Geologic Time Scale

Years Ago	Eon	Era	Period	Life and Environment
0 to 2 million	PHANEROZOIC (*Evident Life*)	CENOZOIC (*Recent Life*)	QUATERNARY	First humans evolve and coexist with mammoths, mastodons saber-toothed cats, and giant ground sloths.
2 to 67 million			TERTIARY	First large mammals appear and dominate the period. Primitive whales, rodents, primates followed by pigs, cats, horses, dogs, bears and the first hominids. Grasses and modern birds also appear.
67 to 140 million		MESOZOIC (*Medieval Life*)	CRETACEOUS	Heyday of dinosaurs at the start of the Cretaceous followed by their extinction (with many plants and animals) at end of the period from volcanism and/or asteroid impact. First flowering plants .
140 to 208 million			JURASSIC	Earliest birds appear. Giant dinosaurs (Sauropods) flourish. Plants include ferns, cycads and gingkos.
208 to 250 million			TRIASSIC	Age of dinosaurs begins. First mammals apppear. Mollusks are dominant invertebrate. Many reptiles (turtles and ichthyosaurs).
250 to 290 million		PALEOZOIC (*Ancient Life*)	PERMIAN	Age of amphibians. Supercontinent known as Pangaea forms. Greatest mass extinction ever at end of period. Trilobites go extinct.
290 to 365 million			PENNSYLVANIAN AND MISSISSIPPIAN (Carboniferous)	Widespread coal swamps. Large primitive trees. First winged insects and reptiles. Many ferns. Amphibians common.
365 to 405 million			DEVONIAN	Age of Fishes. Fish and land plants become abundant and diverse. First shark. Earliest amphibians, ferns and mosses.
405 to 430 million			SILURIAN	First insects, jawed fish and vascular plants on land (plants with water-conducting tissue).
430 to 500 million			ORDOVICIAN	First corals. Primitive fishes, seaweed and fungi. First non-vascular land plants (like mosses).
500 to 570 million			CAMBRIAN	Age of Trilobites. The Cambrian Explosion of life occurs. All phyla that exist today develop. First vertebrates and earliest primitive fish. First shells appear on shellfish, mollusks, echinoderms, brachiopods, trilobites.
570 to 2500 million	PROTEROZOIC (*Early Life*)	PRECAMBRIAN		First soft-bodied invertebrates and colonial algae. Oxygen build-up: Mid-Proterozoic
2500 to 3800 million	ARCHEAN (*Ancient*)			Life appears. First bacteria and blue-green algae begins to free oxygen to atmosphere.
3800 to 4600 million	PRE-ARCHEAN			Earth molten.

Shading indicates that rocks from these time periods are present at Round Valley Recreation Area.

The Geology of

Round Valley Recreation Area

Hunterdon County, New Jersey

Department of Environmental Protection
Division of Science and Research
New Jersey Geological Survey

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Cover photo: Round Valley Reservoir looking east from the toboggan hill. South Dam is on the right. Photograph by Thomas Seckler, 1997.

New Jersey Geological Survey

The Geology of Round Valley Recreation Area, Hunterdon County, New Jersey

by
Richard A. Volkert

1997
Printed on recycled paper

Introduction

Round Valley Recreation Area, jointly managed by the New Jersey Department of Environmental Protection and the New Jersey Water Supply Authority, was officially opened to the public in 1977. Located in north-central New Jersey in Hunterdon County (fig. 1), it occupies 5,300 acres of scenic, low rolling hills that bound a prominent, horseshoe-shaped ridge known as Cushetunk Mountain. Round Valley derives its name from the naturally occurring shape of the valley (now beneath the reservoir) that is rimmed on the north, south, and east by Cushetunk Mountain. The name Round Valley has been used for this distinctive geographic feature since before 1836, when Cushetunk Mountain was known either as Round Valley Mountain or Pickel's Mountain.

At the heart of Round Valley Recreation Area, and the principal reason for its development, is Round Valley Reservoir. Situated within the Raritan River watershed, Round Valley was first proposed as a site for a water storage reservoir in 1945 to help meet the growing need for a stable water supply in central New Jersey. Not without local controversy, the project was begun in 1959 and completed in 1965. A dam was constructed across Prescott Brook at the southwestern end of Cushetunk Mountain and a dam and dike across South Branch Rockaway Creek at its northwestern end (fig. 1). The construction was followed by gradual flooding of the interior valley.

To insure that the reservoir remains full, water must sometimes be pumped 3.3 miles uphill from South Branch through a 108-inch diameter pipeline because no streams flow into the reservoir. At other times water is released from Round Valley to flow into Prescott Brook, South Branch Rockaway Creek, or South Branch Raritan River.

Cushetunk Mountain provides a natural barrier for most of Round Valley Reservoir because its ridge top elevations range from 440 to 834 feet above sea level, while the valley floor averages only 280 feet. With an approximate width of 1.5 miles and length of 2.6 miles, Round Valley Reservoir has a surface area of 2,350 acres. It is the second largest freshwater body in New Jersey, surpassed only by Lake Hopatcong. The reservoir is 160 feet at its deepest point, and with a storage capacity of 55 billion gallons, it is the largest reservoir in New Jersey. Typically, it provides 70 million gallons of water per day to help meet the water supply needs of central New Jersey.

