GIFFORD PINCHOT STATE PARK

DIABASE (MOLTEN LIQUID ROCK)

Gifford Pinchot State Park contains examples of the three major rock classes: igneous, metamorphic, and sedimentary. The most common rock present in the park is the igneous rock *diabase,* formed below the earth's surface and originally hot and liquid (molten). The least common rocks in the park are sedimentary rocks, which are here present as red sandstone and shale layers. Sedimentary rocks of the park are those that were formed from sand and mud in a former large body of water. The metamorphic rocks of the park consist of altered red sandstones and shales, which were baked (metamorphosed) into a very hard, dark-gray rock by the heat of the adjacent molten diabase.

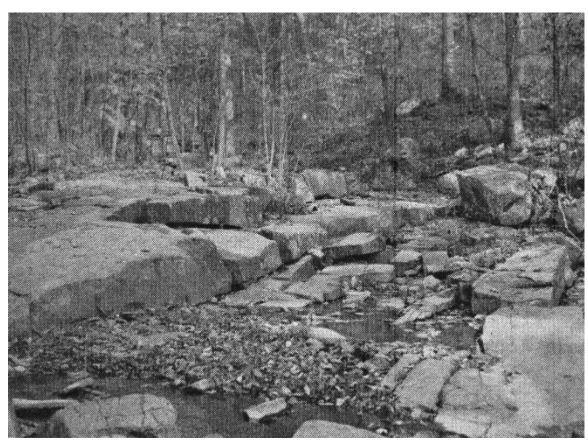
Diabase underlies nearly all of Gifford Pinchot State Park except along the northern and southern boundaries. Here, the diabase and the metamorphosed sedimentary layers, both of which are resistant to weathering, form two ridges that outline the park. The diabase may be seen exposed at map localities 1–4, at many places along the lake shore, and as scattered boulders in many areas of the park.

The hot fluid, later to cool and become rock, was injected under pressure into the red sandstones and shales that already existed in the area of the park. The molten rock followed a natural separation zone in the sedimentary rocks, forcing the layers apart. The diabase, as it was injected and solidified, took on the shape of a large tabular layer paralleling the layers of sedimentary rock. The geologic term for this shape of an igneous rock mass is a *sill.* Since the injection of the sill in the park area, about 180 million years ago, the rocks have been tilted from an originally horizontal position and now are inclined to the northwest at an angle of 35 degrees (refer to block diagram on next page).

