

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Progress Report Form

Exhibit A

DEP Agreement No.:	R1820		
Grantee Name:	Florida Gulf Coast University		
Grantee Address:	10501 FGCU Blvd South, Fort Myers, FL 33965		
Grantee's Grant Manager:	Michael Savarese	Telephone No.:	239-590-7165
Project Title:	An Assessment of Coastal Vulnerability Due to Sea-level Rise and Increased Storminess, Sanibel, Florida		
Reporting Period:	Task 5 Deliverables: January 1 – June 29, 2019		

Provide the following information for all tasks and deliverables identified in the Grant Work Plan: a summary of project accomplishments for the reporting period; a comparison of actual accomplishments to goals for the period; if goals were not met, provide reasons why; provide an update on the estimated time for completion of the task and an explanation for any anticipated delays and identify by task.

NOTE: Use as many pages as necessary to cover all tasks in the Grant Work Plan.

The following format should be followed:

Task 1: Briefings of the Project's Overview and Purpose

Progress for this reporting period:

This task is 100% completed. The following accomplishments were realized:

- (1) A web site was created and linked through the City of Sanibel for the project (deliverable¹).
- (2) On January 18, 2019, staff members from Sanibel's Department of Natural Resources and the FGCU investigatory team met to plan the communication strategy with Sanibel/Captiva citizens and government and to plan the coastal geomorphologic work (tasks 3 & 4).
- (3) A presentation was made to Sanibel City Council on February 5, 2019. A copy of that presentation is posted at the City web site (deliverable²).
- (4) A public forum for Sanibel and Captiva residents was organized and facilitated on February 22, 2019. Copies of the presentation and notes from the discussion are posted at the web site (deliverables^{3,4}).

These gatherings were highly successful. The City Council unanimously endorsed the project and pledged their support. The public forum was attended by approximately 75 residents. The public was very receptive to and supportive of the project; they were engaged in the conversation, and expressed numerous concerns.

While task 1 has been completed, we are organizing a series of forums to debrief the community in fall of 2019. This will include presentations to: (1) members of the teams (as described for task 2), (2) City Council, and (3) the general public.

Identify any delays or problems encountered: No delays or problems were encountered.

Task 2: Forums for Resilience Planning

Progress for this reporting period:

Task 2 is 100% completed. Admittedly, the asset catalog we have established for Sanibel will grow as the project continues and more citizens get involved. At present, however, we have a good representation of what Sanibel and Captiva value in their communities. The following accomplishments were achieved:

- (1) In January and February, the teams representing all aspects of Sanibel / Captiva social, cultural, natural, and business services were defined. Eight teams in all were conceived (Captiva Community Panel, Development Community, Business Community, School/Education, Social Resources, Natural & Cultural Resources, Community Infrastructure, and Community At Large). A captain was identified and recruited for each team, and each team captain selected between 8-12 members to represent their sector. Teams are described at City web site (deliverable⁵).

- (2) A team captain meeting was organized and facilitated on February 12, 2019. The captains were briefed and their team organization was discussed. Notes from this meeting are posted at the web site (deliverable⁶).
- (3) Two of the 8 teams (Captiva Community Panel and Community At Large) met on March 5 and 7, respectively. For those meetings, a questionnaire was prepared and distributed in advance. During the meetings, team members expressed their concerns and identified their assets. The Community At Large Team completed their work, and their asset data have been received. The Captiva Community Panel, however, requested additional time to thoroughly identify the assets for Captiva.
- (4) As of April 19, 2019, all 8 of the teams have met, and we now have data from all 8, including the missing information from the Captiva Community Panel.
- (5) As of April 30, 2019, the notes from each of the 8 teams have been compiled are ready for review. These notes have been returned to the team members for their review. All 8 team notes have been attached to this report.
- (6) The assets identified by the 8 teams have been compiled. Attached here is an Excel spreadsheet that contains all those data. This file is serving as a GIS attribute table.

Identify any delays or problems encountered:

The delays because of Sanibel's busy season (February and March) have been overcome.

The following deliverables for task 2 are described here and are being sent as attachments:

- (1) "Sanibel Business & Community Leader Interview Questions". This outlines the structure of the interviews conducted among the 8 teams and their respective members.
- (2) Summary notes from the 8 teams. Each file is named for the team sector.
- (3) "Sanibel Assets Master File". This file contains the asset inventory and descriptions. This file serves as the GIS mapping attribute table.

Task 3: *Evaluation of the Historic Geomorphology of the Barrier Island (1970-2018)*

Progress for this reporting period:

On the date of this report's submission (June 14, 2019), task 3 is 100% complete. Accomplishments include:

- (1) Two days of field work were scheduled for February 15 and 22. These trips were used to observe the current coastal geomorphology along the island's gulf-side perimeter and to identify the island's current erosion / accretion hot spots.
- (2) Digital elevation models (DEMs) were produced from LiDAR data for each of 6 time frames: 1998, 2004 (post Charley), 2004 (post Ivan), 2006, 2010, and 2015. These are attached here, as deliverables, as a set of TIF files. DEMs are needed to further a vulnerability analysis when inundation and storm surge modeling is conducted.
- (3) Beach profiles were extracted from each of the 6 DEMs. Profiles were generated for each R-monument (R84 south to R174, running the entire length of Captiva and Sanibel) for each of the 6 DEMs, totaling 90 profiles per DEM and 540 profiles for the 6 time frames. These profiles are being used (in task 4) to compute sediment budgets for the coastline to help identify a historical perspective of hot spots for accretion and erosion. A set of Excel workbooks are attached as deliverables for this aspect of task 3.
- (4) Two sets of geomorphologic change maps have been generated. First, the position of the shoreline along both Sanibel and Captiva has been mapped for each of the DEM time

frames. This allows for the assessment of beach evolution over the last 30 years. Second, the position of the seaward-most extent of dune vegetation has been mapped for each DEM time frame. This effectively produces a 30-year historic reconstruction of dune erosion and accretion. While beaches are dynamic and reasonably resilient, dunes require greater time for natural restoration and are more likely to increase coastal vulnerability to SLR and future storms. As deliverables, 1 Google Earth KMZ file is provided showing the shift in shoreline and seaward vegetation over time.

Identify any delays or problems encountered:

No delays or problems with task 3 have been encountered.

Task 4: *Identify Segments of the Coast Most Vulnerable to SLR and Storm Surge*

Progress for this reporting period:

Work for task 4 is now 100% complete. The software package SANDS was used to quantify erosion and accretion along the Captiva and Sanibel coasts. The coastal length was divided into 10 sectors, each comprising 10 R-monuments and circumscribing 10,000 linear feet of shoreline. Sediment budgets were compiled for each sector. A map (kmz file) showing the geographic locations of the 10 sectors is provided. The sediment budgets are summarized in two Excel workbooks. From these data and from data synthesized for Task 3, vulnerability maps were created showing the relative magnitude of erosion and deposition between each monument pair and for 3 timeframes: (1) post Charley 2004 to post Ivan 2004; (2) post Ivan 2004 and 2006; and (3) 2010 to 2015. There are 14 maps in all and exist as TIF files.

Identify any delays or problems encountered:

There were no delays associated with these deliverables..

Task 5: *Final Reporting*

Progress for this reporting period:

This task is 100%. The final report (sent as an email attachment) and the appendix containing the figure (sent as OneDrive document) were delivered on June 29 and June 28, respectively.

Identify any delays or problems encountered:

No delays are anticipated.

Deliverables:

Task #1

¹ City of Sanibel web site: <https://www.mysanibel.com/Departments/Natural-Resources/Coastal-Resiliency-Planning>

² Presentation given to Sanibel City Council:
<https://www.mysanibel.com/content/download/25891/164781>

³ Public forum presentation: <https://www.mysanibel.com/content/download/25892/164785>

⁴ Notes from public forum: <https://www.mysanibel.com/content/download/25888/164766>

⁵ Team structure and compositions: <https://www.mysanibel.com/Departments/Natural-Resources/Coastal-Resiliency-Planning/Teams>

⁶ Notes from team captain meeting:

<https://www.mysanibel.com/content/download/25889/164770>

Task #2

Ten files containing the team notes and asset inventories.

Task #3

Geomorphologic change maps: A Google Earth KMZ file is provided that tracks the shoreline and seaward-most vegetation through time. This KMZ file can be imported into ArcMAP for further analysis.

DEMs: A zipped folder is attached containing 16 TIF files showing DEMs for each of 6 years. Each year's DEM is subdivided into 3 images, one for Captiva, North Sanibel, and South Sanibel. The LiDAR coverage for 2006 was incomplete. Consequently, there is only a 2006 DEM for Captiva (Sanibel is not available). TIF files can be viewed as images or be imported into ArcMAP.

Beach profiles: Two zipped files are included. The first is an Excel workbook that contains all the profile data and graphic profile. The second is a Word file that shows graphic profiles for every other monument for easier comparison.

Task #4

SANDS Sectors: This is a Google Earth KMZ file showing the location of the 10 sectors.

Average_Volume_Change_by_Sector and Average_Volume_Change_by_Year: These are two Excel files presenting the sediment budgets for the 10 sectors.

Vulnerability Maps: This is a folder containing 14 vulnerability maps.

Task #5

Final report (emailed).

Final report figures (sent as a OneDrive file).

This report is submitted in accordance with the reporting requirements of DEP Agreement No. R1820 and accurately reflects the activities associated with the project.



June 29, 2019

Signature of Grantee's Grant Manager

Date

An Assessment of Coastal Vulnerability Due to Sea-level Rise and Increased Storminess, Sanibel and Captiva Islands, Florida

Project Funded by the Florida Resilient Coastlines Program

*Michael Savarese¹, Felix Jose¹, Andrew Gross¹, Katherine Arnett¹, James Evans²,
and Joel Caouette²*

Submitted: June 30, 2019

¹ *Florida Gulf Coast University, Department of Marine & Ecological Sciences*

² *City of Sanibel, Department of Natural Resources*

Appendix: Figures to Accompany the Report's Text



Figure 1. Google Earth map showing Captiva and Sanibel Islands, the study area for this project.



Figure 2. Google Earth map for Captiva Island.



Figure 3. Google Earth map for Sanibel Island.



Figure 4. Google Earth map showing the location of Coastal Range Monuments (R-Monuments) on Captiva and Sanibel Islands. Monuments are numbered R-084, in the north, to R-174, in the southeast.



Figure 5. Google Earth map of Captiva Island showing the location of its Coastal Range Monuments (R-Monuments) and its 3 sectors.

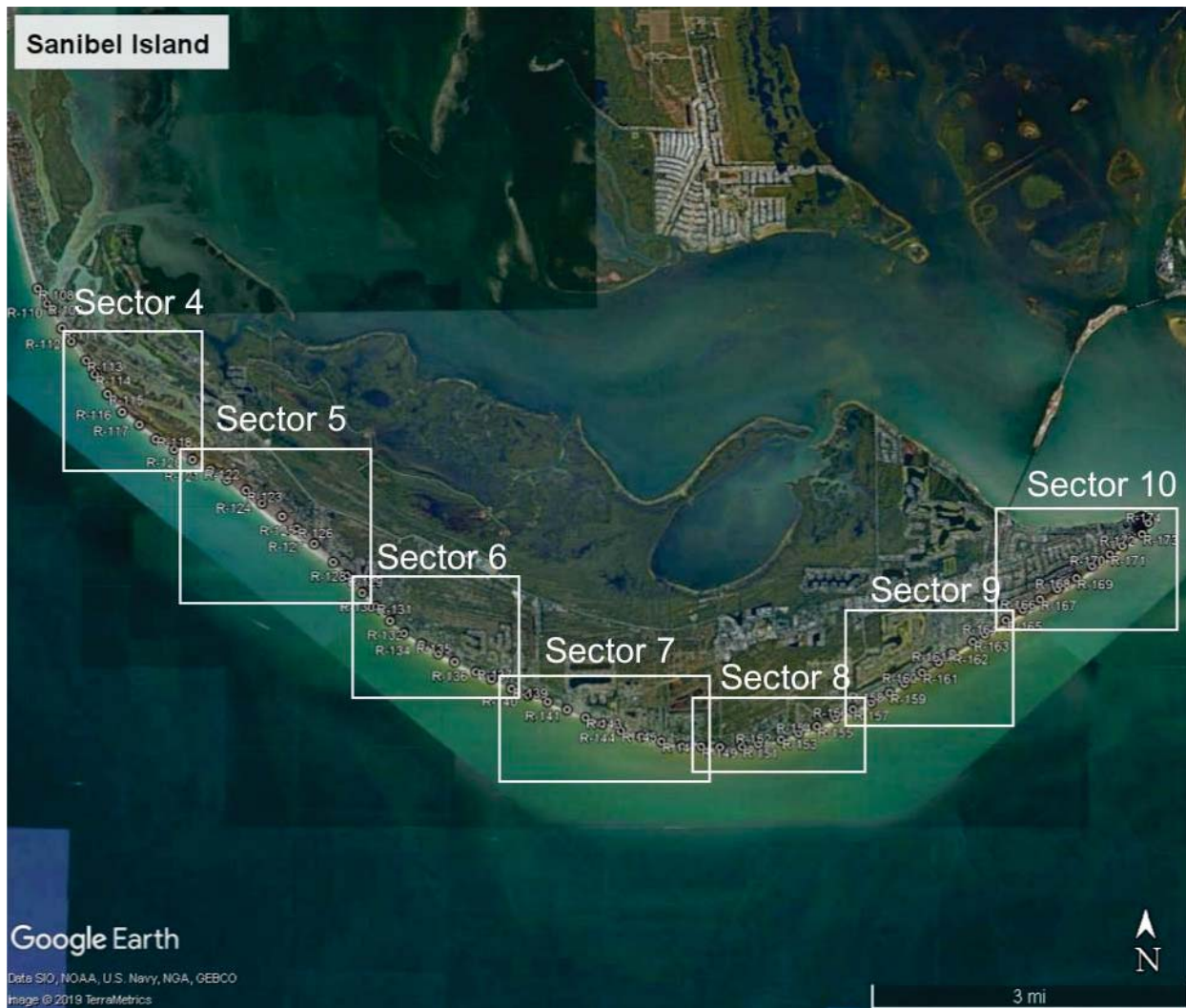


Figure 6. Google Earth map showing Sanibel Island’s Coastal Range Monuments (R-Monuments) and its 7 sectors.

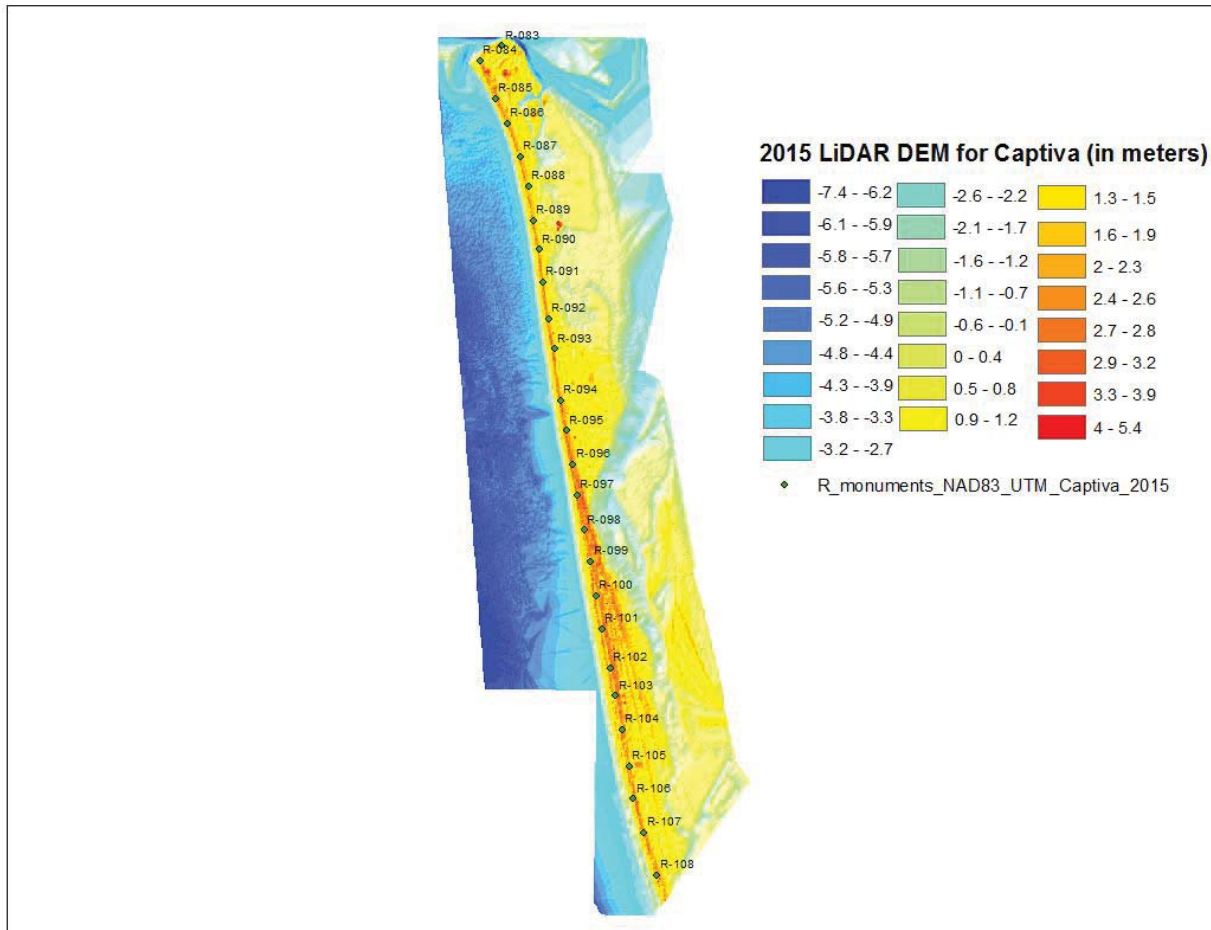


Figure 7. 2015 LiDAR Digital Elevation Model (DEM) for Captiva Island. Elevations in meters and relative to NAVD88.

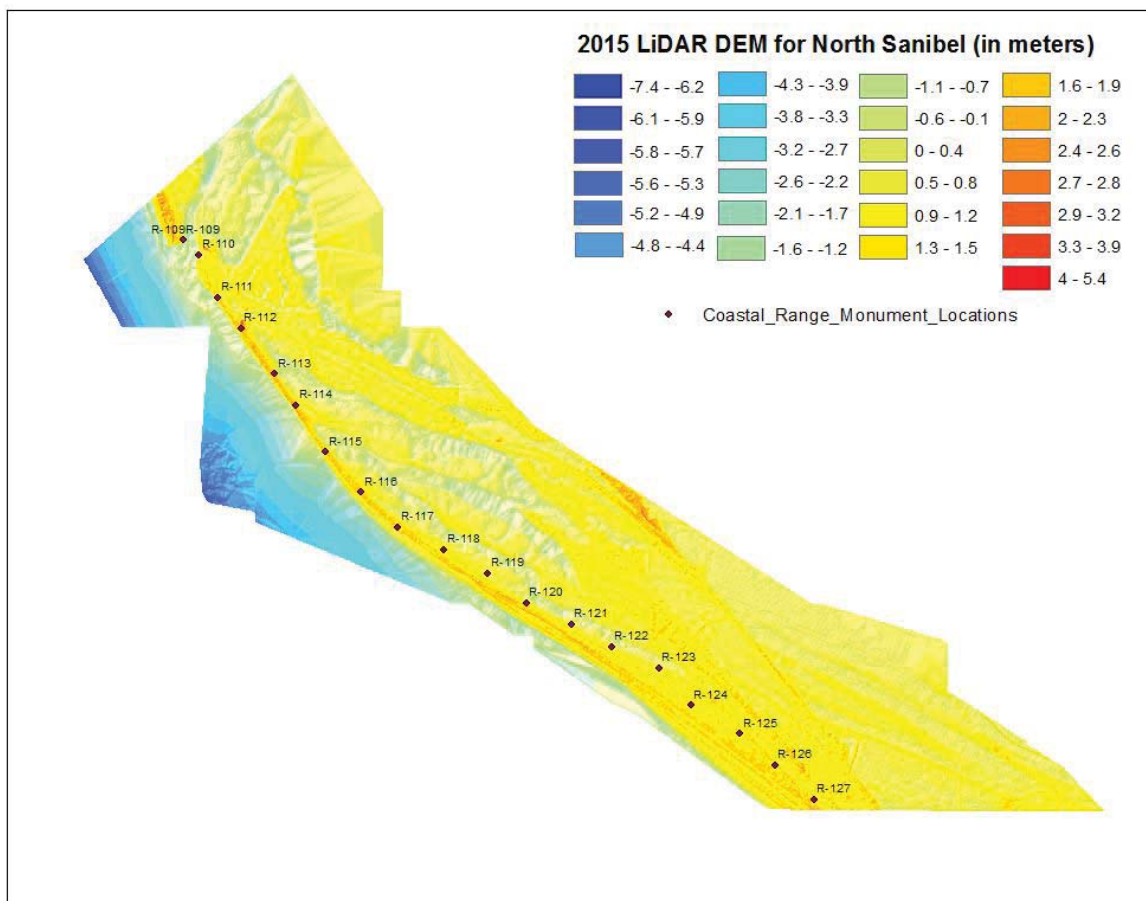


Figure 8. 2015 LiDAR Digital Elevation Model (DEM) for North Sanibel Island. Elevations in meters and relative to NAVD88.

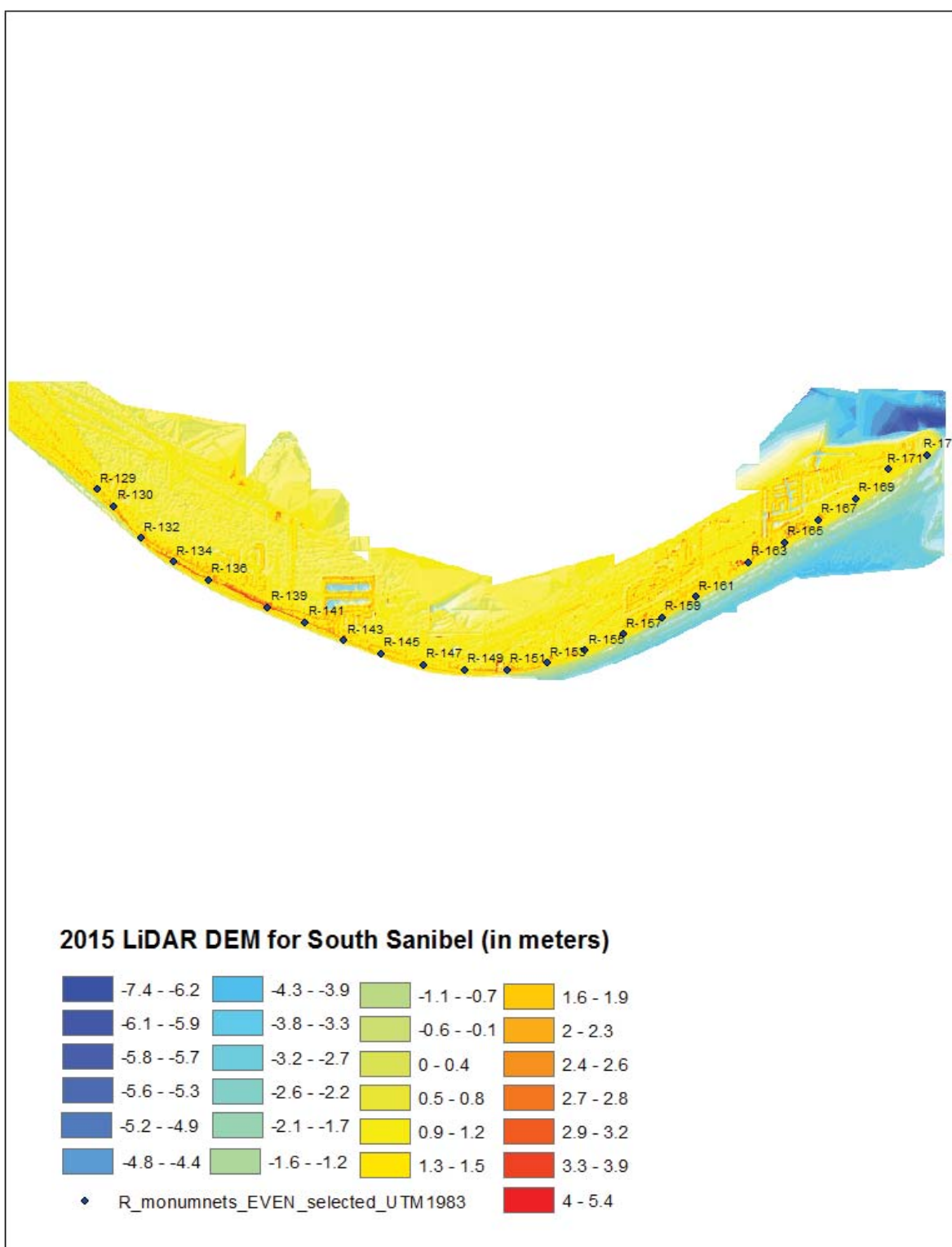


Figure 9. 2015 LiDAR Digital Elevation Model (DEM) for South Sanibel Island. Elevations in meters and relative to NAVD88.

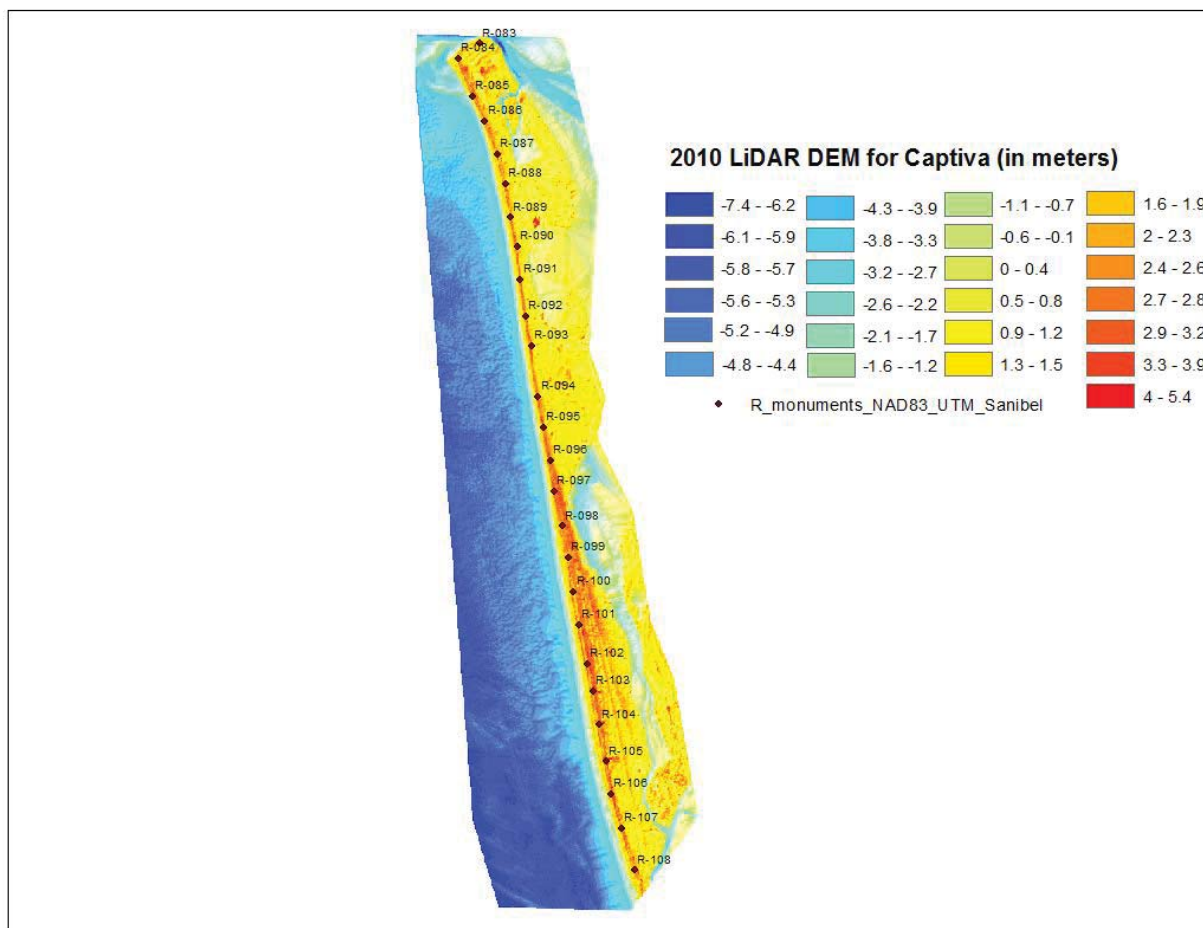


Figure 10. 2010 LiDAR Digital Elevation Model (DEM) for Captiva. Elevations in meters and relative to NAVD88.