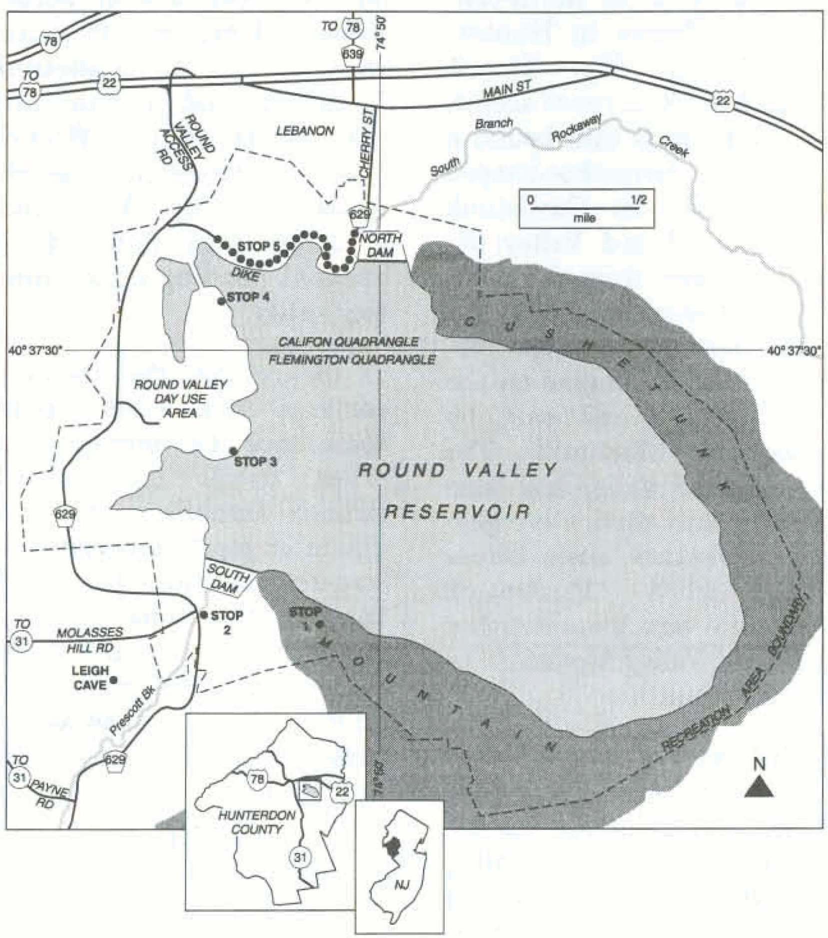


Figure 1.-- Location of Round Valley Recreation Area, Hunterdon County, and detail with features mentioned in text.

Geology and History of the Region

North-central New Jersey has endured a long and complex geologic history resulting in the formation of a variety of rock types of different ages (geologic time scale, back cover). The oldest rocks in the Round Valley area are Precambrian (Middle Proterozoic) and are about 1.3 billion to about 700 million years old. They underlie the New Jersey Highlands physiographic province (fig. 2), a scenic area of rugged mountains separated by broad to narrow valleys. Some of the highest elevations in the state are in the Highlands because the Precambrian rocks resist erosion so well.

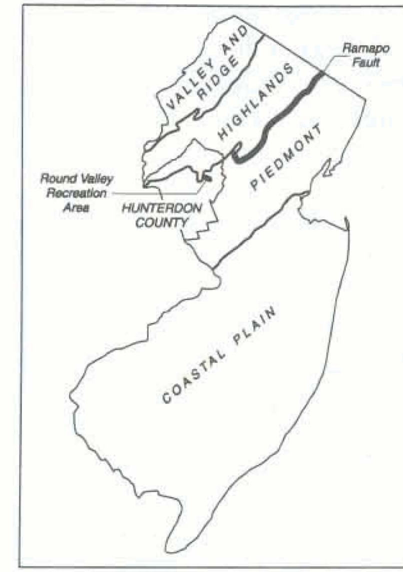


Figure 2.-- Physiographic provinces of New Jersey, and location of Round Valley Recreation Area.

The Roots of the Appalachians

Precambrian rocks of the Highlands form the roots of the ancestral Appalachian Mountains and are exposed today because of the erosion of younger sedimentary rocks that once covered them. The Precambrian rocks consist mainly of granite, gneiss (pronounced "nice"), and marble. Some of the gneisses and the marble were originally sedimentary rocks such as sandstone, shale (gneiss) or limestone (marble), and some of the gneisses were originally igneous rocks. Several types of granite intrudes all of the gneisses and the marble. The Precambrian rocks were metamorphosed under conditions of high temperature and pressure deep within the Earth's crust during the collision of continental land masses about one billion years ago. This was the earliest event in the formation of the Appalachian Mountains, which were uplifted to heights rivaling the present day Rocky Mountains.

