

Geologic Resources Inventory Scoping Summary Sagamore Hill National Historic Site

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The Geologic Resources Inventory (GRI) provides each of 270 identified natural area National Park System units with a geologic scoping meeting and summary (this document), a digital geologic map, and a geologic resources inventory report. The purpose of scoping is to identify geologic mapping coverage and needs, distinctive geologic processes and features, resource management issues, and monitoring and research needs. Geologic scoping meetings generate an evaluation of the adequacy of existing geologic maps for resource management, provide an opportunity to discuss park-specific geologic management issues, and if possible include a site visit with local experts.

The National Park Service held a GRI scoping meeting for Sagamore Hill National Historic Site on June 23, 2010 in Theodore Roosevelt Jr.'s bedroom in the Theodore Roosevelt Museum building, Oyster Bay, New York. A site visit at the site followed the meeting. Heather Stanton (Colorado State University [CSU]) facilitated the discussion of map coverage and Bruce Heise (NPS-GRD) led the discussion regarding geologic processes and features at the park. After an introduction by park Chief of Maintenance, Eric Witzke, Norbert Psuty from Rutgers University presented a brief geologic overview of the park and surrounding area. Participants at the meeting included NPS staff from the park and Geologic Resources Division, a geologist from Rutgers University, and cooperators from Colorado State University (see table 2). This scoping summary highlights the GRI scoping meeting for Sagamore Hill National Historic Site including the geologic setting, the plan for providing a digital geologic map, a prioritized list of geologic resource management issues, a description of significant geologic features and processes, lists of recommendations and action items, and a record of meeting participants.

Park and Geologic Setting

Authorized on July 25, 1962, Sagamore Hill National Historic Site includes Theodore Roosevelt's beloved home (1887-1919), an associated cultural landscape, glacial features, and a small coastal area. The park covers more than 33 ha (83 ac). The park consists of one unit located on the eastern side of Cove Neck in Oyster Bay, New York. The park seeks to preserve the cultural landscape as it was when the Roosevelts were in residence as well as preserve the pioneering legacy of a fascinating president. Features at the park include fresh and saltwater marshes, forested slopes, glacial kettles (ponds), beaches, dunes, tidal channels, and open orchards. The park provides an important natural habitat for horseshoe crabs, amphibians, and various birds on the north shore of Long Island.

Sagamore Hill National Historic Site sits north of the maximum extent of Pleistocene glacial advance into New York, and glacial deposits including till and outwash mantle the underlying Cretaceous sedimentary units. Sagamore Hill, underlain by glacial deposits rises 52 m (170 ft) above sea level. The coastal areas of the park contain very young, Holocene sands and gravels, derived primarily from the glacial deposits being eroded at the head of Cove Neck and transported down the eastern shore of the neck by longshore drift.

Geologic Mapping for Sagamore Hill National Historic Site

During the scoping meeting, Heather Stanton (CSU) showed some of the main features of the GRI's digital geologic maps, which reproduce all aspects of paper maps, including notes, legend, and cross sections, with the added benefit of being GIS compatible. The NPS GRI Geology-GIS Geodatabase Data Model incorporates the standards of digital map creation for the GRI Program and allows for rigorous quality control. Staff members digitize maps or convert digital data to the GRI digital geologic map model using ESRI ArcGIS software. Final digital geologic map products include data in geodatabase and shapefile format, layer files complete with feature symbology, FGDC-compliant metadata, an Adobe Acrobat PDF help document that captures ancillary map data, and a map document that displays the map, and provides a tool to access the PDF help document directly from the map document. Final data products are posted at NEW LINK. The data model is available at <http://science.nature.nps.gov/im/inventory/geology/GeologyGISDataModel.cfm>.

When possible, the GRI Program provides large scale (1:24,000) digital geologic map coverage for each park's area of interest, which is often composed of the 7.5-minute quadrangles that contain park lands (fig. 1). Maps of this scale (and larger) are useful to resource managers because they capture most geologic features of interest and are spatially accurate within 12 m (40 ft). The process of selecting maps for management begins with the identification of existing geologic maps (table 1) and mapping needs in the vicinity of the park unit boundary. Scoping session participants then select appropriate source maps for the digital geologic data or develop a plan to obtain new mapping, if necessary.