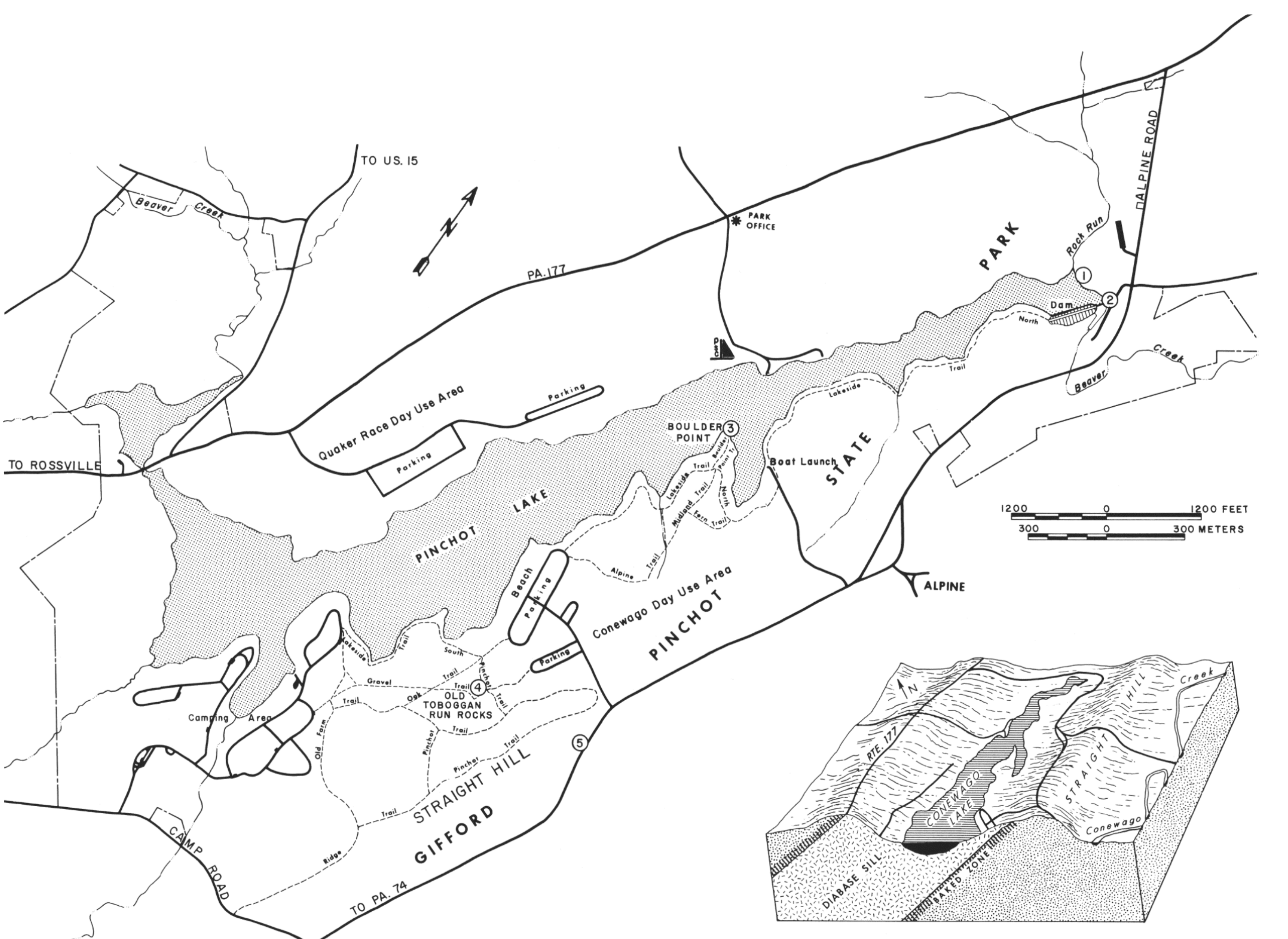
As the intensely hot diabase entered the red sandstone and shale it baked the cooler surrounding rock and changed it to a dark-gray color with tinges of deep maroon. The metamorphosed rocks can be seen in the highway bank south of the Conewago Day Use Area where the road descends Straight Hill (locality 5 on the map).

Diabase is composed largely of two minerals, one a member of the plagioclase feldspar group and the other of the pyroxene group. Both are dark minerals and thus diabase rock is very dark. As the originally molten rock cooled, these two minerals crystallized from the melt. Since it cooled at a considerable depth beneath the earth's surface it cooled uniformly, although fairly rapidly; thus the crystals that formed were small and about equal in size.

As the diabase cooled its volume shrank and a network of shrinkage cracks formed; some cracks formed approximately parallel to the enclosing sedimentary rock. These cracks and the layering thus formed within the igneous rock can be seen in the creek bed of Rock Run (photograph 1) at the northeast



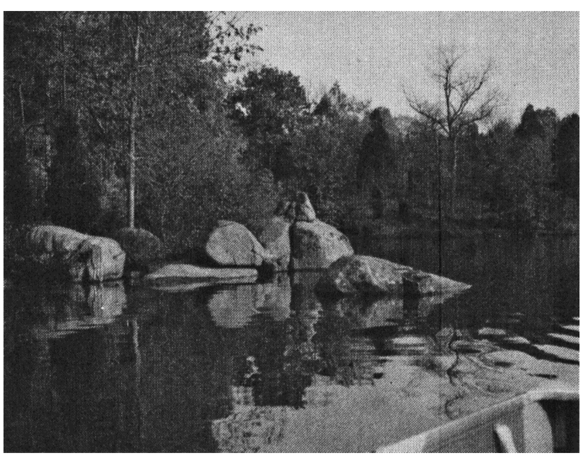
1. Cooling cracks and resulting layers in diabase at Rock Run.



