

Glacial Terraces and Ancient Shoreline Features at Camp Arden
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Camp Arden is underlain by a thick sequence of glacial deposits that, once emplaced, have been modified by later events both later in the glacial epoch and post-glacial. The surface expression of these features is of a series of terraces whose origin can be ascribed to at least three agents.

Characteristics and Origin of the Deposits. At the very bottom is a blue-gray bouldery clay till. This is exposed at the bottom of the ravine approximately one-half mile from the road and about the same distance up the stream. There is an uneven terrace at this exposure which may represent the top of the till.

The remainder of the unconsolidated sediments is a thick unbroken sequence of fluvial sediments, up to a terrace at 150 meters elevation. This unit consists of medium-to-coarse sand and significant gravel. Lenses of cobble-size stones are common, and there are boulders scattered through the deposit as well. This deposit is at least 42 meters (about 140 feet) thick, the distance from the highest terrace to the present West River level, and may extend below the river level. This is an outwash deposit; the large size of the material shows that there was a high rate of flow when the deposit was forming.

In places along the valley downstream, these deposits are much thinner, plastered against the bedrock of the valley wall. This is shown quite spectacularly in a roadcut on Camp Arden Road 0.2 mile east of the driveway into Camp Arden. A thin veneer of glacial outwash is in contact with bedrock, filling nooks and crannies of the bedrock and filling in around it. The bedrock surface has not been altered from its natural state by the road work, and is nearly vertical, i.e., it forms the original valley wall.

At another place, on Green Mountain Camp Road just northeast of the junction Day Road, the same outwash deposit is thin in a different aspect: coarse sandy outwash is about a foot thick on a horizontal bedrock surface near the edge of the ancient valley. This is seen in a fortuitous exposure under the root system of a tree that was uprooted in the storm of Friday, July 6, 2007; I happened to drive by it the following day. This exposure is also at the 150-meter level.

The bedrock surface of the Camp Arden Road exposure is instructive about the origin of this deposit. The surface is smooth but not even. It is wavy with many irregular ins-and-outs. It shows all the characteristics of a water-worn surface. Thus, it is a natural surface but not a glaciated one. Glaciated surfaces are evenly smoothed into streamlined shapes. The surface was formed by erosion by glacial meltwater coursing down the ancestral West River valley, carrying an immense load in prodigious amounts of water. [There are other lines of evidence that indicate that this valley was a major outwash channel carrying a lot of water, including the Dumplings at Jamaica State Park and the giant potholes at Hamilton Falls]. The great extent of the outwash flow is confirmed by the presence of

cobble beds and boulders in the Camp Arden deposit, and by the fact that the water-worn surface in the roadcut is some 18 meters (60 feet) above the present river.

Terraces on the Deposits. The outwash deposit has been sculpted into a series of terraces, with apparently three different causes. The uppermost is at about 150 meters, and is against the bedrock hills surrounding the valley. Everything above this level is underlain by a variable thickness of glacial till on bedrock [the bedrock is variable: west of the ravine, where this terrace is most prominent, the bedrock is garnetiferous schist of the Northfield Formation; at the roadcut on Camp Arden Road, it is highly contorted and intruded amphibolites of the Barnard Volcanics; under the blown-down tree on Green Mountain Camp Road, it is schist of the Waits River Formation]. This terrace represents the top of the deposit and the apparent level to which the valley was filled with outwash. Since the valley is filled with outwash (it may have been completely filled to this level from bank to bank, though the topographic map does not show a terrace at this level on the other bank) and there are no lake sediments under the outwash, these deposits were formed before the lake extended this far north.

The next terrace is at some elevation between 150 meters and 120 meters. It is of limited extent, being best exposed on the hillside between the camp complex and the ravine. There is an old outhouse on it; just beyond the outhouse and at the base of the slope up to the 150-meter terrace is a small meander scar. The soil right at the surface is sandy; gravel and cobble beds are present within a foot of the surface. Everything suggests that this is a stream terrace formed as meltwater cut into the deposit formed previously.

The next terrace is at 126 meters. It has several features that distinguish it from the two terraces above. At places there is a small bench at the base of the slope up to the next terrace; the best example I saw is behind the vernal pool just in the woods not far from the field with the broken-down garage and plentiful milkweed. The upper material of the terrace is well-sorted sand. The best exposure of this sand is at the top of the rise in the old logging road on the west side of the ravine; white sand is exposed under a tree stump. In contrast to the sand at the surface of the next higher terrace, this unit is about three feet thick; no gravel or cobbles are visible in this unit. This unit has all the characteristics of beach sand. At the base of the slope up to the next terrace, there are concentrations of soccer-ball sized boulders in many places.

This 126-meter terrace is clearly the terrace of glacial Lake Hitchcock. It formed by the reworking of the pre-existing outwash deposits at the lake shore. Waves worked against the material, further sorting it, carrying fine material out into the deep parts of the lake, winnowing the sand into a beach, and leaving the boulders as a rampart where the waves broke against the cliff. The little benches might represent raised beaches of short duration. Thus, the shoreline of the glacial lake is shown not by lake sediments, but by the reworking of sediments in a manner characteristic of the action of nearshore lake water. It should be pointed that this level is consistent with the known glacial lake level in Brattleboro.

Below the 126-meter terrace are some smaller ones of limited extent cut into the slope extending to the current river. These are post-lake terraces, formed as the West River began cutting into the deposits exposed after the lake emptied.

Ancient Landslides. These deposits tend to stand up in steep cliffs which, when not stabilized by vegetation, can fail in landslides. One large landslide scar occurs in the big ravine; it forms an irregular, hummocky bench in the slope. Trees on the surface (as well as many other places in the ravine) have the characteristic outward curve at the bases of their trunks as the young trees began growing on an unstable surface, then growing straight as their growth stabilized the slope.

The instability of the slopes probably occurs when the slopes are free of vegetation, particularly trees. This condition occurred most recently when the area was farmed in the late 19th to early 20th century.