

Geologic Resource Evaluation Scoping Summary

Acadia National Park, Maine

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The Geologic Resource Evaluation (GRE) Program provides each of 270 identified natural area National Park Service units with a geologic scoping meeting, a digital geologic map, and a geologic resource evaluation report. Geologic scoping meetings generate an evaluation of the adequacy of existing geologic maps for resource management, provide an opportunity for discussion of park-specific geologic management issues and, if possible, include a site visit with local experts. The purpose of these meetings is to identify geologic mapping coverage and needs, distinctive geologic processes and features, resource management issues, and potential monitoring and research needs. Outcomes of this scoping process are a scoping summary (this report), a digital geologic map, and a geologic resource evaluation report.

The National Park Service held a GRE scoping meeting for Acadia National Park (ACAD) on June 9-10, 2008 at the Schoodic Education and Research Center, Acadia National Park. Bruce Heise (NPS) led a discussion regarding geologic processes and features and Melanie Ransmeier (NPS) facilitated the discussion of map coverage for Acadia National Park. David Manski (ACAD, Chief of Resource Management) presented an overview of geologic resource management issues at the park. Bob Marvinney (Maine Geological Survey, State Geologist) and Chris Koteas (University of Massachusetts) described the bedrock geology of Acadia National Park, and Joe Kelley (University of Maine) presented an overview of the Quaternary geology. Mark Borrelli (Texas A&M, NPS) explained the NPS submerged resource mapping program and how the program may apply to Acadia National Park. Participants at the meeting included NPS staff from the park, Geologic Resources Division, and Northeast Regional Office and cooperators from the Maine Geological Survey (MGS), University of Maine, University of Massachusetts, Texas A&M, and Colorado State University (see table 2). This scoping summary highlights the GRE scoping meeting for Acadia National Park including the geologic setting, the plan for providing a digital geologic map, a 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

Acadia National Park consists of a cluster of islands off the Maine coast about 113 km (70 mi) southwest of the U.S.-Canadian border. The park is the only National Park along the eastern seaboard with a dramatic coastline carved by glaciers during the most recent ice age. The Pleistocene glaciers created a rugged landscape where steep slopes rise above rocky shores. The most contiguous park acreage lies on Mt. Desert Island, the largest of many islands located along the coast of Maine. Cadillac Mountain, rising to an elevation of 466 m (1,530 ft) on Mt. Desert Island, is the highest point on the eastern coastline of the Americas, extending from Canada to Rio de Janeiro in Brazil. The official park boundary includes Mt. Desert Island, Isle au Haut, and the southern tip of the Schoodic Peninsula about 16 km (10 mi) east of Mt. Desert Island. Baker Island and a small parcel on Little Cranberry Island are fee owned by Acadia. Other lands protected by conservation easements and managed by the park include all or parts of Great Cranberry Island, Porcupine Island, and Long Island.

Composed primarily of undeformed bedrock over 400 million years old that has been dramatically shaped by both dynamic glacial and shoreline processes, Acadia National Park is arguably one of the most geologically interesting places along the Atlantic Coast.

The Cambrian-age Ellsworth Schist is the oldest rock unit exposed in the park. Silurian-age volcanic rocks of the Cranberry Island Series are named from exposures on the Cranberry Islands. The Cranberry volcanic units are about 3-5 km (2-3 mi) thick and represent a period of extraordinary volcanic eruptions in this area. The siltstones and sandstone beds of the Bar Harbor Formation exposed in the park are non-metamorphosed sedimentary rock units. These Cambrian and Silurian rock units were intruded by a variety of granitic rocks that include the Cadillac Granite, Sommesville Granite, and the granite of Southwest Harbor. Previously mapped as Devonian, these granites have been age-dated as latest Silurian, and some of the intrusions may be correlative with the Silurian volcanic rocks of the Cranberry Island series. This association between intrusive and extrusive igneous rocks is rare in Maine. Younger, north-south trending mafic dikes have intruded the granites, schist, and volcanic rocks. The age of these dark gray intrusive units is not known although similar dikes in southern Maine are Mesozoic in age.