Continental Displacement

The next oldest rocks in the area are Paleozoic from the Cambrian and Ordovician Period; these are about 570 million to about 470 million years old. Between the Late Precambrian and the start of the Paleozoic, most of the mountainous area of the Highlands had been eroded nearly flat and was covered by a shallow sea. The North American continent that contained what would one day be New Jersey began to drift away from the other continents, creating an ancient ocean basin between them. During collisions among the African, European and North American continents about 450 and 290 million years ago, part of this ocean basin was destroyed. In New Jersey these events renewed uplift and mountain formation in the Highlands and, to the west, in the Valley and Ridge province (fig. 2).

The Paleozoic rocks in the region are all sedimentary. They include quartzite, sandstone, siltstone, and shale formed from sand, silt, and clay, as well as limestone and dolomite from the calcareous material of marine organisms. During the Paleozoic the ocean covering New Jersey was inhabited by various forms of marine life. Today, some of the shale exposed near Jutland, a few miles west of Round Valley Recreation Area, contains fossils of some of these life forms known as brachiopods, graptolites, and conodonts.

Newark Basin

The youngest rocks in the region are Mesozoic, from the Triassic and Jurassic Periods, and are about 240 million to about 190 million years old. They underlie the Piedmont physiographic province (fig. 2), which is sometimes called the Triassic lowlands. The Piedmont is located south and east of the Highlands and is an area of gently rolling hills and lowlands with minor ridges and uplands. During the early Mesozoic, New Jersey was a humid, partly swampy place with little topographic relief but many lakes and rivers. Abundant fish swam in the lakes, while reptiles, small dinosaurs, and mammals roamed over the land. At the start of the Mesozoic, Africa, Europe, North America, and South America

separated and the present day Atlantic Ocean basin formed. The Earth's crust in what was to become New Jersey was pulled apart along the Ramapo fault (fig. 2), creating a down-dropped block east of the Highlands known as the Newark basin. The uplifted Highlands began to erode, and eventually provided the sediment from Precambrian and Paleozoic rocks that filled the Newark basin.

The Piedmont is underlain by sedimentary and igneous rocks. The sedimentary rocks include conglomerate, sandstone, siltstone, and shale that formed from gravel, sand, silt, and clay-sized sediments respectively. These sediments were deposited on land mainly in rivers and lakes. The igneous rocks include basalt and diabase. Large fractures deep in the Earth's crust opened in northern New Jersey and molten basalt flowed onto the sediments as thick lava. During the same period, molten diabase rose through fractures and was intruded between sedimentary layers beneath the land surface in bodies known as dikes and sills. Because of their tight interlocking minerals, basalt and diabase resist erosion and form ridges and uplands in the Piedmont that currently stand above the more easily eroded sedimentary rocks. Cushetunk Mountain, the Watchung Mountains, and the Palisades are examples of this.

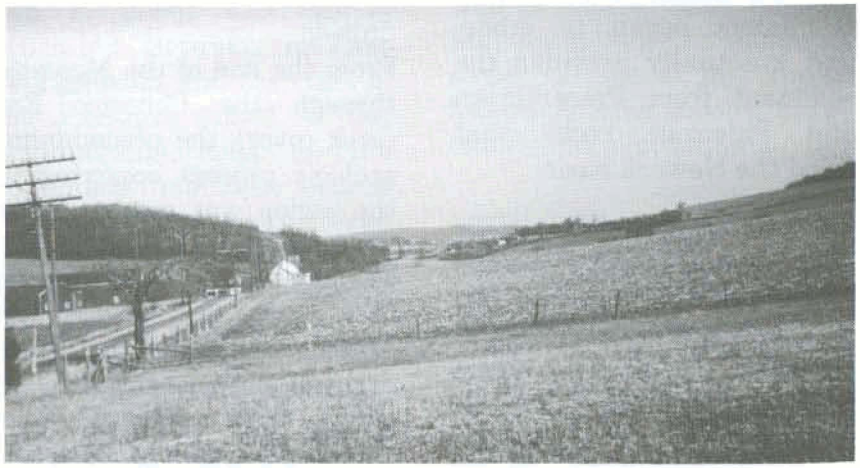
Erosion

From the end of the Mesozoic through the Cenozoic Era (back cover), the predominant geologic process occurring in the region was erosion. Most areas of the Highlands and Piedmont were again reduced to a nearly flat surface. The present landscape has since evolved slowly, largely through stream erosion. Streams have cut deeply into the Paleozoic and Mesozoic sedimentary rocks leaving the more resistant Precambrian and Mesozoic rocks rising above them as ridges.

Glaciers

As the climate became colder during the Pleistocene Epoch 2 million to 21,000 years ago, northern New Jersey was covered by glacial ice sheets three different times. Only the earliest of these advanced as far south as Round Valley. During much of the Pleistocene the ground was permanently frozen, creating a tundra-like environment in Hunterdon County that resembled northern Canada today. Glacial ice sheets melted and receded during the warmer interglacial stages.

