

Edey Foundation Report

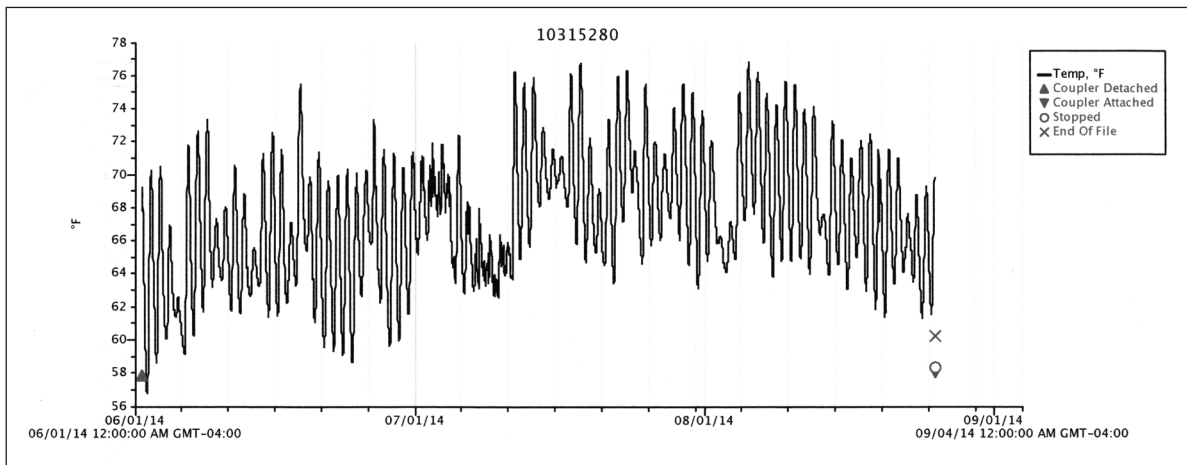
Mill Brook Water Temperature Study

2013 & 2014



Above: Mill Brook, Town Cove, location of logger #10315280.

Below: Water temperature data for this location, date and time.



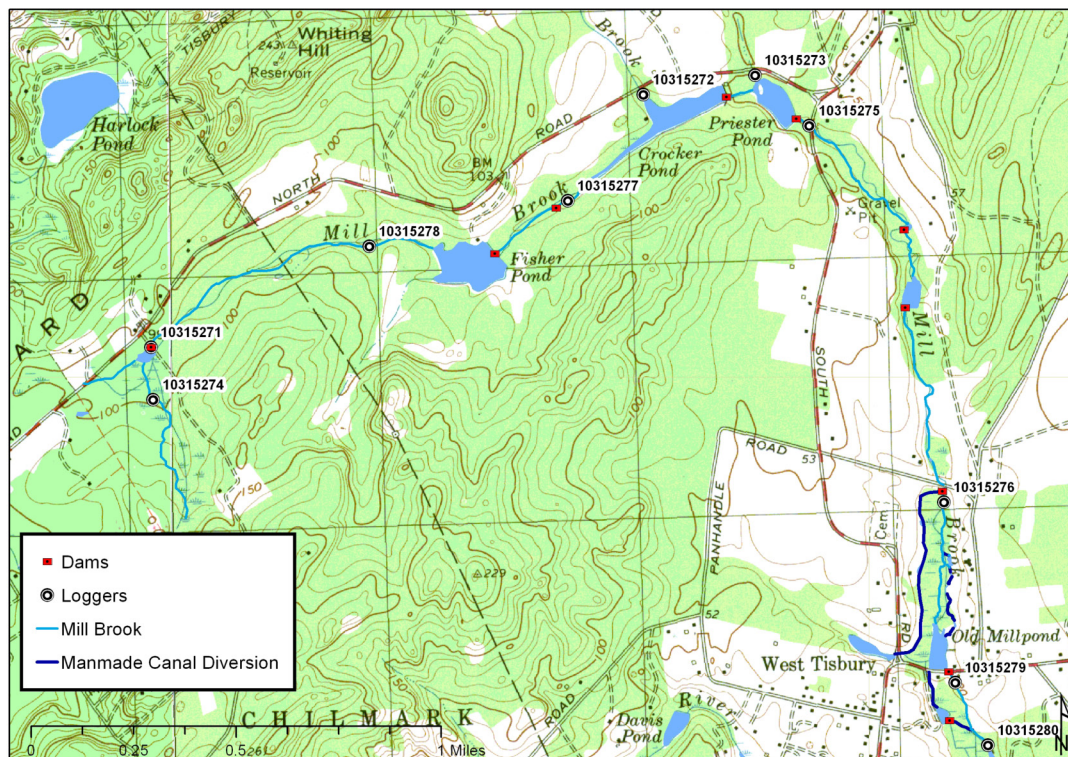
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We wish to thank the Edey Foundation for their generosity in funding this water temperature study of Mill Brook. We apologize and appreciate your understanding of the reasons for the tardiness of this report. The benefit is that we now have eighteen months of data, including two summer seasons. We also thank the property owners who granted us access for this study: Sheriff's Meadow Foundation, Martha's Vineyard Land Bank, The Nature Conservancy, Francine Woods and Robert Doane. Likewise, we thank Matt Pelikan of The Nature Conservancy, Chris Seidel of the Martha's Vineyard Commission, Maria McFarland and Mark Kiley for technical support on the computer and in the field. Particular thanks go to Steve Hurley, Southeast District Fisheries Manager, Massachusetts Division of Fisheries and Wildlife for his tireless help and expertise in managing and graphing this water temperature data.

