Ithaca is Gorges

PART I: BEEBE LAKE

Most people assume that the gorges of the Finger Lakes region are related in some way to glaciation. This is certainly true, but these are not glacially carved features, as some of the local tourist literature suggests!

If you arrived at Beebe Lake via the footbridge below the dam, then you have seen one of the two gorges that bound the central part of Cornell campus. This is the northern of the two, Fall Creek gorge. The other is Cascadilla gorge, between the Engineering quad and Collegetown. Beebe Lake was created in 1832 by Ezra Cornell in order to provide power and water to mills along Fall Creek. The dam was placed at the top of Triphammer Falls where the gorge becomes substantially deeper.

Fall Creek is a west-flowing tributary to Cayuga Lake, which, like all of the Finger Lakes, is aligned predominantly north-south (Figure 1). Cayuga Lake is one of the longest (38 miles) and deepest (435 feet) of the Finger Lakes; the elevation of the lake floor is 53 feet below sea level.

![Shaded relief map of the southern end of Cayuga Lake. Gorge-forming tributary streams are shown.](image)

Figure 1: Shaded relief map of the southern end of Cayuga Lake. Gorge-forming tributary streams are shown.

OBSERVATIONS

A view (or better yet a walk!) both upstream and downstream along Fall Creek will provide clues to one aspect of the origin of Ithaca’s gorges. Beebe Lake currently occupies the floodplain of this section of Fall Creek. The old creek banks can be seen cut into the bedrock, especially on the opposite (south) side of the lake. The lake is only a few feet deep, with the exception of the central channel. The nature and size of this channel is evident at the small stone footbridge at the upper end of the lake. A walk upstream would show you that Fall Creek is a meandering stream, with modern and former channels cut
into both bedrock and overlying glacially deposited debris. The bedrock channels are exposed as you first walk upstream, giving way farther along to nested channels and floodplain terraces entirely in the loose glacial material. There are many ancient meanders preserved at different elevations along the course of Fall Creek (Figure 2).

If you turn around and walk to the west you would notice that the Cornell campus is built on a series of slopes and terraces that descend toward downtown Ithaca and Cayuga Lake. Lower Fall Creek has dissected these slopes and terraces, cutting through the surficial deposits and into the underlying bedrock, creating the gorge seen below Triphammer Falls. These features are related to the abandoned meanders upstream, and to the Pleistocene glaciers that advanced and retreated across central New York.

The last piece of local geography that is important to this story is the Valley Heads moraine, an extensive moraine system that marks a stillstand of the last ice sheet as it melted away to reveal Ithaca 14,000 years ago. Valley heads debris blocks all of the valleys just south of Ithaca. Deposition of this moraine reversed the local stream drainage; prior to 14 ka streams flowed south into the Susquehanna River, now they flow north to Lake Ontario.

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DISCUSSION

So how are the stream meanders and abandoned floodplains related to the slopes and terraces on campus, to Cayuga Lake and the Valley Heads moraine, and to the gorge of Fall Creek? The key is the melting glacier. When ice sheets first advanced across this part of the world the landscape was one of hills and stream valleys—no gorges, no Finger Lakes. The advancing ice gouged and deepened the N-S valleys (such as that of the “Cayuga River”) while at the same time filling in the E-W valleys with glacial debris. When the ice sheet began to melt and retreat the deeper valleys were filled with ponded meltwater, forming proglacial lakes. These lakes were dammed by the ice sheet to the north, by the Valley Heads moraine to the south, and by high topography to the east and west. The smaller streams tried to re-occupy their previous valleys, but found them choked with glacial till. Streams such as Fall Creek began eroding the till, washing it to its mouth at the shore of the proglacial lake. Here the sediment was deposited and began to accumulate to form a delta, while upstream the creek began to meander and create a floodplain. Eventually the volume of glacial meltwater was sufficient to overtop the Valley Heads moraine, eroding the moraine and causing and proglacial lake to partially drain. This lowered lake level very quickly, leaving Fall Creek delta stranded on the hillside above the lake. Fall Creek flowed down to meet the new, lower, proglacial lake surface, where it began forming a new delta, while upstream the creek cut into its old floodplain and began forming a new, lower meandering channel and floodplain. This processes was repeated each time the proglacial lake broke through whatever barrier contained it. The result is a series of hanging deltas that create the slope and flat topography of Cornell campus and the entrenched meanders and abandoned floodplains of upper Fall Creek. The entire process took less than 2000 years, giving lower Fall Creek an extraordinarily steep gradient and enough steam power to erode through the underlying bedrock to form a deep gorge.

Figure 3: Proglacial lake at 980 feet above sea level. Compare with Figure 1.
FLORA AND FAUNA OF BEEBE LAKE

Beebe Lake is at the center of a 7 mile long corridor of managed natural areas that contain a wide variety of native plants. When the dam at Triphammer Falls was constructed, the trees of Fall Creek floodplain were removed. However the slopes both north and south of the lake preserve stands of very mature trees. The forest on the slope south of the lake contains sugar maples, beech and hemlock, while the north slope hosts a dry oak woods. The steep bank between the lake and Helen Newman Hall was landscaped with slope-stabilizing Crown vetch, a plant that has proven so persistent in its job of preventing erosion that newer plantings have all died. The gravel island at the upper end of the lake (formed of coarse flood deposits) has been planted with native vegetation. Numerous species of birds are easy to spot around Beebe Lake. Great Blue herons are common, as are Mallard ducks and Canada geese. Look also for Redwing blackbirds, Northern cardinals, Goldfinches and Barn and Tree swallows. If you’re wearing red clothing, watch out for Ruby-throated hummingbirds—they’re very territorial!

REFERENCES