8	0.34	0.16	-	0.27	-	-5.77	-5.02	-0.75	-
BP9	0.07	0.91	-	0.13	-	12.43	1.42	11.00	-
BP10	-3.20	-0.26	-	-0.01	-	1.43	1.35	0.08	-
BP11	-1.37	-0.41	-	-0.12	-	0.35	-0.04	0.38	-

Plumb Beach

ID	Δ Distance (m)			Δ Elevation (m)		Δ Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
PB1	-1.03	0.12	-	-0.04	-	0.00	-0.45	0.45	-
PB2	0.62	0.98	-	-0.06	-	2.18	1.44	0.74	-
PB3	-1.40	-0.73	-	0.07	-	-0.70	-1.20	0.50	-
PB4	1.09	-2.73	-	0.05	-	2.21	4.98	-2.84	-
PB5	3.11	-0.15	-	0.01	-	92.97	3.26	0.27	-

Great Kills

ID	Δ Distance (m)			Δ Elevation (m)		Δ Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
GK1	-	-	-	-	-	-	-	-	-
GK2	-	-	-	-	-	-	-	-	-
GK3	-	-	-	-	-	-	-	-	-
GK4	-	-	-	-	-	-	-	-	-
GK5	-	-	-	-	-	-	-	-	-
GK6	-	-	-	-	-	-	-	-	-
GK7	-	-	-	-	-	-	-	-	-
GK8	-	-	-	-	-	-	-	-	-
GK9.1	-	-	-	-	-	-	-	-	-
GK9.2	-	-	-	-	-	-	-	-	-

Miller Field

ID	Δ Distance (m)			Δ Elevation (m)		Δ Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
MF1	2.53	0.40	-	-0.03	-	5.14	7.39	-2.26	-
MF2	-1.99	-	-	-	-	-3.28	-2.64	-0.64	-

Fort Wadsworth

ID	Δ Distance (m)			Δ Elevation (m)		Δ Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
FW1	2.48	-	-	-	-	11.09	11.09	-	-
FW2	-1.81	-0.60	-	0.03	-	4.83	3.78	1.05	-
FW3	1.47	-0.23	-	-0.03	-	3.92	4.25	-0.33	-

Fall 2010 - Spring 2011

Sandy Hook

ID	Δ Distance (m)			Δ Elevation (m)		Δ Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
SH1	5.45	1.68	-	0.21	-	-10.63	-13.81	3.18	-
SH2	-6.23	3.66	-	0.33	-	-7.59	-10.61	3.02	-
SH3	21.93	-0.87	-	-0.09	-	-11.29	-3.85	-7.44	-
SH4	-11.75	-0.45	-	0.21	-	-18.62	-20.57	1.95	-
SH5	2.22	-0.74	-	0.02	-	-4.86	-5.56	0.70	-
SH6	8.88	0.00	-	0.00	-	2.77	2.77	0.00	-
SH7	-15.22	-1.18	-	-0.08	-	2.50	1.41	1.09	-
SH8	25.38	2.04	-	0.10	-	56.63	47.70	8.93	-
SH9.1	-10.71	-0.73	-	-1.64	-	-53.86	-33.77	-20.10	-
SH9.2	12.93	-1.61	-	-1.16	-	-132.63	-80.47	-52.17	-
SH10	-7.18	-7.05	-	-0.10	-	19.53	13.95	5.58	-
SH11	-3.81	0.00	-	0.00	-	-4.53	-3.96	-0.57	-
SH12	1.57	0.38	-	-0.05	-	5.61	1.82	3.79	-
SH13	1.57	0.74	-	0.29	-	2.03	1.05	0.98	-
SH14	3.11	0.00	-	0.00	-	-0.52	-0.99	0.47	-
SH15	20.76	-0.22	-	0.09	-	18.65	16.42	2.23	-
SH16	-2.02	-1.45	-	0.00	-	-6.97	-2.89	-4.08	-

