

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science Directorate
Geologic Resources Division



Fire Island National Seashore

GRI Ancillary Map Information Document

Produced to accompany the Geologic Resources Inventory (GRI) Digital Geologic
Data for Fire Island National Seashore

fiis_geomorphology.pdf

Version: 9/15/2016

Geologic Resources Inventory Ancillary Map Information Document for Fire Island National Seashore

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Geologic Resources Inventory Map Document



Fire Island National Seashore, New York

Document to Accompany Digital Geomorphological-GIS Data

[fiis_geomorphology.pdf](#)

Version: 9/15/2016

This document has been developed to accompany the digital geologic-GIS data developed by the Geologic Resources Inventory (GRI) program for Fire Island National Seashore, New York (FIIS).

Attempts have been made to reproduce all aspects of the original source products, including the geologic units and their descriptions, geologic cross sections, the geologic report, references and all other pertinent images and information contained in the original publication.

This document contains the following information:

- 1) **About the NPS Geologic Resources Inventory Program** – A brief summary of the Geologic Resources Inventory (GRI) Program and its products. Included are web links to the GRI GIS data model, and to the GRI products page where digital geologic-GIS datasets, scoping reports and geology reports are available for download. In addition, web links to the NPS Data Store and GRI program home page, as well as contact information for the GRI coordinator, are also present.
- 2) **GRI Digital Maps and Source Citations** – A listing of all GRI digital geologic-GIS maps produced for this project, post and pre-Hurricane Sandy, as well as for the William Floyd Estate unit, along with sources used in their completion. In addition, a brief explanation of how each source map was used is provided.
- 3) **Post-Hurricane Sandy Geomorphological Map**
 - a) **Map Unit Listing** – A listing of all geomorphic map units present on the post-Hurricane Sandy map.
 - b) **Map Unit Descriptions** – Descriptions for all geomorphic map units that are present on the post-Hurricane Sandy map.
 - c) **Ancillary Source Map Information** – Additional source map information present on post-Hurricane Sandy source map.
- 4) **Pre-Hurricane Sandy Geomorphological Map**
 - a) **Map Unit Listing** – A listing of all geomorphic map units present on the pre-Hurricane Sandy map.

b) **Map Unit Descriptions** – Descriptions for all geomorphic map units that are present on the pre-Hurricane Sandy map.

c) **Ancillary Source Map Information** – Additional source map information present on pre-Hurricane Sandy source map.

5) **William Floyd Estate Geomorphological Map**

a) **Map Unit Listing** – A listing of all geomorphic map units present on the William Floyd Estate map.

b) **Map Unit Descriptions** – Descriptions for all geomorphic map units that are present on the William Floyd Estate map.

c) **Ancillary Source Map Information** – Additional source map information present on William Floyd Estate map.

6) **GRI Digital Data Credits** – GRI digital geologic-GIS data and ancillary map information document production credits.

For information about using GRI digital geologic-GIS data contact:

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About the NPS Geologic Resources Inventory Program

Background

Recognizing the interrelationships between the physical (geology, air, and water) and biological (plants and animals) components of the earth is vital to understanding, managing, and protecting natural resources. The Geologic Resources Inventory (GRI) helps make this connection by providing information on the role of geology and geologic resource management in parks.

Geologic resources for management consideration include both the processes that act upon the earth and the features formed as a result of these processes. Geologic processes include: erosion and sedimentation; seismic, volcanic, and geothermal activity; glaciation, rockfalls, landslides, and shoreline change. Geologic features include mountains, canyons, natural arches and bridges, minerals, rocks, fossils, cave and karst systems, beaches, dunes, glaciers, volcanoes, and faults.

The Geologic Resources Inventory aims to raise awareness of geology and the role it plays in the environment, and to provide natural resource managers and staff, park planners, interpreters, researchers, and other NPS personnel with information that can help them make informed management decisions.

The GRI team, working closely with the Colorado State University (CSU) Department of Geosciences and a variety of other partners, provides more than 270 parks with a geologic scoping meeting, digital geologic-GIS map data, and a park-specific geologic report.

Products

Scoping Meetings: These park-specific meetings bring together local geologic experts and park staff to inventory and review available geologic data and discuss geologic resource management issues. A summary document is prepared for each meeting that identifies a plan to provide digital map data for the park.

Digital Geologic Maps: Digital geologic maps reproduce all aspects of traditional paper maps, including notes, legend, and cross sections. Bedrock, surficial, and special purpose maps such as coastal or geologic hazard maps may be used by the GRI to create digital Geographic Information Systems (GIS) data and meet park needs. These digital GIS data allow geologic information to be easily viewed and analyzed in conjunction with a wide range of other resource management information data.

For detailed information regarding GIS parameters such as data attribute field definitions, attribute field codes, value definitions, and rules that govern relationships found in the data, refer to the NPS Geology-GIS Data Model document available at: <http://science.nature.nps.gov/im/inventory/geology/GeologyGISDataModel.cfm>

Geologic Reports: Park-specific geologic reports identify geologic resource management issues as well as features and processes that are important to park ecosystems. In addition, these reports present a brief geologic history of the park and address specific properties of geologic units present in the park.

For a complete listing of Geologic Resource Inventory products and direct links to the download site visit the GRI publications webpage http://www.nature.nps.gov/geology/inventory/gre_publications.cfm

GRI geologic-GIS data is also available online at the NPS Data Store Search Application: <http://irma.nps.gov/App/Reference/Search>. To find GRI data for a specific park or parks select the appropriate park

(s), enter "GRI" as a Search Text term, and then select the Search Button.