Table 1. GRI Mapping Plan for Sagamore Hill National Historic Site

Covered Quadrangles	Relationship to the park	Citation	Format	Assessment	GRI Action
Parts of all quadrangles of interest	Intersects part of SAHI	Isbister, John, 1966, Geology and hydrology of northeastern Nassau County, Long Island, New York, U.S. Geological Survey, Water-Supply Paper 1825, 1:48000 scale	Paper/DJVU	No	Digitize map for identified area of interest
Lloyd Harbor and Huntington	Intersects part of SAHI	Lubke, E.R., 1964, Hydrogeology of the Huntington - Smithtown area, Suffolk County, New York, U.S. Geological Survey, Water-Supply Paper 1669-D, 1:62500 scale	Paper/DJVU	No	Digitize map for identified area of interest

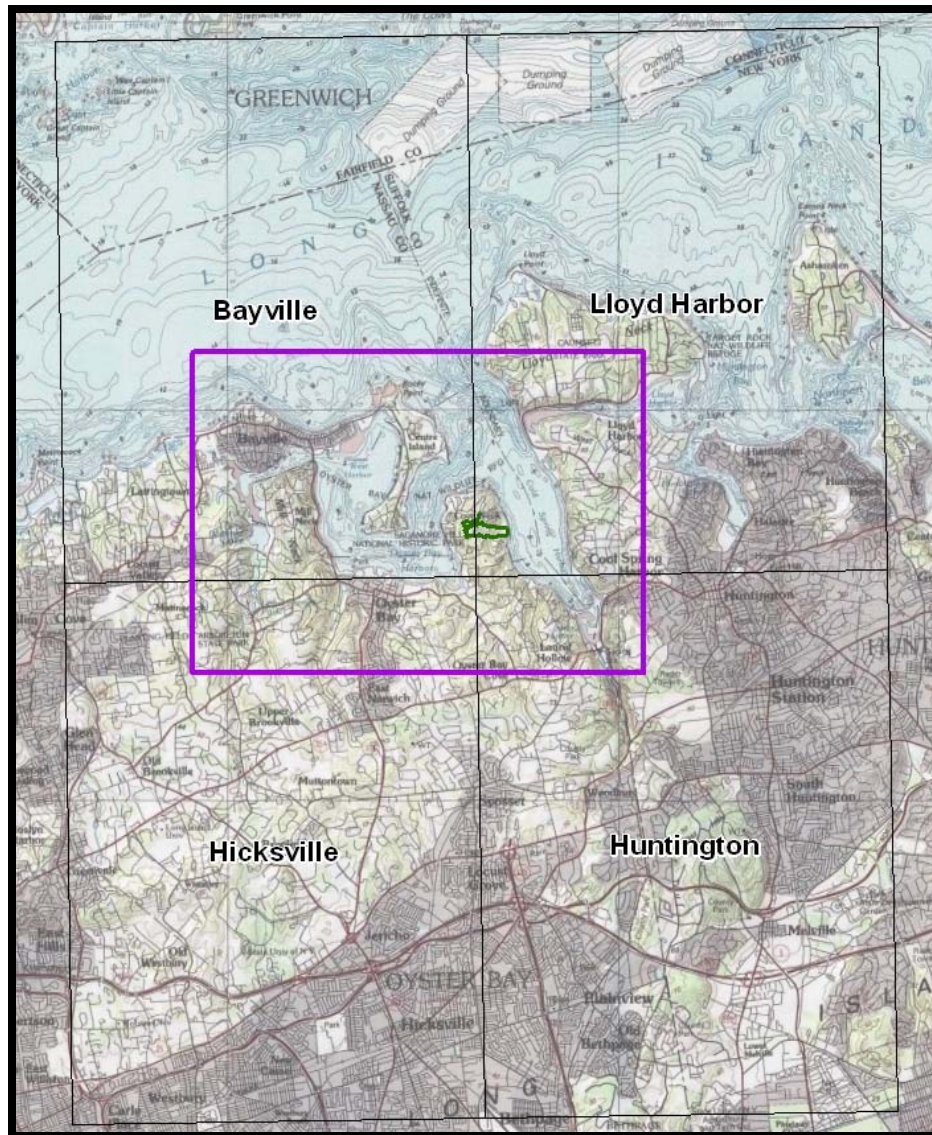


Figure 1. Area of interest for Sagamore Hill National Historic Site, New York. The 7.5-minute quadrangles are labeled in black. Green outline indicate national historic site boundary. Area to be digitized outlined in purple.