In our 2013 application to the Edey Foundation, we wrote "temperature data such as this will show how the water temperature of Mill Brook is affected by the six impoundments along its length." Data from 2013 and 2014 show that Mill Brook water temperatures are profoundly impacted by the man made impoundments. The surface area of these bodies of water act as solar collectors, raising the water temperatures significantly as Mill Brook flows through them. With the money we received from Edey Foundation, we purchased ten Hobo ProV2 water temperature loggers, one waterproof data shuttle and the software to manage this data.

The map below (Figure 1) shows Mill Brook and serves as a guide to the locations of the ten Hobo data loggers. The headwater (logger #10315274) at the Roth Woodlands Preserve is at the left of the map. Data logger #10315272 was deployed in Witch Brook, a tributary to Mill Brook above Crocker Pond, and data logger #10315273 was deployed in the unnamed tributary to Mill Brook above Priester's Pond. Mill Brook flows into Town Cove of Tisbury Great Pond four miles below the headwater at the lower right hand corner of map.

Figure 1



Water temperatures below the impoundments routinely reach levels lethal to our native coldwater fish, including sea run Brook Trout (*Salvelinus fontinalis*) and American Brook Lamprey (*Lethenteron appendix*), a species listed as threatened in Massachusetts. Brook trout cannot long survive water temperatures above 70 degrees Fahrenheit (F). Optimal temperatures for brook trout are 52-56 degrees F, with optimal egg production occurring (in January and February) between 33- 53 degrees F.

These next two graphs (Figures 2 and 3) illustrate these effects. The four lines at the bottom of each graph indicate the headwaters and tributaries. The remaining lines in the upper half of each graph represent the locations below the impoundments.