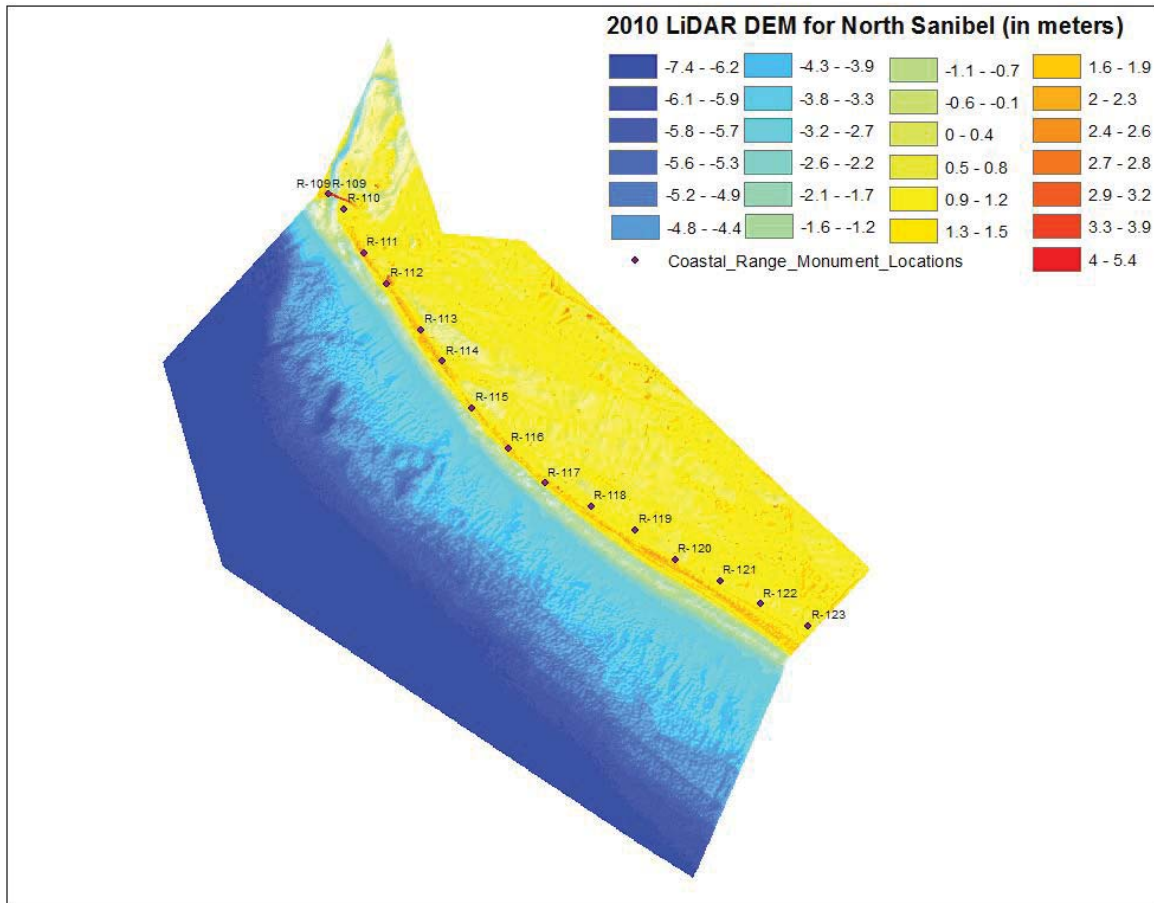


Figure 11. 2010 LiDAR Digital Elevation Model (DEM) for North Sanibel. Elevations in meters and relative to NAVD88.

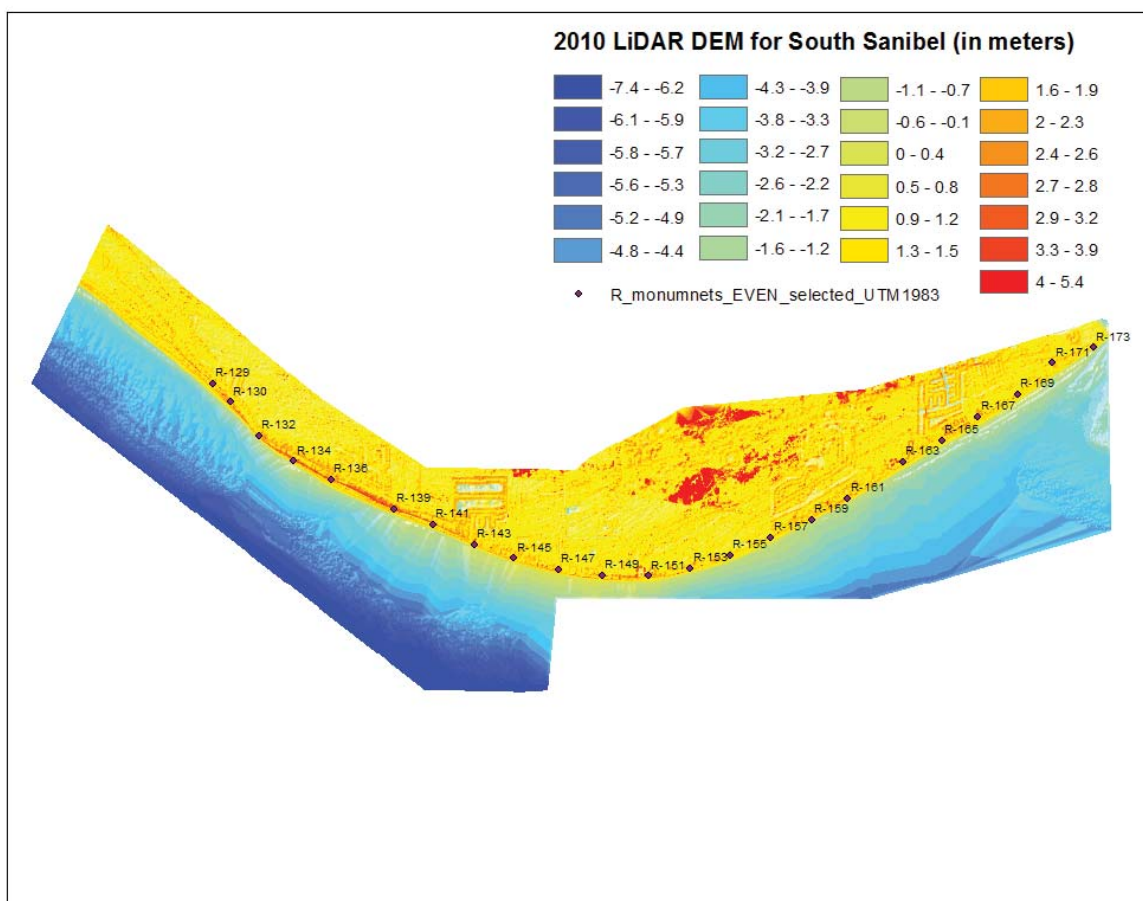


Figure 12. 2010 LiDAR Digital Elevation Model (DEM) for South Sanibel. Elevations in meters and relative to NAVD88.

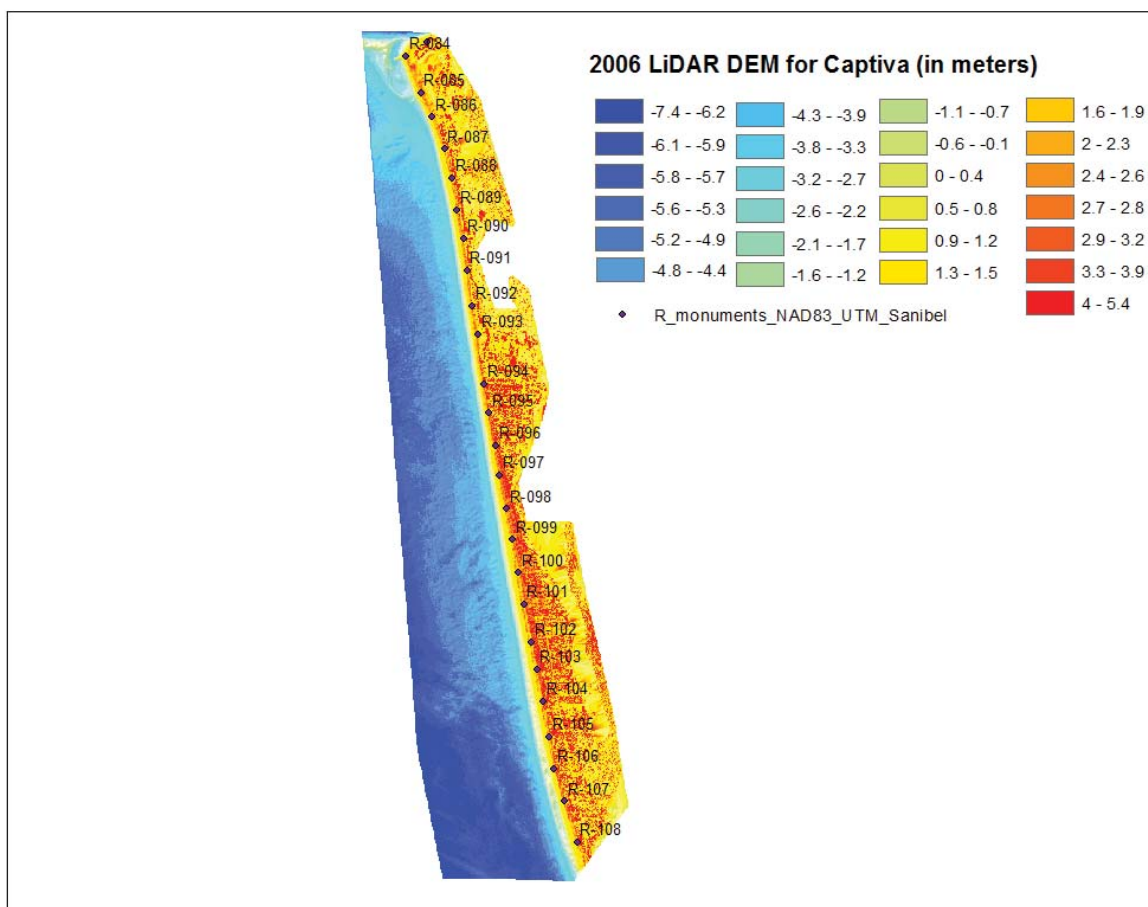


Figure 13. 2006 LiDAR Digital Elevation Model (DEM) for Captiva Island. Elevations in meters and relative to NAVD88.

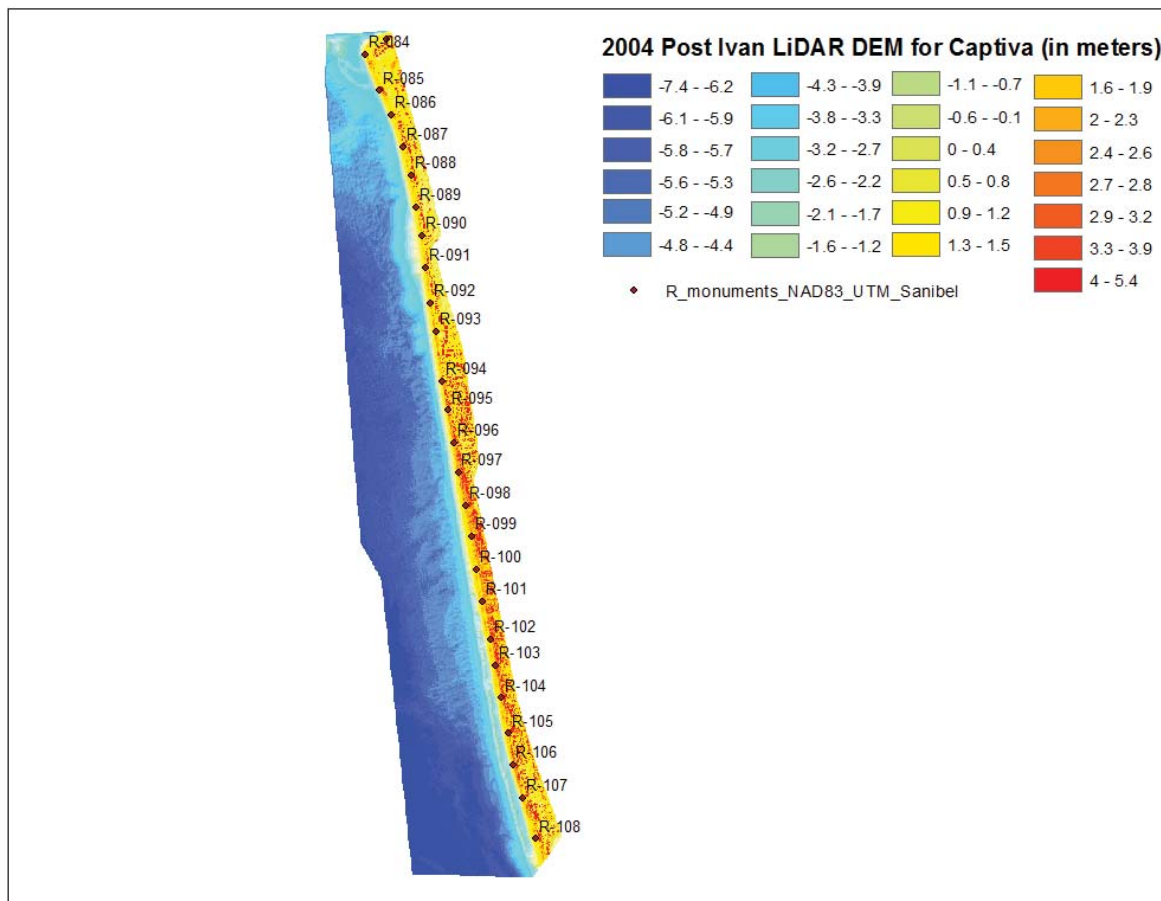


Figure 14. 2004 Post Hurricane Ivan LiDAR Digital Elevation Model (DEM) for Captiva Island. Elevations in meters and relative to NAVD88.

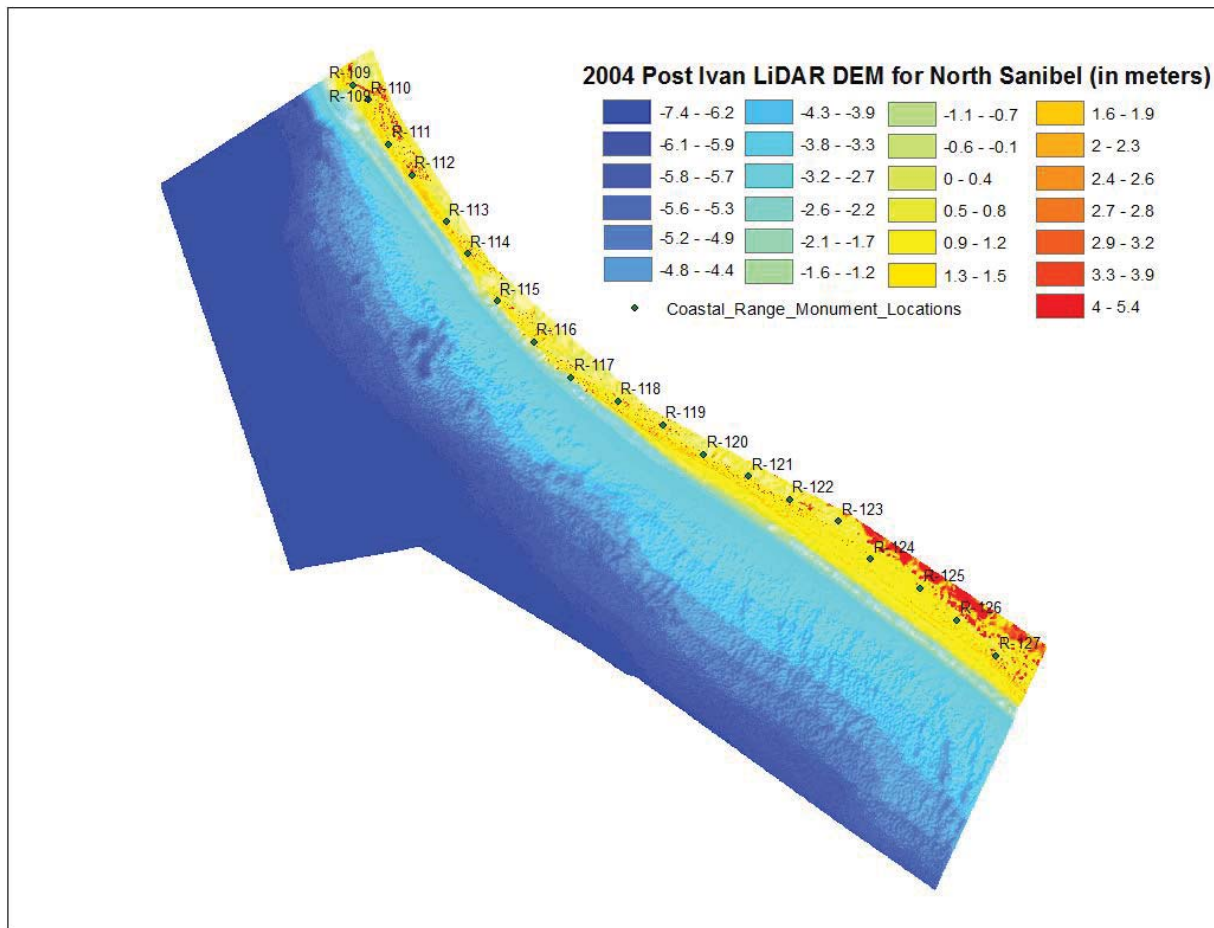


Figure 15. 2004 Post Hurricane Ivan LiDAR Digital Elevation Model (DEM) for North Sanibel Island. Elevations in meters and relative to NAVD88.

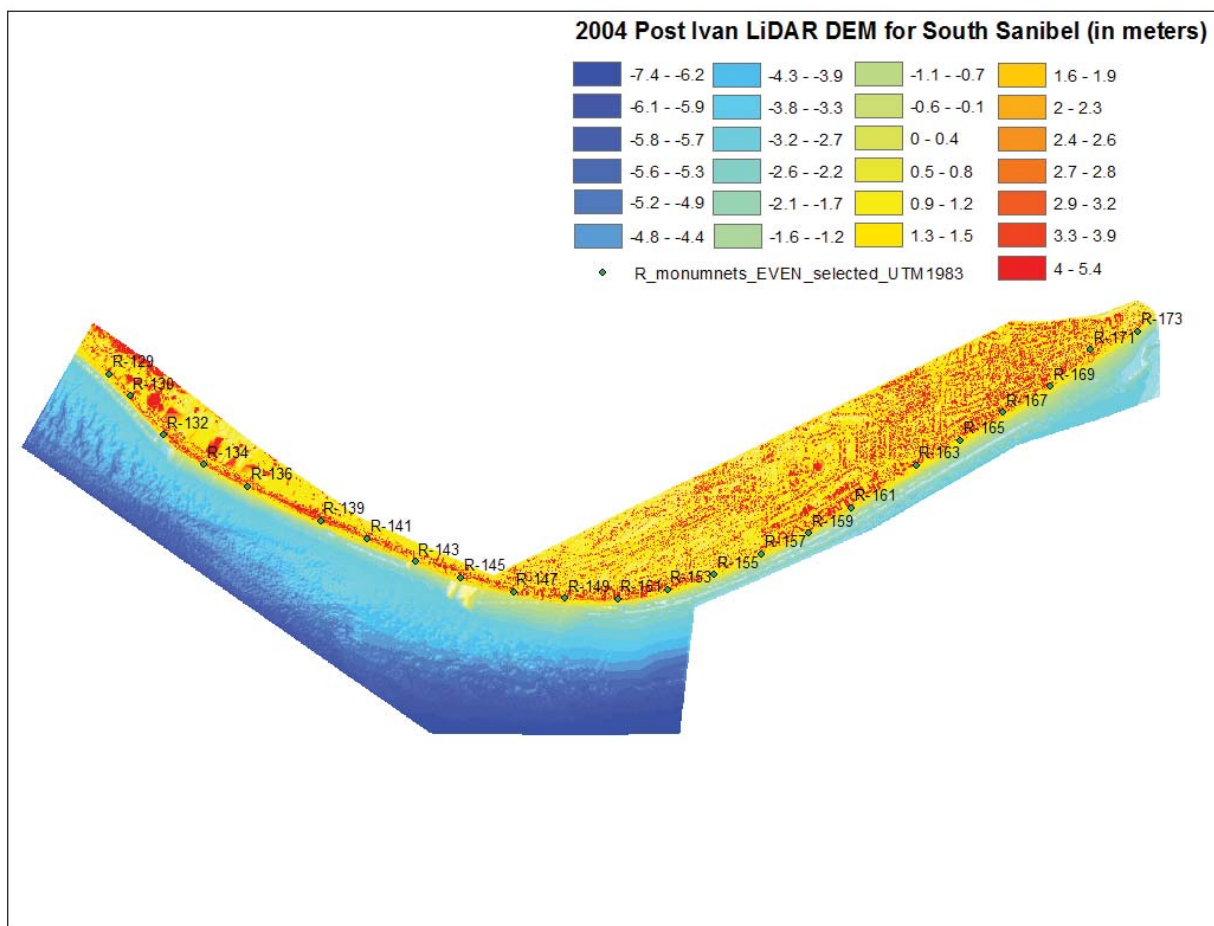


Figure 16. 2004 Post Hurricane Ivan LiDAR Digital Elevation Model (DEM) for South Sanibel Island. Elevations in meters and relative to NAVD88.

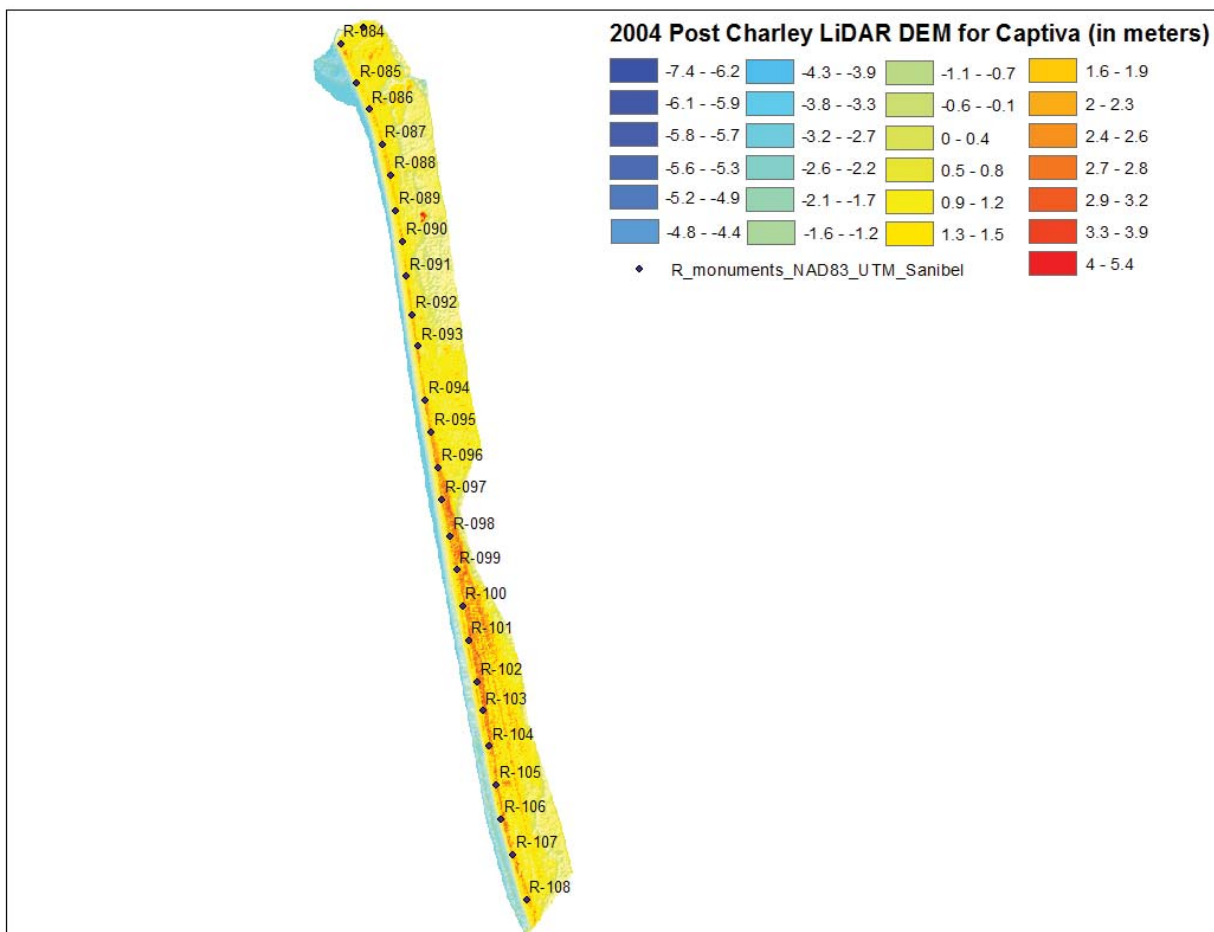


Figure 17. 2004 Post Hurricane Charley LiDAR Digital Elevation Model (DEM) for Captiva Island. Elevations in meters and relative to NAVD88.