For more information about the Geologic Resources Inventory Program visit the GRI webpage: <http://www.nature.nps.gov/geology/inventory>, or contact:

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The Geologic Resources Inventory (GRI) program is funded by the National Park Service (NPS) Inventory and Monitoring (I&M) Division.

GRI Digital Maps and Source Map Citations

The GRI digital geomorphological-GIS maps for Fire Island National Seashore, New York (FIIS):

Digital Post-Hurricane Sandy Geomorphological Map of Fire Island National Seashore, New York (GRI MapCode FIIS_post-sandy)

The source geomorphic map (listed below) is "post-Hurricane Sandy", and was produced using 2012 ("post-Hurricane Sandy") images and LiDAR data. The GRI used the full extent of the source digital GIS data, and incorporated prominent components of the provided source map and report (e.g., unit colors and unit descriptions) into the GRI digital geologic-GIS dataset and product.

Source Map:

Psuty, N. P., Patel, Schmelz, W., Greenberg, Joshua, Beal, Irina., and Spahn, A., 2015, Development of the Geomorphological Map of Fire Island National Seashore (Post-Hurricane Sandy): Rutgers University, Institute of Marine and Coastal Sciences, unpublished digital data and map, scale 1:12,000. ([post-Hurricane Sandy Geomorphological Map of Fire Island](#)). (GRI Source Map ID 76043).

Digital Pre-Hurricane Sandy Geomorphological Map of Fire Island National Seashore and Vicinity, New York (GRI MapCode FIIS_pre-sandy)

This dataset supersedes the previous GRI geomorphic-GIS dataset for Fire Island National Seashore. The geomorphic map (listed below) is "pre-Hurricane Sandy", and was produced using 2011 ("pre-Hurricane Sandy") images and LiDAR data. The GRI used the full extent of the source digital GIS data, and incorporated prominent components of the provided source map and report (e.g., unit colors and unit descriptions) into the GRI digital geologic-GIS dataset and product.

Source Map:

Psuty, N. P., Patel, M., Freeman J., Schmelz, W., Robertson, W., and Spahn, A., 2013, Development of the Geomorphological Map for Fire Island National Seashore: Rutgers University, Institute of Marine and Coastal Sciences, unpublished digital data and map, scale 1:12,000. ([pre-Hurricane Sandy Geomorphological Map of Fire Island](#)). (GRI Source Map ID 75677).

Digital Geomorphological Map of the William Floyd Estate Unit, Fire Island National Seashore, New York (GRI MapCode WIFE)

This dataset was produced for the William Floyd Estate unit, and as per communication with the source map author the map was not changed or altered significantly by Hurricane Sandy.

Source Map:

Psuty, N., Schmelz, W., and Spahn, A., 2014, Development of the Geomorphological Map for William Floyd Estate, a unit of the Fire Island National Seashore: Rutgers University, Institute of Marine and Coastal Sciences, unpublished digital data and map, scale 1:6,000. ([Geomorphological Map for William Floyd Estate](#)). (GRI Source Map ID 75946).

Additional information pertaining to each source map is also presented in the GRI Source Map

Information (FIISMAP) table included with the GRI geomorphological-GIS data.

Post-Hurricane Sandy Geomorphological Map

Map Unit List (post-Hurricane Sandy)

The post-Hurricane Sandy geomorphological units present in the digital geomorphological-GIS data produced for Fire Island National Seashore, New York (FIIS) are listed below. Units are listed with their assigned unit symbol and unit name (e.g., Hbe - Beach). Units are listed by geomorphological classification. Information about each geomorphological unit is also presented in the GRI Geomorphological Unit Information (fiisunit) table included with the GRI geomorphological-GIS data. Note that there is some difference in units mapped between post-Hurricane Sandy and pre-Hurricane Sandy.

Cenozoic Era

Quaternary Period

Recent

Anthropogenic Features

[Rbu](#) - Bulkhead

[Rjg](#) - Jetty/groin

[Raps](#) - Artificial planar surface

[Rd](#) - Ditch

Holocene Epoch

Active Features

[Hiwb](#) - Interior water bodies

[Hbe](#) - Beach

[Hfd3](#) - Active foredune

[Hwl](#) - Wetland

Abandoned Features

[Hfd2](#) - Abandoned foredune

[His2](#) - Abandoned inter-ridge swale

[Hbd2](#) - Abandoned back dune slope

[Hos](#) - Abandoned wash-over zone/sand flat

Ancestral Features

[Hfd1](#) - Ancestral foredune

[His1](#) - Ancestral inter-ridge swale

[Hid](#) - Ancestral inter dune system depression

[Hbd1](#) - Ancestral back dune slope

Map Unit Descriptions (post-Hurricane Sandy)

Descriptions of all post-Hurricane Sandy geomorphological map units, listed by their geomorphological classification (i.e., anthropogenic, active, abandoned or ancestral), are presented below.

Anthropogenic Features

Rbu - Bulkhead (Recent)

Conceptual Basis

An erosion control structure that is constructed at and parallel to the shoreline to harden the shoreline next to existing development or to maintain water-dependent uses such as marinas. Erosion-control structures include bulkheads, riprap, marinas or other structures that harden the shoreline.

Physical Description and Identification

Erosion control structures are identified from LiDAR, from a prepared data source, orthophotos, and in the field. These structures are found in developed portions of the island as a linear shoreline that separates land from water with an abrupt change in elevation.

[\(post-Hurricane Sandy Geomorphological Map of Fire Island\)](#).

Rjg - Jetty/groin (Recent)

Conceptual Basis

An engineered structure that projects perpendicular to the shoreline. A jetty is a large structure with the purpose to stabilize the location of an inlet channel. A groin is a smaller structure in the beach, built to trap sand and stabilize a portion of a sandy beach.