During the Late Silurian-Early Devonian Acadian Orogeny, the collision of a micro-continent with North America generated the magma that became the various intrusive rocks exposed in Acadia National Park. Surprisingly, these older Paleozoic rocks are relatively undeformed and have not been subjected to metamorphism.

Acadia National Park provides excellent exposures of the complex relationship between the intrusive and host rocks. Co-mingling magmas of varying temperatures have interacted with country rock to create a rich assortment of intrusive textures and compositions. One intriguing feature, rarely exposed along the Atlantic seaboard, is a shatter zone that surrounds the Cadillac Mountain granite. The zone consists of angular blocks of intensely shattered country rock imbedded near the pluton's margin.

Recent mapping has shown that the granites exposed on the Schoodic peninsula are quite different from the granites on Mt. Desert Island. Dated at approximately 419 million years old, the Goldsboro pluton of the Schoodic peninsula is the same age as the Cadillac pluton but has a different composition and lacks a shatter zone. The contact between these plutons is located somewhere in Frenchman Bay. The upper portion of the magma chamber, along with excellent exposures of mafic dike swarms that show an intermingling of two hot, plastic magma bodies, are found on the Schoodic peninsula. Zones of mingling of intermediate magma with felsic magma and intermediate pillow lava attest to the dynamic interaction of long-lived volcanic activity accompanied by pulsed incremental injections of magma. The lack of a shatter zone and the rounded blocks of greenstone within the diorites of the Schoodic peninsula represent a different method of intrusion from the Cadillac pluton.

During the last ice age, Pleistocene glaciers stripped off all of the rocks and sediment deposited in the Acadia National Park region over the last 419 million years. The continental ice sheet reached its maximum extent about 21,000 years ago, covering all of the land area of New England and extending into the Gulf of Maine and onto the continental shelf almost 600 km (370 mi) southeast

of the present Maine coast. The withdrawal of the last ice sheet started about 18,000 years ago as the ice margin receded northward.

About 14,000 years ago, Sargent Mountain emerged from the ice as the first visible landform above the massive glacial ice that extended beyond the present Acadia National Park area. Ice lobes extended southward along the major valleys in the central part of Mount Desert Island, and the flowing ice carried rock debris that was deposited in mounds and ridges at the front edge of the ice. These end moraines became dams behind which lakes and bays formed, including Long Pond, Somes Sound, and Jordan Pond. One of the better-known end moraines in Acadia National Park is the one that forms a natural dam at the south end of Jordan Pond and upon which Jordan Pond House was built. As the glaciers melted, sea level rose to approximately 60 m (200 ft) above its present level.

Unburdened from the weight of the ice, the crust began to rebound about 11,000-10,500 years ago. Sea level that had initially risen when the glaciers melted began to fall as the crust rose, eventually reaching a level approximately 60 m (200 ft) below its present position. At that time, Somes Sound was a lake dammed by an end moraine. Acadia National Park is one of the premier places in the world to see evidence of such dramatic crustal rebound and sea level changes. For example, paleo-sea stacks, paleo-sea caves, and paleo-thunderholes, formed by an ancient shoreline, are now exposed well above sea level along Gorham Mountain Trail. Depositional remnants of glacial activity can be seen in such features as moraines and glacial erratics. Landforms such as whalebacks, U-shaped valleys, and striations provide evidence of the erosive power of glaciers.

Today, Acadia National Park is an erosional landscape. Notches in bedrock cliffs and sea caves form from wave action along the high tide mark. Differential erosion causes less resistant rocks such as diabase and schist to erode more easily than granite, forming such features as Thunder Hole.

Geologic Mapping for Acadia National Park

During the scoping meeting Melanie Ransmeier (NPS, GRD) showed some of the main features of the GRE Program's digital geologic maps, which reproduce all aspects of paper maps including notes, legend, and cross sections, with the added benefit of GIS compatibility. The NPS GRE Geology-GIS Geodatabase Data Model incorporates the standards of digital map creation set for the GRE Program. Staff members digitize maps or convert digital data to the GRE 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, a Windows HelpFile that captures ancillary map data, and a map document that displays the map and provides a tool to access the HelpFile directly.