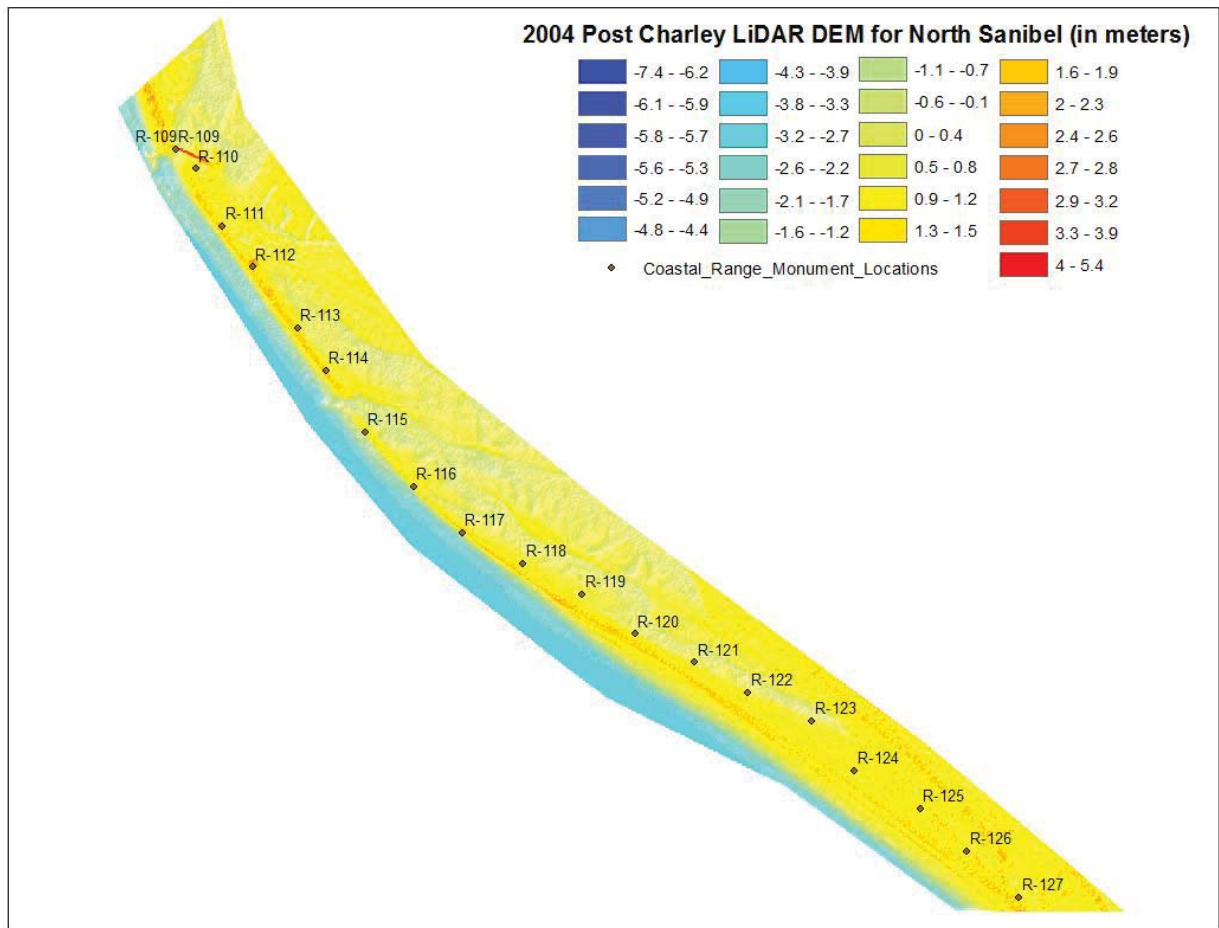


Figure 18. 2004 Post Hurricane Charley LiDAR Digital Elevation Model (DEM) for North Sanibel Island. Elevations in meters and relative to NAVD88.

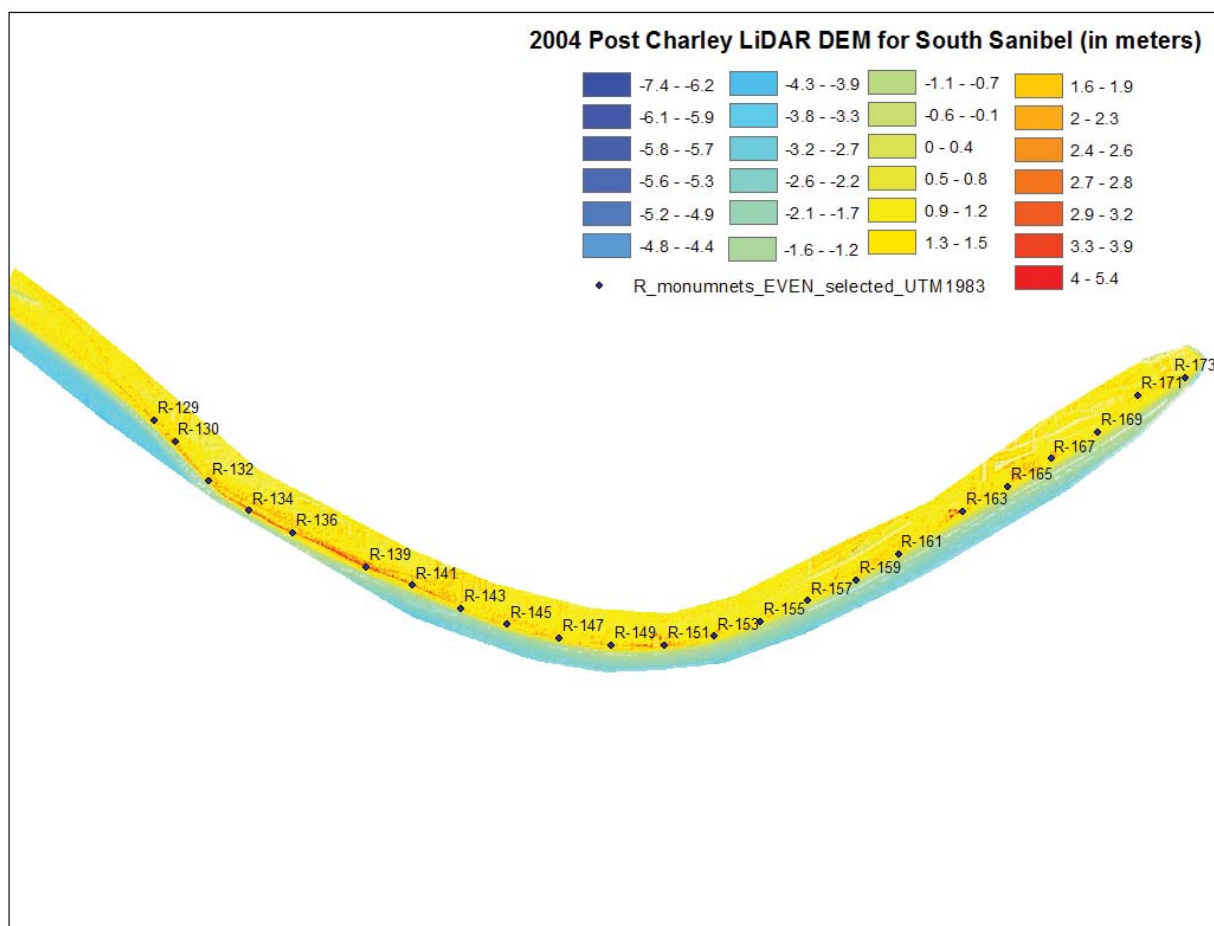


Figure 19. 2004 Post Hurricane Charley LiDAR Digital Elevation Model (DEM) for South Sanibel Island. Elevations in meters and relative to NAVD88.

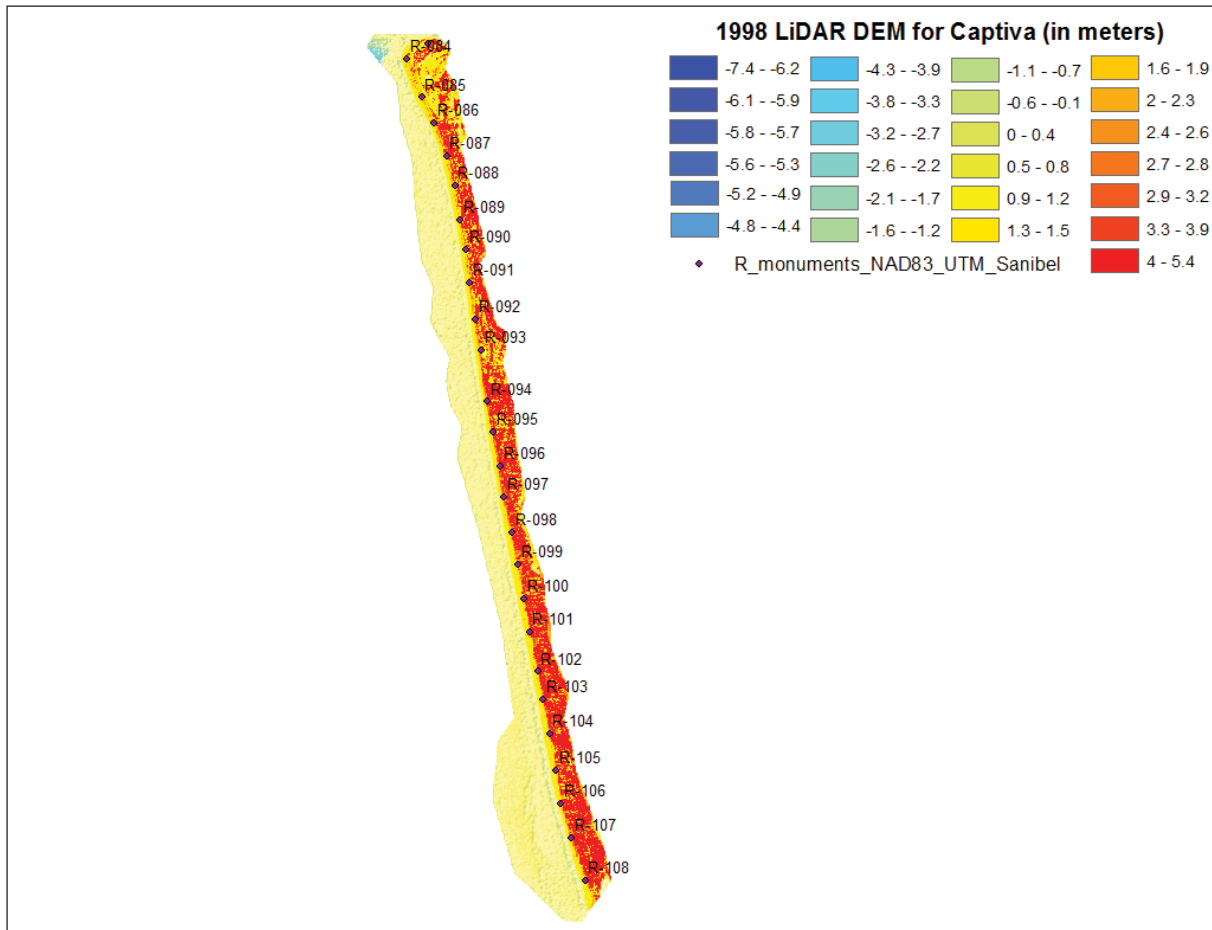


Figure 20. 1998 LiDAR Digital Elevation Model (DEM) for Captiva Island. Elevations in meters and relative to NAVD88.

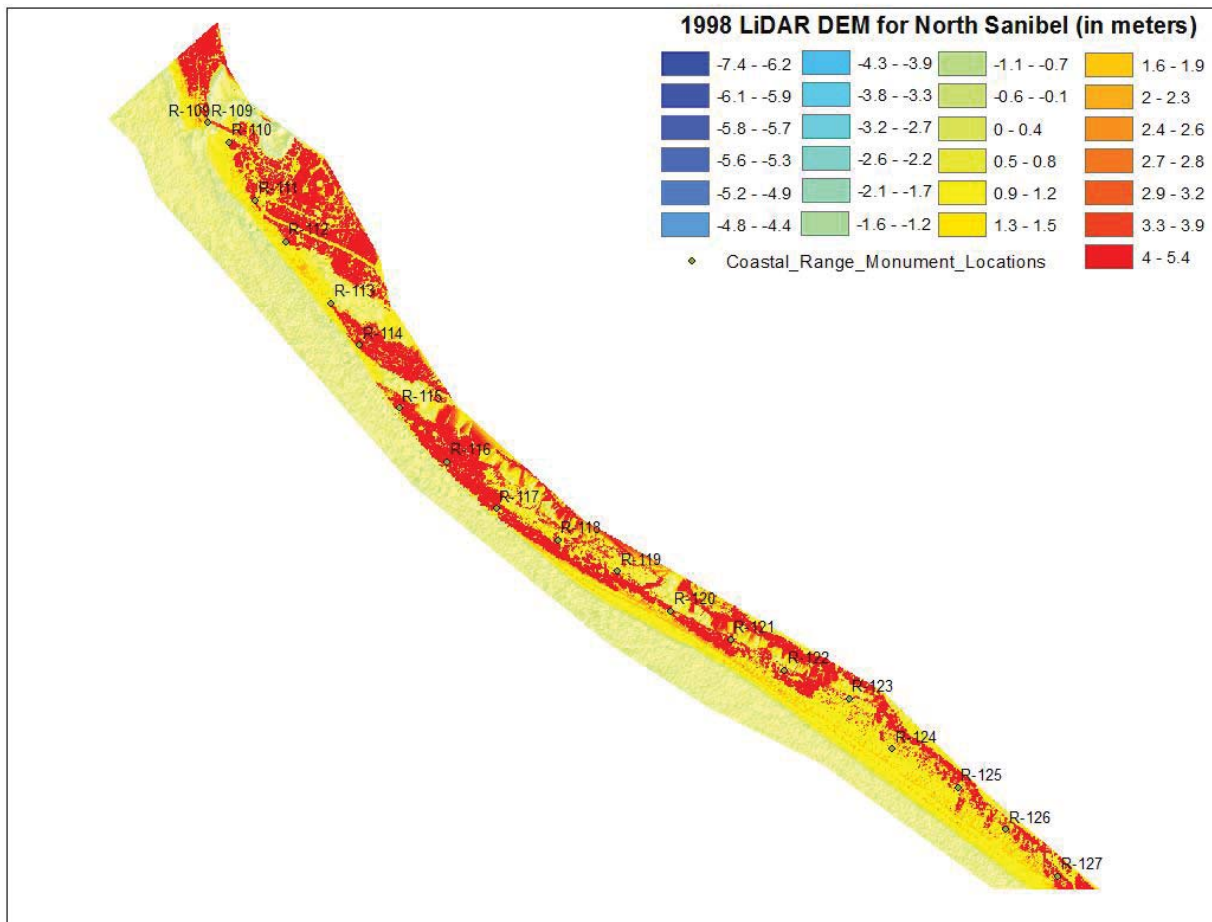


Figure 21. 1998 LiDAR Digital Elevation Model (DEM) for North Sanibel Island. Elevations in meters and relative to NAVD88.

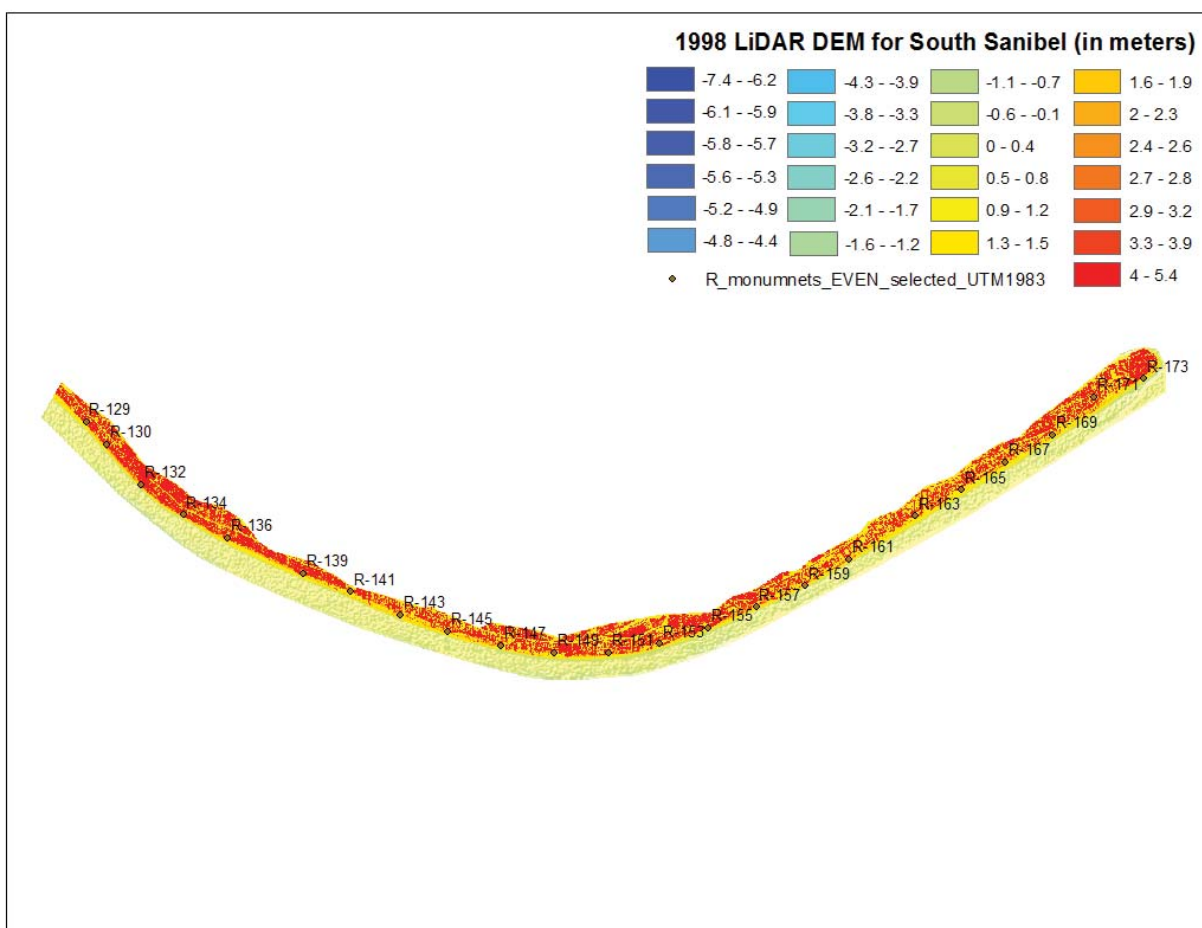


Figure 22. 1998 LiDAR Digital Elevation Model (DEM) for South Sanibel Island. Elevations in meters and relative to NAVD88.

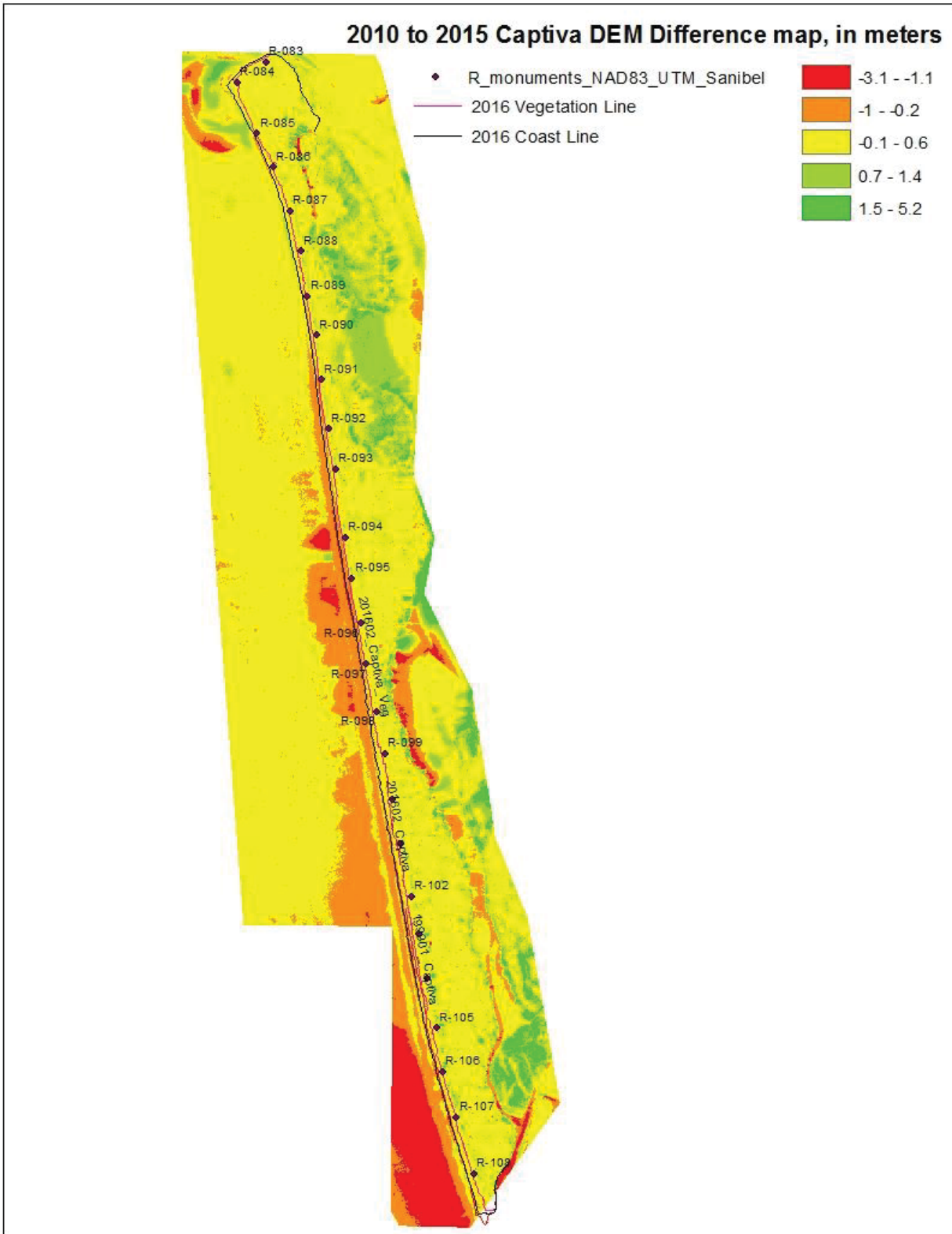


Figure 23. 2010 to 2015 Captiva Elevation Difference Map. Also shown are the positions of shoreline and vegetation line in 2016.

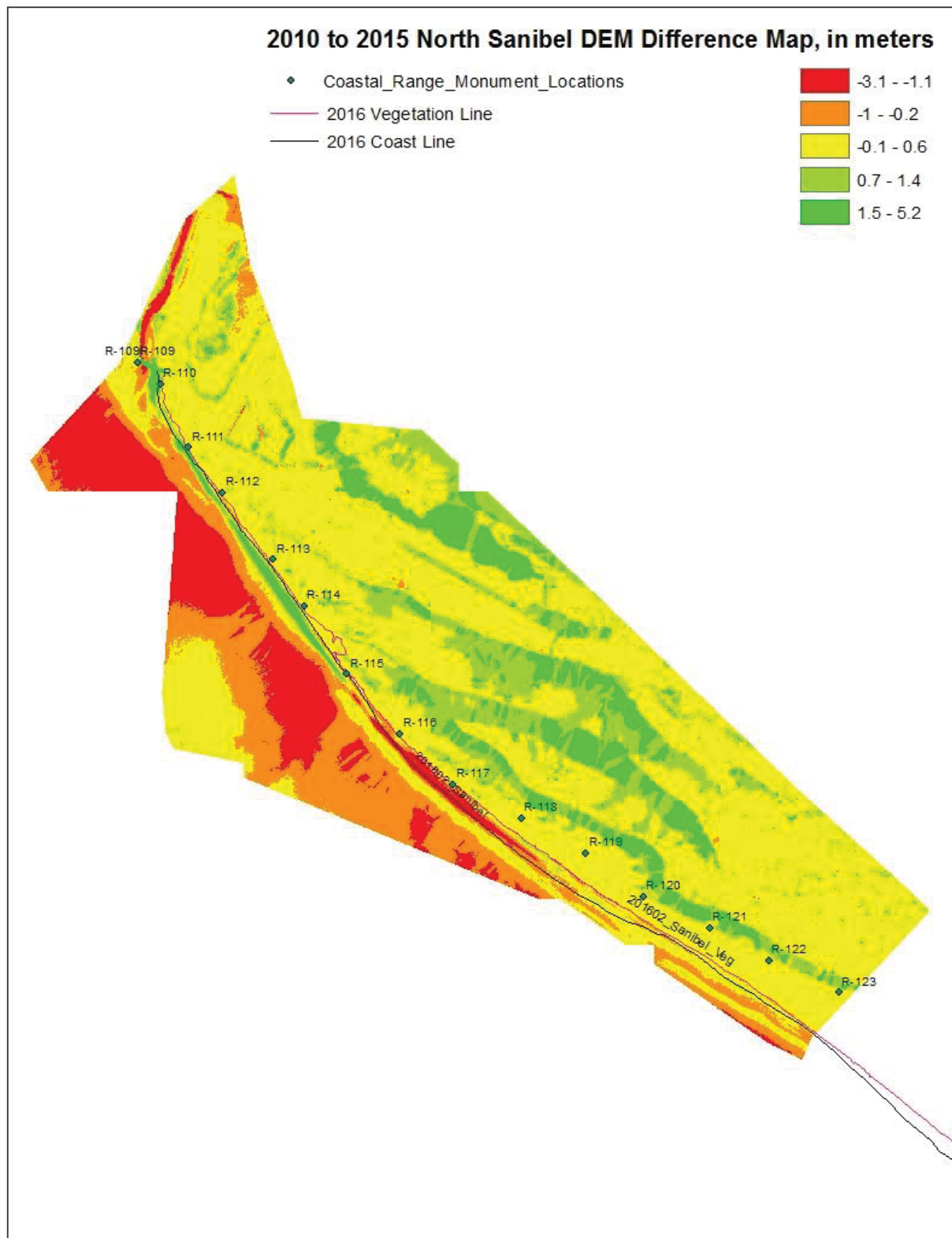


Figure 24. 2010 to 2015 North Sanibel Elevation Difference Map. Also shown are the positions of shoreline and vegetation line in 2016.

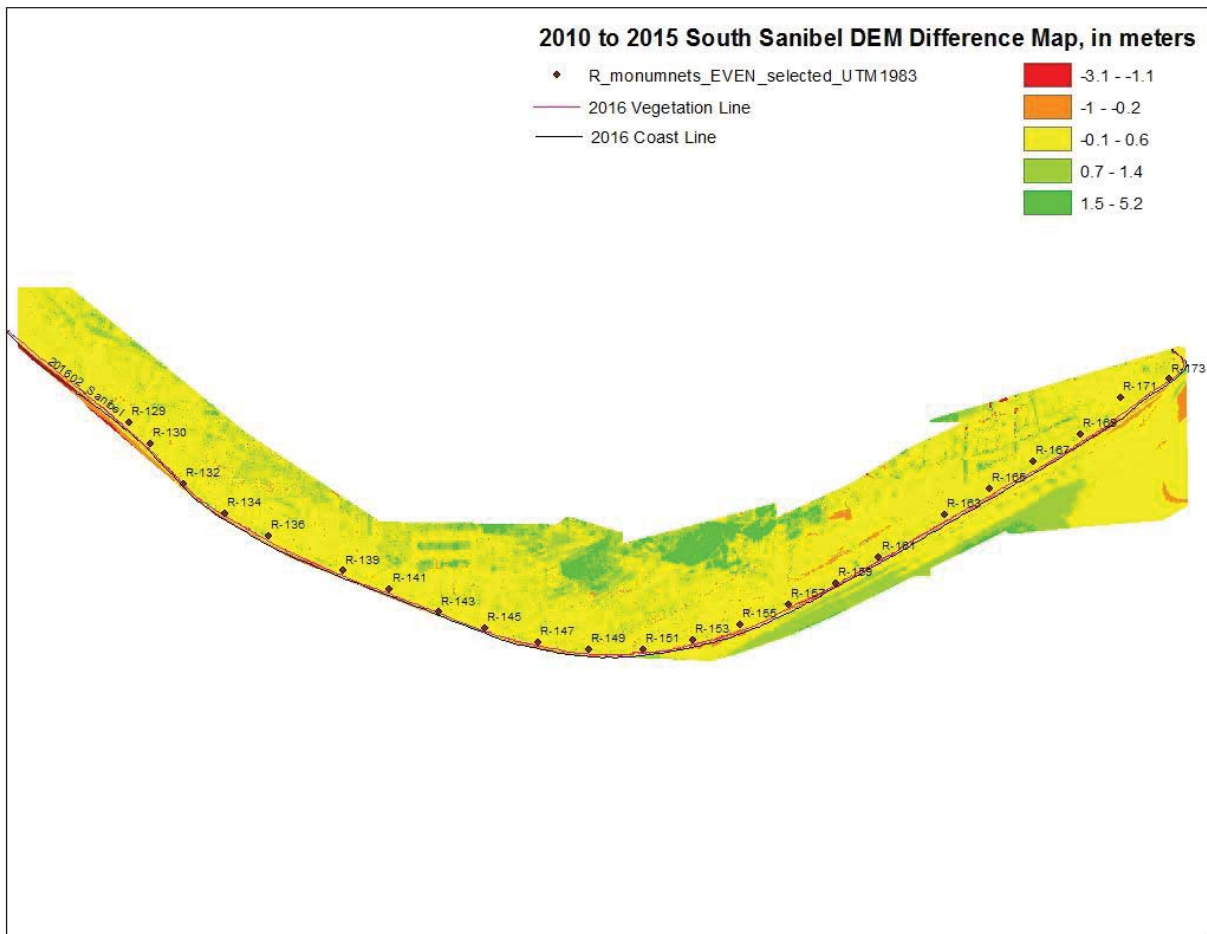


Figure 25. 2010 to 2015 South Sanibel Elevation Difference Map. Also shown are the positions of shoreline and vegetation line in 2016.