The landscape continues to undergo gradual change even now. Sediments eroded from rocks of the Highlands and Piedmont are transported by local tributaries to the Raritan and Delaware Rivers and ultimately to the Atlantic Ocean.



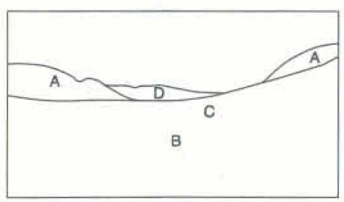


Figure 3.-- View looking north toward present site of North Dam from valley floor prior to flooding of reservoir. A) Mesozoic diabase of Cushetunk Mountain; B) subdued topography underlain by Mesozoic sedimentary rock; C) present location of North Dam; and D) ridges of Middle Proterozoic gneiss and granite north of Interstate 78. Photograph by Meredith E. Johnson, State Geologist, January 2, 1954.

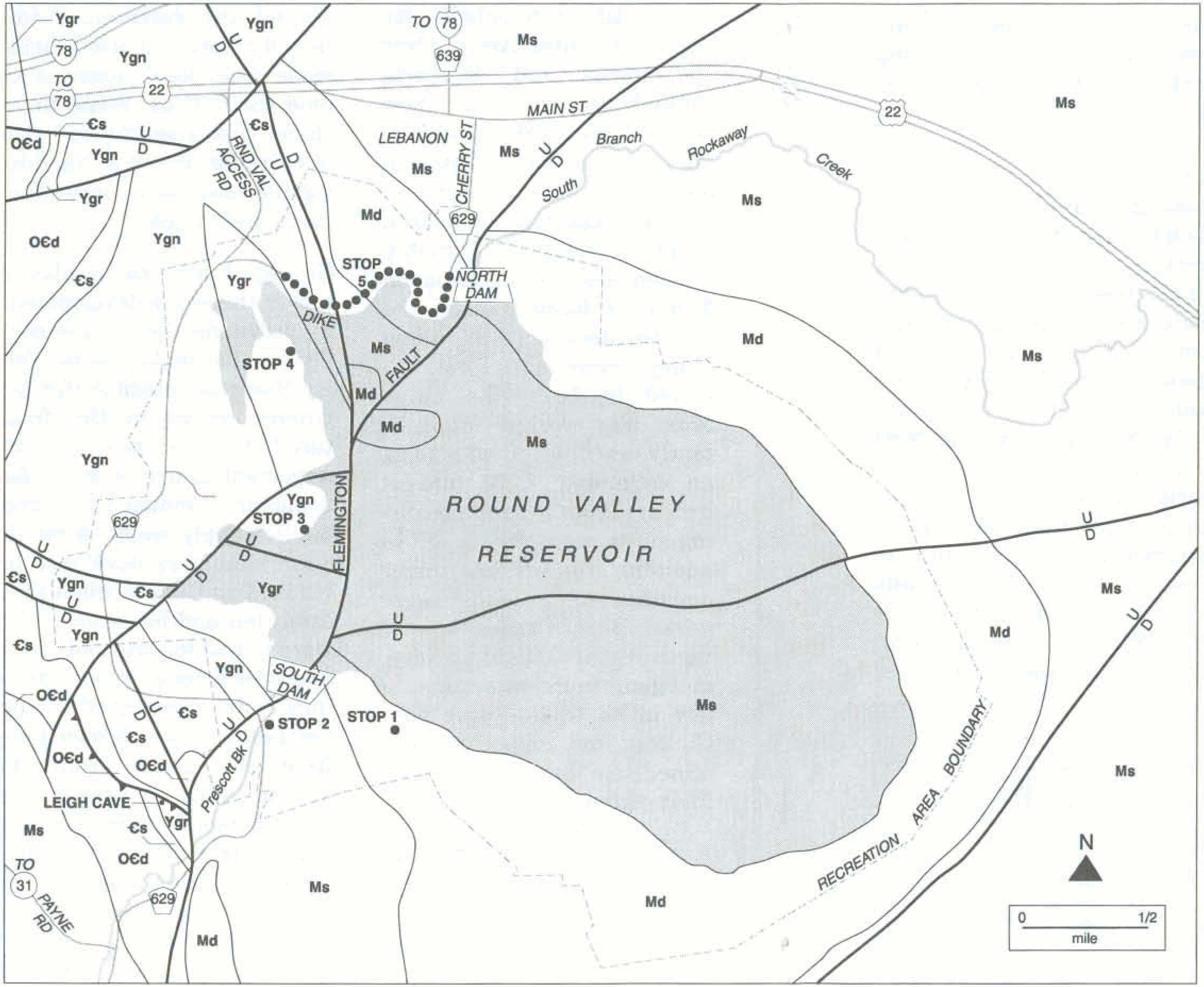
Economic Geology

Hunterdon County has a rich and varied history, but people are often unaware of the role geology has played in the development of this rural region. Indigenous peoples no doubt settled in Round Valley to take advantage of the sheltered protection offered by Cushetunk Mountain. Later, between 1710 and 1966, a thriving iron ore industry existed throughout northern New Jersey which, during the early 19th century, led the

