**#.#.# Section Introduction**

Observations that constrain the incision of Buttermilk Creek since deglaciation provide key information to the modeling effort by supplying the time-variable elevation of the watershed outlet. Incision of the watershed after retreat of glacial ice occurred in response to the lowering of the junction of Franks Creek and Buttermilk Creek; thus, the timing of the incision of the outlet serves as a boundary condition to the model runs. In order to be usable to the suite of models developed by the EWG erosion team, the incision history constrained by geomorphic and geochronologic evidence must be supplied as value pairs of time and elevation above modern river level. Here we supply two alternative scenarios for river incision that we recommend for implementation by the modeling team (Tables 1 and 2, Figure 1).

**Scenario 1: Meander Scenario**

The first scenario, termed the Meander Scenario, is predominantly based on the dates from the Abandoned Meander site (Table 1). This scenario also uses a combination of observations of sediment burial (OSL) and buried wood (14C) dating to indicate that Buttermilk Creek had reached its present grade approximately 2.5 ka (thousand years before 1950). This interpretation assumes that the dates on buried wood do not represent preservation of the absolute oldest point in time that Buttermilk Creek occupied its current grade. Thus, it uses the sediment burial (OSL) date of 2.5 ka as the point at which Buttermilk Creek occupied its current grade. The Abandoned Meander is located upstream of the Franks Creek-Buttermilk Creek junction and thus the elevation of Buttermilk Creek at this location does not correspond exactly to the elevation of the Franks Creek-Buttermilk Creek junction. However, the model only requires elevation of the channel *relative* to the modern channel elevation. This was determined by subtracting the elevations of Abandoned Meander sites from the modern elevation of Buttermilk Creek at the Abandoned Meander.

**Scenario 2: Buttermilk Context Scenario**

An alternative scenario, termed the Buttermilk Context Scenario, differs from the Meander Scenario in three ways. First, it projects all observations to the junction of Franks Creek and Buttermilk Creek using the slope of the 13 ka age line and the elevation and gradient of modern Buttermilk Creek. Elevations of the channel above the modern river level are then determined by subtracting the elevations from the modern elevation of Buttermilk Creek at its junction with Franks Creek. Second, it includes a date and elevation pair from the Heinz Trench site HT-7 at 3.785 ka and 42’ above the modern channel elevation. Finally, it considers two additional observations in order to make a different interpretation of the slowing of the incision as Buttermilk Creek approached its current grade: a date of 1.653 ka at the Tree Farm Site located at 16’ above modern river level and a date of 2.128 ka at site HT-33 located 7’ above modern river level. Taken in concert with the OSL and buried wood 14C observations an age elevation point of 2.3 ka and 14’ above modern river level is used. This indicates that incision slowed but did not stop in the period ~2.5 ka to the present.

**alternative_incision_histories.pdf**

**Figure 1.** Graphical summary of alternative lowering histories.

**Table 1.** Meander Site Scenario

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Elevation of Buttermilk Creek at the Abandoned Meander (ft) | | | |
| Date (YBP)\* | Above Modern Channel | Above MSL |  | Source of Age |
| 13000 | 159 | 1351 | \*\* | Youngest wood in Simmonds Rd/Kent moraine site and Genesee Valley site |
| 10600 | 109 | 1301 |  | Trench T-7 |
| 9495 | 99 | 1291 |  | Meander Trench MT-34 |
| 6764 | 99 | 1291 | \*\*\* | Meander Trench MT-37 |
| 5632 | 99 | 1291 | \*\*\* | Trench MT-38 S4 |
| 2500 | 0 | 1192 |  |  |
| 0 | 0 | 1192 |  | Modern elevation of Buttermilk Creek at the Abandoned Meander Site |
| \* relative to 1950 \*\* Initial surface estimated to be between 1340' and 1360' based on observations at the meander site. Initial elevation set to 1351' for consistency in total amount of incision between this and other downcutting scenarios.  \*\*\* Samples located 2' above MT-34. This would imply aggradation to the model, of which none is observed. Thus this elevation was adjusted to the elevation of MT-34. | | | | |

**Table 2.** Buttermilk Context scenario

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Elevation of Buttermilk Creek at its junction with Franks Creek (ft) | | | |
| Date (YBP)\* | Above Modern Channel | Above MSL |  | Source of Age |
| 13000 | 159 | 1340 | \*\* | Youngest wood in Simmonds Rd/Kent moraine site and Genesee Valley site |
| 10600 | 114 | 1295 |  | Projected trench T-7 |
| 9495 | 104 | 1285 | \*\*\* | Projected Meander Trench MT-34 |
| 5632 | 104 | 1285 | \*\*\* | Projected Meander Trench MT-38 |
| 3785 | 42 | 1223 |  | Projected Heinz terrace-3 trench HT-7 |
| 2300 | 14 | 1195 |  |  |
| 0 | 0 | 1181 |  | Modern Elevation of Buttermilk Creek at its junction with Franks Creek |
| \* relative to 1950  \*\* Elevation of initial surface chosen based on Figure 4.5-1  \*\*\*Additional samples are located at the abandoned meander site with dates between 9495 YBP and 5632 YBP. | | | | |