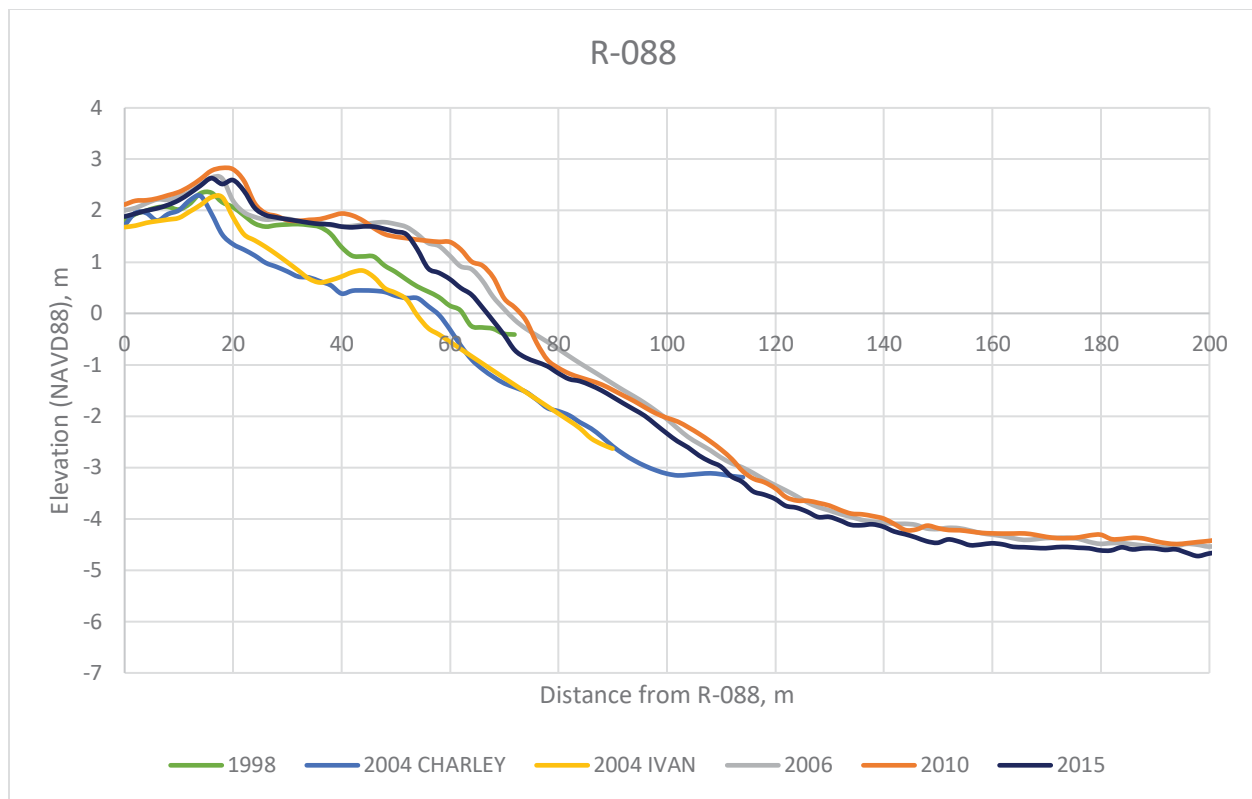


Figure 26. Beach profiles at R-088 extracted from LiDAR surveys. Elevations shown with respect to NAVD88. 0 m on x-axis represents the position of the R-monument; distance increases in the seaward direction.

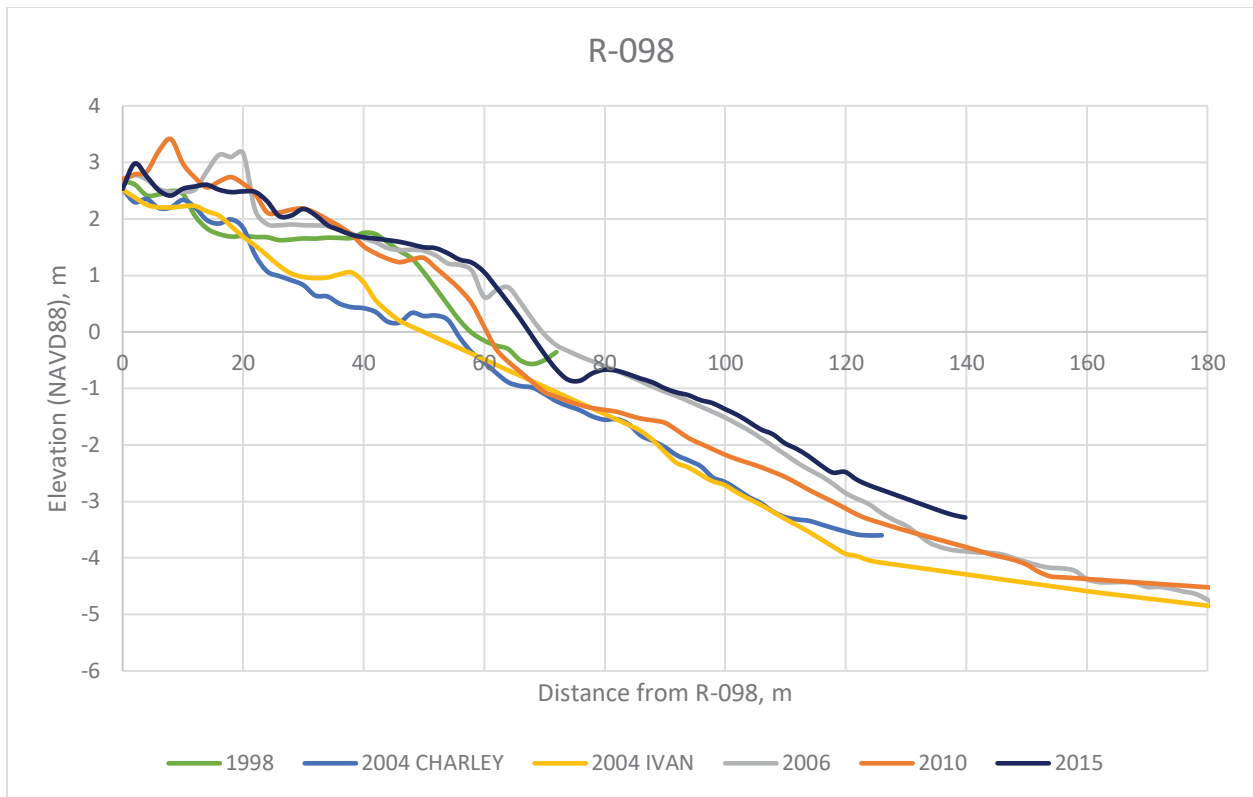


Figure 27. Beach profiles at R-098 extracted from LiDAR surveys. Elevations shown with respect to NAVD88. 0 m on x-axis represents the position of the R-monument; distance increases in the seaward direction.

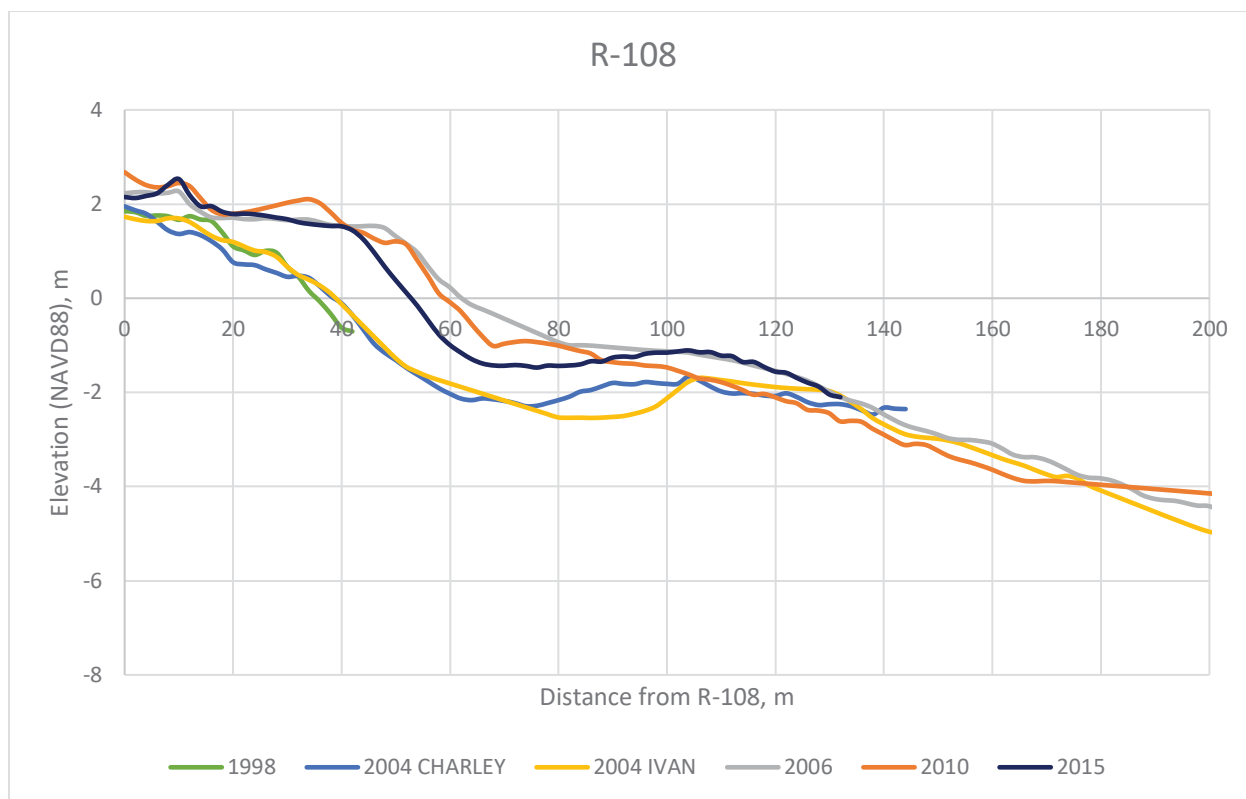


Figure 28. Beach profiles at R-108 extracted from LiDAR surveys. Elevations shown with respect to NAVD88. 0 m on x-axis represents the position of the R-monument; distance increases in the seaward direction.

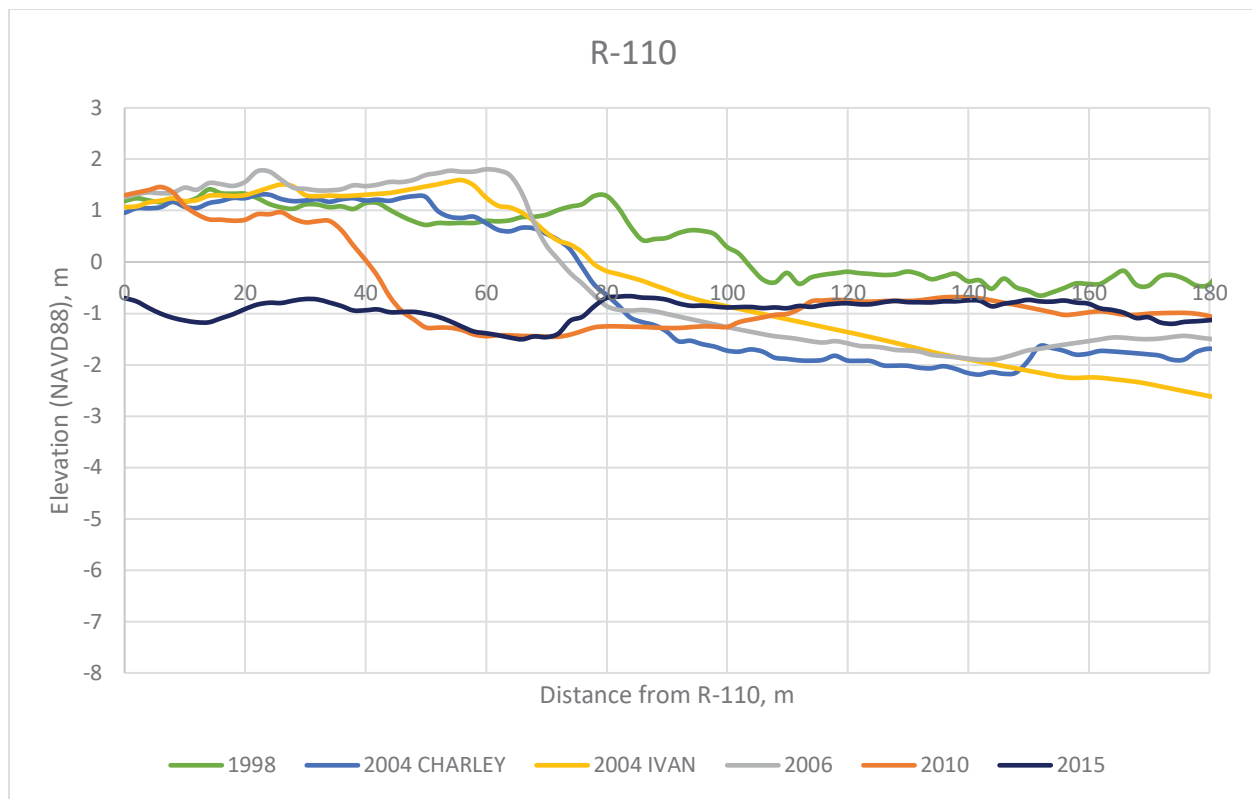


Figure 29. Beach profiles at R-110 extracted from LiDAR surveys, showing extensive erosion in the Santiva area. Elevations shown with respect to NAVD88. 0 m on x-axis represents the position of the R-monument; distance increases in the seaward direction.

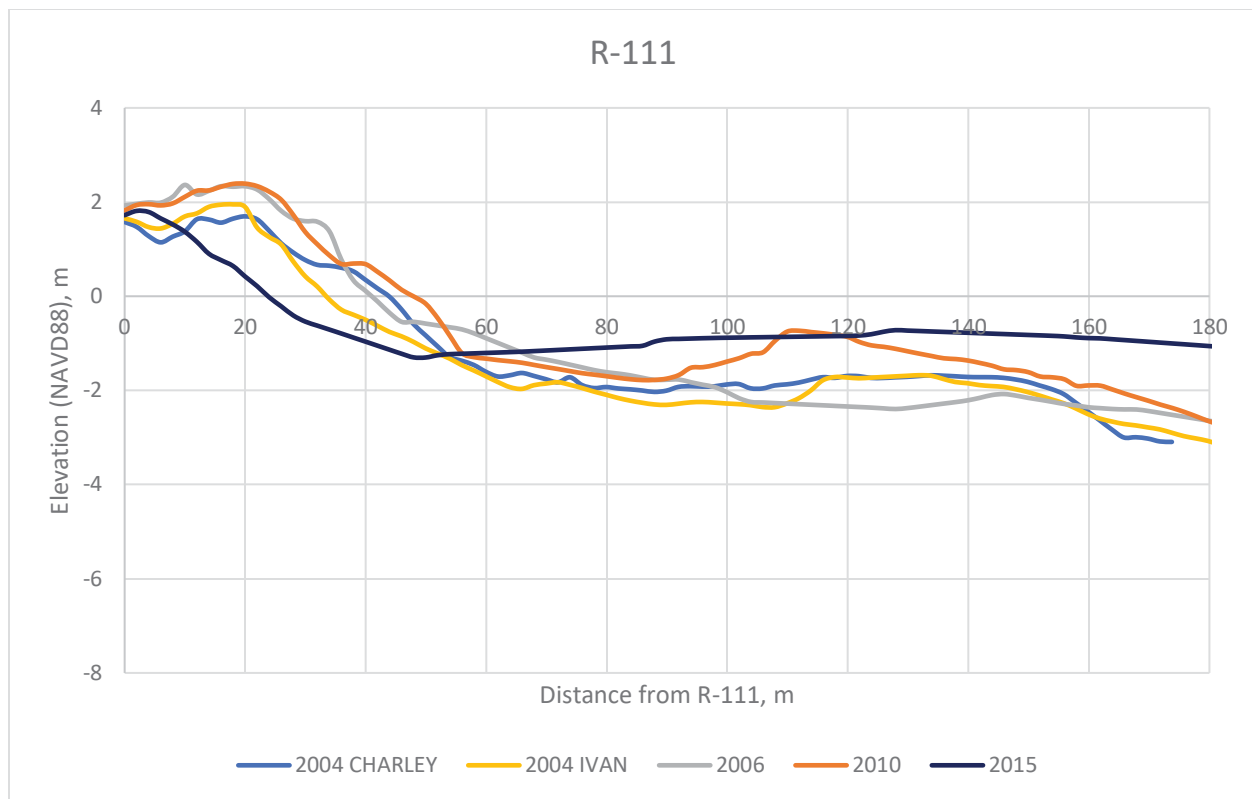


Figure 30. Beach profiles at R-111 extracted from LiDAR surveys, showing extensive erosion in the Santiva area. Elevations shown with respect to NAVD88. 0 m on x-axis represents the position of the R-monument; distance increases in the seaward direction.

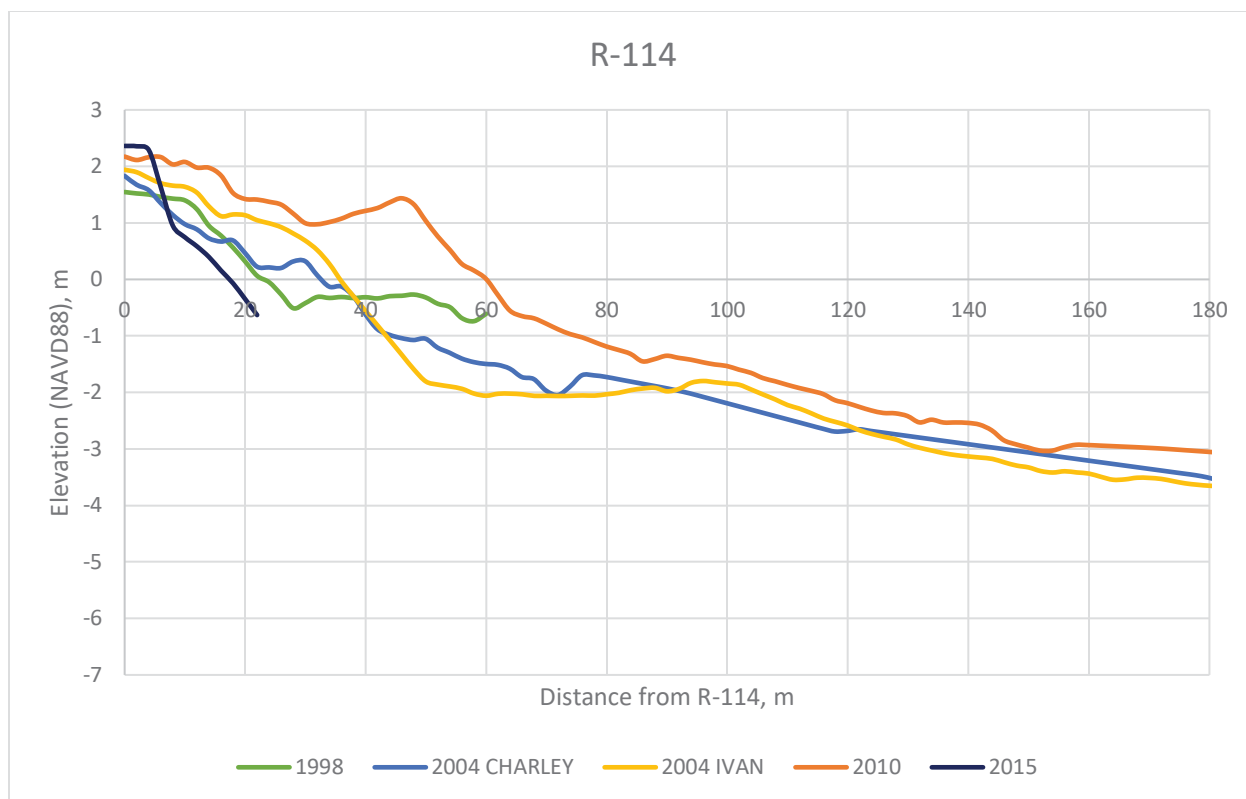


Figure 31. Beach profiles at R-114 extracted from LiDAR surveys. Elevations shown with respect to NAVD88. 0 m on x-axis represents the position of the R-monument; distance increases in the seaward direction.

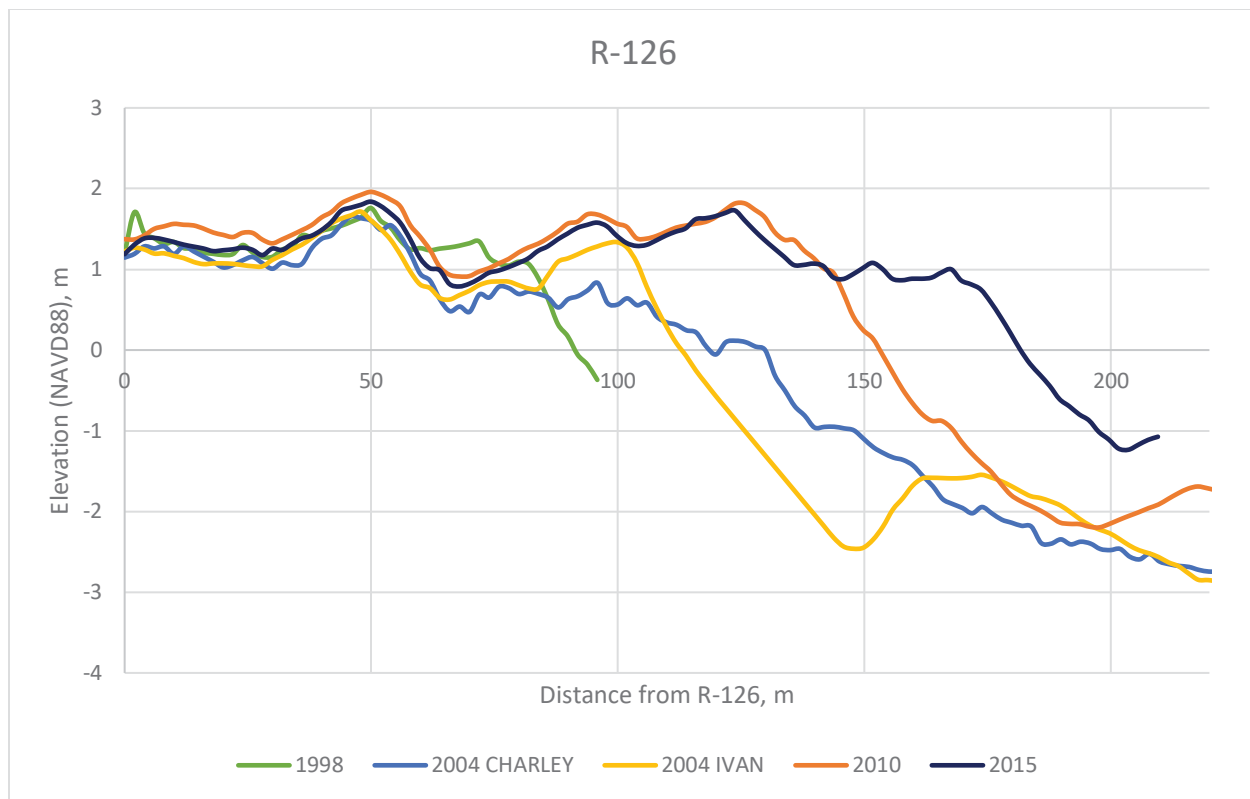


Figure 32. Beach profiles at R-126 extracted from LiDAR surveys, showing major accretion. Elevations shown with respect to NAVD88. 0 m on x-axis represents the position of the R-monument; distance increases in the seaward direction.

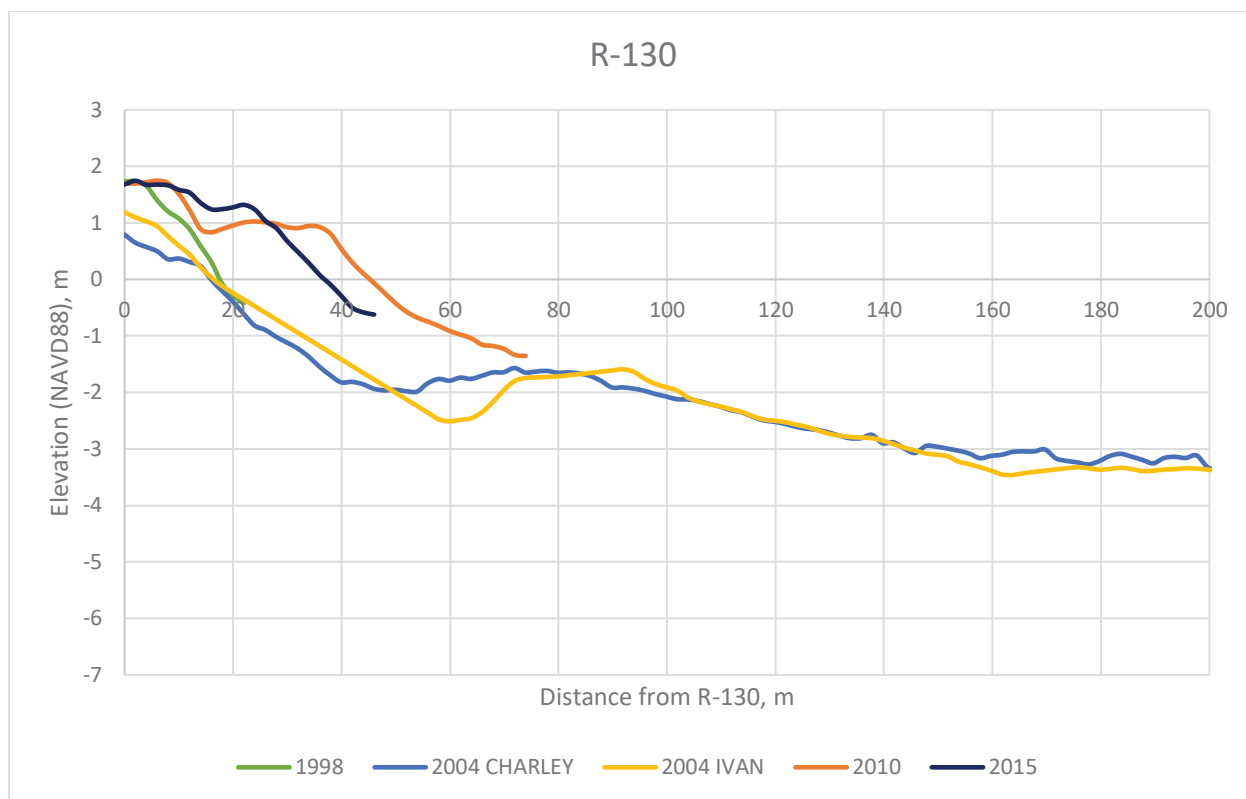


Figure 33. Beach profiles at R-130 extracted from LiDAR surveys. Elevations shown with respect to NAVD88. 0 m on x-axis represents the position of the R-monument; distance increases in the seaward direction.

