Dr. Jon Boothroyd:

Dr. Jon Boothroyd was acclaimed as a field geologist specializing in coastal geology, braided river processes, and various glacial environments. He served as Rhode Island's Geologist for more than a decade and the research he conducted with his students provided the framework for the current beach-use and conservation regulations in Rhode Island. Throughout his career, Dr. Boothroyd trained several generations of environmental geologists, managers, and academics working in the field today. Dr. Boothroyd was developing the geology trail at the time of his death.

This document was made by the GEO 210 Class at the University of Rhode Island in the Spring of 2016.

Visit the Friends of Canonchet Farm website at www.canochet.org for additional products related to the trail: a virtual field trip, kids activities and a 1-page flyer.

A Teacher's Guide for the Canonchet Farm Geology Trail

Trail begins and ends at the
South County Museum
115 Strathmore Street,
Narragansett, R.I.

Background on Rhode Island Geology: The bedrock in the area of the Canonchet Farm Geology Trail is from the Rhode Island Formation (upper to Middle Pennsylvanian in age) and consists of the sedimentary rocks sandstone, shale and conglomerate. In some locations the bedrock was intruded by granite from the Narragansett Pier Plutonic Suite (Permian in age). To the north of the trail is the Narragansett Basin which was filled with mostly sedimentary rocks that were subsequently metamorphosed.

The bedrock in Rhode Island is covered with sediment deposited during the Late Wisconsin glaciation which culminated 26,000 years ago. The glaciers advanced from the north to the south and picked up, transported and deposited glacial material (till and stratified deposits). Boulders from glacial till have been used to make stone walls which are common in the area.

Along the Canonchet Farm Geology Trail look for evidence of glacial erosion (Roche Moutonnee, striations) and deposition (erratics) as well as human modifications (stone walls, stiles, quarrying).

There was an attempt to split the large erratic using a star drill, feathers, and wedges. A star drill is a 4 jointed chisel that would be hammered into a large erratic along a fracture point. After a line of holes 2 to 3 inches deep is drilled, feathers and wedges are placed in the holes. Feathers are two outward facing shims and wedges are placed in between. The force of a hammer applied to the wedge splits the boulder. The large erratic did not split correctly. At the time, it was considered bad luck for a stone to split incorrectly. Therefore, this large erratic was abandoned with the feathers and wedges in place.

Site 10: Large Erratic

This is the largest erratic on the Canonchet Farm Geology Trail. It is made of metamorphosed sandstone from the Rhode Island Formation and is Pennsylvanian in age (320 MYBP). The natural breaks in the erratic are called joints.

Recent History:

The Canonchet Farm area was used by the Narragansett Indians for seasonal hunting, cultivation and fishing in about 1000 A.D. The area was part of the Pettaquamscutt Purchase in 1658 and vast acres were transferred to English settlers in the early 1700s. The present Canonchet Farm was first owned by the Robinson Family. Governor, later Senator, William Sprague purchased the land in the 1850s. A 64-room four-story Victorian mansion built on the property burned down in the early 1900s. The Farm area was acquired by the town of Narragansett in 1973 and in 1985 the town leased two acres of land to the South County Museum. Subsequent agreements have brought the Museum's total use to approximately seven acres.

General Geology Terms:
Igneous Rocks form when magma or lava cools. They can be divided into two categories, intrusive or extrusive. Intrusive rocks, or plutonic rocks form from the cooling of magma beneath the earth's surface while extrusive, or volcanic rocks, form when lava cools on the earth's surface. One of the most well-known types of igneous rocks is granite. Granite, as pictured below, is a type of plutonic rock. Granite can be quarried and used for many things such as countertops, and rock walls on older properties such as Canonchet Farm. The common minerals found in granite are quartz, feldspar and mica.

Photo Credit: http://geology.com/rocks/granite.shtml

Site 9: Step Quarry

Granite was quarried from this location. The granite is from the Narragansett Pier Plutonic Suite and is over 245 million years old.

Have the students walk up to the quarry and look for drill marks in the granite. Drilling holes is the first step in quarrying. Quarried granite can be used to make stone walls, hitching posts and other structures.

Site 8: Granite fence/hitching post

Hundreds of years ago, granite was the rock of choice for building everyday structures. Granite is typically mined from quarries. Once the granite is extracted, it is shaped by the builder into the proper size for which it is needed. Early settlers in Rhode Island used granite for everything from fence posts to rock walls. The two granite posts that you will come across on the trail (one upright and one lying down) were originally thought to be fence posts, but it has recently been considered that since there is only one hinge on each post, they were more likely to have been hitching posts. Hitching posts were traditionally installed to allow one to tie up horses or livestock.

Sedimentary Rocks form by the deposition and cementation of materials at the earth's surface and in bodies of water.
Sandstone is a very common type of sedimentary rock (see below), primarily made up of sand-sized particles of minerals and rock fragments.

Photo Credit: http://geology.com/rocks/sandstone.shtml

Conglomerate is another type of sedimentary rock. Conglomerates are made of rounded rock fragments with a fine-grained matrix.

Puddingstone is a popular name given to a conglomerate that has a sharp color contrast between the rock fragments and the matrix.