Figure 2
2013 Average Monthly Temperatures
Mill Brook System

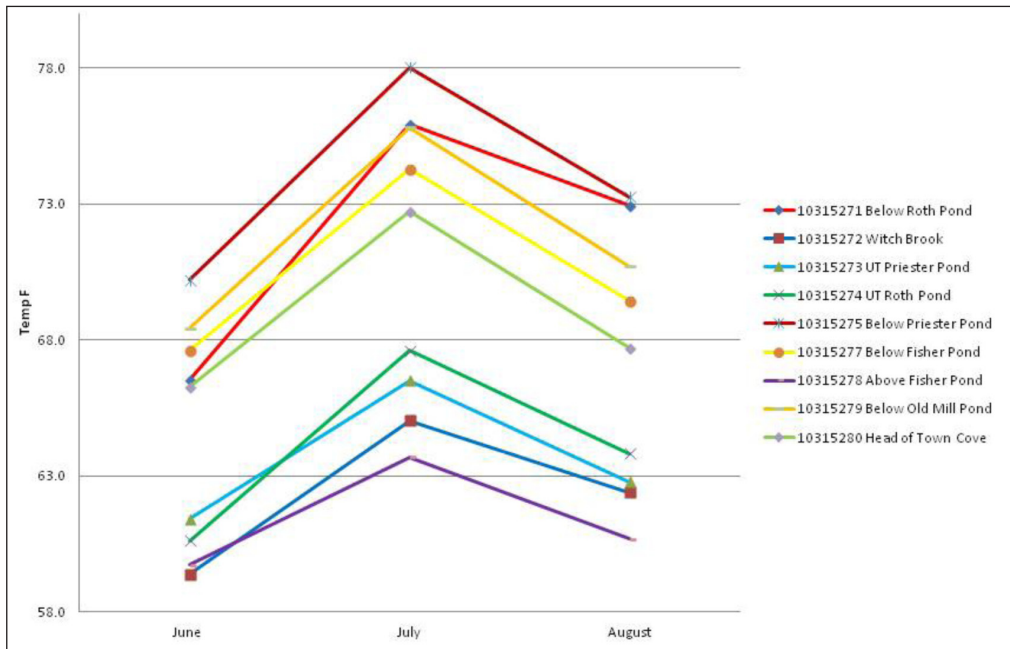
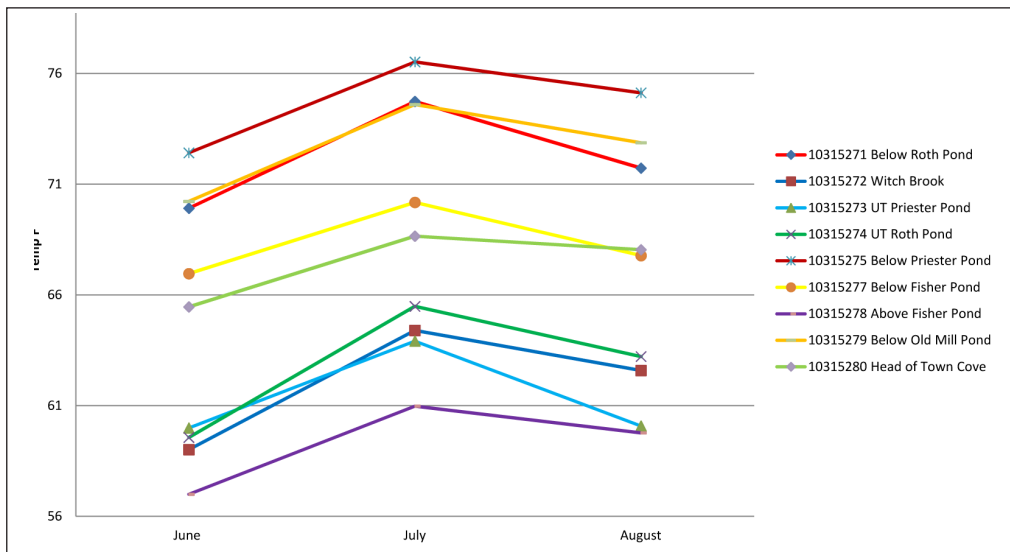
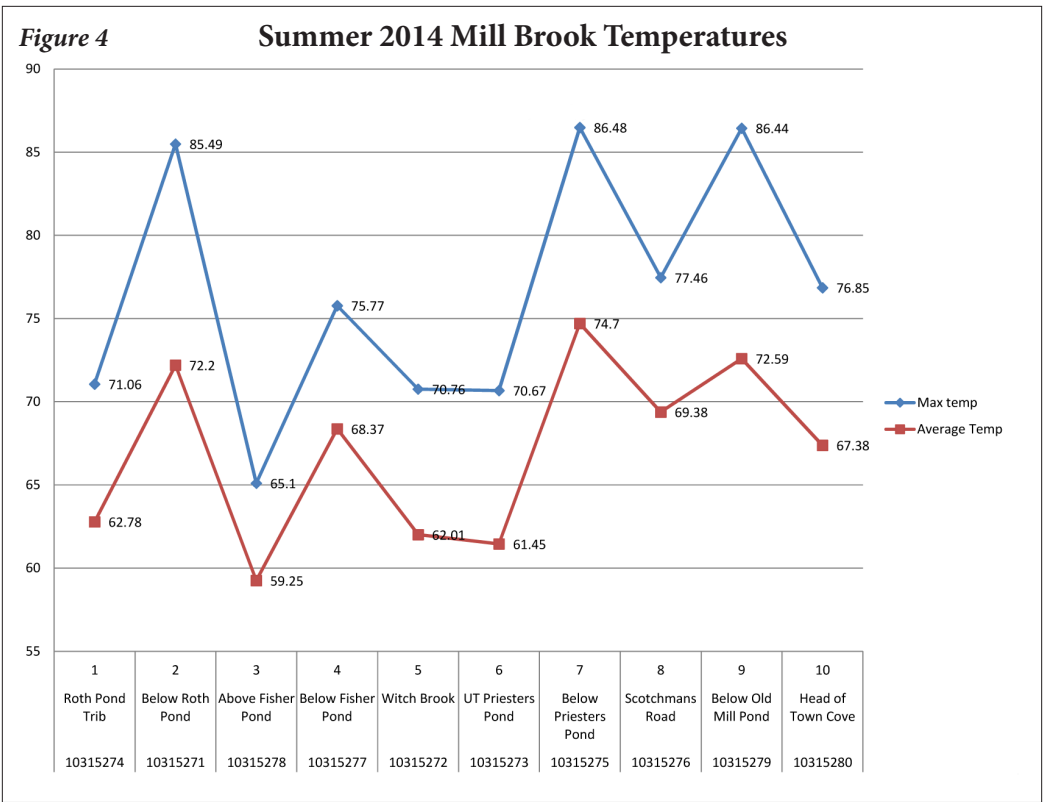