Breezy Point

ID	Δ Distance (m)			Δ Elevation (m)		Δ Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
BP1	19.97	-0.63	-	0.07	-	40.33	40.46	-0.14	-
BP2	-6.45	0.00	-	0.00	-	-11.62	-11.62	-	-
BP3	13.77	-0.41	-	-0.02	-	20.68	21.95	-1.28	-
BP4	-2.58	2.57	-	0.13	-	-21.95	-18.43	-3.52	-
BP5	2.74	-0.05	-	0.08	-	4.02	2.34	1.67	-
BP6	8.93	2.72	-	0.06	-	10.53	9.24	1.29	-
BP7	-21.91	-0.95	-	0.46	-	-21.78	-26.57	4.79	-
BP8	11.26	-2.26	-	-0.69	-	-4.64	16.69	-21.32	-
BP9	-0.13	16.53	-	-0.02	-	-2.53	-2.74	0.21	-
BP10	-2.04	0.41	-	-0.09	-	-2.35	-2.41	0.06	-
BP11	-0.81	-0.41	-	0.09	-	-2.98	-1.77	-1.22	-

Plumb Beach

ID	Δ Distance (m)			Δ Elevation (m)		Δ Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
PB1	0.74	-0.20	-	0.05	-	1.15	0.26	0.90	-
PB2	-2.00	-0.13	-	0.06	-	-1.02	-1.04	0.02	
PB3	-0.25	-0.29	-	0.06	-	-0.11	-0.20	0.08	
PB4	-2.45	0.10	-	0.09	-	-1.34	-6.79	5.43	-
PB5	-3.91	-0.36	-	-0.05	-	-88.61	-0.37	1.21	-

Great Kills

ID	Δ Distance (m)			Δ Elevation (m)		Δ Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
GK1	-	-	-	-	-	-	-	-	-
GK2	-	-	-	-	-	-	-	-	-
GK3	-	-	-	-	-	-	-	-	-
GK4	-	-	-	-	-	-	-	-	-
GK5	-	-	-	-	-	-	-	-	-
GK6	-	-	-	-	-	-	-	-	-
GK7	-	-	-	-	-	-	-	-	-
GK8	-	-	-	-	-	-	-	-	-
GK9.1	-	-	-	-	-	-	-	-	-
GK9.2	-	-	-	-	-	-	-	-	-

Miller Field

ID	Δ Distance (m)			Δ Elevation (m)		Δ Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
MF1	-0.06	-0.48	-	-0.01	-	-0.48	-1.75	1.28	-
MF2	-0.06	-	-	-	-	-0.09	-0.64	0.55	-

Fort Wadsworth

ID	Δ Distance (m)			Δ Elevation (m)		Δ Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
FW1	0.15	-	-	-	-	-8.80	-8.80	-	-
FW2	0.59	0.80	-	-0.05	-	-5.36	-4.80	-0.56	-
FW3	-1.07	-0.02	-	0.04	-	-5.13	-5.94	0.81	-

Spring 2010 - Spring 2011

Sandy Hook

ID	Δ Distance (m)			Δ Elevation (m)		Δ Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
SH1	-7.10	1.68	-	0.21	-	-29.04	-32.78	3.74	-
SH2	10.01	3.66	-	0.33	-	31.14	27.97	3.17	-
SH3	14.52	-0.87	-	-0.09	-	-5.55	1.89	-7.44	-
SH4	-19.21	-0.45	-	0.01	-	-20.56	-17.78	-2.78	-
SH5	5.86	-4.68	-	-0.48	-	-15.37	1.20	-16.57	-
SH6	26.12	0.66	-	-0.31	-	31.63	28.43	3.20	-
SH7	31.89	0.68	-	-0.05	-	74.39	68.79	5.60	-
SH8	32.93	1.35	-	0.00	-	69.33	58.62	10.71	-
SH9.1	-11.83	-1.21	-	-1.60	-	-58.36	-41.14	-17.22	-
SH9.2	22.70	-1.17	-	-1.19	-	-66.13	-14.05	-52.08	-
SH10	1.68	-2.08	-	-0.05	-	24.51	19.53	4.98	-
SH11	-	-	-	-	-	-	-	-	-
SH12	0.42	-0.32	-	0.24	-	8.46	3.44	5.02	-
SH13	3.95	0.16	-	0.23	-	3.71	2.83	0.88	-
SH14	0.49	-1.22	-	-0.13	-	-3.82	-3.07	-0.75	-
SH15	17.41	-0.21	-	0.09	-	16.05	14.65	1.40	-
SH16	-3.40	-1.70	-	0.04	-	-9.00	-4.58	-4.42	-