SCHEMATIC BLOCK DIAGRAM

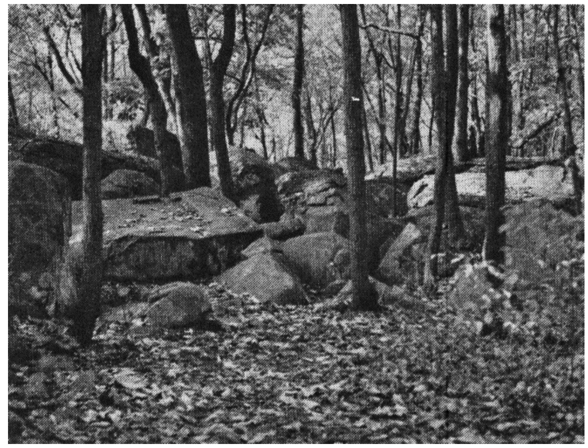
end of the park (locality 1 on the map) and in the spillway cut of Pinchot Lake Dam (locality 2). Other cracks in the diabase formed perpendicular to this layering and also at right angles to each other. As the diabase was exposed to surface weathering due to erosion, these cracks were naturally weaker zones for chemical (alteration) and mechanical (frost- and plant-wedging) weathering.

The diabase boulders seen at Gifford Pinchot State Park are the result of this weathering. Chemical and mechanical weathering processes attack the corners and edges of the rectangular blocks outlined by the cooling cracks. The weathering processes "round" the blocks so that they take on a spherical shape. This is known as *spheroidal weathering.* Good examples of the rounded boulders may be seen at Boulder Point (locality 3 on the map; photograph 4), Old Toboggan Run Rocks (locality 4; photograph 3), and many points along the lake shore (photograph 2), particularly in the eastern part of Pinchot Lake near localities 1 and 2.

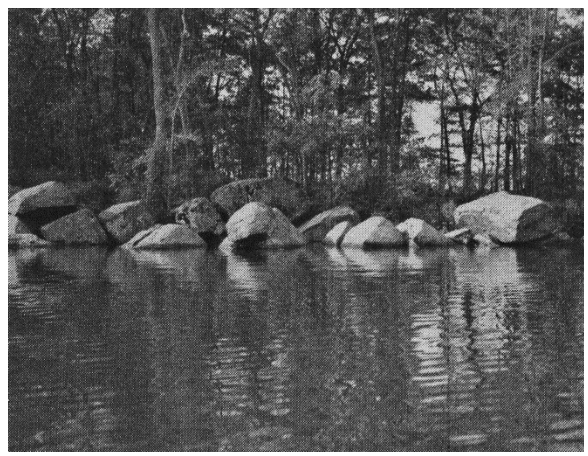


2. Rounded diabase boulders along shore of Pinchot Lake.

A special example of the results of spheroidal weathering may be seen at Boulder Point (locality 3; photograph 5), where a very large boulder is balanced on two small supports. The boulder was once a large