During the scoping meeting the following quadrangles were determined to be of interest for park resource management needs: Bayville, Lloyd Harbor, Hicksville and Huntington. Further discussion yielded an area of interest within those quadrangles that incorporates the extent of both Cold Springs Harbor and Oyster Bay Harbor and the access road into the park (in purple in Figure 1). The GRI will digitize maps included in two publications in Table 1: Isbister (1966) and Lubke (1964). These maps were determined to have the best detail covering the area of interest. The Geologic Resources Division will also fund a Geologic Society of America GeoCorps intern to map the glacial geology within the park's boundary. An additional resource that could be consulted for data covering Sagamore National Historic Site is the New York State GIS Clearinghouse (<http://www.nysgis.state.ny.us/>).

LiDAR data exist for this area, it was prepared in 2009 for the coastal barrier network. These data are difficult to obtain due to the dense vegetation on the slopes of the park lands. Tim Layton and Dennis Skidds have GIS data. A private firm is supposed to supply utilities information in a GIS to use with facilities management and restoration efforts. Soils map coverage is good for the park area and could be tied into a geologic/geomorphic map. These data are available through the NRCS. There is some offshore geology coverage (Long Island Sound USGS mapping) and the GRI could probably just provide the link to this. Google Earth has bathymetric data that the park might find useful.

Geologic Resource Management Issues

The scoping session for Sagamore Hill National Historic Site provided the opportunity to develop a list of geologic features and processes, which will be further explained in the final GRI report. During the meeting, participants prioritized the most significant issue as coastal processes and management. Other geologic resource management concerns discussed include slope processes, fluvial and lacustrine features and processes, seismicity, disturbed lands, and impacts from climate change. The park's general management plan was completed several years ago. The park is currently working on biological surveys to determine any anthropogenic impacts. The park is also replanting historic fruit trees in the former orchard and restoring historic farm fields. Knowledge of the geology of the area would add to these endeavors, including understanding how the plant communities vary based on geologic substrate and structure.

Coastal management

The coastline at Sagamore Hill National Historic Site is constantly changing. Two of the major factors influencing the shoreline geomorphological evolution at the park are sea level change and sediment supply. Sea level change plus other components such as wave energy (dimension and direction) control the transport of sediment in the system. With current levels of sea level rise, instability is generally causing shoreline erosion and continual displacement of shoreline features. These results in a morphology manifested as scarps, cliffs, dunes, and beaches. At Sagamore Hill, the coastal area formed as a series of accretionary ridges and spits. There is also a tidal channel and flood tidal deposits. Tidal action does not add much sediment though. Most sediment comes from the headland of Cove Neck. When open tidal areas shift southward, spartina establishes a vegetation base for a marsh area in the interdune swales. On the small beach, there is a 6 inch high dune on the pebbly ridges (fig. 2). There is the potential to study dimensional changes with aerial photographs and maps through time.

Given the dynamic nature of the coastal areas within the park, the entire coast could change in one storm. In March 2010, several meters of shoreline eroded during the storm. Much sandy sediment washed into the tidal marsh, which has then slowly reworked back out into the system again. Small, scarps (less than 1 m (3 ft) high), washover lobes, and interrupted vegetation still mark the passage of this particular storm at the coast of Sagamore Hill (fig. 3).

The park's boundary currently sits at mean high tide and the Fish and Wildlife Service and local city governments administer the water component. The NPS does manage the marsh areas along the coast. Because of the confusion over the park's boundary, many people often land boats on park land and degrade the coastal area. Affluent neighbors are also having a direct impact on park

resources in the coastal area. The neighbor to the south has a marina input that is often dredged and the neighbor is attempting to stem the influx of sediment across this channel (fig. 4). The sand supply and channel are naturally migrating southward impinging on the marina entrance. There is some bamboo at the park boundary and pilings. This landowner has also created a “beach” area with retaining walls and dredged sand.

Other geologic resource management issues

Fluvial features and processes

Ale Creeks runs along the eastern margin of the park with a boardwalk over it (fig. 5). Local Bayville Creek is tidal-influenced and is included on a map with Cold Spring Harbor and Oyster Bay Harbor. One small creek leaks into the salt marsh. The presence of cattails marks the freshwater area of the marsh. In general, there is abundant groundwater available locally as homeowner wells and artesian wells attest.

One gully on the northern end of the park is ephemeral. Gullies and small ravines to the south indicate some ephemeral stream activity there. Amphibian surveys spotted other wetter areas that provide vital habitat. Theodore Roosevelt mentioned the presence of a frog spring on the slope near the gully, but there is no trace of it now. Flooding on the steep slopes of the park can impact the nature trail and expose historic debris and garbage, most of which is considered historic from the Roosevelt era.