The GRE Team has already prepared digital bedrock and surficial geologic maps for the Mt. Desert Island portion of ACAD. The source maps used in preparation of this GIS product were:

- Gilman, R.A., and Chapman, C.A. 1988. Bedrock geology of Mount Desert Island: Maine Geological Survey Bulletin 38, scale 1:50,000, and
Lowell, T.V., and Borns, H.W., Jr. 1988. Surficial geology of Mount Desert Island: Maine Geological Survey Bulletin 38, scale 1:50,000.

These products utilized the best available geologic data for the Mt. Desert Island area and are available through the NPS data store. Geologic mapping coverage for the Schoodic Peninsula and Isle au Haut portions of ACAD still needs to be completed. When possible, the GRE program provides large scale (1:24,000) digital geologic map coverage for each park's area of interest, commonly composed of the 7.5-minute quadrangles that cover park lands (fig. 1). Maps of this scale (and larger) are useful to resource management because they capture most geologic features of interest and are positionally accurate within 40 feet. The process of selecting maps for management use begins with the identification of existing geologic maps and mapping needs in vicinity of the park. Scoping session participants then select appropriate source maps for the digital geologic data to be derived by GRE staff.

During the scoping meeting for ACAD it was determined that none of the currently published maps can provide detailed geologic information for the Schoodic Peninsula or Isle au Haut portions of ACAD. Fortunately, new mapping recently completed by Chris Koteas as part of a Ph.D. project for the University of Massachusetts is currently in the publication process with the Maine Geological Survey. These maps will provide 1:24,000 scale geologic coverage of the Winter Harbor and Schoodic Head quadrangles. Once published, the GRE program will convert the digital data into the NPS Geology GIS Geodatabase Data Model and provide it to the park for use in GIS. Meeting participants also knew of work by professor Mike Rhodes and his former student Marshall Chapman, from the University of Massachusetts, who has done mapping on Isle au Haut. Participants thought that this work may also be close to publication, however, this may require some compilation effort and will require further investigation. The GRE team plans to contact Marshall Chapman to determine the status of mapping in the Isle au Haut East and West quadrangles. (Following the meeting, Steve Mabee talked with Marshall Chapman, who mentioned that he had a map that Mike Rhodes and he published in a paper in the early 1990s. For a small fee, Marshall would compile the map in larger format that the NPS could digitize.)

Table 1 lists the source maps chosen for Acadia National Park.

Table 1. GRE Mapping Plan for Acadia National Park

Covered Quadrangles	Citation	Scale	Format	Assessment	GRE Action
Salsbury Cove, Bar Harbor, Seal Harbor, Southwest Harbor, Bartlett Island, Bass Harbor, Baker Island	Gilman, R.A., and Chapman, C.A. 1988. Bedrock geology of Mount Desert Island: Maine Geological Survey Bulletin 38, scale 1:50,000.	1: 50,000	Paper & digital	Provides bedrock geology	GRD has digitized this map
Salsbury Cove, Bar Harbor, Seal Harbor, Southwest Harbor, Bartlett Island, Bass Harbor, Baker Island	Lowell, T.V., and Borns, H.W., Jr. 1988. Surficial geology of Mount Desert Island: Maine Geological Survey Bulletin 38, scale 1:50,000.	1: 50,000	Paper & digital	Provides surficial geology	GRD has digitized this map.



Figure 1. Area of interest for Acadia National Park, Maine.

