

# Work Summary Document

## Volunteer Water Temperature Monitoring

### EPA-Equipment Loan

#### -2009-

#### **Synopsis:**

From May 2009 through October 2009 eighteen EPA loaners and thirteen TU owned Hobo Water Temp Pro (Onset Computer Corporation, Bourne, Mass. <http://www.onsetcomp.com>) temperature probes were deployed (Figure 1).

The purpose of the deployments was to obtain water temperature data during the summer months. This data then could be used to complement ongoing watershed efforts to protect/restore aquatic habitat.

Summer 2009 was considered to be cooler and much wetter than normal. Both June and July were much cooler than normal with daily high temperatures rarely exceeding historic average and many low values below normal. Specifically July 13-14, 2009 tallied record low temperatures. In addition rainfall was abundant with 6.27 inches total for June and 11.17 for July (historic average around 4 inches each month). The season's warmest temperatures were all in April, with only a couple of 90 degree temperatures in August (Figure 2). There were no prolonged heat waves throughout the summer.

Three organizations, The Farmington River Watershed Association (FRWA), The Nature Conservancy at Devils Den (TNC), and Trout Unlimited-Candlewood Valley Chapter (TU) cooperated with this project. The probes were supplied to DEP as part of a volunteer monitoring equipment loan program sponsored by the US EPA. Probes were deployed sites selected by the volunteer organization in late April and retrieved in Mid October. Each of the HOBO water temperature probes were programmed to record water temperature once an hour from 6/1/09 to 9/30/09 for a total of 2928 data points for each probe. The probes were returned to DEP where data were off loaded and appended into the ambient monitoring database. Temperature data for all locations are evaluated from 6/1/09 to 9/30/09 so to capture warmest stream conditions.

Data are presented by cooperating organization, FRWA (pp. 3-5), TNC (pp. 6-8), and finally TU (pp. 9-13). Within each section probe deployment location is presented in both a table and graphic. Summary data include box plot of all data by station id and deployment year, scatter plot of 2009 daily maximum temperature by station id, and a table of summary statistics by station and 2009 summer month.

Upper lethal temperature values for brook trout and brown trout are 22 and 25 degrees respectively. Data from each location are reviewed against these thresholds in Table 5.

Thank you Alisa Griggs (FRWA), Sally Harold (TNC) and Joe Hovious (TU) for taking the lead in deployment and retrieval of these temperature probes. Thank you to US EPA Region 1 for loan of the equipment. CT DEP looks forward to obtaining additional water temperature data in summer 2010.