Disturbed lands and boundary issues

Sagamore Hill National Historic Site contains cultural features that might be considered disturbed lands; however, these are part of the historical context of the park and are not targets for restoration. Such sites include rock piles at the base of the hill, cleared for agricultural fields in Roosevelt’s time. The park is restoring the agrarian landscape at the park for interpretive reasons. There is some potential for increased runoff and erosion by removing vegetation from the park’s slopes. The area was originally settled and cleared in the 1500s and once assumes that soil erosion occurred then. At the base of the house slope, trees were cleared to restore a historic view, but the reseeding of grass was not successful.

The surrounding areas are potential targets for development and disturbance and the park managers remain vigilant to threats to park viewshed and resources. The north side of the kettle contains a retaining wall constructed by a neighbor to protect his driveway from flooding. At one time, Robert Moses wanted to put a bridge across the sound and run it through Cove Neck. There may still be plans to construct a tunnel beneath all of this. The idea would definitely impact the park with increased exposure and traffic.

Impacts from climate change

The park is very interested in changing climate management. Even a small change in sea level with have dramatic effects on the coastal landforms and wetland areas within the park. On March 14, 2010, an extended cyclonic nor’easter storm lasted over six high tides and caused drastic damage and erosion. At the park, several meters of beach berm eroded away. If climate change causes increased storm frequency and intensity, the park natural resources are in danger of severe degradation and change. The access road into the park area has an 2.5-m-high (8 ft) seawall. This has already overwashed during a storm (Cove Neck Road).

Seismicity

The passive eastern continental margin of the United States is not a hotspot for seismicity. Nevertheless, seismic events occur all along the coast as buried ancient structures accommodate stresses within Earth's crust. Historically, there were two magnitude ≈ 5 earthquakes in the New York City area. One was on Coney Island in 1884 and another occurred locally in the 1730s. There are low-magnitude events occurring on a constant basis. The New York City Metro area consortium has data for New York.

Slope processes

Steep, forested slopes exist within the park. Active gullies attest to some local erosion; however, no active slumping was obvious within park boundaries. There are several dry washes with minor flooding onto the park nature trail, but nothing considered serious to park resource managers.



Figure 2. Beach face and berm at Sagamore Hill National Historic Site. View is to the north. Photograph is by Trista L. Thornberry-Ehrlich (Colorado State University).



Figure 3. Washover lobe attesting to storm activity in March 2010. View is to the west. Photograph is by Trista L. Thornberry-Ehrlich (Colorado State University).



Figure 4. Neighboring landowner's attempts to stem the influx of sediment over the inlet of his marina, and to create an artificial beach. View is to the south. Photograph is by Trista L. Thornberry-Ehrlich (Colorado State University).



Figure 5. Boardwalk over tidal creek in the coastal area at the base of the forested slope at Sagamore Hill National Historic Site. View is to the east. Photograph is by Trista L. Thornberry-Ehrlich (Colorado State University).

Features and Processes

Coastal features and processes

Geomorphological features along the coastal areas are divisible as formed via accumulation or erosion. Features formed by accumulation include beaches, dunes, barrier spits, and accreted headlands. Features formed by erosion include bluffs, channels, scours, and scarps. However formed, the topography, habitat, and ecosystem at Sagamore Hill National Historic Site are worthy of careful management. Coastal features at Sagamore Hill National Historic Site include a series of barrier spit/islands moving from north to south along the shoreline, gravel and pebble ridges, and erosional embayments. Pulses of sediment along the beach face form small spits that can encapsulate topographic lows and make local marshes with spartina grass. These are not on park property at present. There is a cutbank along the tidal channel that exposes sand deposits; the park boundary is at the top of the divide between channels (fig. 6). The tidal channel and associated wetlands are within park boundaries. At the base of the steep glacial-influenced slope white oak trees appear to have found a niche, beyond them are mucky peat bog areas, a salt marsh, and a beach. The coarse pebbly beach and tidal inlet is an ideal habitat for nesting horseshoe crabs (fig. 7). Blood from these creatures is used in pharmaceutical research and fishermen also use them as bait. There is also a coarse gravel beach ridge supporting beach laurel growth and diamond back terrapin nesting habitat.