nation in iron ore production. During the Revolutionary War, some of this ore was forged into cannonballs for the Continental Army. Over 400 mines and prospects throughout northern New Jersey were worked, producing an estimated total yield of 50 million tons of iron ore. One of these, the Large Iron Mine in Clinton Township (known also as the Lebanon Mine), is located along the southwestern edge of Round Valley Reservoir. First explored in 1872, the Large Mine was worked intermittently until 1899, producing an estimated 1,200 tons of iron ore from a vein measuring six to eight feet wide. In addition, iron ore and minor amounts of graphite were mined a few miles to the north near High Bridge, manganese ore was mined a few miles to the west near Clinton, and copper ore was mined further south near Flemington.

Agriculture is an important industry in the region, a direct result of geologic processes that created the rich, fertile soil covering much of the area around the reservoir. Additionally, farmers used limestone from local quarries to lime their fields. Some limestone was also mixed with iron ore for use as a flux during the roasting of ore in furnaces and forges.

Geology continues to play a role in the area's development by providing the unique conditions that make Round Valley Reservoir possible (fig. 3). Ground water in the fractured bedrock provides an important source of water for domestic, industrial, and public supply wells. A minor quarry industry developed in Hunterdon County when Precambrian and Mesozoic rocks were mined for crushed stone and brownstone. Many buildings were constructed in the northeast using brownstone from the early 1700's to around 1900. Several of the crushed stone quarries in the region are still active supplying construction material.



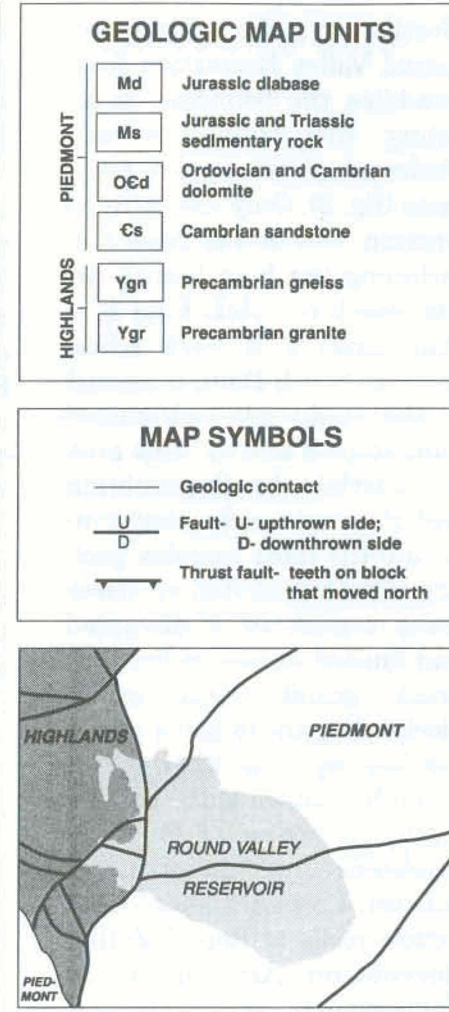


Figure 4.-- Geologic map (left) of the area surrounding Round Valley Recreation Area showing the location of faults and rocks of different ages that underlie the region. Fault map (above) illustrates the physiographic provinces of the area.

Geology of Round Valley Recreation Area

Mostly in the Piedmont, Round Valley Recreation Area straddles the boundary separating the Highlands and Piedmont physiographic provinces (fig. 2). Only the extreme western end of the reservoir, including the boat launch areas, beach complex, Pine Tree Trail area, and Park office, south to South Dam, is located in the Highlands (self-guided tour, stops 3 and 4). This area is underlain by Precambrian and Paleozoic rocks that constitute the most complex geology of the region (fig. 4). These rocks consist of a disrupted and faulted mosaic of Precambrian granite and gneiss blocks that are in some places overlain by, and other places in fault contact with, equally disrupted bodies of Paleozoic sandstone and dolomite. In general, Precambrian and Paleozoic rocks at Round Valley Recreation Area occur in north-south or northwest-southeast-trending blocks. However, along the western edge of the reservoir they have rotated along faults and trend nearly east-west. The alignment of minerals (foliation) in the Precambrian rocks dips toward the reservoir (east), whereas the sedimentary layers (bedding) in the overlying Paleozoic rocks dip toward the west.