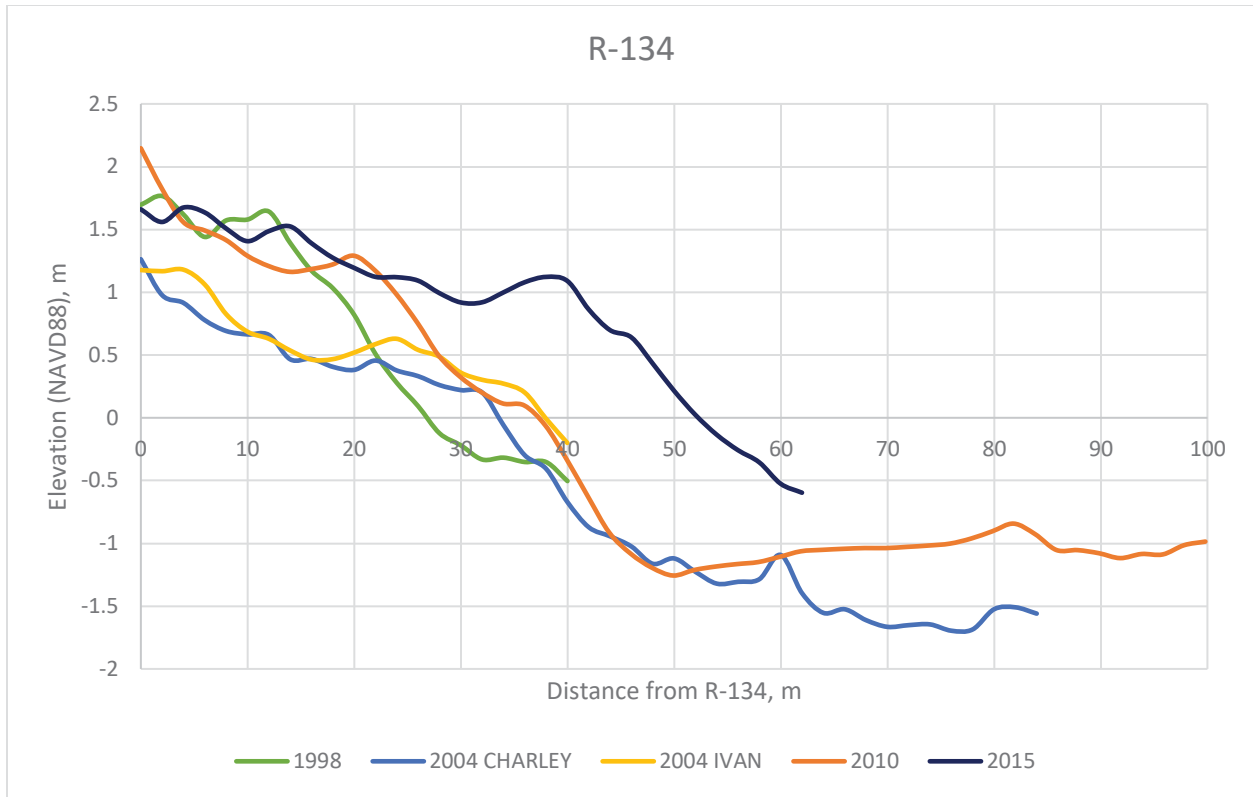


Figure 34. Beach profiles at R-134 extracted from LiDAR surveys. Elevations shown with respect to NAVD88. 0 m on x-axis represents the position of the R-monument; distance increases in the seaward direction.

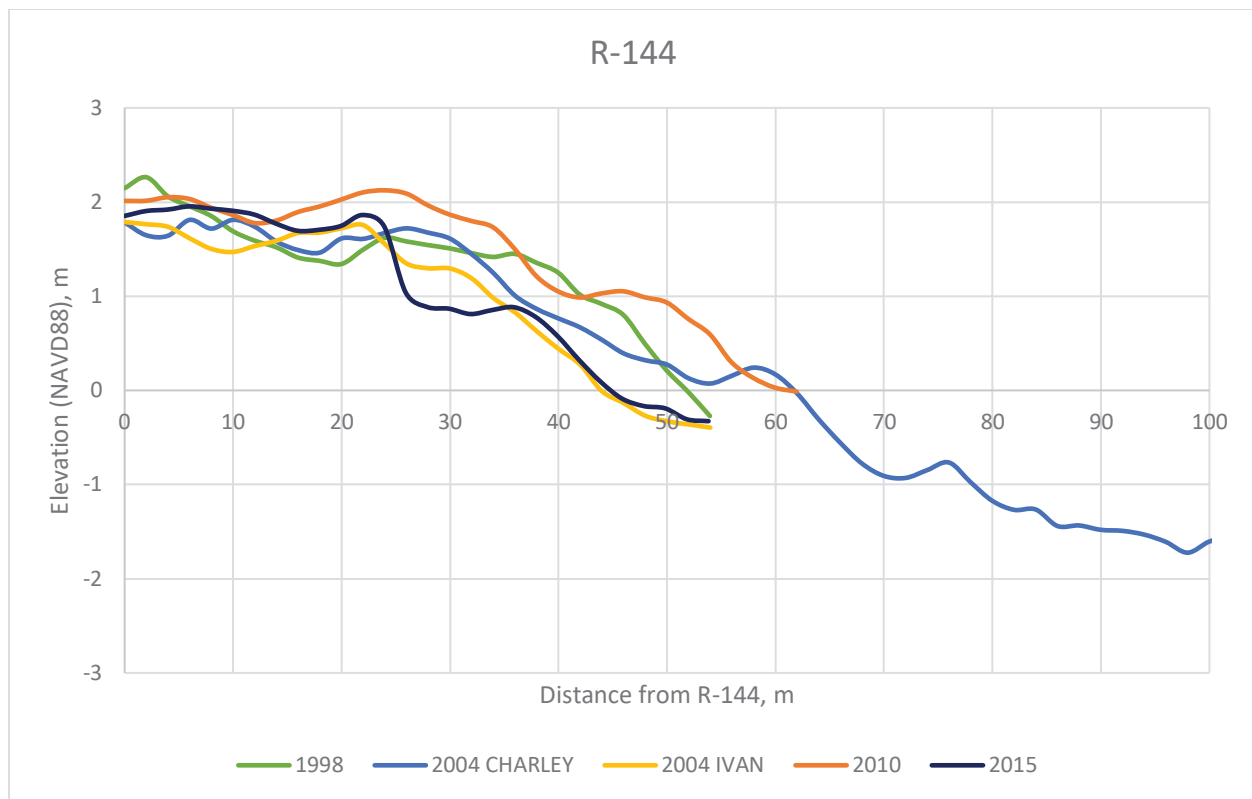


Figure 35. Beach profiles at R-144 extracted from LiDAR surveys. Elevations shown with respect to NAVD88. 0 m on x-axis represents the position of the R-monument; distance increases in the seaward direction.

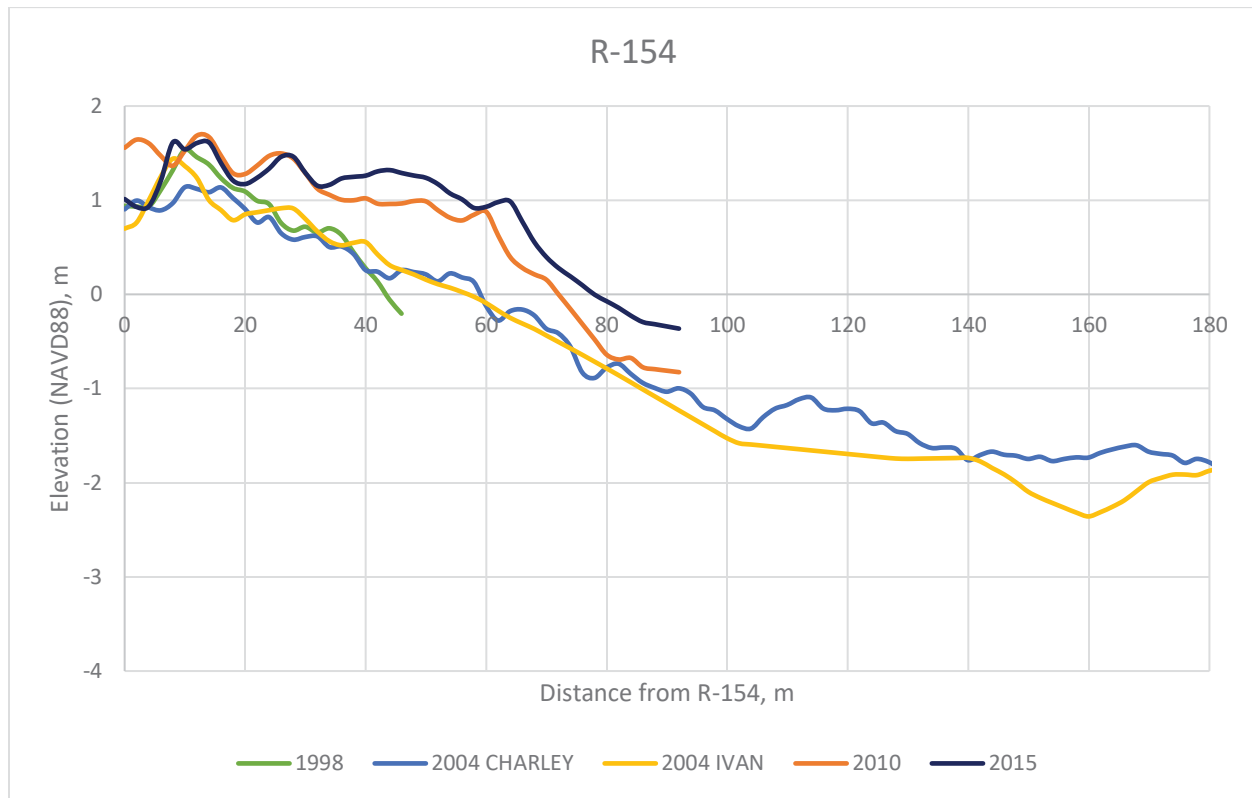


Figure 36. Beach profiles at R-154 extracted from LiDAR surveys. Elevations shown with respect to NAVD88. 0 m on x-axis represents the position of the R-monument; distance increases in the seaward direction.

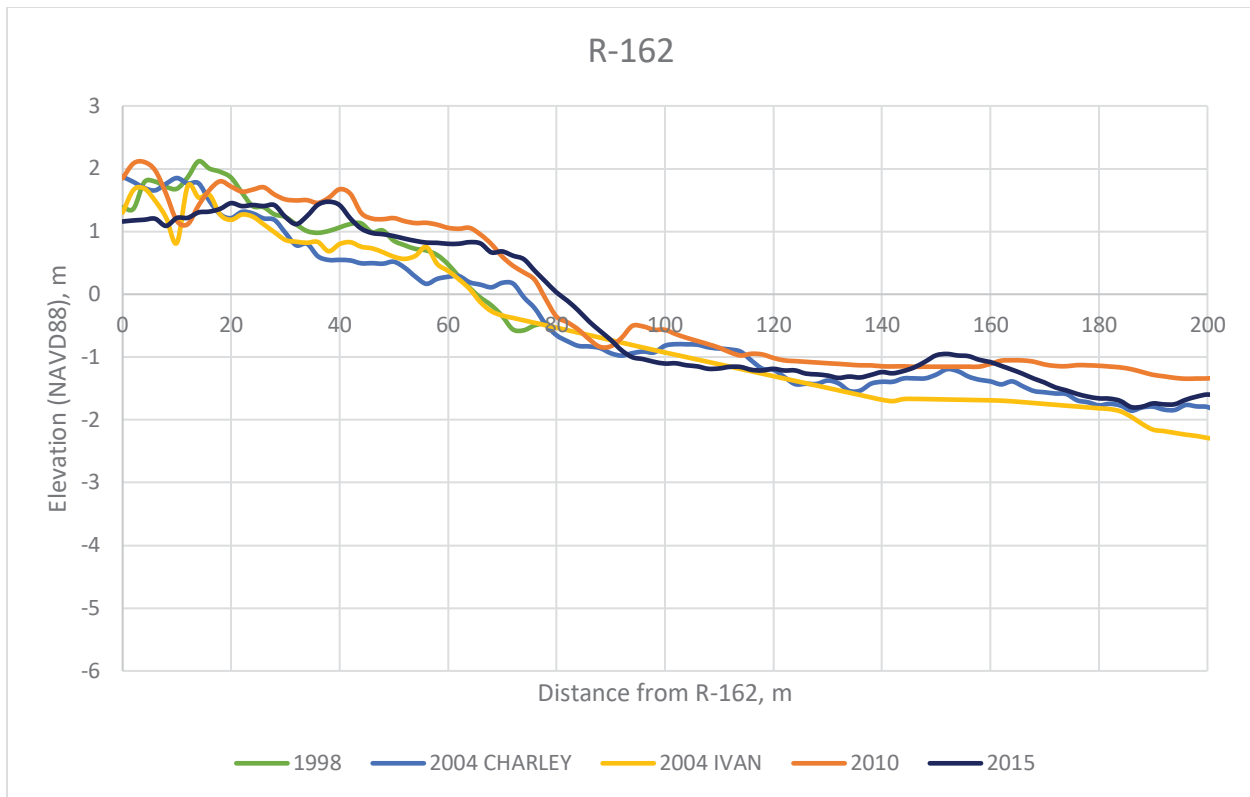


Figure 37. Beach profiles at R-162 extracted from LiDAR surveys. Elevations shown with respect to NAVD88. 0 m on x-axis represents the position of the R-monument; distance increases in the seaward direction.

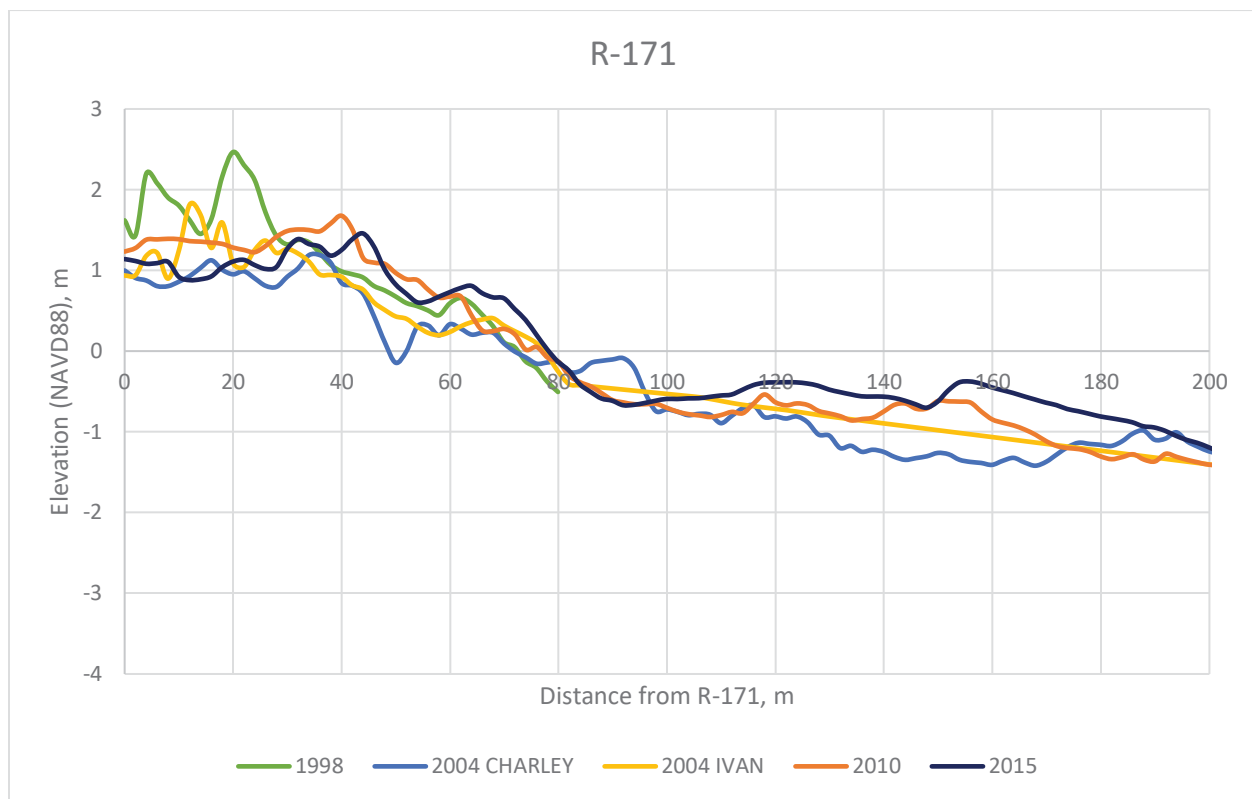


Figure 38. Beach profiles at R-171 extracted from LiDAR surveys. Elevations shown with respect to NAVD88. 0 m on x-axis represents the position of the R-monument; distance increases in the seaward direction.



Figure 39. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Captiva Island.



Figure 40. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Captiva Island.

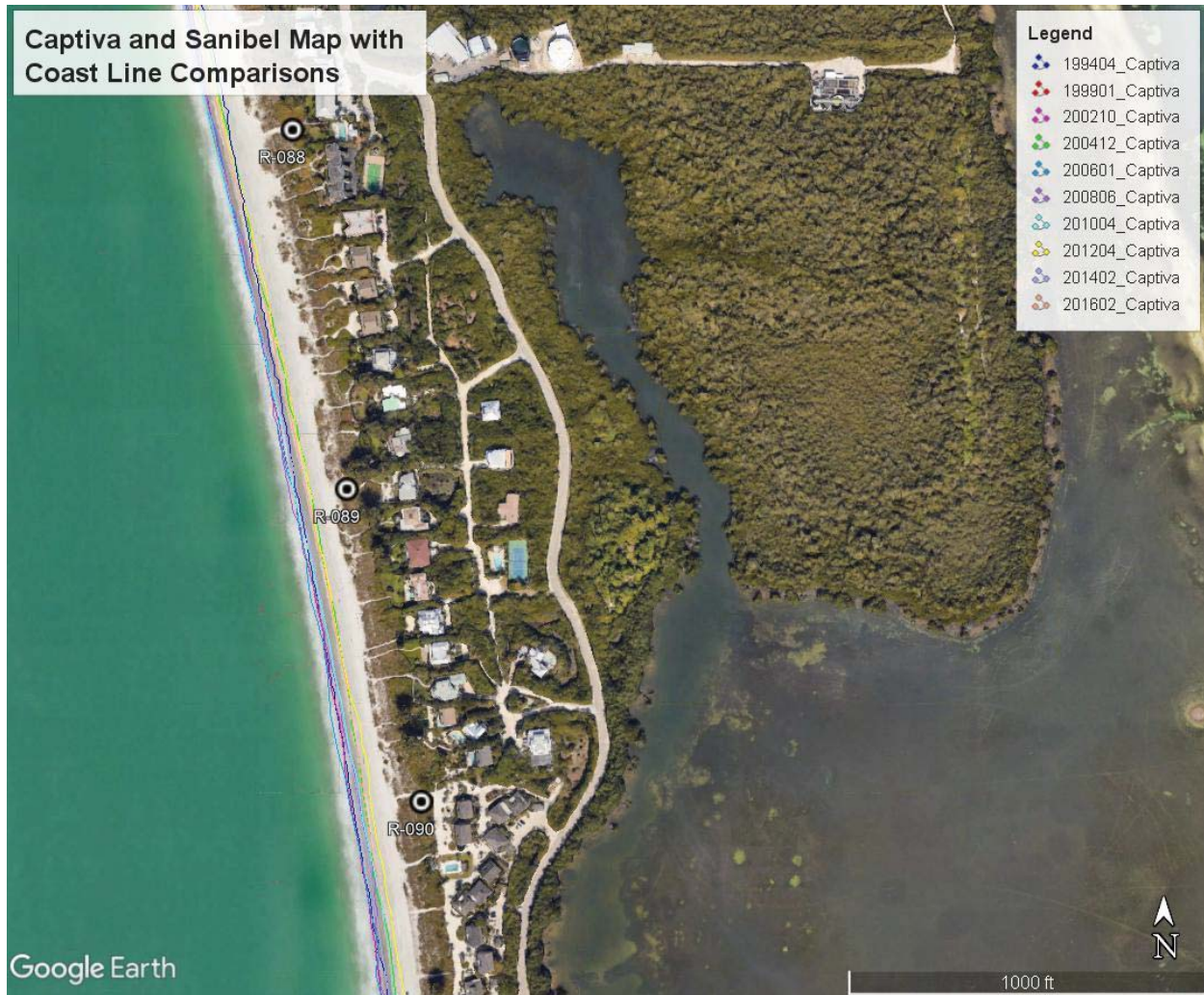


Figure 41. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Captiva Island.

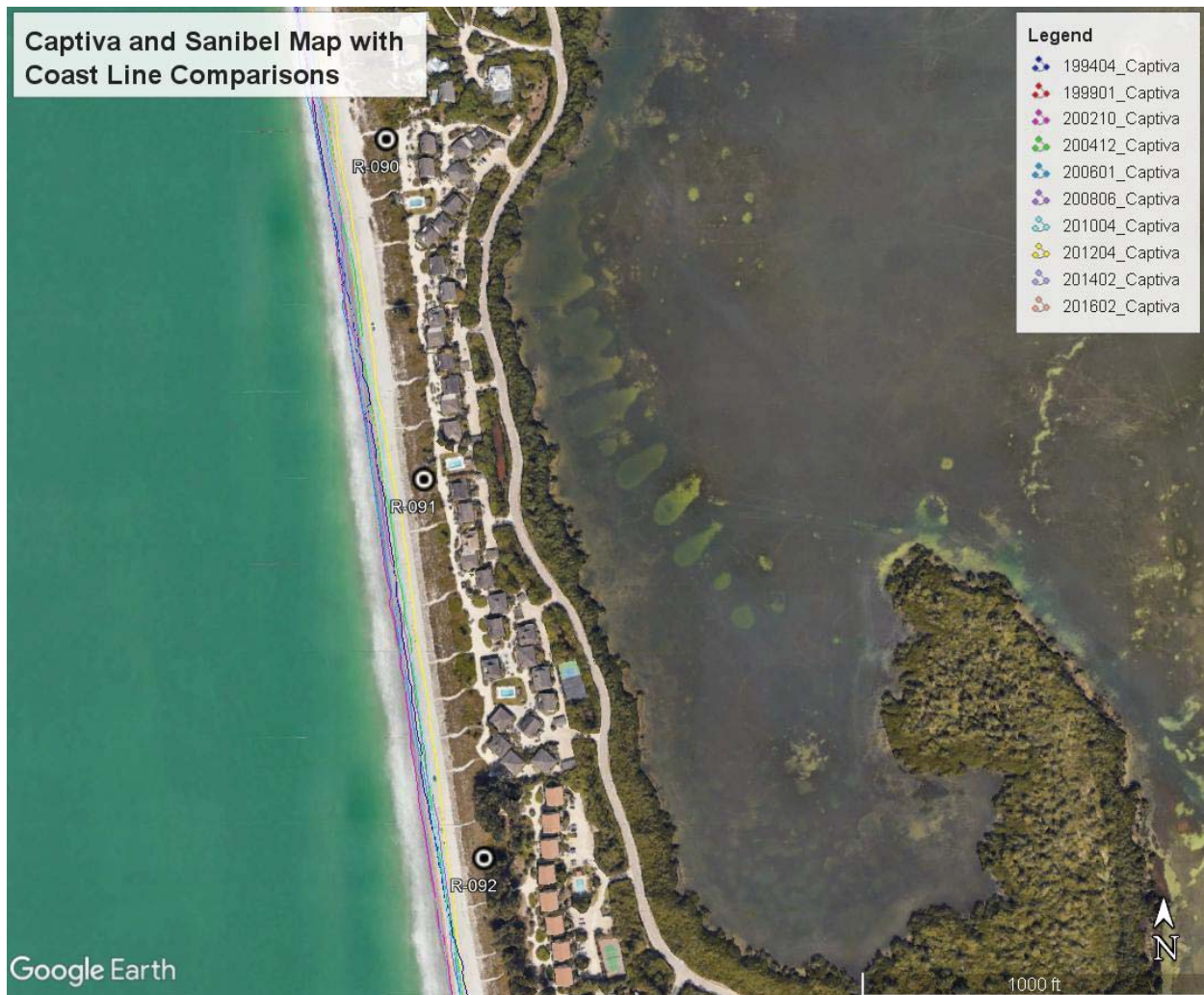


Figure 42. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Captiva Island.

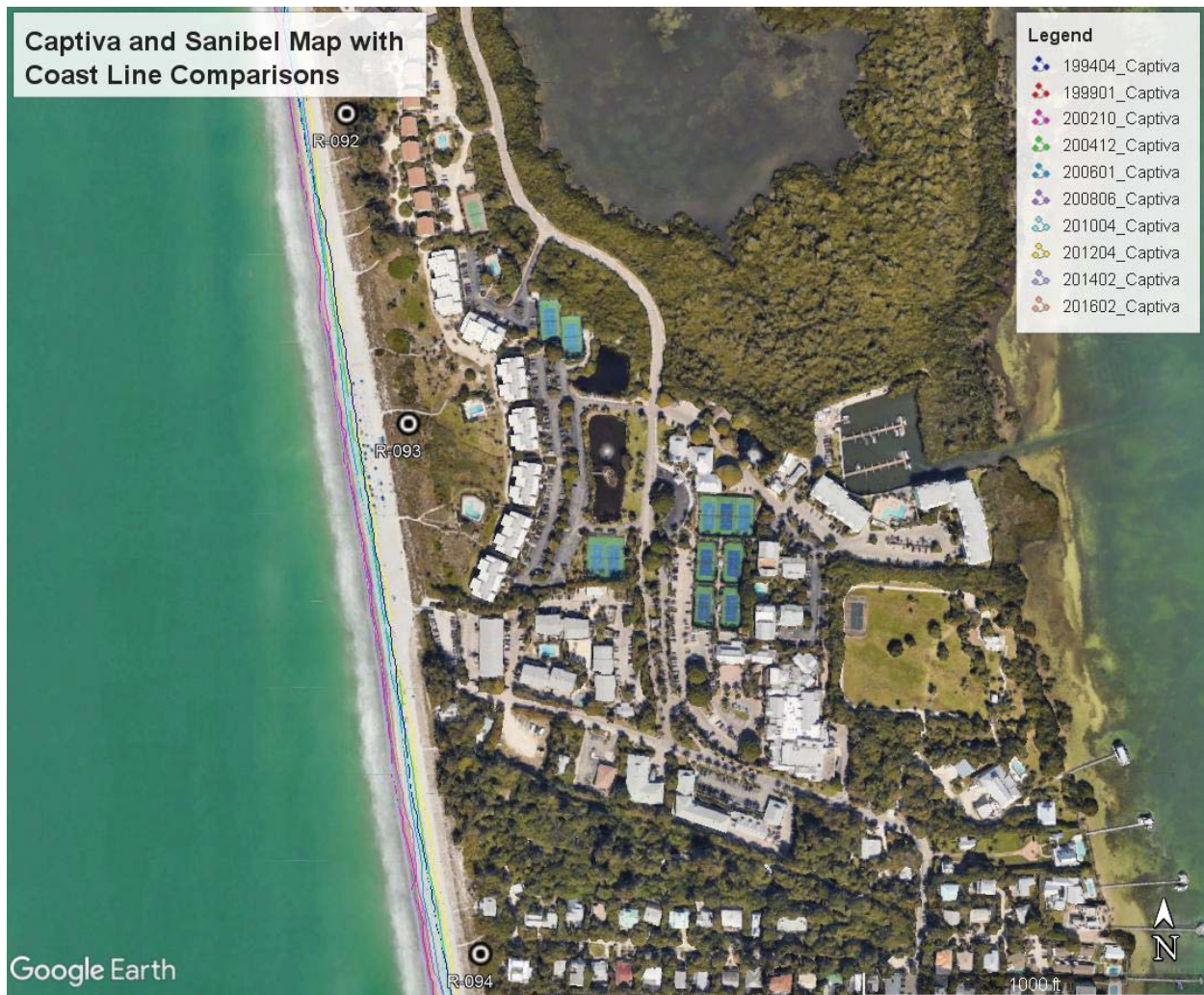


Figure 43. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Captiva Island.