Physical Description and Identification

Jetties and groins can be identified utilizing orthophotography. Their location is often indicated by the linear margin of an inlet, perpendicular to the trend of the shoreline, or as an offset in the beach that is the result of trapped sediment, respectively.

[\(post-Hurricane Sandy Geomorphological Map of Fire Island\)](#).

Raps - Artificial planar surface (Recent)

Conceptual Basis

A human-made flat or planar surface that has been leveled or built-up to site some sort of structure or human use, such as a building, parking area, or commercial activity. Underlying topography is destroyed or covered and replaced by created surface. Irregular dunal ridge and swale topography may be leveled to create a uniform surface. Or, sediment may be introduced by dredging or truck to elevate a surface above tidal levels.

Physical Description and Identification

Elevation of the surface is nearly or completely homogeneous and level. This surface produces an abrupt interruption of adjacent naturally-occurring topography. Boundary of surface is often sharply-defined and clearly visible on the orthophotos. On the bayside, it is usually associated with bulkheads and housing or marinas on the orthophotos and in the field. Fill may also cover pre-existing wetlands and provide a dry foundation for human occupation.

[\(post-Hurricane Sandy Geomorphological Map of Fire Island\)](#).

Rd - Ditch (Recent)

Conceptual Basis

Waterways historically dug in wetlands in a parallel grid pattern in order to drain wetlands and control mosquito populations. They are usually abandoned and no longer maintained as a water course.

Physical Description and Identification

Drainage ditches are identified from orthophotos as linear channels within the wetland area. Abandoned or unmaintained ditches may be filled in with sediment. Only ditches visible at the map scale are delineated as straight blue lines.

[\(post-Hurricane Sandy Geomorphological Map of Fire Island\)](#).

This feature is listed as "Drainage ditch" in the source report, however, in the source GIS data and maps the feature is simply referred to as a "ditch".

Active Features

Hiwb - Interior water bodies (Holocene)

Conceptual Basis

Areas of open water within the boundaries of the barrier island, not connected by tidal channels to the bay or ocean. Often occurs as ponds within wetlands but may exist in other areas as well.

Physical Description and Identification

Distinctly visible on orthophotos. Only water bodies identified at map scale are delineated in this category.

[\(post-Hurricane Sandy Geomorphological Map of Fire Island\)](#).

Hbe - Beach (Holocene)

Conceptual Basis

Wave-deposited accumulation of sediment, specifically the seaward portion of a beach profile between the low tide line and the upper limit of storm wave action.

Physical Description and Identification

Alongshore area of low, nearly planar elevation on the oceanside and bayside margin of the barrier island. A very prominent feature that tends to be broad, continuous, and has sparse to no vegetation. Extends from the lowest tide level to the toe of the active foredune.

[\(post-Hurricane Sandy Geomorphological Map of Fire Island\)](#).

Hfd3 - Active foredune (Holocene)

Conceptual Basis

Ridge formed by wind- and water-deposited sand at the inland margin of a beach, parallel to the coastline. It is vegetated by pioneer plant species that trap sediment. The foredune is actively participating in sediment exchange with the beach.

Physical Description and Identification

A continuous, linear feature of elevated topography (positive relief) that is parallel to the shoreline and immediately inland of the oceanside or bayside beach. Foredunes may be irregular in areas of dissection by wind and/or water.

([post-Hurricane Sandy Geomorphological Map of Fire Island](#)).

This unit is listed as "Foredune" in the source GIS data, maps, and report, but was changed by the GRI to "Active foredune" to help distinguish the unit from units "Abandoned foredune" and "Ancestral foredune".

Hwl - Wetland (Holocene)**Conceptual Basis**

A general term describing swamps and marshes in areas of very low elevation. Often found in areas sheltered from ocean waves such as the bayward side of the barrier island or isolated islands on the bayside.

Physical Description and Identification

A flat surface in the intertidal zone characterized by wetland vegetation identified through the use of vegetation maps and aerial imagery. Drainage ditches are often located in wetland area.

([post-Hurricane Sandy Geomorphological Map of Fire Island](#)).

Abandoned Features**Hfd2 - Abandoned foredune (Holocene)****Conceptual Basis**

A previously active foredune ridge that is no longer in sediment exchange with the beach because of shoreline progradation. It may form on the oceanside or bayside margins of the barrier island and may have been reworked by winds into parabolic, hummocky, or dissected features.

Physical Description and Identification

A dune ridge inland of the active foredune, it may be generally linear and intact or dissected. It is usually in relatively close proximity and parallel to the active foredune ridge.

([post-Hurricane Sandy Geomorphological Map of Fire Island](#)).

His2 - Abandoned inter-ridge swale (Holocene)**Conceptual Basis**

A topographical low area between shore-parallel dune ridges that forms during time of abundant sediment supply (shoreline progradation), and occupies the space between the sequential, parallel foredune ridges.

Physical Description and Identification

Swales are the continuous and low areas that occur between the sequential, parallel foredune ridges, usually parallel to the active shoreline.

([post-Hurricane Sandy Geomorphological Map of Fire Island](#)).

This unit is listed as "Inter-ridge swale" in the source GIS data, maps, and report, but was changed by the GRI to "Abandoned inter-ridge swale" to help distinguish the unit from unit "Ancestral inter-ridge swale".

Hbd2 - Abandoned back dune slope (Holocene)

Conceptual Basis

Low area immediately inland of the leeward slope of the inlandmost dune ridge. It is related to the foundation of the dune-forming processes.

Physical Description and Identification

Located on the inland margin of a dune ridge or series of dune ridges. Elevation and slope are generally low and tend to decrease toward the bay side, i.e., slopes away from the dune ridge toward the water.

[\(post-Hurricane Sandy Geomorphological Map of Fire Island\)](#).