Leigh Cave

Geologic relationships at Leigh cave (fig. 5), approximately 0.5 miles southwest of the reservoir's South Dam, help emphasize the geologic complexity of this area. In terms of total underground volume, Leigh cave is probably the largest cave in New Jersey, and second or third largest in total length. It contains more than 800 feet of passages. The cave is unique because the floor and walls are Paleozoic dolomite, while the ceiling is Precambrian granite that was thrust over

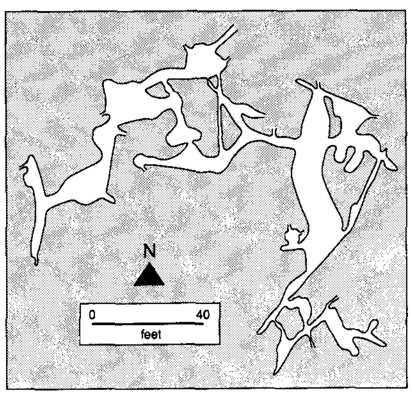


Figure 5.-- Simplified drawing of Leigh Cave illustrating the extent of underground passages. Modified from Dalton (1976).

the dolomite along a fault during the Paleozoic Era. Because water dripping through fractures in the roof of the cave flows through insoluble Precambrian rock instead of soluble limestone or dolomite as in most caves, characteristic forms such as stalagmites, stalactites, and flowstone are lacking.

Mesozoic Rocks

The remainder of Round Valley Recreation Area is underlain by Mesozoic sedimentary and igneous rocks (fig. 4). Of these, sedimentary rocks of Triassic age underlie most of the area. These are mainly reddish-brown sandstone, siltstone, and shale that occur in the valley beneath the reservoir, as well as lowland areas north, east, and south of Cushetunk Mountain. They trend northeast-southwest or east-west and dip gently toward the northwest or the north. Igneous rocks at Round Valley are mainly greenish-gray diabase of Jurassic age. They underlie all of Cushetunk Mountain, the hill west of the reservoir's North Dam, and a low hill to the south which is currently under water (fig. 4). Cushetunk Mountain is interpreted as a dike that intrudes the surrounding sedimentary rocks.

Faults

The many faults that affect the rocks at Round Valley Recreation Area formed in response to adjustments in the Earth's crust through geologic time. It is known that the faults are Paleozoic in age because younger Mesozoic sedimentary rocks deposited on top are unaffected by them. The Flemington fault (fig. 4) separates the Precambrian and Paleozoic rocks of the Highlands from the Mesozoic rocks of the Piedmont. It and other faults to the east are the same age or younger than the Mesozoic rocks. There is no evidence that any of the faults in the area of Round Valley have been active since the Mesozoic Era.

Most of the faults in the area are known as normal faults. That is, the block on the west or north side of the fault moved upward, while the block on the east or south side dropped downward relative to each other. An exception is a reverse, or thrust, fault at Leigh cave. Here the Precambrian rocks on the south side of the fault were pushed upward and over the Paleozoic rocks on the north side.

Engineering Geology

Of special interest is the geology of the reservoir's North Dam, Dike, and South Dam. In the 1950's, extensive rock-core drilling was undertaken to locate faults and determine engineering suitability of the soil and bedrock for construction of the reservoir. Drilling across the North Dam revealed this area to be entirely underlain by Cushetunk Mountain diabase. Near the center of the dam drilling encountered the Flemington fault (fig. 4), which follows the same northerly trend here as South Branch Rockaway Creek. From this information geologists determined that the fault dips gently toward the east at approximately 25°. Diabase on the east side of the Flemington fault is offset toward the north and on the west side toward the south (fig. 4).

Drilling across the South Dam showed that the eastern half of this area is underlain by Jurassic diabase, while the western half is Precambrian granite (fig. 4). They are separated by the Flemington fault, which was encountered during drilling near where the center of the South Dam now is. This fault runs south beneath the western end of the reservoir from the North Dam, and at the South Dam roughly follows the same trend as Prescott Brook (fig. 4).

Drilling across the area presently underlain by the Dike reveals even more complex geology than that at either dam. The Dike is underlain (from east to west) by Jurassic diabase and highly weathered sedimentary rock, Cambrian sandstone, and Precambrian gneiss. Drilling at the west-central part of the Dike encountered a north-trending, east-dipping fault that separates the gneiss and sandstone on the west from the Mesozoic rocks on the east (fig. 4). This fault segment may be a branch of the Flemington fault.

The reason for siting the dams and dike over a known fault is because the rock adjacent to it was physically weakened and therefore, more easily eroded. The erosion caused gaps and low spots to form on the ground surface above the fault where Prescott Brook, South Branch Rockaway Creek, and the drainage north of the Dike flow through prominent gaps in the adjacent ridges. In order to impound water in the reservoir, dams and a dike were required to close the gaps and low spots resulting from the fault's presence. Fractures and openings in the bedrock were filled with grout (a mixture of cement and fine sand) to strengthen the rock and prevent leakage before the dams or dike were constructed. This procedure is analogous to dental work in which cavities are filled to strengthen a tooth. The result is relatively impermeable rock of sufficient strength to support the dams and dike.

Acknowledgments

The New Jersey Geological Survey is grateful to David Eckwielen and Holly Tolbert of Round Valley Recreation Area, and Edward Buss, New Jersey Water Supply Authority, for their assistance during preparation of this booklet.