Breezy Point

ID	Δ Distance (m)			Δ Elevation (m)		Δ Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
BP1	19.83	0.60	-	0.25	-	1.11	18.46	-17.35	-
BP2	-0.73	0.40	-	-0.02	-	-0.18	-0.18	-	-
BP3	5.48	-0.48	-	0.05	-	14.07	9.37	4.71	-
BP4	-9.40	-1.12	-	0.04	-	-24.76	-24.67	-0.09	-
BP5	4.47	0.14	-	-0.03	-	51.87	48.36	3.51	-
BP6	56.94	2.80	-	0.00	-	57.35	54.93	2.43	-
BP7	22.98	1.24	-	0.37	-	34.46	30.68	3.78	-
BP8	11.60	-2.10	-	-0.41	-	-10.41	11.67	-22.07	-
BP9	-0.05	17.44	-	0.11	-	9.90	-1.31	11.21	-
BP10	-5.23	0.15	-	-0.11	-	-0.92	-1.06	0.14	-
BP11	-2.18	-0.82	-	-0.03	-	-2.64	-1.80	-0.83	-

Plumb Beach

ID	Δ Distance (m)			Δ Elevation (m)		Δ Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
PB1	-0.29	-0.08	-	0.01	-	1.16	-0.19	1.35	-
PB2	-1.38	0.85	-	0.00	-	1.16	0.40	0.76	-
PB3	-1.65	-1.02	-	0.13	-	-0.81	-1.40	0.59	-
PB4	-1.36	-2.63	-	0.14	-	0.87	-1.81	2.60	-
PB5	-0.80	-0.51	-	-0.04	-	4.37	2.89	1.48	-

Great Kills

ID	Δ Distance (m)			Δ Elevation (m)		Δ Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
GK1	-3.62	-	-0.85	-	-0.01	-9.35	-7.66	-	-1.69
GK2	-1.99	-	-0.52	-	-0.04	-3.72	-5.73	-	2.01
GK3	-1.17	-	-0.71	-	0.00	-3.42	-2.61	-	-0.82
GK4	69.49	-	-0.47	-	0.05	-4.02	-4.44	-	0.42
GK5	0.13	-0.26	-	0.19	-	2.58	1.98	0.61	-
GK6	0.00	-2.17	-	0.04	-	2.75	0.81	1.94	-
GK7	-	-	-	-	-	-	-	-	-
GK8	0.23	-0.64	-	0.03	-	-3.46	-3.42	-0.05	-
GK9.1	0.71	-0.23	-	0.06	-	5.31	3.62	1.69	-
GK9.2	0.62	2.51	-	0.10	-	3.09	0.62	2.48	-

Miller Field

ID	Δ Distance (m)			Δ Elevation (m)		Δ Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
MF1	2.48	-0.08	-	-0.04	-	4.66	5.64	-0.98	-
MF2	-2.06	-	-	-	-	-3.37	-3.28	-0.08	-

Fort Wadsworth

ID	Δ Distance (m)			Δ Elevation (m)		Δ Cross Section Area (m^2)			
	NAVD88	Dune Crest	Cliff Edge	Dune Crest	Cliff Edge	Total	Beach	Dune	Cliff
FW1	2.63	-	-	-	-	2.29	2.29	-	-
FW2	-1.22	0.19	-	-0.02	-	-0.53	-1.02	0.49	-
FW3	0.40	-0.25	-	0.01	-	-1.21	-1.69	0.47	-

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

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