This unit is listed as "Back dune slope" in the source GIS data, maps, and report, but was changed by the GRI to "Abandoned back dune slope" to help distinguish the unit from unit "Ancestral back dune slope".

Hos - Abandoned wash-over zone/sand flat (Holocene)

Conceptual Basis

Feature caused by an episodic storm event that penetrated inland of the foredune ridge toward the bayside margin of the barrier. A relatively flat blanket of sediment deposited in place of previously existing features, often including a washover fan-shaped deposit on the landward side of the barrier island.

Physical Description and Identification

May be identified as an uncharacteristic break in continuous, shore-parallel linear features of positive relief such as the active foredune or abandoned foredune. It may be a fan-shaped positive elevation on a lower planar surface. Often visible on orthophotography as bare sand. The previously existing dunes may be retained adjacent to the washover fan as low, hummocky dune features.

[\(post-Hurricane Sandy Geomorphological Map of Fire Island\)](#).

This unit is listed as "Wash-over zone/sand flat" in the source GIS data, maps, and report, but was changed by the GRI to "Abandoned Wash-over zone/sand flat" to better denote the unit is an "Abandoned Feature" unit.

Ancestral Features

Hfd1 - Ancestral foredune (Holocene)

Conceptual Basis

An ancestral barrier island component that has been incorporated into and forms the accretionary core of the modern-day barrier island. This feature is temporally distinct from the more recently-created abandoned and active foredunes. The ancestral foredune is more dissected and less continuous than the modern foredune and its associated abandoned foredune ridges. There is a distinct spatial gap between the more recent coherent ridge forms and the more irregular ancestral foredune features, represented by a significant inter dune system depression.

Physical Description and Identification

Inactive dunal ridge at the inland margin of the barrier, it may be highly dissected and reworked by wind or overwash. Often physically separated from more recent ridges by a significant inter dune system depression. Forms the core of highly stable, broad sections of the barrier island. Feature may be large and coherent or low and dissected. It is spatially and morphologically separated from the shore-parallel active foredune.

([post-Hurricane Sandy Geomorphological Map of Fire Island](#)).

His1 - Ancestral inter-ridge swale (Holocene)**Conceptual Basis**

Accumulation of sand between dune ridges that forms during a time of abundant sediment supply (shoreline progradation), and occupies the space between the sequential, parallel foredune ridges.

Physical Description and Identification

A linear hollow or topographical low between parallel dune ridges, that is usually parallel to the shoreline at that time. Swale will have lower elevation and negative relief in relationship to the adjacent dune ridges.

([post-Hurricane Sandy Geomorphological Map of Fire Island](#)).

This unit is listed as "Inter-ridge swale" in the source GIS data, maps, and report, but was changed by the GRI to "Ancestral inter-ridge swale" to help distinguish the unit from unit "Abandoned inter-ridge swale".

Hid - Ancestral inter dune system depression (Holocene)**Conceptual Basis**

Accumulation of sand that forms during a time of abundant sediment supply (shoreline progradation), it is a topographical low separating the development of modern foredune systems from the ancestral foredune system. It is a prominent linear depression at a lower elevation than adjacent ridge systems.

Physical Description and Identification

Substantial area of lower elevation (negative relief) between major dune systems. Often parallel to the coastline, separating the shore parallel modern dune ridges from the ancestral dune ridges. In some areas where the older dune system has been substantially reworked, the inter dune system depression merges with the back dune slope.

([post-Hurricane Sandy Geomorphological Map of Fire Island](#)).

This unit is listed as "Inter dune system depression" in the source GIS data, maps, and report, but was changed by the GRI to "Ancestral inter dune system depression" to better denote the unit is an "Ancestral Feature" unit.

Hbd1 - Ancestral back dune slope (Holocene)**Conceptual Basis**

Area immediately inland of the leeward slope of the inner dune ridge.

Physical Description and Identification

Elevation is generally low and tends to decrease toward bay side, i.e., slopes away from the dune ridge toward the water.

([post-Hurricane Sandy Geomorphological Map of Fire Island](#)).

This unit is listed as "Back dune slope" in the source GIS data, maps, and report, but was changed by the GRI to "Ancestral back dune slope" to help distinguish the unit from unit "Abandoned back dune slope".

Additional GRI Source Map Information (post-Hurricane Sandy)

Geomorphological Map of Fire Island

Psuty, N. P., Patel, Schmelz, W., Greenberg, Joshua, Beal, Irina., and Spahn, A., 2015, Development of the Geomorphological Map of Fire Island National Seashore ("post-Hurricane Sandy"): Rutgers University, Institute of Marine and Coastal Sciences, unpublished digital data and map, scale 1:12,000. (GRI Source Map ID 76043).

Map Legend

Modern Features		Ancestral Features		Anthropogenic Features	
 Beach	 Back dune slope	 Ancestral foredune	 Artificial planar surface	 Ditch	 Jetty/Groin
 Active foredune	 Washover zone/Sand flat	 Inter-ridge swale	 Major road	 Bulkhead	
 Abandoned foredune	 Wetland	 Inter dune system depression	 Other roads/walkways		
 Inter-ridge swale	 Interior water bodies	 Back dune slope			

Some of the unit names presented in this figure were modified to match unit names in the source GIS data or to better clarify the feature "type" (i.e., Abandoned, Active, Ancestral or Anthropogenic). Unit age and name symbols (e.g., Rbu) were also assigned to all units in the GRI digital geologic-GIS data so that units are denoted by a "geologic symbol" and not simply their unit name. Some unit colors, derived from source maps without hillshade, may vary slightly with those source maps that were produced draped over hillshade.

Extracted from: ([post-Hurricane Sandy Geomorphological Map of Fire Island](#)).