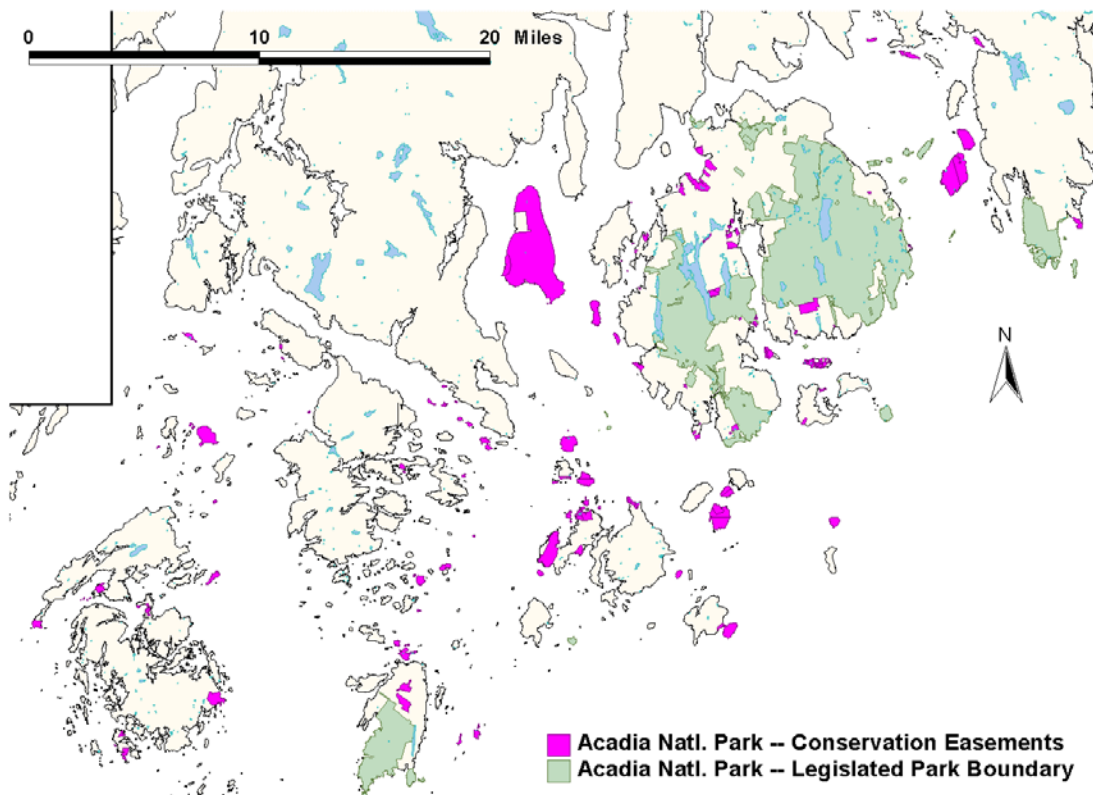


Figure 2. Conservation easement properties within Acadia National Park.

In summary, the mapping discussion concluded:

- The GRE program has completed bedrock and surficial geologic map coverage for the Mt. Desert Island portion of ACAD utilizing the best available data.
- The GRE Program still needs to acquire geologic map coverage for the remainder of ACAD's legislated park lands including the Schoodic Peninsula and Isle au Haut.
- Chris Koteas has mapped the Schoodic peninsula at a scale of 1:24,000. Once published the GRE team will use this map as a source for a digital geologic map for the Schoodic Peninsula.
- GRD will contact Marshall Chapman to determine the extent of mapping coverage available for Isle au Haut and investigate the possibility of publishing these maps through the Maine Geological Survey. Chris Koteas may be available to assist in the compilation of geologic data for Isle au Haut.
- Further research will be conducted to see what maps are available for Long Island and other islands that ACAD manages via conservation easement (fig. 2). These citations and existing publications will be provided to the park but will not be converted to the GRE data model.

Mapping Submerged Resources at Acadia National Park

Submerged resource mapping is not part of the GRE program. However the newly formed Ocean Resources branch of the WRD is working closely with GRD to provide useful near and off shore mapping to coastal NPS units. Acadia National Park is one of 97 ocean and coastal National Parks (Mark Borrelli). The park has 103 km (64 mi) of ocean and estuarine shoreline. Acadia's boundaries do not extend past the shoreline, but mapping beyond the boundaries is important so that potential impacts to the park from offshore development may be addressed. Some activities that may impact the park include wind power development, development of tidal energy resources, offshore sand and gravel mining, pipeline installation, and aquaculture.

Issues related to global warming may also become important with regards to purchasing properties that may eventually be under water and to the destruction of shoreline from rising sea level. An essential first step toward understanding marine resources would be an inventory of known submerged data, maps, and research. The recently formed Ocean and Marine Branch of the NRPC Water Resources Division will answer many of these mapping and potential impact questions.