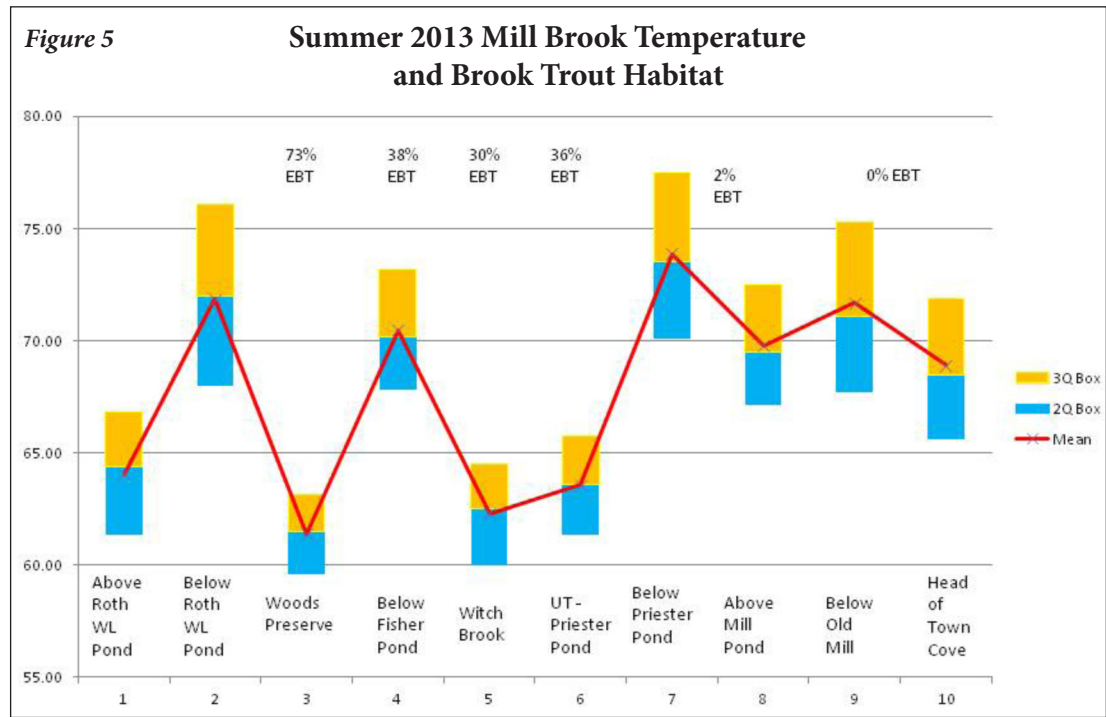
Figure 3
2014 Average Monthly Temperatures
Mill Brook System