Report

The report that accompanied the post-Hurricane Sandy source digital data and map is presently in draft format awaiting publication as a NPS Natural Resource Report.

Psuty, N. P., Patel, Schmelz, W., Greenberg, Joshua, Beal, Irina., and Spahn, A., 2015, Development of the Geomorphological Map of Fire Island National Seashore (Post-Hurricane Sandy): Rutgers University, Institute of Marine and Coastal Sciences, yet unpublished Natural Resource Report NPS/NRPC/GRD/NRR—2016/____. National Park Service, Ft. Collins, Colorado.

Once published it is the plan of the GRI program to include this report with this document. Users can always search the NPS IRMA Data Store, <https://irma.nps.gov/DataStore/>, should the report be published, but not yet included with this document.

Pre-Hurricane Sandy Geomorphological Map

Map Unit List (pre-Hurricane Sandy)

The pre-Hurricane Sandy geomorphological units present in the digital geomorphological-GIS data produced for Fire Island National Seashore, New York (FIIS) are listed below. Units are listed with their assigned unit symbol and unit name (e.g., Hbe - Beach). Units are listed by geomorphological classification. Information about each geomorphological unit is also presented in the GRI Geomorphological Unit Information (fiisunit) table included with the GRI geomorphological-GIS data. Note that there is some difference in units mapped between the pre-Hurricane Sandy and post-Hurricane Sandy maps

Cenozoic Era

Quaternary Period

Recent

Anthropogenic Features

[Rbu](#) - Bulkhead

[Rjg](#) - Jetty/groin

[Raps](#) - Artificial planar surface

[Rdk](#) - Dike

Holocene Epoch

Active Features

[Hiwb](#) - Interior water bodies

[Hbe](#) - Beach

[Hfd3](#) - Active foredune

[Hwl](#) - Wetland

Abandoned Features

[Hfd2](#) - Abandoned foredune

[His2](#) - Abandoned Inter-ridge swale

[Hbd2](#) - Abandoned back dune slope

[Hos](#) - Abandoned wash-over zone/sand flat

Ancestral Features

[Hfd1](#) - Ancestral foredune

[His1](#) - Ancestral inter-ridge swale

[Hid](#) - Ancestral inter dune system depression

[Hbd1](#) - Ancestral back dune slope

Map Unit Descriptions (pre-Hurricane Sandy)

Descriptions of all pre-Hurricane Sandy geomorphological map units, listed by their geomorphological classification (i.e., anthropogenic, active, abandoned or ancestral), are presented below.

Anthropogenic Features

Rbu - Bulkhead (Recent)

Conceptual Basis

An erosion control structure that is constructed at and parallel to the shoreline to harden the shoreline next to existing development or maintain water-dependent uses such as marinas. Erosion-control structures include bulkheads, riprap, marinas or other structures that harden the shoreline.

Physical Description and Identification

Erosion control structures are identified from LiDAR, from a prepared data source, orthophotos, and in the field. These structures are found in developed portions of the island.

[\(pre-Hurricane Sandy Geomorphological Map of Fire Island\)](#).

Rjg - Jetty/groin (Recent)

Conceptual Basis

An engineered structure that projects perpendicular to the shoreline. A jetty is a large structure with the purpose to stabilize the location of an inlet channel. A groin is a smaller structure, built to trap sand and stabilize a sandy beach.

Physical Description and Identification

Jetties exist on the ends of the island to stabilize margins of the inlets. Several groins occur on the oceanside and cause an offset in the beach. Small groins occur on the bayside, usually near a dock or marina. They often cause a displacement of the shoreline.

[\(pre-Hurricane Sandy Geomorphological Map of Fire Island\)](#).

Raps - Artificial planar surface (Recent)

Conceptual Basis

A human-made flat or planar surface that has been leveled to site a structure such as a highway, parking area, buildings, or sand dike. Underlying topography is destroyed or covered and replaced by created surface.

Irregular dunal ridge and swale topography may be leveled to create a uniform surface. Or, sediment may be introduced by dredging or truck to elevate a surface above tidal levels.

Physical Description and Identification

Elevation of surface is nearly or completely homogeneous and level. This surface produces an abrupt interruption of adjacent naturally-occurring topography. Boundary of surface is often sharply-defined and clearly visible on the orthophotos.

On the bayside, it is usually associated with bulkheads and housing or marinas on the orthophotos and in the field. Fill may also cover pre-existing wetlands and provide a dry foundation for human occupation.

[\(pre-Hurricane Sandy Geomorphological Map of Fire Island\)](#).

The previously assigned unit symbol of Rps was updated to Raps to match post-Hurricane Sandy data and map.

Rdk - Dike (Recent)

Conceptual Basis

Elevated ridges that create barrier to flooding, or alter the drainage patterns in the wetlands.

Physical Description and Identification

Topographical ridges that create rectangular reclaimed features adjacent to the better-drained upland.

[\(pre-Hurricane Sandy Geomorphological Map of Fire Island\)](#).

The previously assigned unit symbol of Rd was updated to Rdk to better distinguish it from unit Rd - Ditch in the Post-Hurricane Sandy map and data.

Active Features

Hiwb - Interior water bodies (Holocene)

Conceptual Basis

Areas of open water within the boundaries of the barrier island, not connected by tidal channels to the bay or ocean. Often occurs as ponds within wetlands but may exist in other areas as well.

Physical Description and Identification

Inland water bodies are distinctly visible on orthophotos. Only water bodies visible at the map scale and not subject to tidal inundation are delineated in this category.

[\(pre-Hurricane Sandy Geomorphological Map of Fire Island\)](#).

The previously assigned unit symbol of Hiw was updated to Hiwb to match post-Hurricane Sandy data and map.