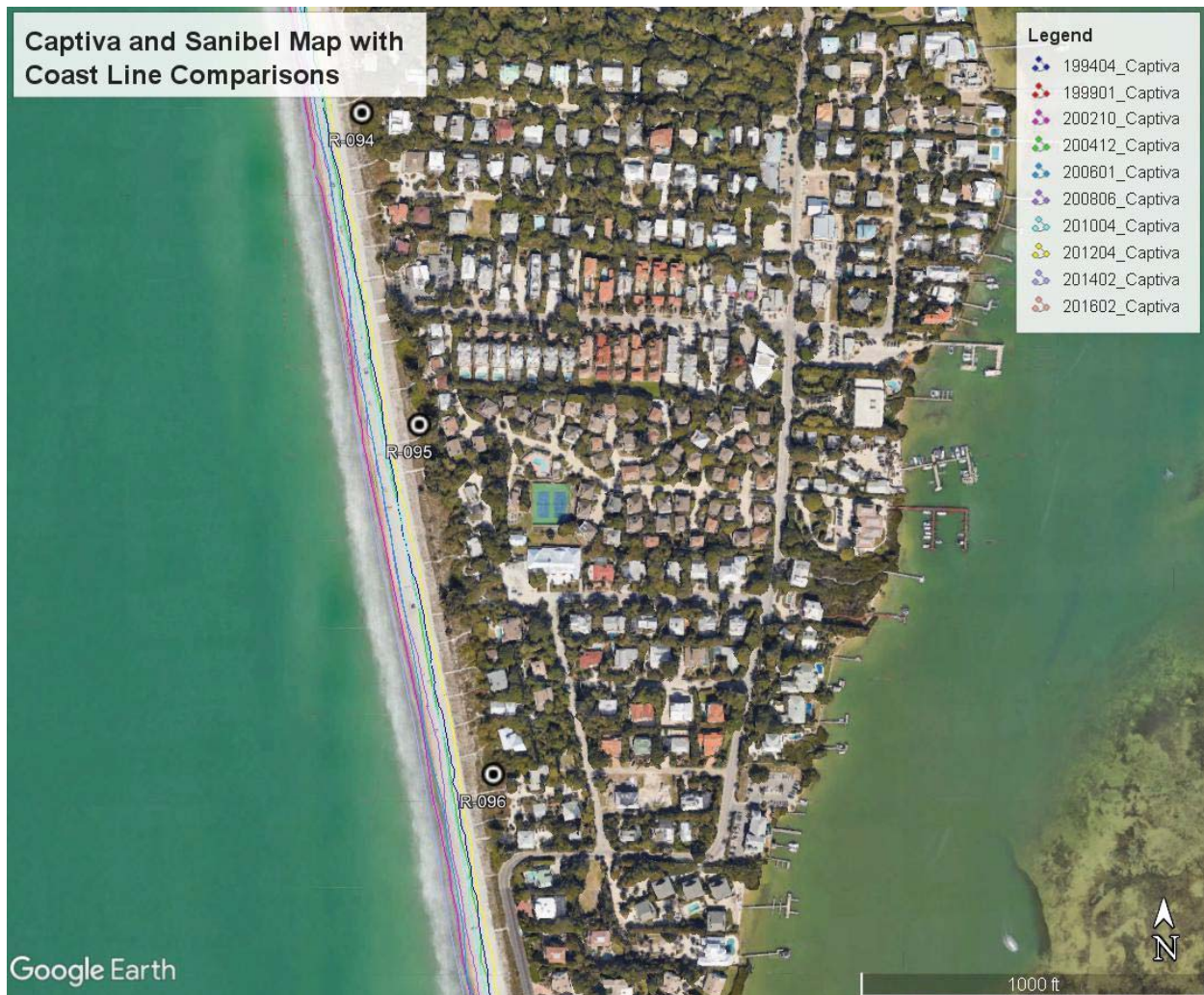


Figure 44. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Captiva Island.

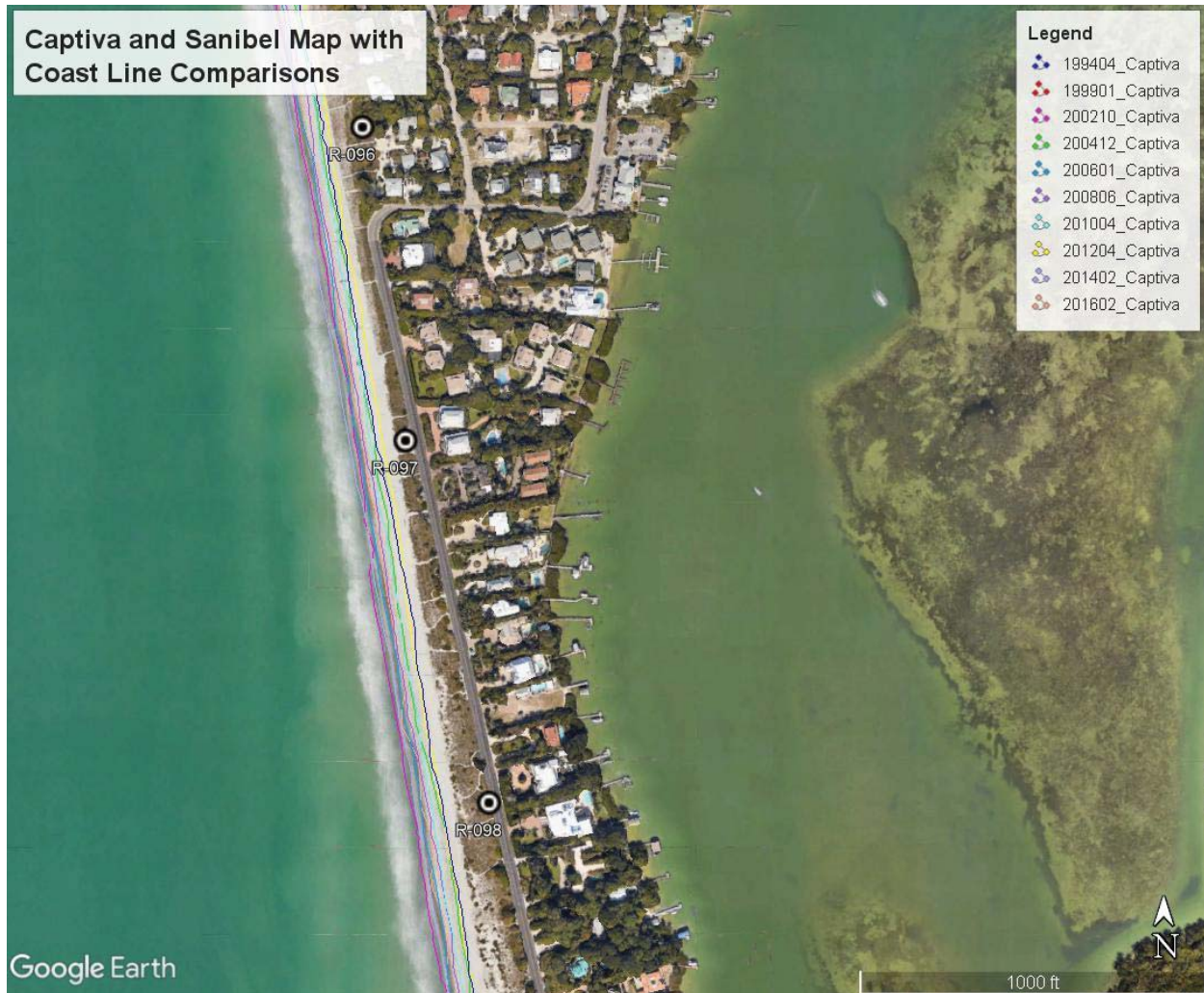


Figure 45. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Captiva Island.

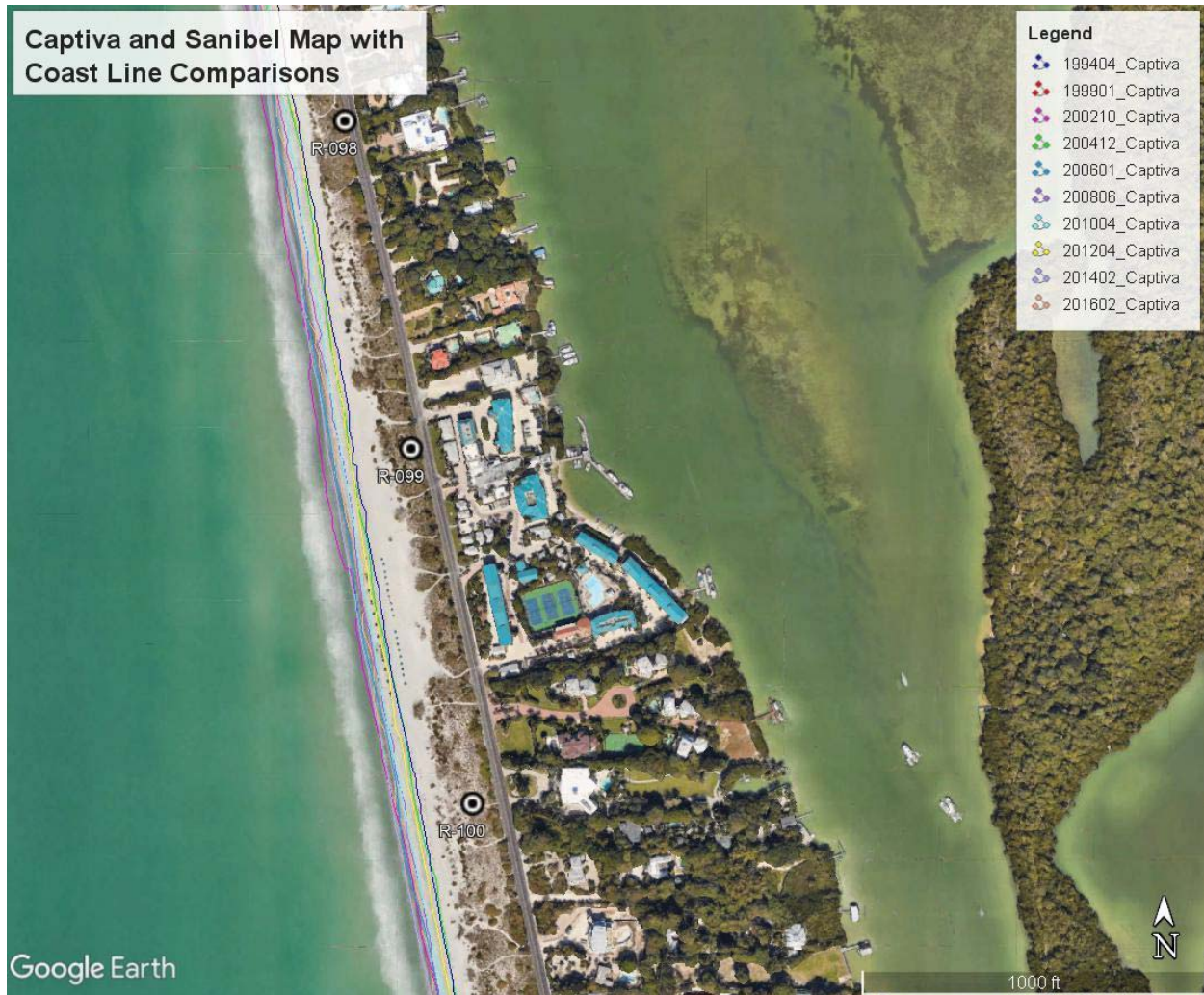


Figure 46. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Captiva Island.

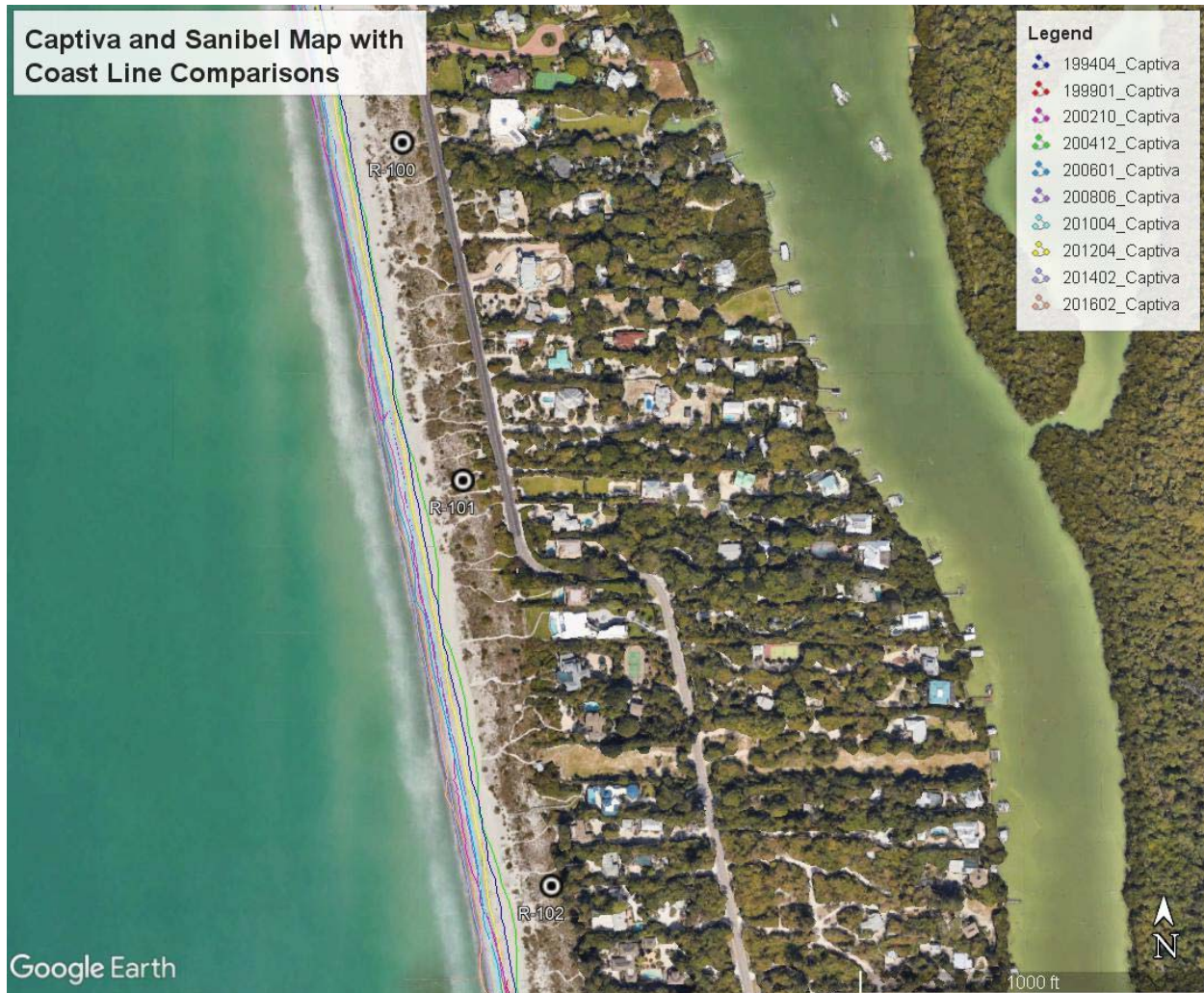


Figure 47. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Captiva Island.



Figure 48. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Captiva Island.



Figure 49. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Captiva Island.

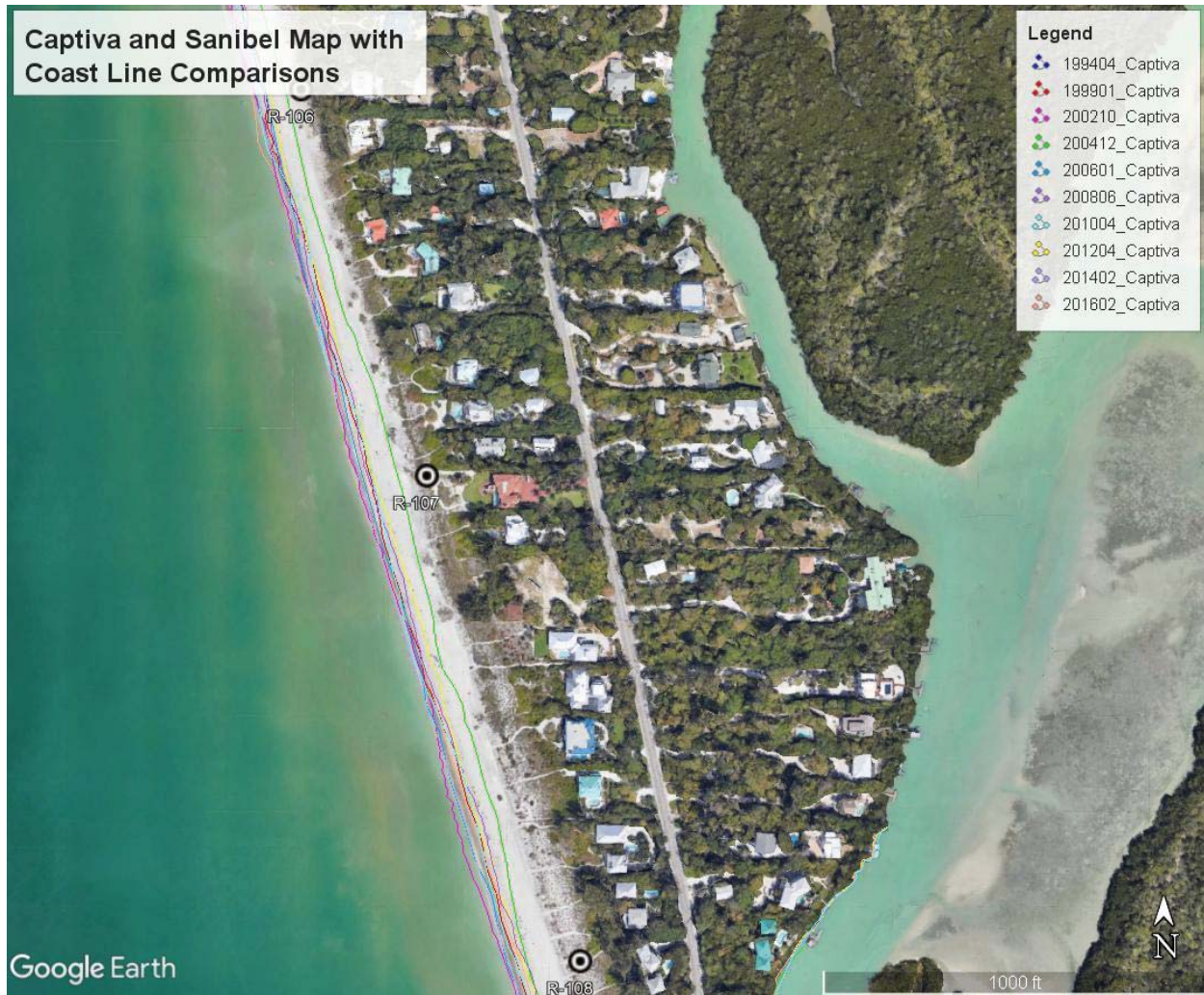


Figure 50. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Captiva Island.

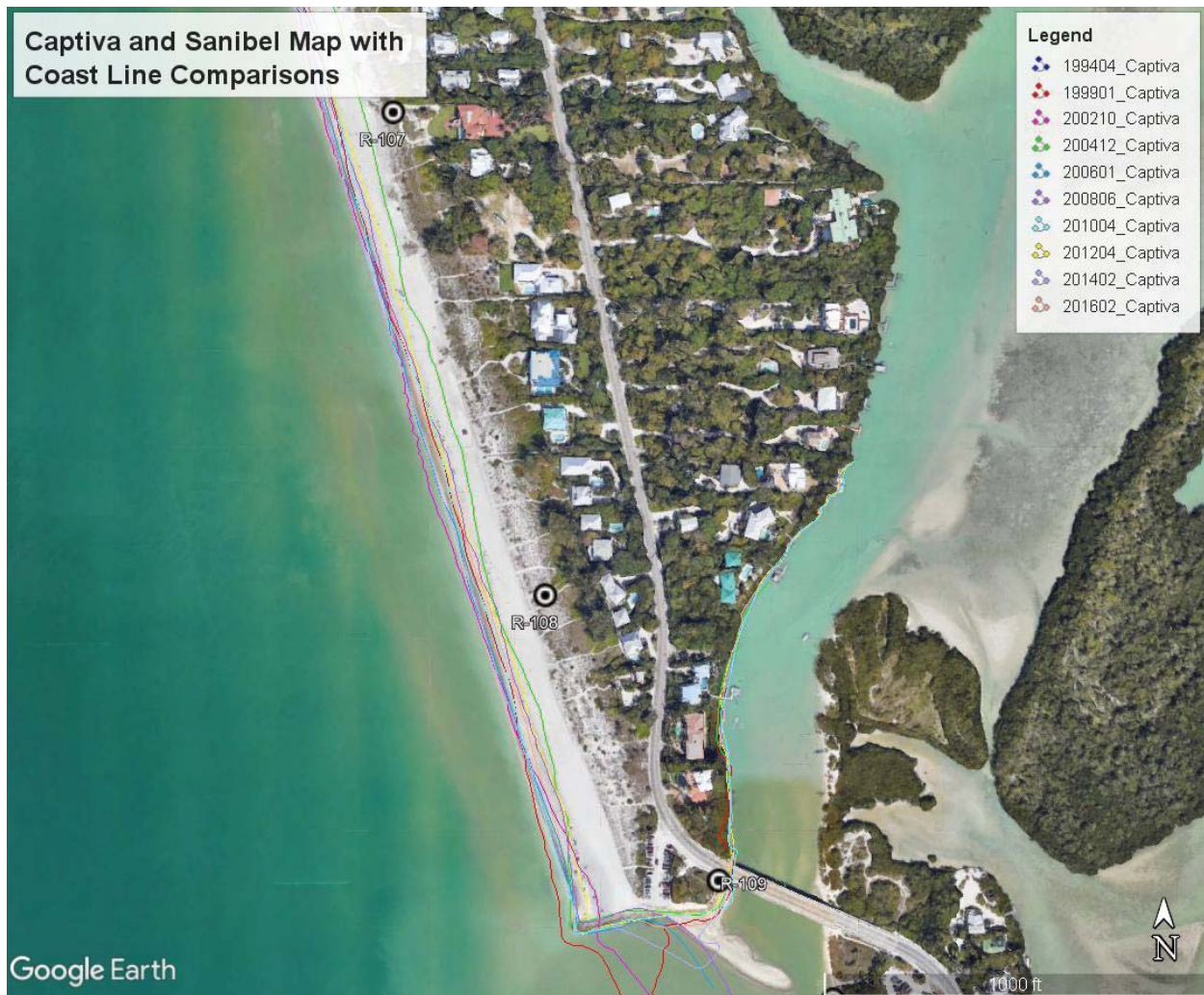


Figure 51. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Captiva Island.



Figure 52. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Sanibel Island.



Figure 53. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Sanibel Island.



Figure 54. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Sanibel Island.



Figure 55. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Sanibel Island.



Figure 56. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Sanibel Island.



Figure 57. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Sanibel Island.



Figure 58. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Sanibel Island.



Figure 59. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Sanibel Island.

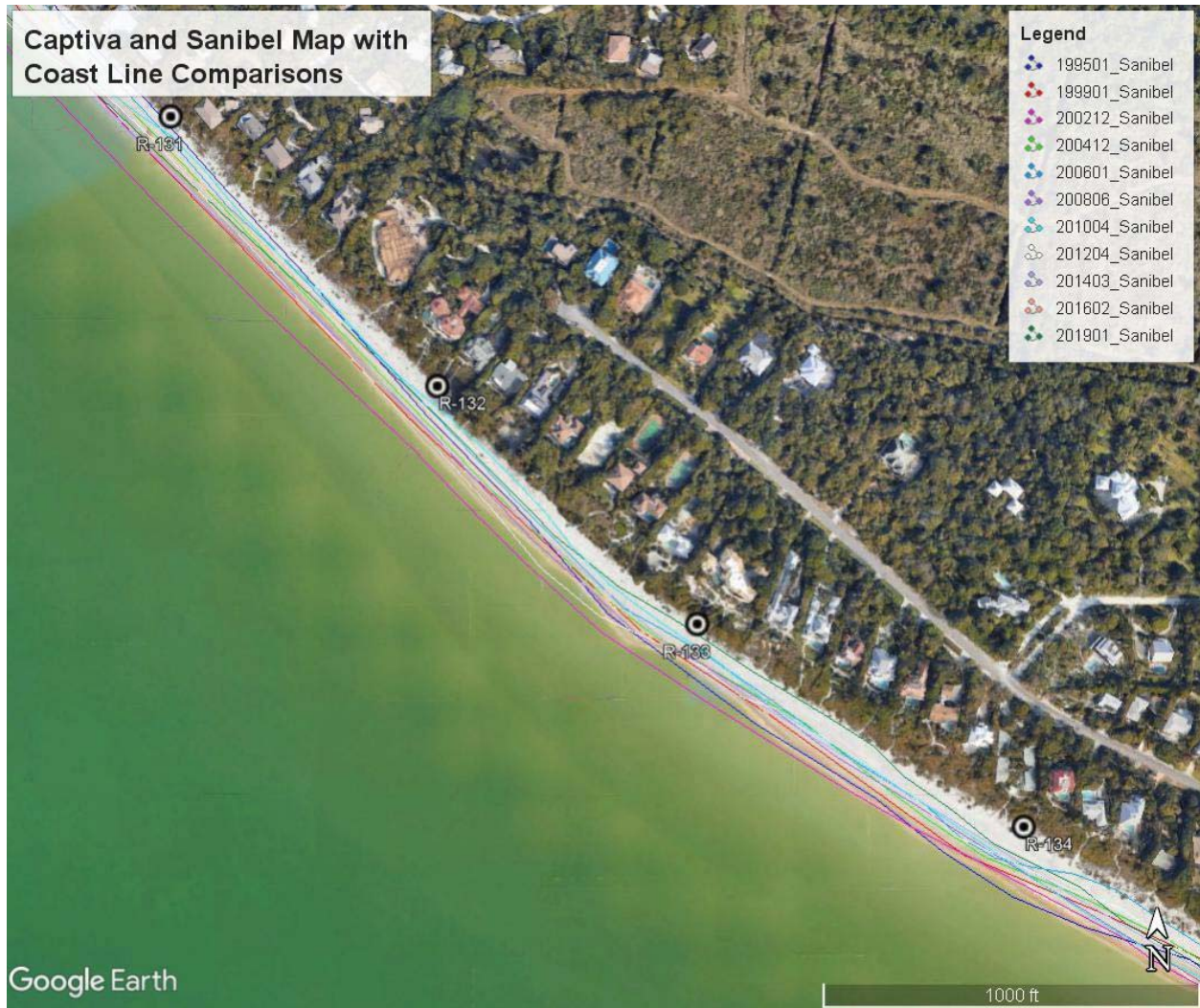


Figure 60. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Sanibel Island.