3. Rounded diabase boulders at Old Toboggan Run Rocks.



4. Rounded diabase boulders at Boulder Point.

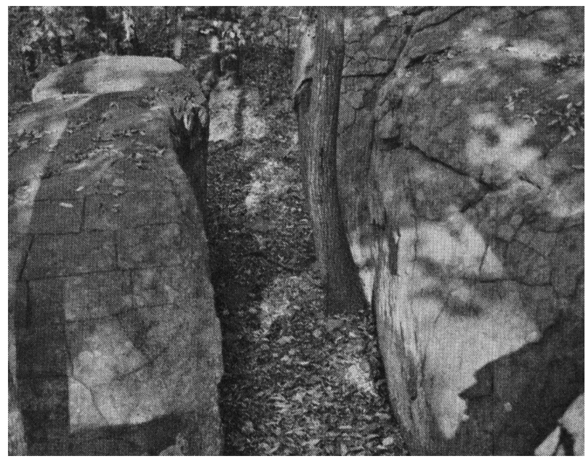
5. "Balanced" rock at Boulder Point.

rectangular block. As chemical and mechanical weathering processes attacked the boulder they "rounded" the formerly rectangular block so that the portions of the bottom part of the rock that do not bear the weight of the block have been eroded, leaving a gap between the underlying rock and the boulder. Weathering has thus produced a “balanced” rock.

Excellent examples of cooling cracks can be seen in boulders of diabase at Old Toboggan Run Rocks (locality 4; photograph 6). Here many of the rock surfaces exhibit rectangular cracks now accentuated by chemical weathering. As weathering proceeds these cracks will get deeper and the rocks will eventually break down into smaller blocks.

Large-scale mechanical weathering produced by frost wedging is also a prominent feature at Old Toboggan Run Rocks (locality 4; photograph 7). Here very large boulders of diabase have been cracked through and separated several feet by mechanical frost heaving of the rock so that trees now grow between the boulders and one can walk through the passageway created from the crack.

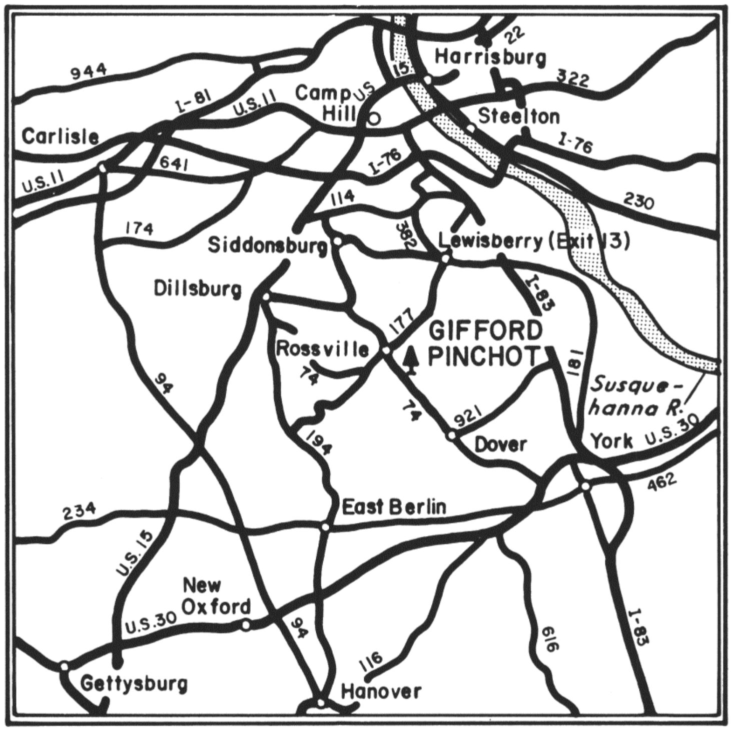
6. Rectangular cooling cracks on surfaces of diabase boulders at Old Toboggan Run Rocks. Note large recent frost-wedge crack separating boulder into three pieces.



7. Large boulders that have been separated by frost wedging at Old Toboggan Run Rocks. Note rectangular cooling cracks accentuated by chemical weathering.

—Donald M. Hoskins, Geologist
Pennsylvania Geological Survey
1978

NOTE! State Park regulations prohibit defacing of park property. Do not chip samples from the boulders. Take nothing but pictures; leave nothing but footprints!



LOCATION MAP

Gifford Pinchot State Park
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PREPARED BY

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