Geologic Resource Management Issues

The scoping session for Acadia National Park provided the opportunity to develop a list of geologic issues that may be important to park management. These issues will be further explained in the final GRE report. The issues identified at the meeting included:

- Mass wasting and slope failure
- Coastal erosion
- Sustainability of Sand Beach and visitor safety issues
- Seismic activity (earthquakes)
- Cobble collecting
- Impacts to life forms in Anemone Cave from fresh water draining from the parking area
- Gas pockets in Somes Sound
- Popularity of geologic features
- Potential flooding from failed dams
- Aquaculture
- Mining
- Energy development
- Water quality and quantity

Mass Wasting and Slope Failure

Every spring, rockfalls impact the Park Loop Road and bluffs slump in the coastal areas. Slumping along Fraser Creek and the picnic area on the Schoodic peninsula are driven by erosion but are not a constant process. Human impacts in these areas are managed. Slumping also has occurred along Hunters Brook where glacial marine clay has eroded into the stream, destabilizing the stream bank and changing the course of the stream. This site was visited on the field trip. Slumping is located on the opposite side of the stream from the hiking trail. The park does not have a comprehensive study or map that addresses slope failure or areas of potential slope failure.

The October 2, 2006 earthquake triggered large landslides on Mt. Desert Island and damaged trails and roads. Acadia National Park has over 160 km (100 mi) of trails, some of which are along steep cliff faces. Earthquakes, however, are relatively rare in Maine, and the loci of future earthquakes has proven impossible to predict.

Coastal Erosion

Coastal erosion is a natural and continual process. The hydraulic energy of the waves at high tide undercut the granitic cliffs creating sea arches, sea caves, boulder beaches, sea stacks, and thunderholes. Differential erosion is actively forming sea caves above the high tide line at Iron Bound Island in Frenchman Bay an area protected by a conservation easement. Storm surges may damage trails and infrastructure, as seen by the severe erosion caused by the April 17, 2007 Patriots Day Storm. At Seawall Beach, major storms cause boulders to wash onto the road. The present shoreline is migrating inland as sea level rises. Joe Kelley (U Maine) believes that eventually, sections of the Park Loop Road will have to be moved. At Thunder Hole, high energy waves erode the retaining wall so that the trail and stairs often need repair.

Sustainability of Sand Beach and Visitor Safety Issues

Sand Beach on Mt. Desert Island and a beach on Cranberry Island, which is not on park property, are the only beaches in the state of Maine that contain dunes and a beach composed almost entirely of calcium carbonate sand (shell fragments). In fact, the closest calcium carbonate beach along the Atlantic coastline is found south of Cape Hatteras, NC. The beach is considered to be a significant visitor resource area and is an important visitor contact area for interpretation. Educational signs are posted in the area and interpretive walks begin at Sand Beach.

Fed by offshore sand-size shell fragments that are thousands of years old, the beach is being impacted by quartz and potassium feldspar sand (20%) derived from the erosion of a glacial delta deposit under the parking lot. Because quartz and potassium feldspar are harder than calcium carbonate, an increase in their concentration would abrade the now dominant calcium carbonate and diminish the beach.

Natural processes are allowed to take place at Sand Beach. In 2007, storms eroded much of the sand from the beach and exposed a rocky bolder deposit at the base of the steps leading to the beach. The rocky exposures presented a visitor safety issue. The situation, however, was only temporary and the sand was naturally restored within a few months.

In the past, visitors crossing the dune area impacted the integrity of the dunes. However, a fence now prevents foot traffic and erosion. At times, sediment chokes the tidal inlet connecting the sea to the lagoon behind the dunes, preventing tidal flushing. The park monitors bacteria levels in the lagoon on a weekly basis, and bacteria levels have never been significant enough to warrant closing the beach.

Seismic Activity

Although located on a passive tectonic margin, seismic events occasionally impact the area. In 2006, a 4.2 magnitude earthquake caused landslides in the park and damaged roads and trails. Magnitude 3 earthquakes occur somewhere in Maine at a frequency of about once each year. The cause of earthquakes in Maine is still under investigation.

Cobble Collecting

Visitors collect cobbles from the cobble beaches in the park. Some cobbles are collected as souvenirs; some are collected for landscaping purposes. Signs in the park discourage cobble collecting, but cobble theft continues.