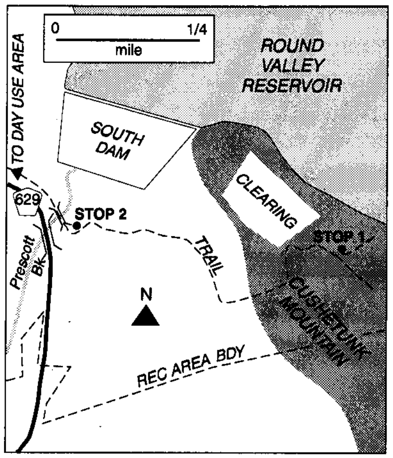
Self-Guided Tour of Round Valley's Geology

Round Valley Recreation Area offers an excellent opportunity to examine a billion years of interesting and diverse geology. The following five stops were chosen for a self-guided tour because at them, a particular rock type or geologic feature is best observed. Once at a stop, don't quit at the first rock outcrop you encounter. Outcrops, like people, are each different. See if you can spot some of the differences. Compare their color, texture, grain size, fractures, and any other feature you may find interesting. Above all, enjoy yourself!

Stop 1. Jurassic diabase

(Allow approximately 45 minutes to hike from the Day Use Area to Stop 1.)

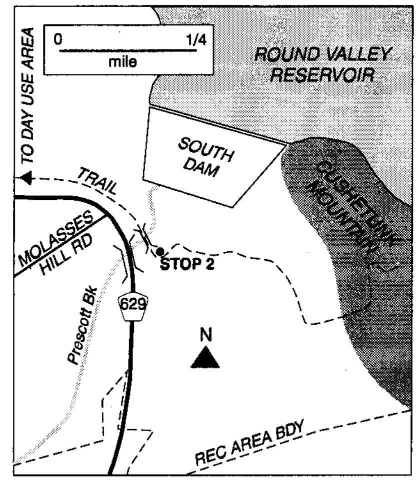
Abundant pieces (known as float) of the Cushetunk Mountain diabase are seen littering the slope along the trail. Much



of the bedrock in the area is obscured beneath a soil cover making outcrops of bedrock rare. Rock is present here because the soil cover is relatively thin to absent and the effects of weathering have broken up the underlying bedrock. The intersection of several naturally-occurring sets of fractures form the rectangular to square blocks of diabase seen along this section of trail. This is an early step in the process of physical weathering which turns large rocks into small ones. Diabase is greenish-gray where fresh, but weathers light tannish-gray and locally is yellowish-brown stained from the chemical weathering (oxidation) of iron in the rock. The three principal minerals in diabase are iron oxides (black), feldspar (white), and pyroxene (green or bronze). Notice the speckled light and dark appearance of the rock on weathered surfaces caused by the weathering of these minerals. Also note the interlocking texture of the mineral grains and the relatively fine grain size of the rock. These factors combine to give diabase a strength and durability that resists erosion, enabling it to form uplands and steep ridges.

Stop 2. Outcrop of Mesozoic sedimentary rock

Walking east along the trail below the South Dam (toward Cushetunk Mountain), a small bedrock outcrop can be seen just after crossing



Prescott Brook. The rock here is dusky reddish-brown, very-fine- to fine-grained sandstone. The irregular rock surfaces dipping downslope toward Prescott Brook are the original layers (beds) of accumulated sediments deposited over a considerable length of time. After deposition, the sediments were compacted and cemented into rock. Various minerals and rock fragments making up this sandstone are visible on the bedding surfaces. The minerals present are predominantly quartz and feldspar stained reddish-brown by a common iron mineral called hematite. Light green shale chips measuring up to 1/4 inch long are the most abundant rock fragment in the sandstone. Because quartz is more resistant to erosion than feldspar or the rock fragments, it tends to stand out on the irregular bedding surfaces as small bumps up to 1/2 inch long. These sedimentary beds were originally deposited horizontally. However, they now dip about 30° to the west (downslope toward Prescott Brook) because movement along the Flemington fault during the Mesozoic tilted them.

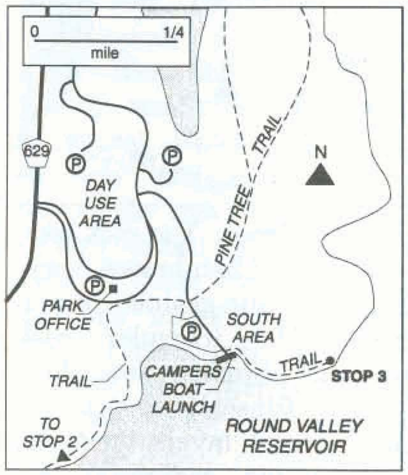
The sandstone outcrop is cut by a parallel set of naturally-occurring fractures. These are oriented uphill at nearly the same angle as the trail. Another set of joints can be seen oriented roughly parallel to Prescott Brook. It is likely that this joint set was important in establishing the course of Prescott Brook because it represents a natural physical weakness. Rivers and streams often follow such joint systems because the rock is more easily eroded along them, and over time they can be worn into channels.

Looking upstream from the

bridge toward the South Dam, it can easily be seen how Prescott Brook has cut through the soil layer and underlying bedrock exposed along the bank on the right.