This next graph (Figure 4) illustrates the maximum and minimum summer water temperatures in 2014. You see that water temperatures below the impoundments reached as high as 86.48 degrees F at the Priester's Pond outlet. Summer water temperatures below other impoundments routinely reached 85 degrees F and above. In 2013, maximum temperatures of 92 degrees F were recorded at the outlet of the Roth Woodlands impoundment. High temperatures from this location were generally unable to impact the stream below as the perched culverts prevented most water flow during low flow conditions in the summers. Elsewhere, these high temperatures persist downstream. Logger #10315277 is located one quarter mile downstream of Fisher Pond, well shaded by tree/shrub canopy, yet still recorded summer temperatures as high as 82 degrees. Likewise, logger #10315280, located just above Town Cove in Tisbury Great Pond one quarter mile downstream (also well shaded) of Mill Pond also registered summer temperatures as high as 82 degrees.



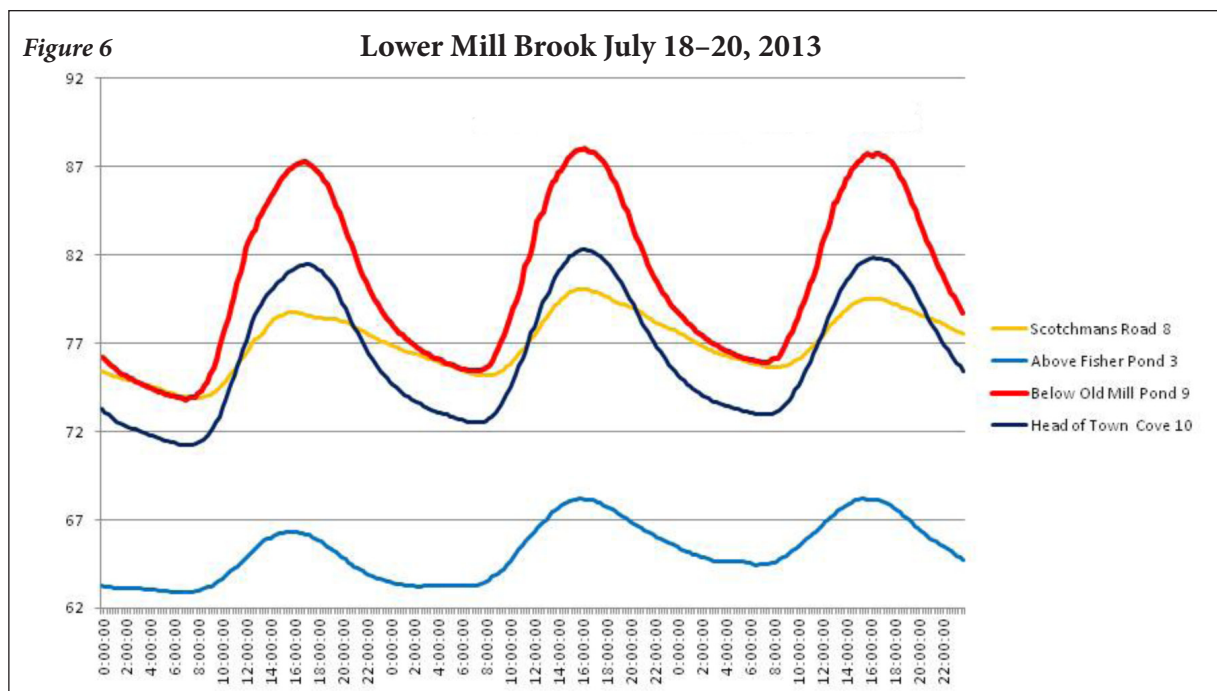
Correlating this temperature data with data from the 2012 electrofishing survey of Mill Brook by Massachusetts Division of Fisheries and Wildlife results in this next graph (Figure 5). While eastern brook trout (EBT) continue to survive and breed (indicated by multiple age classes found in survey) in the cool waters of the upper Mill Brook, the number of brook trout plummeted as we moved downstream and the waters warmed up. During this survey, not a single brook trout was found in lower Mill Brook, though they were found there in some abundance by Nelson Bryant as recently as the 1950s (personal communication, Nelson Bryant). Nelson grew up in West Tisbury one half mile from Mill Brook and has fished the brook for over 80 years. For over 30 years, he wrote a column for the New York Times entitled "Outdoors". Man made impoundments appeared on Mill Brook at different times through our history here. While there are currently seven impoundments totaling 26.53 acres (Chris Seidel, GIS/cartographer