Figure 61. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Sanibel Island.



Figure 62. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Sanibel Island.



Figure 63. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Sanibel Island.



Figure 64. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Sanibel Island.



Figure 65. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Sanibel Island.



Figure 66. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Sanibel Island.



Figure 67. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Sanibel Island.



Figure 68. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Sanibel Island.



Figure 69. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Sanibel Island.



Figure 70. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Sanibel Island.



Figure 71. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Sanibel Island.



Figure 72. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Sanibel Island.



Figure 73. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Sanibel Island.



Figure 74. Map showing the positions of the shoreline through time superimposed upon a 2019 image of Sanibel Island.



Figure 75. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Captiva Island.

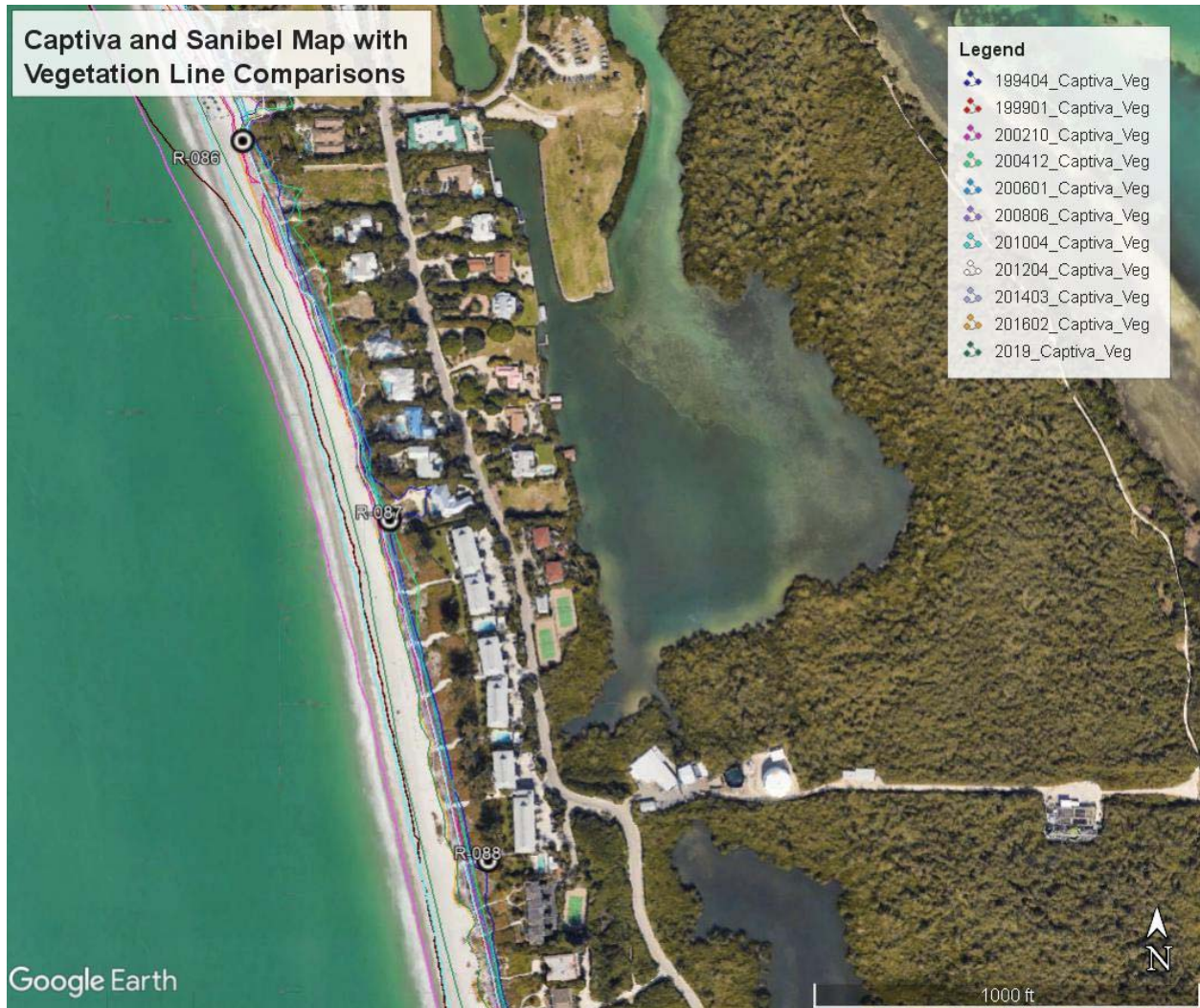


Figure 76. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Captiva Island.

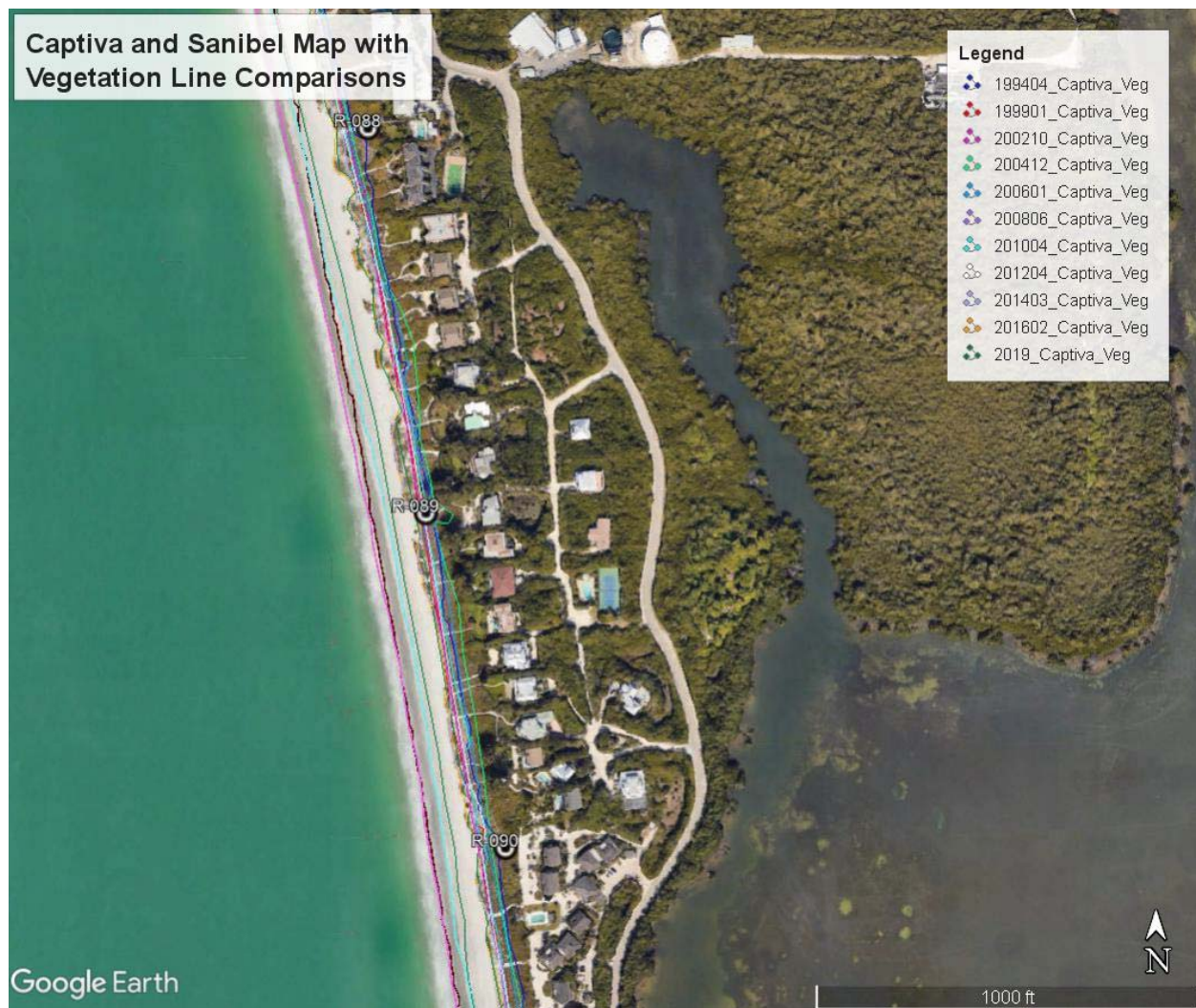


Figure 77. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Captiva Island.

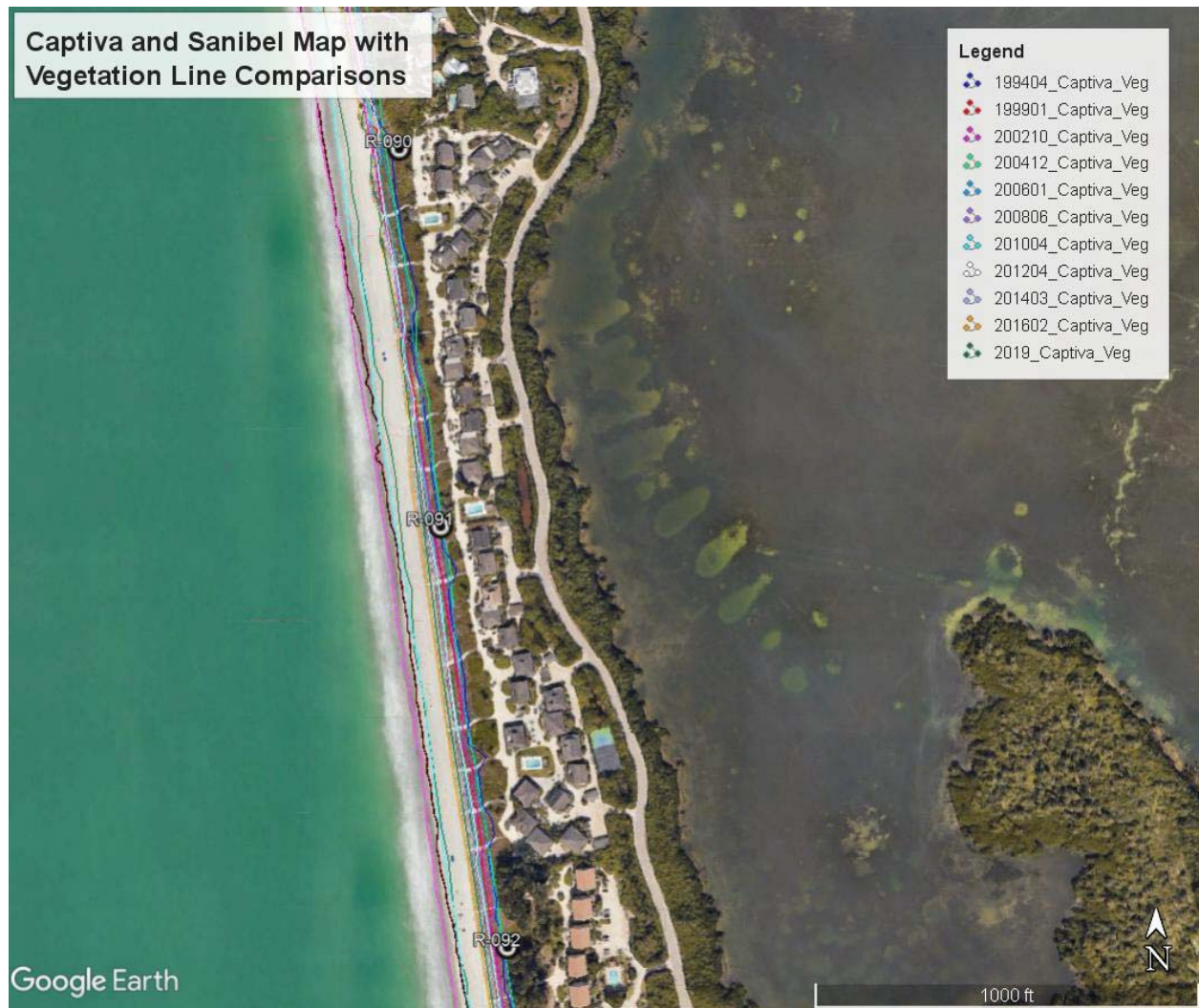


Figure 78. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Captiva Island.

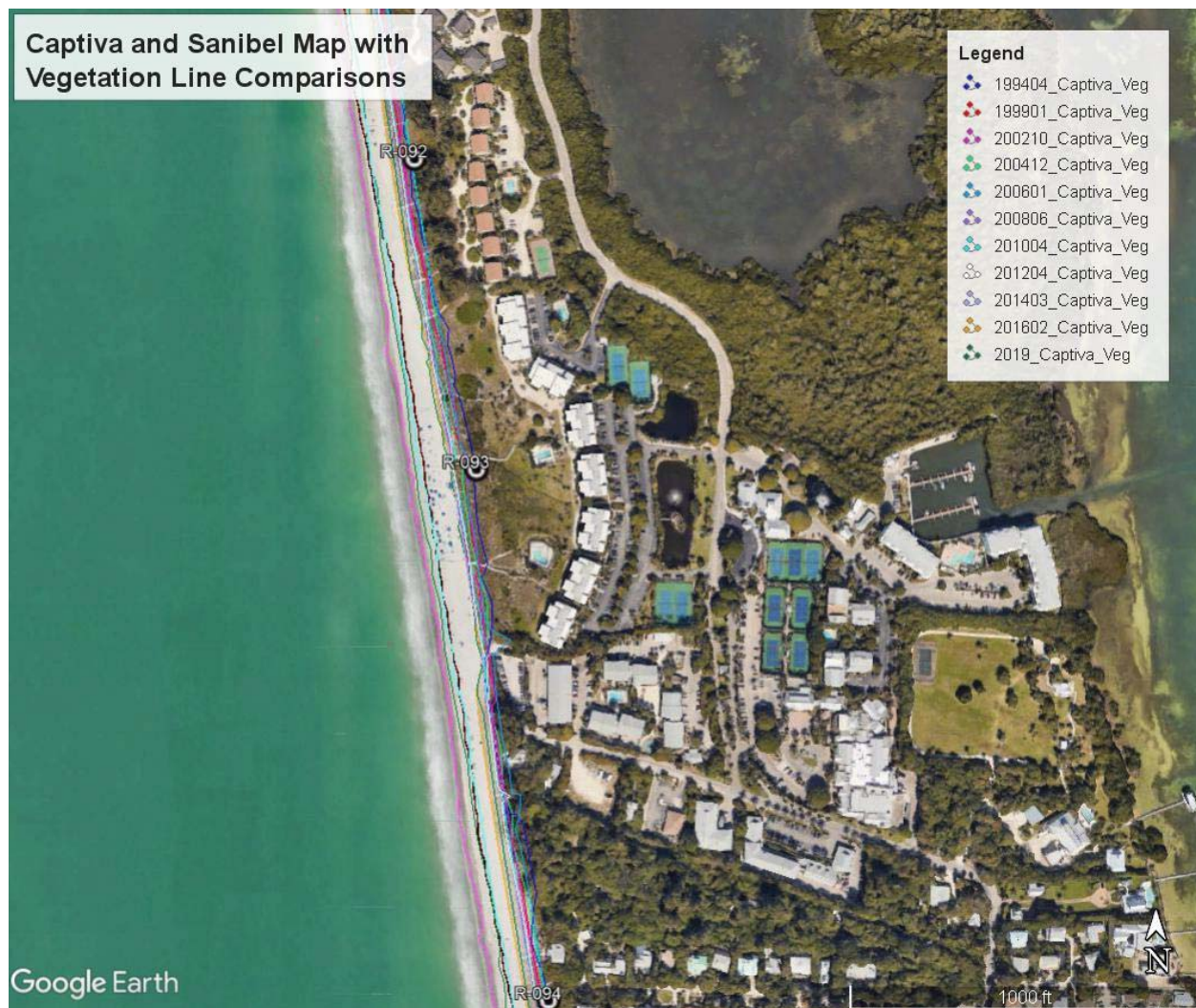


Figure 79. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Captiva Island.

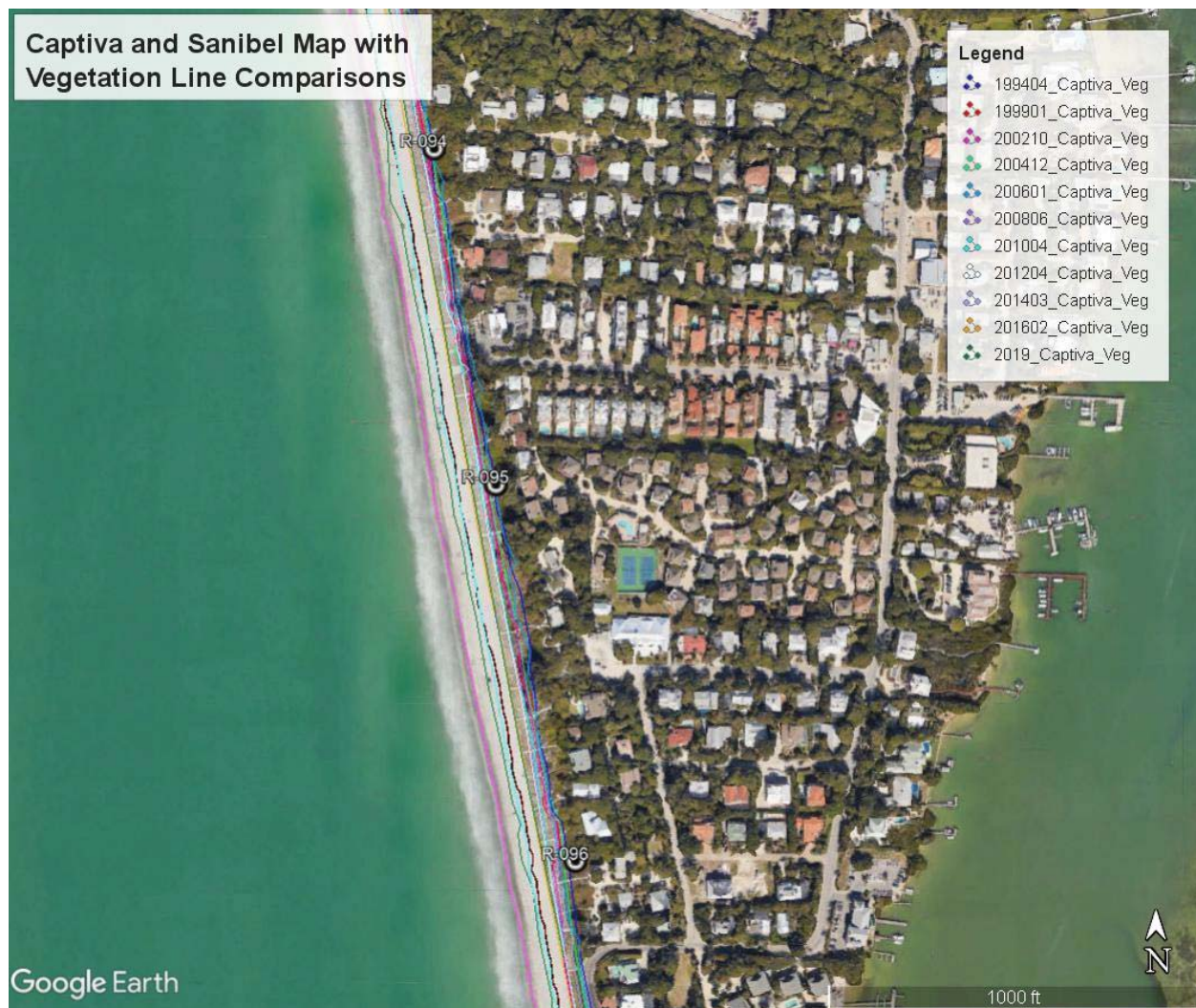


Figure 80. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Captiva Island.



Figure 81. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Captiva Island.

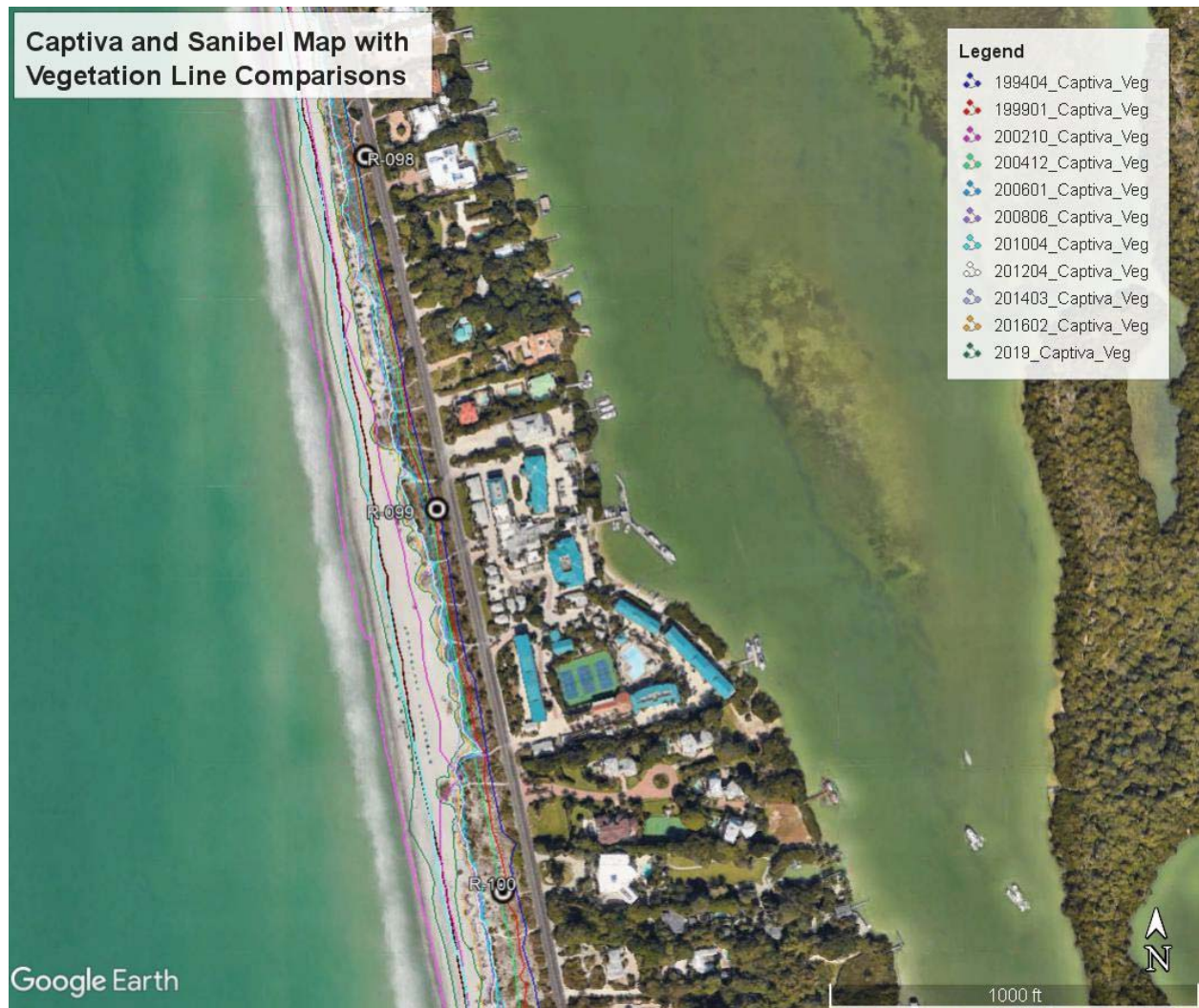


Figure 82. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Captiva Island.



Figure 83. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Captiva Island.

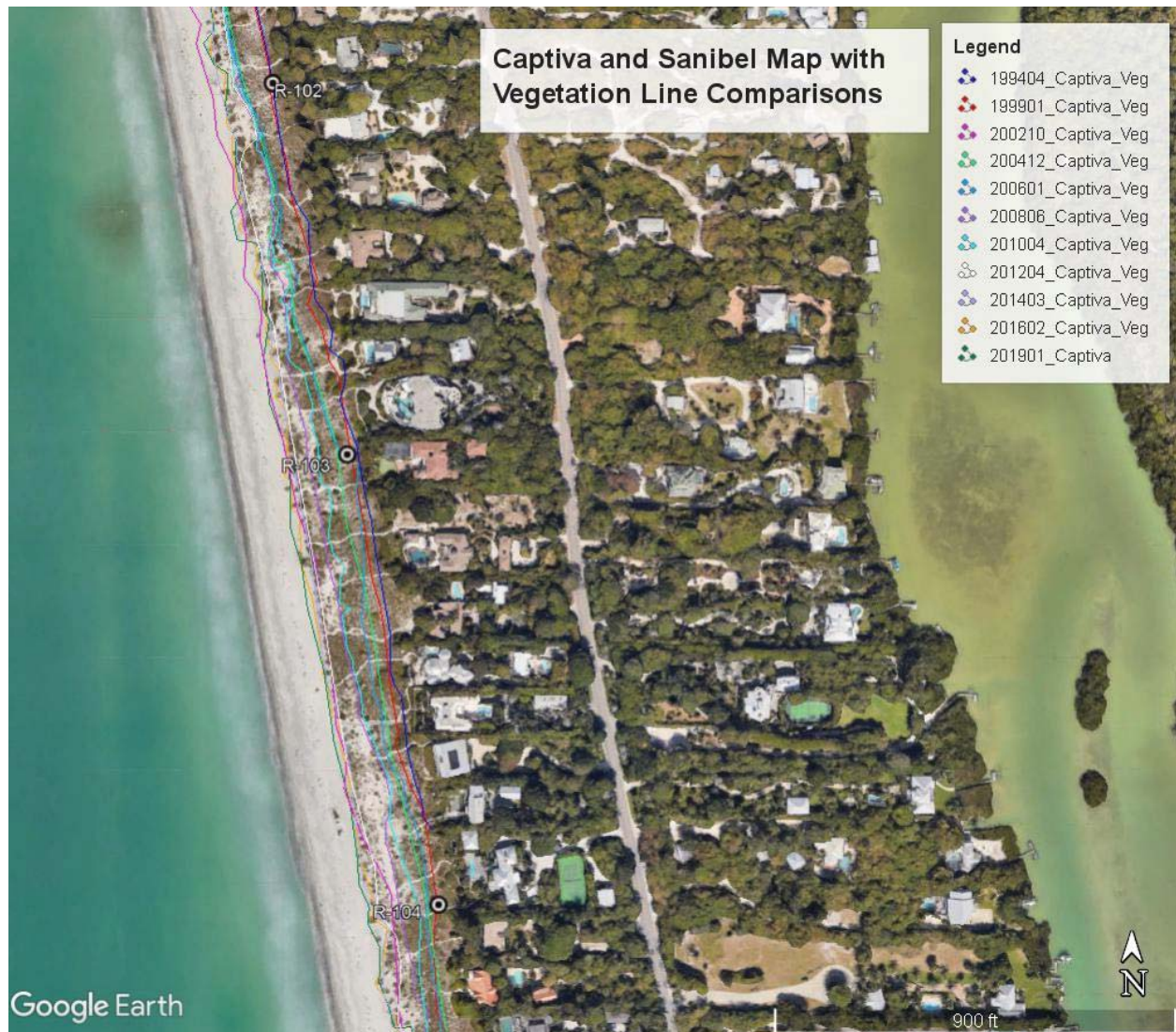


Figure 84. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Captiva Island.