Anemone Cave

The population of anemones in Anemone sea cave has declined dramatically since a 1999 survey. While anemones exist elsewhere in the park, they are neither as plentiful nor as accessible as they are in Anemone cave. Sea caves are not common at this latitude and are rare in Acadia National Park. Two potential reasons for the decline of anemones are: 1) fresh water runoff from the parking lot has changed the chemistry of the water in the tide pools, and 2) disturbance as a result of high visitor impact. In the past, perhaps in the 1960s or 1970s, the park removed all references to the cave from maps and the parking lot and removed visitor developments, such as the handrail, to access the cave. Unless asked specifically about Anemone Cave, management policy is to not market the cave to visitors. The park is trying to get additional data about visitor vs. freshwater input impacts to determine the cause of anemone declines.

Gas pockets in Somes Sound

Pockets of natural gas are located in Somes Sound due to the large amount of organic matter in the lake. Disturbance of these pockets by earthquakes, for example, may cause a hazardous pressure release and form craters in the marine embayment. Mapped craters in the sound are quite deep attesting to the potential energy stored in these pockets.

Popularity of Geologic Features

The popularity of some of the features in Acadia National Park causes a management concern. Repeated visits result in erosion and trampling of the naturally thin soils and sensitive sub-alpine vegetation at popular sites, such as Cadillac Mountain and Bubble Rock.

Potential Flooding if Dams Fail

Eagle Lake and Jordan Pond are dammed by glacial moraines composed of a thick unit of relatively impermeable glacial till. No evidence was discussed that would indicate these dams might fail, but if they did, flooding may impact park infrastructure, primarily roads. The park is not responsible for maintaining these dams, but it is recommended that ACAD staff contact the NPS Dam Safety manager about this situation.

Aquaculture

In-shore aquaculture for salmon and mussels is no longer a major industry adjacent to Acadia's land interests. In the past, management has been concerned about the possibility for water quality issues, but no water quality issues have arisen. The park has limited influence on aquaculture because the park boundary ends at the shoreline.

Mining

Although registered mines were historically present in the Acadia region, mining is not active now nor a major issue of concern. A copper mine was located on Beach Hill and a silver/copper mine was located on Sable Island. Gold and silver were once mined on the Schoodic Peninsula. Rock is still obtained from historic quarries in the area and used to maintain trails and roads, which were originally built with local stone. Active boutique quarries are located on the Schoodic Peninsula. These quarries provide sculpture and building stone. Off shore sand and gravel deposits may become a potential target for mining in the future.

Energy Development

Interest in wind farms off the coast of Maine is increasing due to the hard, relatively stable sea floor. Tidal energy is not an issue at this time for park management. St. Croix Island could be impacted by increased wake from large ship traffic as a result of liquefied natural gas (LNG) development.

Water Quality and Quantity

Private water well development, salt water intrusion into the groundwater aquifer, and contamination of water resources from septic systems are major concerns for park management but are addressed by the NPS Water Resources Division. Water samples from remote springs in the park (Sieur du Mont Spring, Birch Spring, Maple Spring) yielded surprisingly high metals content that may result from the bedrock geology. Atmospheric deposition impacts to surface water resources come from industrial emissions far removed from the park. These sources have also contributed mercury to park lakes and to the diversity of park biota.

Features and Processes

The scoping session for Acadia National Park provided the opportunity to develop a list of geologic features and processes, which will be further explained in the final GRE report. Several of these geologic features and processes were observed on Tuesday's (06/10/2008) field trip. Prominent geologic features in the park include:

- Sand Beach is a carbonate sand beach, which are not found north of Cape Hatteras other than on Cranberry Island
- Anemone sea cave and other actively forming sea caves on Iron Bound Island
- Sea arches
- Sargent Mountain Pond, the first lake in Maine established after the retreat of the glaciers
- Jordan Pond, the clearest lake in Maine
- Boulder deposits that may represent post-glacial tsunami deposits
- Paleozoic volcanic and plutonic rocks that have not been deformed provide an opportunity for researchers to study what this region was like 420 million years ago
- Excellent exposures of the shatter zone associated with the Cadillac pluton are present in Little Hunters Cove
- Erosional glacial features including glacial polish, striations, chatter marks, notches, roche moutonnée (also called whalebacks and streamlined features), U-shaped valleys
- Depositional glacial features including glacial till, glacial marine mud, delta deposits, moraines, fjord (Somes Sound), and glacial erratics (Bubble Rock)
- Rock geochemistry data, paleontology data from cores, radiocarbon data on beach shells, and carbon 14 data from Sargent Cove accurately date Precambrian and glacial episodes