Hbe - Beach (Holocene)

Conceptual Basis

Wave-deposited accumulation of sediment, specifically the seaward portion of a beach profile between the low tide line and the upper limit of storm wave action. Regularly inundated by waves during high-water phases of the tidal cycle. Dominant direction of wave approach determines alongshore sediment flow.

Physical Description and Identification

Area of low, nearly planar elevation on oceanside and bayside of barrier island. A very prominent feature that tends to be broad, continuous, and has sparse to no vegetation. It extends from the lowest tide level to the toe of the active foredune.

[\(pre-Hurricane Sandy Geomorphological Map of Fire Island\)](#).

Hfd3 - Active foredune (Holocene)

Conceptual Basis

Ridge formed by eolian (wind-blown) sand at the back of a beach, parallel to the coastline. It is vegetated by pioneer plant species that trap sediment. Dune is actively participating in sediment exchange with the beach.

Physical Description and Identification

A continuous, linear feature of elevated topography (positive relief) that is parallel to the shoreline and immediately adjacent to the beach. Sparsely to moderately vegetated.

[\(pre-Hurricane Sandy Geomorphological Map of Fire Island\)](#).

Hwl - Wetland (Holocene)

Conceptual Basis

A general term describing swamps and marshes, i.e., an area of very low elevation vegetated by saltwater, brackish water, and freshwater plants. Often found in areas sheltered from ocean waves such as the bayward side of the barrier island or isolated islands on the bayside.

Physical Description and Identification

Wetlands are roughly approximated by areas of very low (nearly sea-level) elevation. Marsh vegetation is often distinctly visible on orthophotos. In places where the exact position of the wetland boundary is uncertain, it is useful to consult vegetation maps showing where wetland plants exist. Old drainage ditches are sometimes recognized and represented as straight lines in the wetland areas.

[\(pre-Hurricane Sandy Geomorphological Map of Fire Island\)](#).

Abandoned Features

Hfd2 - Abandoned foredune (Holocene)

Conceptual Basis

A previously active foredune that is no longer in sediment exchange with the beach. Often found parallel or adjacent to an active foredune. May have been reworked by winds into parabolic, hummocky, or dissected features.

Physical Description and Identification

Foredune ridge may be generally linear and intact or dissected, depending on the age of the feature, the influence of wind, the dimensions of the original feature. The original, relatively high elevation is often preserved long after the dune has been abandoned. It is usually in relatively close proximity to the active foredune ridge; i.e., ridges not separated by a major interdune depression.

[\(pre-Hurricane Sandy Geomorphological Map of Fire Island\)](#).

His2 - Abandoned inter-ridge swale (Holocene)

Conceptual Basis

Seaward accumulation of sand that forms during time of abundant sediment supply (shoreline progradation), and occupies the space between the sequential, parallel foredune ridges.

Physical Description and Identification

A linear hollow or topographical low between parallel dune ridges, that is usually parallel to the shoreline.

Swale will have lower elevation and negative relief in relationship to the adjacent dune ridges. Swales are indicative of a positive sediment budget that creates accretionary foredune ridges.

([pre-Hurricane Sandy Geomorphological Map of Fire Island](#)).

This unit is listed as "Inter-ridge swale" in the source GIS data, maps, and report, but was changed by the GRI to "Abandoned inter-ridge swale" to help distinguish the unit from unit "Ancestral inter-ridge swale".

Hbd2 - Abandoned back dune slope (Holocene)

Conceptual Basis

Area immediately inland of the leeward slope of the inner dune ridge.

Physical Description and Identification

Elevation is generally low and tends to decrease toward bay side (i.e., slopes away from the dune ridge toward the water).

([pre-Hurricane Sandy Geomorphological Map of Fire Island](#)).

This unit is listed as "Back dune slope" in the source GIS data, maps, and report, but was changed by the GRI to "Abandoned back dune slope" to help distinguish the unit from unit "Ancestral back dune slope".

Hos - Abandoned wash-over zone/sand flat (Holocene)

Conceptual Basis

Remnant of an episodic storm event that penetrated inland of the foredune ridge toward the bayside margin of the barrier. A relatively flat blanket of sediment deposited in place of previously existing features, often including an overwash fan-shaped deposit on the landward side of the barrier island.

Physical Description and Identification

May be visible as an uncharacteristic break in continuous, shore-parallel linear features of positive relief such as the active foredune or abandoned foredune. A low, bare sand planar surface inland of the foredune location. The previously existing dunes may be retained adjacent to the overwash as low, hummocky dune features.

([pre-Hurricane Sandy Geomorphological Map of Fire Island](#)).

This unit is listed as "Overwash/sand flat" in the source GIS data, maps, and report, but was changed by the GRI to "Abandoned wash-over zone/sand flat" to denote the unit is an "Abandoned Feature" unit, and to better match the unit's name in the post-Hurricane Sandy data and map.

Ancestral Features

Hfd1 - Ancestral foredune (Holocene)

Conceptual Basis

An ancestral barrier island component that has been incorporated into and forms the accretionary core of the modern-day barrier island. This feature is temporally distinct from the more recently-created abandoned and active foredunes. The ancestral foredune is more dissected and less continuous than the modern foredune and its associated abandoned foredune ridges. There is a distinct spatial gap between

the more recent coherent ridge forms and the more irregular ancestral foredune features, represented by a significant inter dune system depression.

Physical Description and Identification

Inactive dunal ridge at the inland margin of the barrier, it may be highly dissected and reworked by wind or overwash. Often physically separated from more recent ridges by a significant inter dune system depression. Forms the core of highly stable, broad sections of the barrier island. Feature may be large and coherent or low and dissected. It is spatially separated from the shore-parallel active foredune.