History and geology connections

Sagamore Hill National Historic Site sits atop a high, steep bluff overlooking Cold Spring Harbor on the eastern side of Cove Neck which stretches into Long Island Sound. The underlying geology delineates the geomorphic character and land surface expression of Sagamore Hill. This scenic setting attracted Theodore Roosevelt to purchase the property in 1880. The property has undergone many changes over the years. In 1880, the landscape was almost completely lacking trees in stark contrast to the forested slopes today. The house has undergone cosmetic changes in paint color and adaptations to outbuildings, but largely remains in a preserved historic state. It sits atop thick glacial deposits with well-drained, sandy loam soils. The fertile, unconsolidated regolith supported Roosevelt's working farm. Glacial features within the park provided recreational opportunities for the Roosevelt children including skiing in Devil's Punchbowl (a glacial kettle) located north of the main house. At one time, the park wanted to fill in a low-lying area for a parking lot. This would have distorted the historic aspect of the landscape, rendering Sagamore Hill into a plateau feature. The park has since abandoned this plan.

Paleontological and related cultural resources

According to the paleontological resource inventory and monitoring report prepared by the Geologic Resources Division for Sagamore Hill National Historic Site, there is no known potential to find fossils in local glacial deposits. There are south-dipping Cretaceous rocks at depth that have locally yielded fossil leaves. Mammoth bones occasionally occur between glacial moraine deposits in surrounding areas. Fossils often wash up on beaches. A midden site exists just north of the park. Theodore Roosevelt referenced Paleo-Indian using this hill. Early people likely found arrowheads and other remains.

Glacial features

During the Pleistocene, episodic cooler climates led to global glaciation events. Of these, the Illinoian and later Wisconsinan events strongly influenced the development of the landscape in the Sagamore Hill National Historic Site area. The park sits just north of the glacial terminus of the Wisconsinan event whose terminal moraine is along the southern end of Long Island, and the surrounding area exhibits a glaciated landscape. The terminal moraine formed south of the park approximately 14,000-16,000 years ago. Erosional embayments were possibly original drainage systems that were further scoured by ice and then filled with meltwater moraine material during glacial retreat. These are now coves and necks along the northern shore of Long Island.

Glacial moraine, erratics, till, and outwash deposits underlie much of the park area. Glacial features within the park greatly influence topography and include several kettle ponds such as Devil's Punchbowl, thick glacial tills (more than 1.5 m [5 ft] thick, loose, and oxidized), a possible kame (Sagamore Hill itself), and ground moraine. The kettle holes, some of which are water-bearing, are topographic and geomorphic features. They occur on the uplands and along the slope to the bay. Most local, discrete depressions are likely kettles; however, local farmers may have filled some depressions. Local precipitation frequently inundates the depressions with water. One kettle dries every summer, whereas the (ca. 1952) parking lots drain into a perennial kettle keeping water levels steady enough to provide snapping turtle and amphibian habitat (fig. 8). Originally, runoff was along a curb on the northeastern edge to a culvert, but now a drainage ditch serves to channel the flow (fig. 9).

Aeolian features

There is a seaward "dune" on the gravel ridge at the coast. Atop the glacial till regionally there should be some loess deposits. This might also be reflected in the loamy sandy (winnowed silt) soil types here. It is difficult to discern if it is a cap of loess or already intermixed with the soil profile.



Figure 6. Cutbank along the tidal creek along the southern boundary of Sagamore Hill National Historic Site. View is to the south. Photograph is by Trista L. Thornberry-Ehrlich (Colorado State University).



Figure 7. Horseshoe crab nests (depressions) in the coarse pebble beach at Sagamore Hill National Historic Site. Photograph is by Trista L. Thornberry-Ehrlich (Colorado State University).



Figure 8. Perennial kettle pond supplemented with runoff from the park's parking lot. To the right of the photograph is a retaining wall. Photograph is by Trista L. Thornberry-Ehrlich (Colorado State University).



Figure 9. Drainage ditch channeling runoff from park's main parking area to the perennial kettle. View is to the south, the kettle sits north of the view point. Photograph is by Trista L. Thornberry-Ehrlich (Colorado State University).

Recommendations

1. Consult the New York City administrations GIS clearinghouse for additional map data.
2. Work with GRD to support a GIP to perform large-scale surficial mapping of the park area.

Action Items

1. GRI report author will obtain a PDF of the Fuller 1914 map (from Heather Stanton).
2. GRI staff will obtain a copy of the Harbor Hill moraine publication by J. Brett Bennington (2003).

References

Kenworthy, J. P. and V. L. Santucci. 2003. Paleontological resource inventory and monitoring—Northeast Coastal and Barrier Network. Natural Resource Technical Report TIC # D-340. National Park Service, Fort Collins, Colorado.

National Park Service. 2010. Sagamore Hill National Historic Site. www.nps.gov/sahi (accessed July 25, 2010).

Table 2. Scoping Meeting Participants

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