- Bar Harbor is the type locality for the Bar Harbor Formation
- Modern and ancient sea stacks, sea caves, sea cliffs, boulder beaches, thunder holes, and emergent shorelines
- Seawall Beach where boulders may wash onto the road when major storms occur
- Late hydrothermal epidote in an altered granitic deposit and molybdenite grains embedded in boulders can be found at Boulder Beach

In addition to the terrestrial features exposed in the park, the following submerged marine features were noted:

- Submerged terrestrial landscapes including moraines, inlets, estuaries, lagoons, and drowned beaches
- Extensive and deep canyons in granite forming along contacts with 30° to 40° slopes
- Shelf valleys consisting of hard bottoms, rocky cobbles, and stone axes found among the cobbles
- Gas fields that lie just below the surface and that could potentially become disturbed by anchors, leaving a large crater following a hazardous pressure release
- Ship wrecks and other underwater cultural resource sites are being catalogued by a scientist from East Carolina University (ECU) based on historical evidence and local knowledge
- Recreational diving, scallop diving, urchins and sea cucumber harvesting are activities that occur, but infrequently.

Field Trips

Schoodic Peninsula: On the evening of June 9, Chris Koteas (UMass) led a field trip along the shoreline of the Schoodic Peninsula to observe the relationship between the granite and intrusive dikes. Some of these relationships included:

- Three dike compositions: 1) fine-grained felsic, 2) felsic with plagioclase phenocrysts, and 3) banded rhyolite dikes
- Blobs and chunks of granite that only partially dissolved within the dikes and some with hornblende that formed within the granite from the heat of the intrusion
- Undeformed, pristine granite
- Dikes injecting back on themselves, indicating a dynamic process of intrusion
- Coarse, brecciated pieces of granite within the dikes, which may indicate that the granite solidified near the top of the magma body
- A several-ton block of granite that had been moved by the waves or broken from eroded beach cliff along fractures
- A coarse-grained glacial erratic

Mount Desert Island: On Tuesday, June 10, Joe Kelley (U of Maine) led a field trip to the following locations:

- Schooner Head Overlook (Anemone Cave)
- Sand Beach (carbonate sand; natural processes at work)
- Thunder Hole (trail damage; differential erosion)

- Pebble Beach from Gorham Mtn. Trail parking lot (rounded cobbles; sea stack; molybdenite; hydrothermally altered granite)
- Gorham Mtn. Trail (Pleistocene features: shoreline, wave cut platform, undercut notch, sea cave with boulder in back of cave)
- Otter Beach Causeway (tidal flat that was originally designed to be a swimming beach)
- Little Hunter Cove (shatter zone; boulders on beach; Bar Harbor Formation country rock; evidence of gabbro and granite coeval magmas)
- Hunters Brook Trail (glacial marine clay; slumping)
- Jordan Pond (terminal moraine damming pond; foggy view of The Bubbles; excellent popovers)

Recommendations

- A comprehensive study or map showing the location of potential slope failures
- Study the potential impact to park infrastructure from Jordan dam failure
- Develop an inventory of submerged resources
- Determine the impact of sea level rise and changing shorelines on the park's coastline

Action Items

- GRD will discuss with Chris how to obtain Dr. Rhodes maps of Isle au Haut
- Further research will be conducted to see what maps are available for Long Island and other islands located within the park's boundary.

References

- Gilman, R.A., C.A. Chapman, T.V. Lowell, H.W. Borns, Jr. 1988. The geology of Mount Desert Island: A visitor's guide to the geology of Acadia National Park. Maine Geological Survey, Department of Conservation.
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Table 2. Scoping Meeting Participants

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