MVC), only three impoundments appear on the 1890 USGS map totaling approximately 11 acres (Mill, Priester's and Crocker Pond). Stream conditions were very different when Dr. Jerome VC Smith visited Martha's Vineyard in 1833. In his book "A History of the Fishes of Massachusetts", he wrote about Mill Brook: "... in no place, however, do we remember to have seen them in such abundance as in Dukes County, upon Martha's Vineyard... it was here in the month of November last, and of course in their spawning time, while returning home from a ramble among the heaths and hills of Chilmark and Tisbury, that crossing the principal brook of the Island, our attention was attracted towards the agitated state of the waters, and never do we recollect so fully to have realized the expression of its being 'alive with fish' as on this occasion."

As evidenced in this final graph (Figure #6), there is a cumulative effect of the impoundments on stream temperature, especially at Mill Pond, the last impoundment before Town Cove. While this graph represents just a snapshot of three days in 2013, it is typical of results over both summer seasons. You can see that by the time Mill Brook reaches Scotchman's Bridge Lane, groundwater springs have only slightly moderated the high water temperatures caused by the upstream impoundments between this location and the cool headwater represented by the blue line. One quarter mile downstream, the 2 acre surface area of Mill Pond raises the water temperature back up to 88 degrees F.

Groundwater and surface springs once again attempt to cool the stream below Mill Pond, but the water temperature is still 82 degrees F when it flows into Town Cove. Water temperatures such as these also impact the anadromous species of Tisbury



Great Pond such as White Perch (*Morone americana*), Rainbow Smelt (*Osmerus mordax*), and River Herring (*Alosa pseudoherengus* and *A. aestivalis*) as well as the catadromous American Eel (*Anguilla rostrata*), all species which migrate up into Mill Brook to spawn.

Mill Brook is listed by the Massachusetts Division of Fisheries and Wildlife as a Coldwater Fisheries Resource. This designation is given to high quality streams capable of supporting native species. According to their website "conservation commissions, planning commissions, land trusts, consultants and town open space commissions may find this information useful for conservation planning". Towards this end, all of the data resulting from this water temperature study has been shared with the relevant town boards/officials in West Tisbury (online at www.westtisbury-ma.gov on the page of the Mill Brook Watershed Management Planning Committee) and Chilmark, and all of the Island's conservation groups.

Sheriff's Meadow Foundation is now working with the Massachusetts Division of Ecological Restoration to improve stream connectivity and habitat at their Roth Woodlands Sanctuary on Old Farm Road in Chilmark. They plan to replace the two existing undersized and perched 12" culverts with a larger box culvert that will allow fish and wildlife passage and restore stream flow at this location. Quoted in an article in the Martha's Vineyard Times, 9/3/14, executive director Adam Moore said "We want to be the best possible stewards of the section of Mill Brook that we own."

We hope that this water temperature data will continue to inform future management decisions within the Mill Brook corridor which will impact Mill Brook.