Photo Credit:
http://geology.com/rocks/conglomerate.shtml

Metasedimentary Rocks form when sedimentary rocks start going through the process of metamorphism. Observant hikers will be able to notice a handful of rocks that have undergone this process. For example, the large erratic at Stop 10 is a metamorphosed sandstone.

Metamorphic Rocks form when pre-existing rocks are altered by an increase in pressure and/or temperature. Foliated metamorphic rocks have a layered appearance whereas non-foliated rocks have a non-layered appearance.

Slate is a fine-grained foliated metamorphic rock formed from shale or mudstone by low-grade metamorphism. Typically ranging from a light to dark gray, slate comes in a variety of colors depending on the types of minerals in it. Slate is typically used in roofing, flooring, and flagstone (a special type of flooring).

Photo Credit: http://geology.com/rocks/slate.shtml

Site 7: Stile

A stile is a structure which provides people a passage through or over a fence or boundary via steps, ladders, or narrow gaps. Stiles are often built in rural areas along footpaths, fences, walls or hedges to prevent farm animals moving from one enclosure to another while allowing path walkers to still use the route. The stiles in Canonchet Farm were used by the women to go over the fence after picking apples from the orchard.

Site 6: Cove Overlook

The water body you see is the southern portion of the Pettaquamscutt (Narrow) River known as Pettaquamscutt Cove. Glaciation formed this river valley millions of years ago. During the most recent glacial period, known as the Wisconsinan, the river valley was modified by the advance and retreat of the ice sheet. During the retreat, significant amount of sediment was deposited in the valley, and led to a glacial delta offshore of Narragansett Town Beach. Approximately 1,700 years ago marine water from Rhode Island Sound inundated the valley and the river changed from a closed freshwater system to a tidally influenced estuary. Modern deposition in Pettaquamscutt Cove is still dominated by organic rich silt deposited in this relatively shallow basin.

A large opening in the stone wall was built to allow access for wagons to collect salt marsh hay.

Marble is a type of non-foliated metamorphic rock formed from limestone. Marble comes in a variety of colors ranging from white to black and is used for a variety of purposes. At Canonchet Farm the marble has been used for markers in the cemetery.

Photo Credit: http://geology.com/rocks/marble.shtml

Trail locations

There are 10 stops along the Canonchet Farm Geology Trail which starts and ends at the parking lot for the South County Museum

Site 5: Large erratic on the loop trail

This is another example of an erratic. Point out the vegetation growing on top of the rock. Ask the students how a tree could grow on top of a rock.

Physical and chemical weathering processes make soil that plants can grow in.

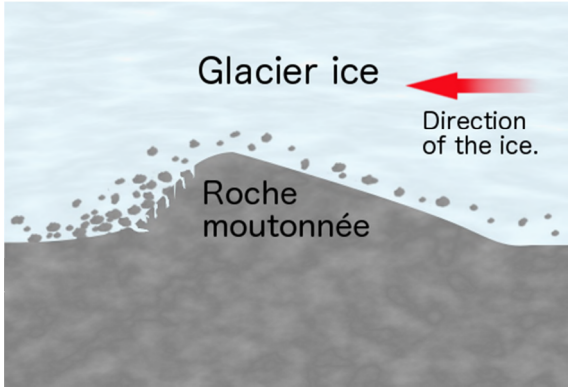
In this area of the trail there is an established tree canopy which is reducing the amount of invasive plant species.

Site 4: Conglomerate Erratic

An erratic is a rock that has been transported a significant distance from its origin by a glacier and then deposited by melting ice. This erratic is a conglomerate which is a type of sedimentary rock made of rounded rock fragments in a fine grained matrix. The source for this rock is the adjacent Narragansett Basin, and outcrops of this conglomerate can be found near Second Beach in Middletown, Rhode Island. Puddingstone is a popular name given to a conglomerate that has a sharp color contrast between the rock fragments and the matrix.

Have the students look at the rock to see the rock fragments.

Site 1: Roche Moutonnee (Sheep Rock)



This feature is a Roche Moutonnee which means “sheep rock”. It is made mostly of Narragansett Pier Granite and is the result of glacial abrasion beneath the Laurentide Ice Sheet over 20,000 years ago. The smooth sloping surface (sheep’s back) is in the up-ice direction (north), and the plucked surface (sheep’s head) is in the down-ice direction (south).

Site 2: Robinson Historic Cemetery

The stone wall around the cemetery is made from quarried rock. Within the cemetery, there are grave markers made of marble and slate. Many of the lighter colored markers were carved from marble and feature intricate designs, some of which are beginning to be lost to chemical weathering. Other markers are constructed from slate, which is a very dark colored stone. Most of these grave markers and their detailed designs are still fairly well preserved because slate is affected less by chemical weathering such as acid rain. However physical weathering (wedging) is splitting the slate apart. The cherub on Sarah Robinson's grave marker was carved by the Stevens family of Newport in the 1800s.

Site 3: Stone Wall

These stone walls can be found all across Rhode Island and were formerly used as fences or property markers. Have your students look at the rocks that make up the stone wall. What can they see?

Many of the stone walls along the trail are made of boulders from the glacial till, remnants of the last glaciation of the area. The rocks types present include igneous rocks (granite), sedimentary rocks (conglomerate) and metasedimentary rocks (metamorphosed sandstone). The granite contains quartz (glassy mineral), feldspar and mica (flat mineral).