Figure 85. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Captiva Island.



Figure 86. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Captiva Island.



Figure 87. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Captiva Island.



Figure 88. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Sanibel Island.



Figure 89. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Sanibel Island.



Figure 90. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Sanibel Island.



Figure 91. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Sanibel Island.



Figure 92. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Sanibel Island.



Figure 93. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Sanibel Island.

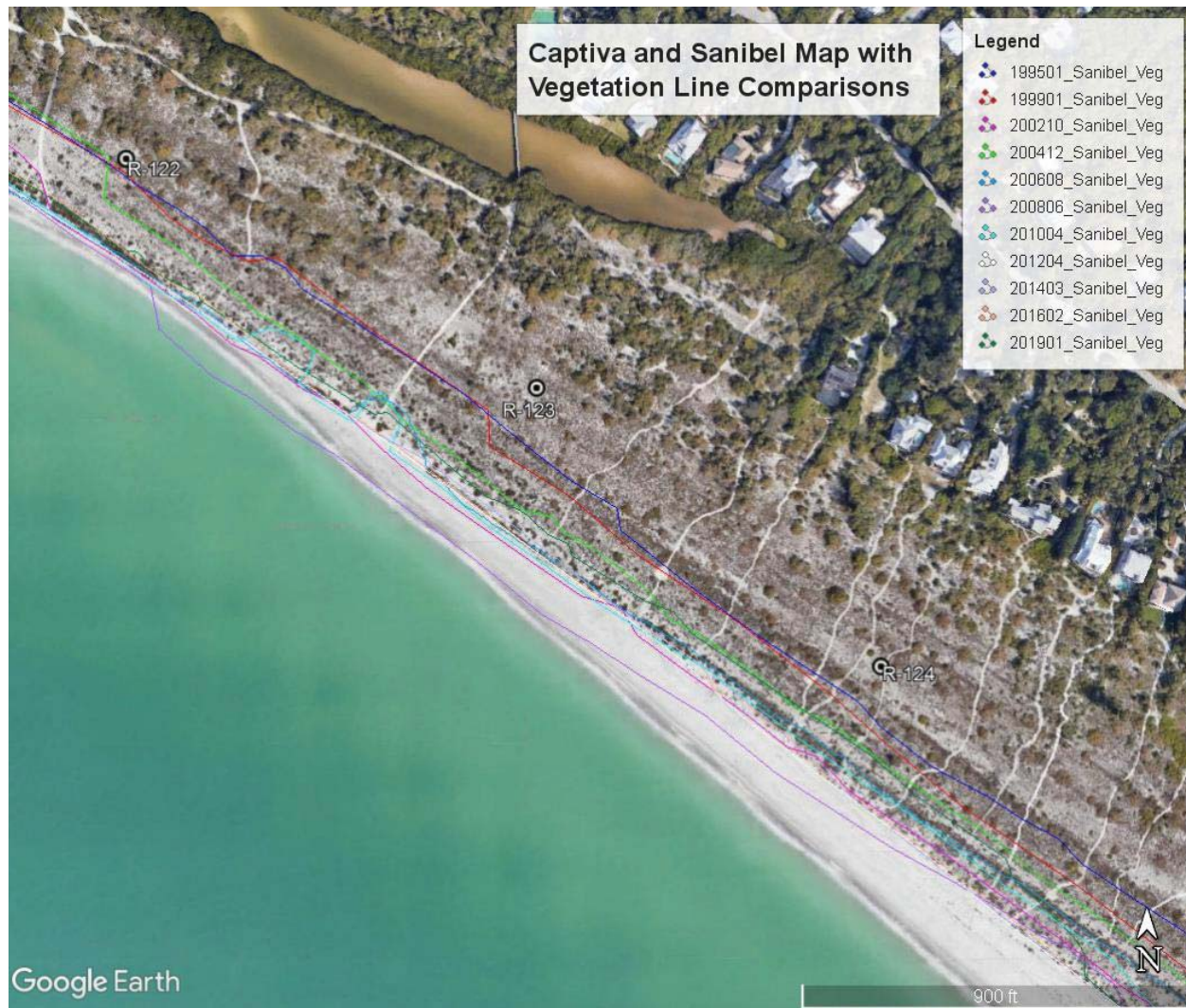


Figure 94. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Sanibel Island.

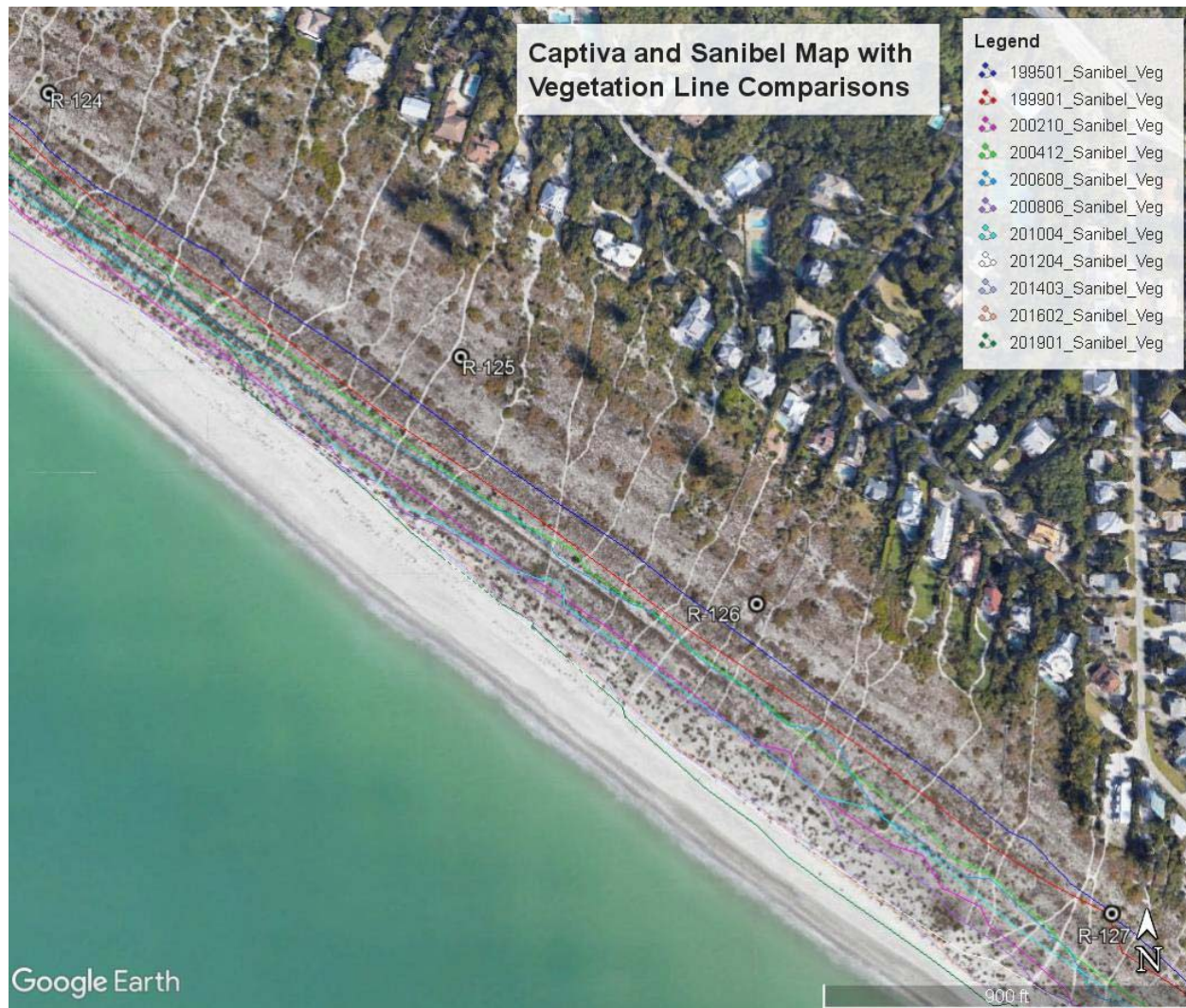


Figure 95. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Sanibel Island.



Figure 96. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Sanibel Island.

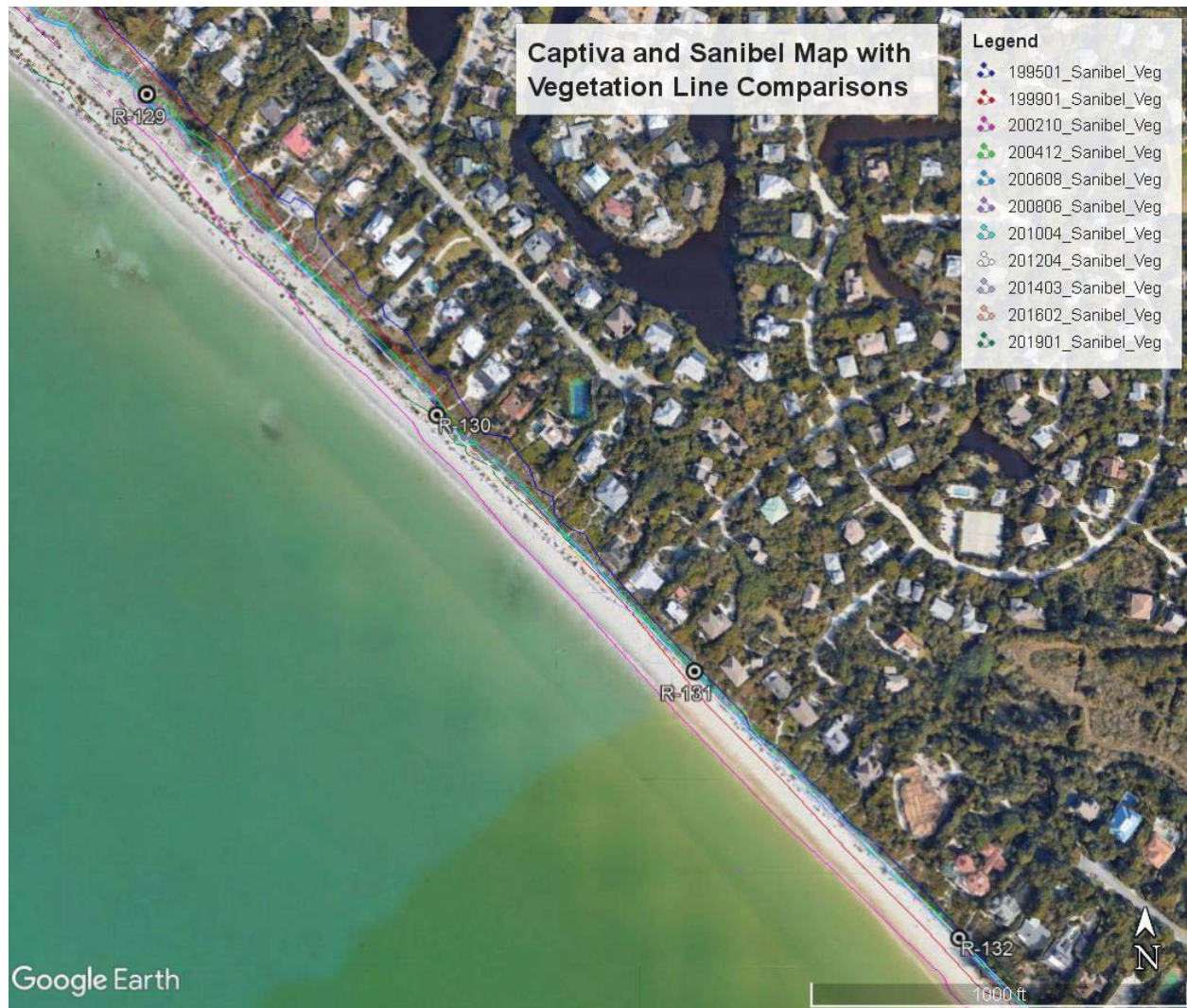


Figure 97. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Sanibel Island.



Figure 98. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Sanibel Island.

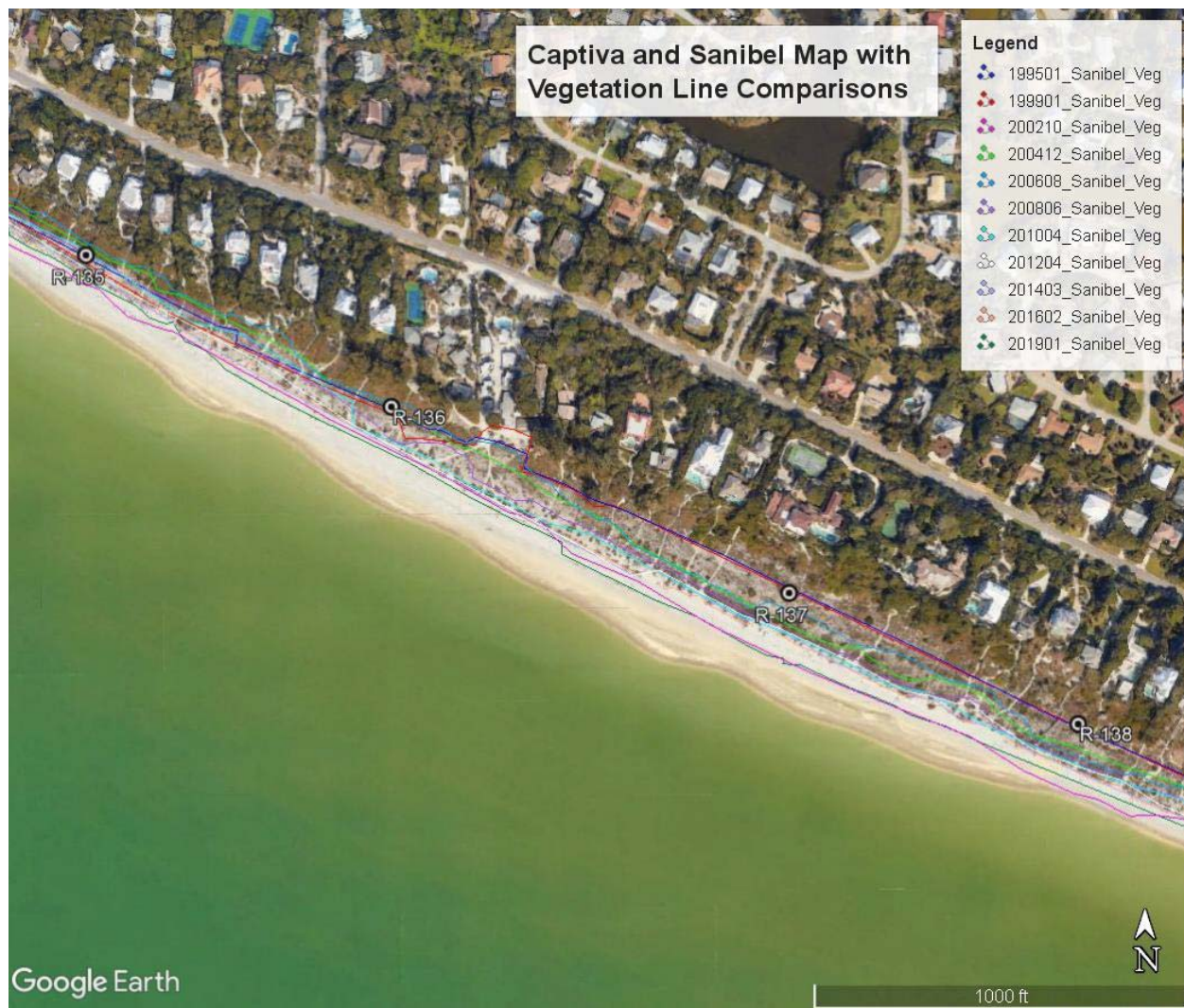


Figure 99. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Sanibel Island.

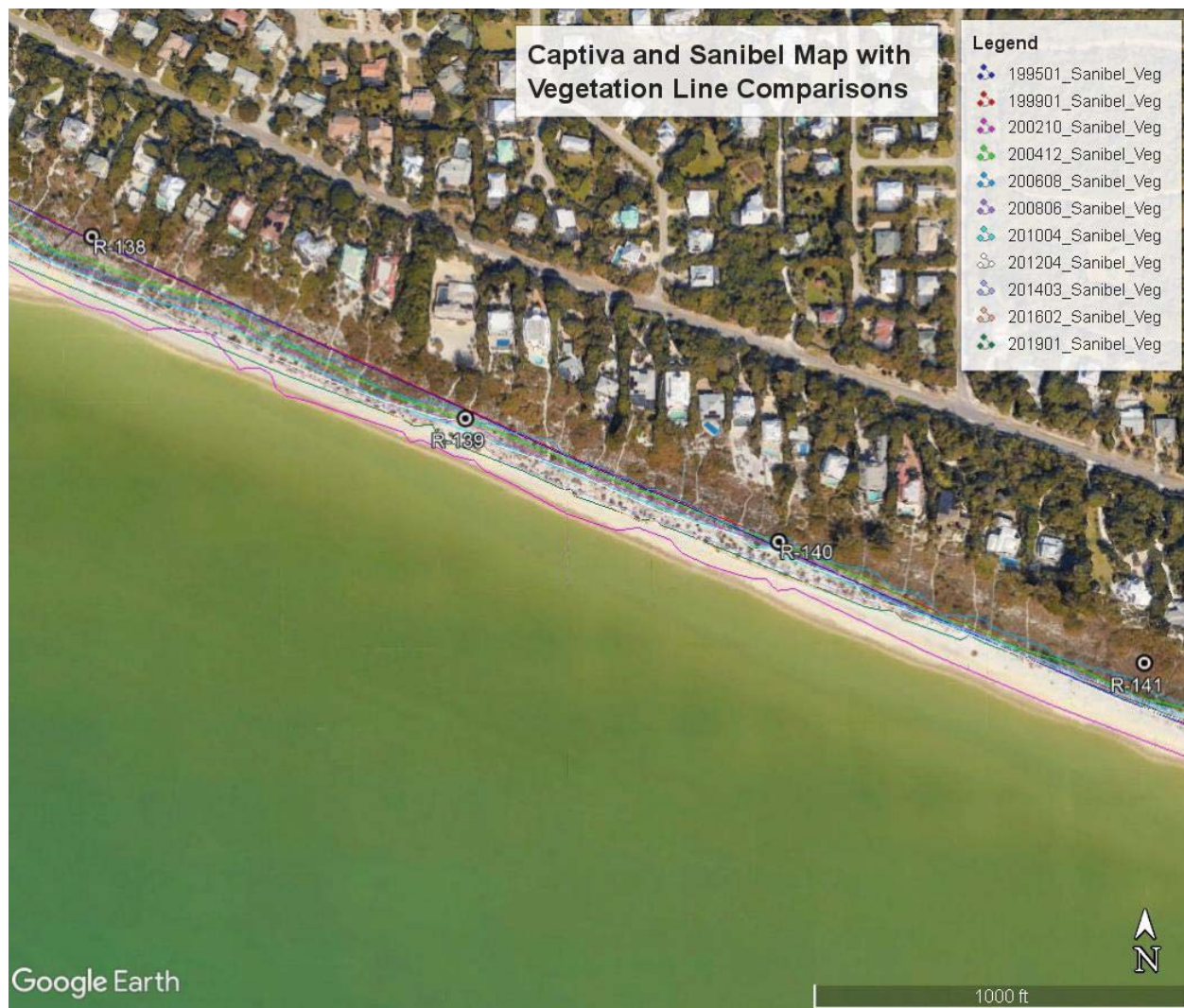


Figure 100. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Sanibel Island.



Figure 101. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Sanibel Island.



Figure 102. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Sanibel Island.

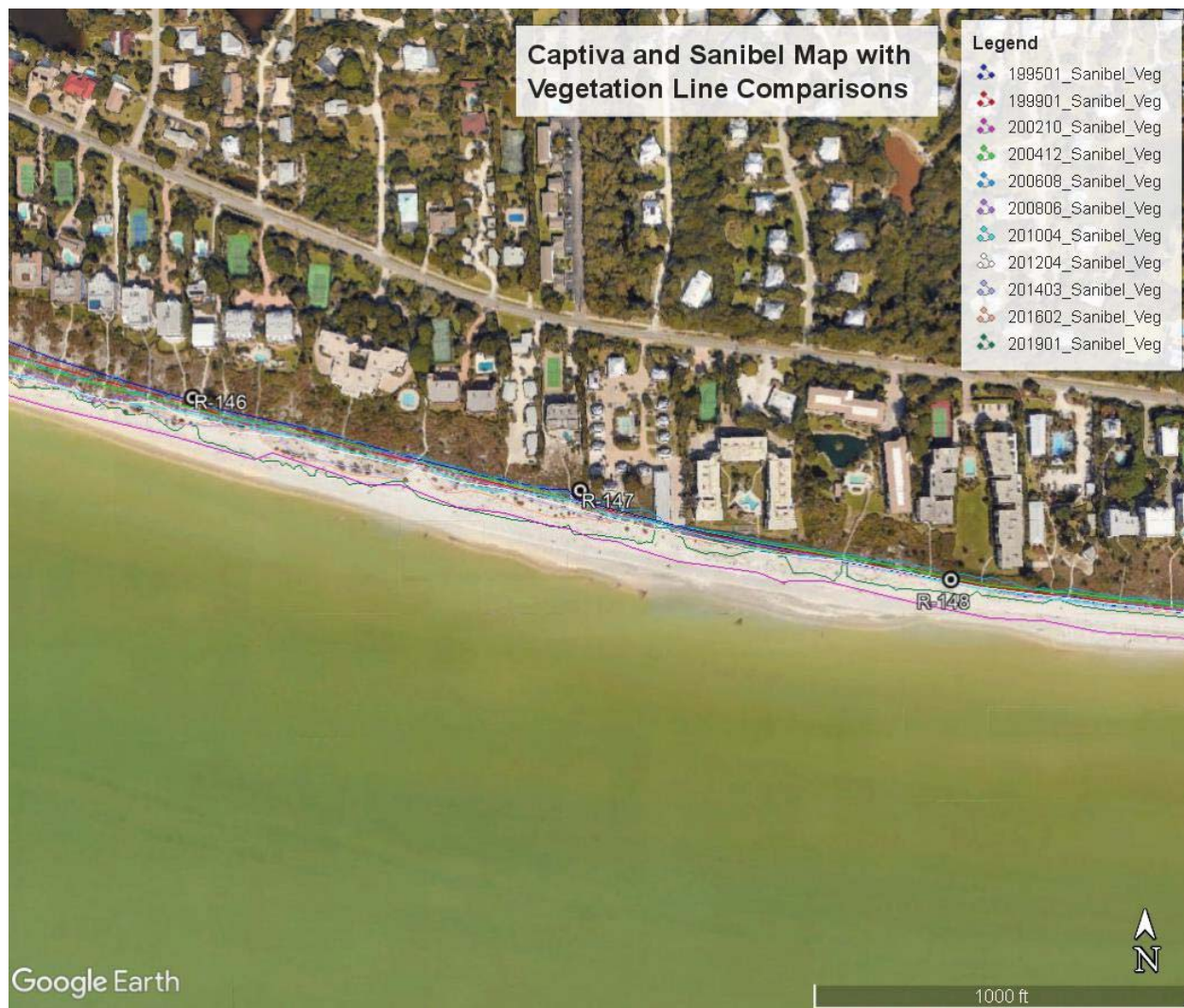


Figure 103. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Sanibel Island.



Figure 104. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Sanibel Island.



Figure 105. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Sanibel Island.



Figure 106. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Sanibel Island.



Figure 107. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Sanibel Island.



Figure 108. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Sanibel Island.



Figure 109. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Sanibel Island.



Figure 110. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Sanibel Island.



Figure 111. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Sanibel Island.



Figure 112. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Sanibel Island.



Figure 113. Map showing the positions of the seaward-most vegetation line through time superimposed upon a 2019 image of Sanibel Island.

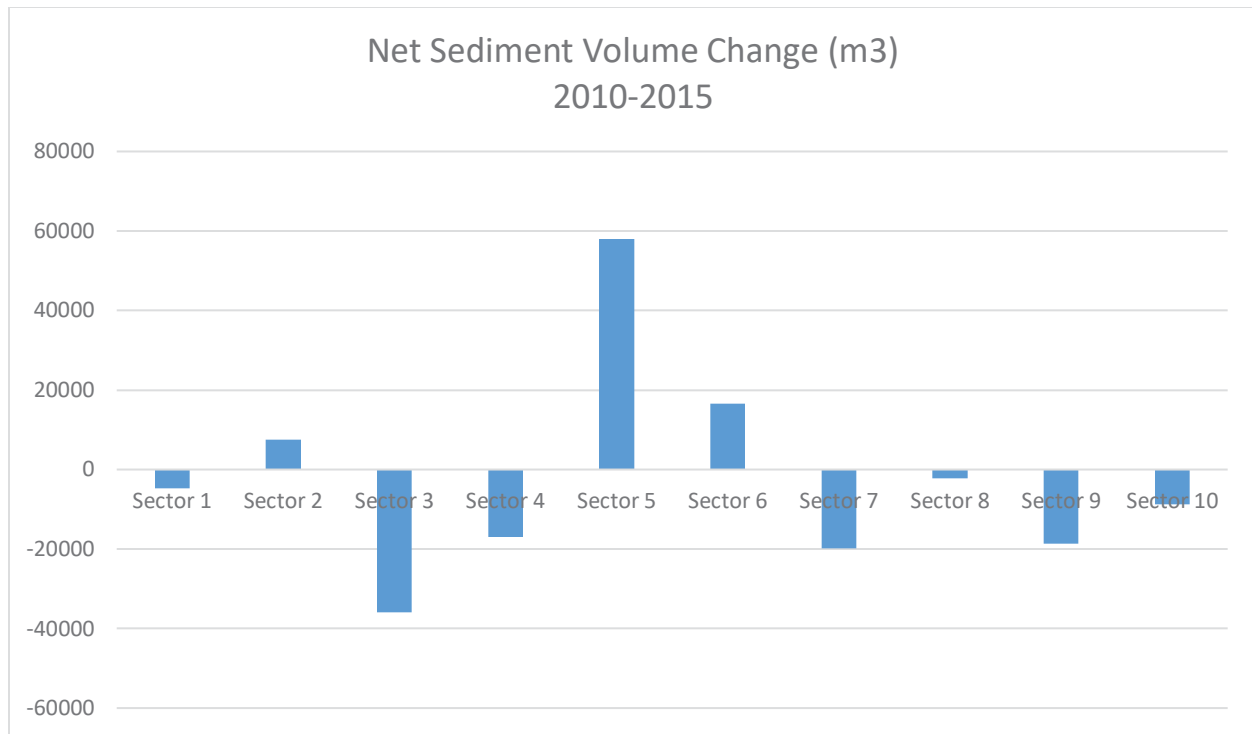


Figure 114. Graph showing the net sediment volume change (in m³) in each of the 10 sectors between 2010 and 2015. Positive values represent net deposition; negative values represent net erosion.



Figure 115. Vulnerability map for Captiva, reflecting sediment budget values between 2010 and 2015.



Figure 116. Vulnerability map for North Sanibel, reflecting sediment budget values between 2010 and 2015.



Figure 117. Vulnerability map for South Sanibel, reflecting sediment budget values between 2010 and 2015.