Stop 3. Outcrops of Precambrian gneiss

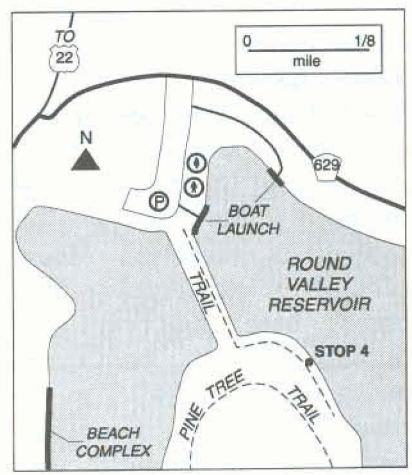
At this stop nearly continuous exposures of gneiss are present east of the boat launch area at the reservoir's edge, and along the low gravel terrace. Most of the gneiss is a black or grayish-black weathered rock known as amphibolite. It is composed of the minerals hornblende (black) and feldspar (white) which give it a salt and pepper appearance when weathered. Locally, amphibolite contains the shiny black mica mineral called biotite. Minor amounts of a white gneiss, composed of feldspar (white) and quartz (light gray), also occur. Both types of gneiss represent metamorphosed volcanic rocks. Most of the rock here is considerably fractured and broken because it is near several major faults (fig. 4). Small faults an inch or so wide that cut these outcrops are easily recognized by the dark brown, broken, crumbly rock associated with them, and also by the pistachio green mineral called epidote that occurs along some fault surfaces. Epidote forms through the chemical breakdown of other minerals in the rock during faulting. Where the gneiss is less fractured and faulted, mineral banding, called foliation, can be seen oriented roughly parallel to the water and dipping toward the north.



Walking north, you can see the erosional development of several low shoreline bluffs with steep faces. Physical weakening of the rock from faulting, and repeated seasonal freezing and thawing along fractures, causes the rock to weather and break apart easily. Water and wave action will continue to erode these low bluffs and claim still more of the shoreline. The accumulated pile of rock fragments at the base of the bluff is called talus. Looking across the water while returning to the boat launch area provides a good view of the South Dam. The rock to the right of the dam is Precambrian granite, to the left, Jurassic diabase forming the southern tip of Cushetunk Mountain.

Stop 4. Outcrops of Precambrian granite

There are good exposures of igneous granite at the water's edge and along the low gravel terrace south of the parking area. The granite has a fairly uniform texture and grain size, and is composed primarily of the buff or pink minerals called feldspar, and light gray quartz. Because of its texture and the absence of extensive fracturing of the rock in this area, the granite is fairly resistant to erosion. It underlies the Pine Tree Trail section of Round Valley between the beach complex and the main reservoir, forming a ridge more than 100 feet above the water.

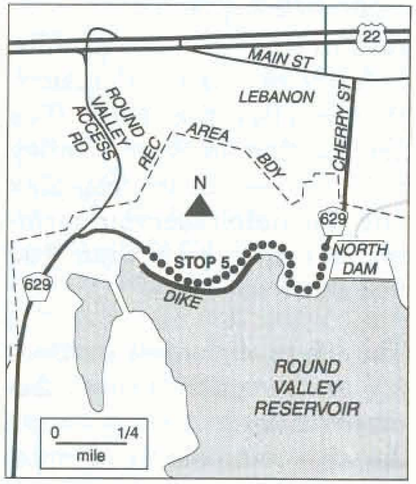


The effects of physical weathering are exceptionally well displayed among these outcrops. As the rock slowly disintegrates in place, it first forms fragments and, with continued weathering, coarse sand. Much of the gravel and sand terrace found along the edge of the reservoir is made up of such fragments from the underlying granite bedrock.

Across the reservoir to the north, the curving, rock-walled Dike can be seen to the left and the North Dam and outlet tower to the right.

Stop 5. Round Valley Reservoir Dike and North Dam
(Drive by only, please do not stop.)

This area is restricted and *no trespassing* is permitted by the New Jersey Water Supply Authority.



The Dike is a curved, earth-fill structure 2,350 feet long and 80 feet high designed to impound water across a natural low spot at the north end of the reservoir. It is constructed of an impermeable core of clay 30 feet wide, and is covered with fill of Mesozoic soil and sedimentary rock excavated from the floor of Round Valley. The outermost layer is an apron, or wall, of rock called riprap that consists of boulder-sized pieces of Jurassic diabase.

The North Dam is an earth-fill structure 1,500 feet long and 135 feet high. Its construction is essentially the same as that of both the Dike and the South Dam.

In all, approximately 370,000 cubic yards of impermeable clay was used for the cores of these structures. Approximately 3,700,000 cubic yards of soil and rock cover was also required for construction of the two dams and the dike. All of these geologic materials were obtained on site. This included the clay, soil and rock fill, and crushed rock used as riprap.

Jurassic diabase can be seen along the road opposite the North Dam. The rock at this outcrop is somewhat finer-grained, but otherwise similar to the diabase that underlies the rest of Cushetunk Mountain. It is considerably fractured here and cut by numerous small faults oriented roughly parallel to the road. These faults are easily recognized by the small piles of rock debris that collect at the base of each one.

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