[\(pre-Hurricane Sandy Geomorphological Map of Fire Island\)](#).

This unit is listed as "Ancestral foredune/barrier island" in the source GIS data, maps, and report, but was changed by the GRI to "Ancestral foredune" to match the unit's name in the post-Hurricane Sandy data and map.

His1 - Ancestral inter-ridge swale (Holocene)

Conceptual Basis

Seaward accumulation of sand that forms during time of abundant sediment supply (shoreline progradation), and occupies the space between the sequential, parallel foredune ridges.

Physical Description and Identification

A linear hollow or topographical low between parallel dune ridges, that is usually parallel to the shoreline. Swale will have lower elevation and negative relief in relationship to the adjacent dune ridges. Swales are indicative of a positive sediment budget that creates accretionary foredune ridges.

[\(pre-Hurricane Sandy Geomorphological Map of Fire Island\)](#).

This unit is listed as "Inter-ridge swale" in the source GIS data, maps, and report, but was changed by the GRI to "Ancestral inter-ridge swale" to help distinguish the unit from unit "Abandoned inter-ridge swale".

Hid - Ancestral inter dune system depression (Holocene)

Conceptual Basis

Accumulation of sand that forms during time of abundant sediment supply (shoreline progradation), it is a topographical low separating the development of active foredune systems from the ancestral foredune system. It is a prominent linear depression at a lower elevation than adjacent ridge systems.

Physical Description and Identification

Substantial area of lower elevation (negative relief) between major dune systems. Often parallel to the coastline. In some areas where the older dune system has been substantially reworked, it can be difficult to distinguish the inter dune system depression from the back dune slope.

[\(pre-Hurricane Sandy Geomorphological Map of Fire Island\)](#).

This unit is listed as "Inter dune system depression" in the source GIS data, maps, and report, but was changed by the GRI to "Ancestral inter dune system depression" to better denote the unit is an "Ancestral Feature" unit.

Hbd1 - Ancestral back dune slope (Holocene)

Conceptual Basis

Area immediately inland of the leeward slope of the inner dune ridge.

Physical Description and Identification

Elevation is generally low and tends to decrease toward bay side (i.e., slopes away from the dune ridge toward the water).

([pre-Hurricane Sandy Geomorphological Map of Fire Island](#)).

This unit is listed as "Back dune slope" in the source GIS data, maps, and report, but was changed by the GRI to "Ancestral back dune slope" to help distinguish the unit from unit "Abandoned back dune slope".

Additional GRI Source Map Information (pre-Hurricane Sandy)

Geomorphological Map of Fire Island

Psuty, N. P., Patel, M., Freeman J., Schmelz, W., Robertson, W., and Spahn, A., 2013, Development of the Geomorphological Map for Fire Island National Seashore, Rutgers University, Institute of Marine and Coastal Sciences, unpublished digital data and map, scale 1:12,000. (GRI Source Map ID 75677).

Map Legend

Modern Features		Ancestral Features		Anthropogenic Features	
 Beach	 Back dune slope	 Ancient Dunal Ridge	 Bulkhead	 Jetty/Groin	 Planar Surface
 Ocean Foredune Ridge	 Washover/Sand Flat	 Ancient Inter-Ridge Swale	 Artificial Fill	 Major Road	 Other Roads/Walkways
 Bayside Foredune Ridge	 Marshland	 Interdune System Depression			
 Abandoned Ocean Foredune Ridge	 Pond	 Back Dune Slope			
 Inter-ridge Swale					
 Interdune System Depression					

Some of the unit names presented in this figure were modified to match unit names in the source GIS data, as well as to correspond with GRI practices that for informal geologic units only the first word of a unit name is in title case (e.g., "Active foredune" versus "Active Foredune"). Unit age and name symbols (e.g., Rbu) were also assigned to all units in the GRI digital geologic-GIS data so that units are denoted by a "geologic symbol" and not simply their unit name.

Extracted from: ([pre-Hurricane Sandy Geomorphological Map of Fire Island](#)).

Report

The report that accompanied the pre-Hurricane Sandy source digital data and map is included with this document. The report was published as a NPS Natural Resource Report.

Psuty, N. P., M. Patel, J. Freeman, W. Schmelz, W. Robertson, and A. Spahn. 2015. Development of the geomorphological map for Fire Island National Seashore: Principal characteristics and components, Natural Resource Report NPS/NRSS/GRD/NRR—2015/941. National Park Service, Fort Collins, Colorado.

The report can be accessed by double-clicking [FIIS_Geomorph_Mapping_2015-0415_NRSS.pdf](#)

William Floyd Estate Geomorphological Map

Map Unit List (William Floyd Estate)

The geomorphological units present in the digital geomorphological-GIS data produced for the William Floyd Estate map are listed below. Units are listed with their assigned unit symbol and unit name (e.g., Hbe - Beach). Units are listed by geomorphological classification. Information about each geomorphological unit is also presented in the GRI Geomorphological Unit Information (fiisunit) table included with the GRI geomorphological-GIS data.

Cenozoic Era

Quaternary Period

Recent

Anthropogenic Features

[Raps](#) - Artificial planar surface

[Rdk](#) - Dike

Holocene Epoch

Active Features

[Hiwb](#) - Interior water bodies

[Hbe](#) - Beach

[Hwl](#) - Wetland

Fluvial Features

[Hfp](#) - Fluvial floodplain

Pleistocene Epoch

Glacial Features

[PEop](#) - Outwash plain

Map Unit Descriptions (William Floyd Estate)

Descriptions of all geomorphological map units present on the William Floyd Estate map, listed by their geomorphological classification (i.e., anthropogenic, active, fluvial or glacial), are presented below.

Anthropogenic Features

Raps - Artificial planar surface (Recent)

Conceptual Basis

A human-made flat or planar surface that has been leveled to site a structure such as a highway or building. Underlying topography is destroyed or covered up.

Physical Description and Identification

Elevation of surface is nearly or completely homogeneous and level. Abrupt interruption of adjacent

naturally occurring topography. Boundary of surface is often clearly visible on the orthophotos.

([Geomorphological Map of the William Floyd Estate](#)).

Rdk - Dike (Recent)

Conceptual Basis

Elevated ridges that create barrier to flooding, or alter the drainage patterns in the wetlands.

Physical Description and Identification

Topographical ridges that create rectangular reclaimed features adjacent to the better-drained upland.

([Geomorphological Map of the William Floyd Estate](#)).

Active Features

Hiwb - Interior water bodies (Holocene)

Conceptual Basis

Areas of open water within or adjacent to marsh wetlands. May occur as ponds within wetlands but may exist in other areas as well.

Physical Description and Identification

Inland water bodies are distinctly visible on orthophotos. Only water bodies visible at the map scale and not subject to tidal inundation are delineated in this category.

([Geomorphological Map of the William Floyd Estate](#)).

Hbe - Beach (Holocene)

Conceptual Basis

Wave-deposited accumulation of sediment, specifically the seaward portion of a beach profile between the low tide line and the upper limit of storm wave action. Regularly inundated by waves during high-water phases of the tidal cycle. Dominant direction of wave approach determines alongshore sediment flow.

Physical Description and Identification

Area of low, nearly planar elevation on oceanside and bayside of barrier island. A very prominent feature that tends to be broad, continuous, and has sparse to no vegetation. It extends from the lowest tide level to the toe of the active foredune.

([Geomorphological Map of the William Floyd Estate](#)).

Hwl - Wetland (Holocene)

Conceptual Basis

A general term describing swamps and marshes, i.e., an area of very low elevation vegetated by saltwater, brackish water, and freshwater plants. Often found in areas sheltered from ocean waves such as the estuarine embayments.

Physical Description and Identification

Wetlands are roughly approximated by areas of very low (nearly sea-level) elevation. Marsh vegetation is

often distinctly visible on orthophotos. In places where the exact position of the wetland boundary is uncertain, it is useful to consult vegetation maps showing where wetland plants exist. Old drainage ditches are sometimes recognized and represented as straight lines in the wetland areas.

([Geomorphological Map of the William Floyd Estate](#)).

Fluvial Features

Hfp - Fluvial floodplain (Holocene)

Conceptual Basis

Accumulations associated with fluvial flooding of a dissected valley in the outwash plain, creating a relatively planar surface at the elevation of modern sea level.

Physical Description and Identification

Low relief and low elevation adjacent to fluvial channels cutting through the outwash plain.

([Geomorphological Map of the William Floyd Estate](#)).

Glacial Features

PEop - Outwash plain (Pleistocene)

Conceptual Basis

Broad, planar surface created by the meltwater discharge of the continental ice, transporting sediment beyond the terminal moraine.

Physical Description and Identification

Relatively flat surface sloping seaward, with little topographical variability, except for discharge channels.

([Geomorphological Map of the William Floyd Estate](#)).

Additional GRI Source Map Information (William Floyd Estate)

Geomorphological Map for William Floyd Estate

Psuty, N., Schmelz, W., Spahn, A., 2014, Development of the Geomorphological Map for William Floyd Estate, a unit of the Fire Island National Seashore: Rutgers University, Institute of Marine and Coastal Sciences, unpublished digital data and map, scale 1:6,000. (*GRI Source Map ID 75946*).

Map Legend

Glacial Features	Coastal Features	Anthropogenic Features
 Outwash plain	 Beach	 Artificial planar surface
	 Wetland	 Dike
Fluvial Features	 Interior water bodies	 Roads
 Fluvial floodplain		 Buildings

Some of the unit names presented in this figure were modified to match unit names in the source GIS data, as well as to correspond with GRI practices that for informal geologic units only the first word of a unit name is in title case (e.g., "Active foredune" versus "Active Foredune"). Unit age and name symbols (e.g., Hfd2 for "Active foredune" and Rbu for "Bulkhead") were also assigned to units in the GRI data.

Extracted from: ([Geomorphological Map of the William Floyd Estate](#)).

Report

The report that accompanied the source digital data and map for the William Floyd Estate unit is presently in draft format awaiting publication as a NPS Natural Resource Report.

Psuty, N. P, W. Schmelz, and A. Spahn, 2014. Development of the Geomorphological Map for William Floyd Estate: Principal Characteristics and Components, Natural Resource Report NPS/NRPC/GRD/NRR—2014/____. National Park Service, Ft. Collins, Colorado.

The report can be accessed by double-clicking [030614_WFE_morf_rpt_npp_v13_WS.docx](#)

GRI Digital Data Credits

This document was developed and completed by Stephanie O'Meara (Colorado State University) and Andrea Croskrey (NPS GRD) for the NPS Geologic Resources Division (GRD) Geologic Resources Inventory(GRI) Program. Quality control of this document by Stephanie O'Meara and James Winter (Colorado State University).

The information in this document was compiled from the GRI source map, and intended to accompany the digital geomorphologic-GIS map and other digital data for Fire Island National Seashore, New York (FIIS) developed by Andrea Croskrey, Stephanie O'Meara, James Winters and Derek Witt (Colorado State University; see the [GRI Digital Maps and Source Map Citations](#) section of this document for all sources used by the GRI in the completion of this document and related GRI digital geomorphologic-GIS map).

GRI finalization by Stephanie O'Meara.

GRI program coordination provided by Bruce Heise (NPS GRD, Lakewood, Colorado).