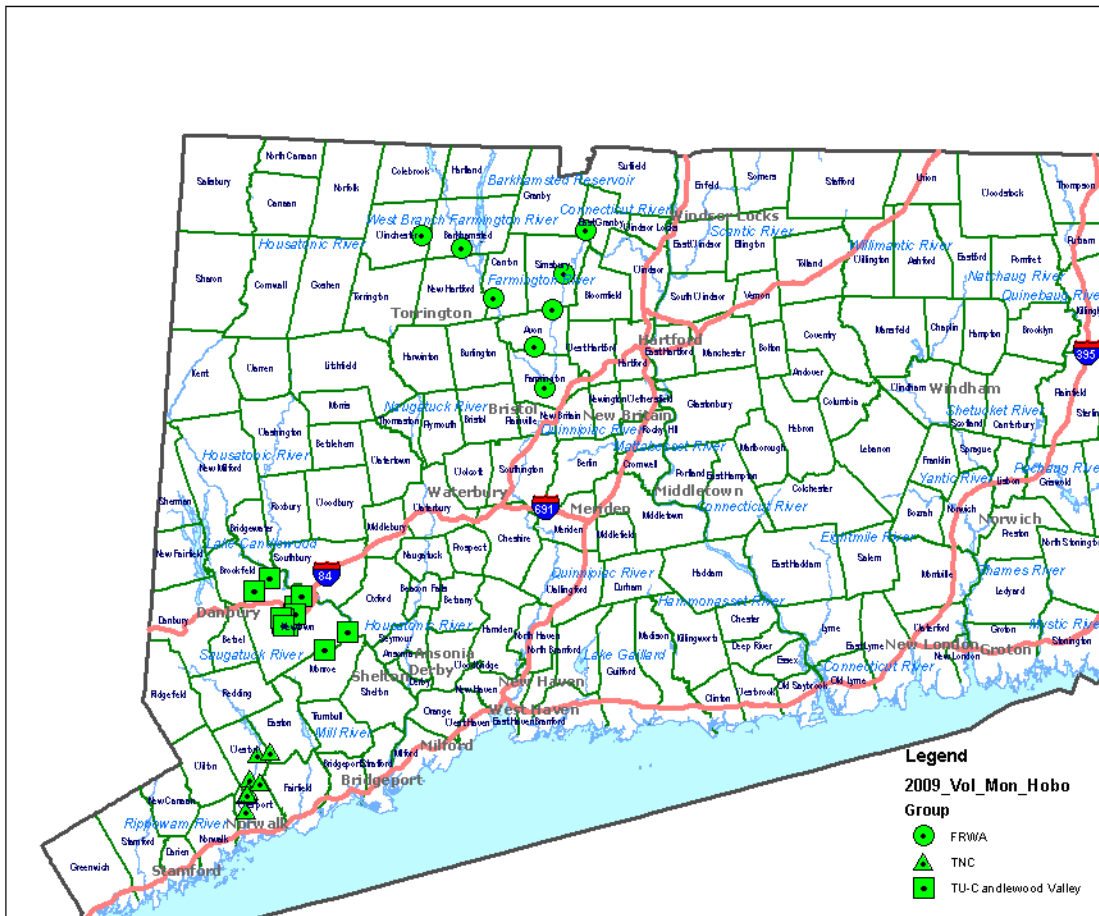


Figure 1. Location of 31 hobo water temperature probe deployments (summer 2009) as part of the EPA volunteer monitoring equipment loan program.

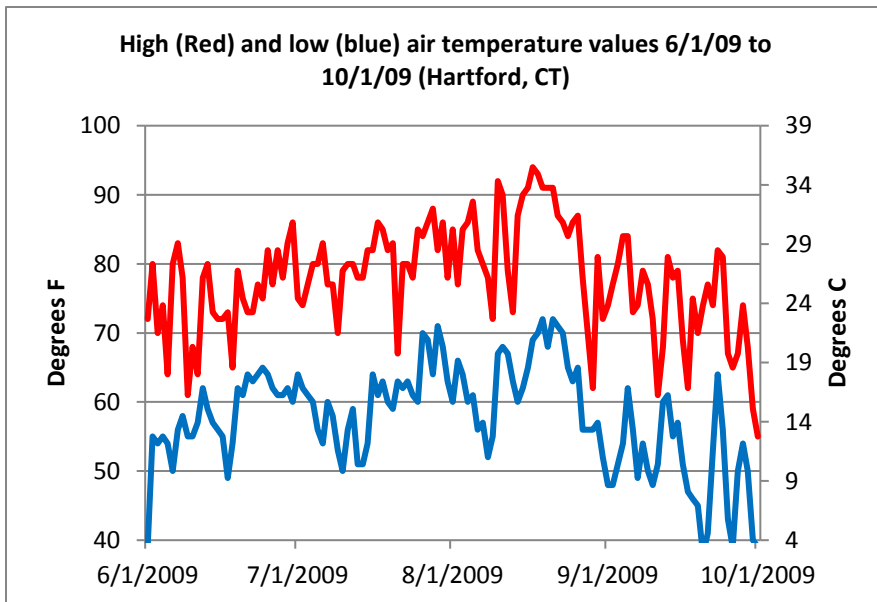


Figure 2. Daily high and low air temperatures for Hartford, CT 6/1/09-10/1/09 (source <http://www.wunderground.com/>)

Table 1. Location of HOB0 deployment by Farmington River Watershed Association during summer 2009. Note 2 probes, one in Salmon Brook and one in the Pequabuck River, were not recovered.

Sample ID	Station ID	Stream	proximity	landmark	Basin id	Municipality	YLat	XLong
15844	1739	Mad River	at	mouth	4302	Winchester	41.91879	-73.0582
15845	408	Morgan Brook	at	mouth	4305	Barkhamsted	41.90177	-72.9889
15846	1513	Cherry Brook	US	Route 44	4309	Canton	41.8365	-72.9295
15848	1130	Thompson Brook	75 m DS	Thompson Rd.	4316	Avon	41.77167	-72.8564
15849	1244	Nod Brook	US	Footbridge and Pond in Nod Brook FCA	4317	Avon	41.81971	-72.8245
15850	5949	Hop Brook	at	Route 10	4318	Simsbury	41.86859	-72.8061
LOST	2450	Salmon Brook	DS	Floydville Rd Bridge	4320	East Granby	41.92556	-72.7671
LOST	1974	Pequabuck River	at	Meadow Road	4315	Farmington	41.71652	-72.8399

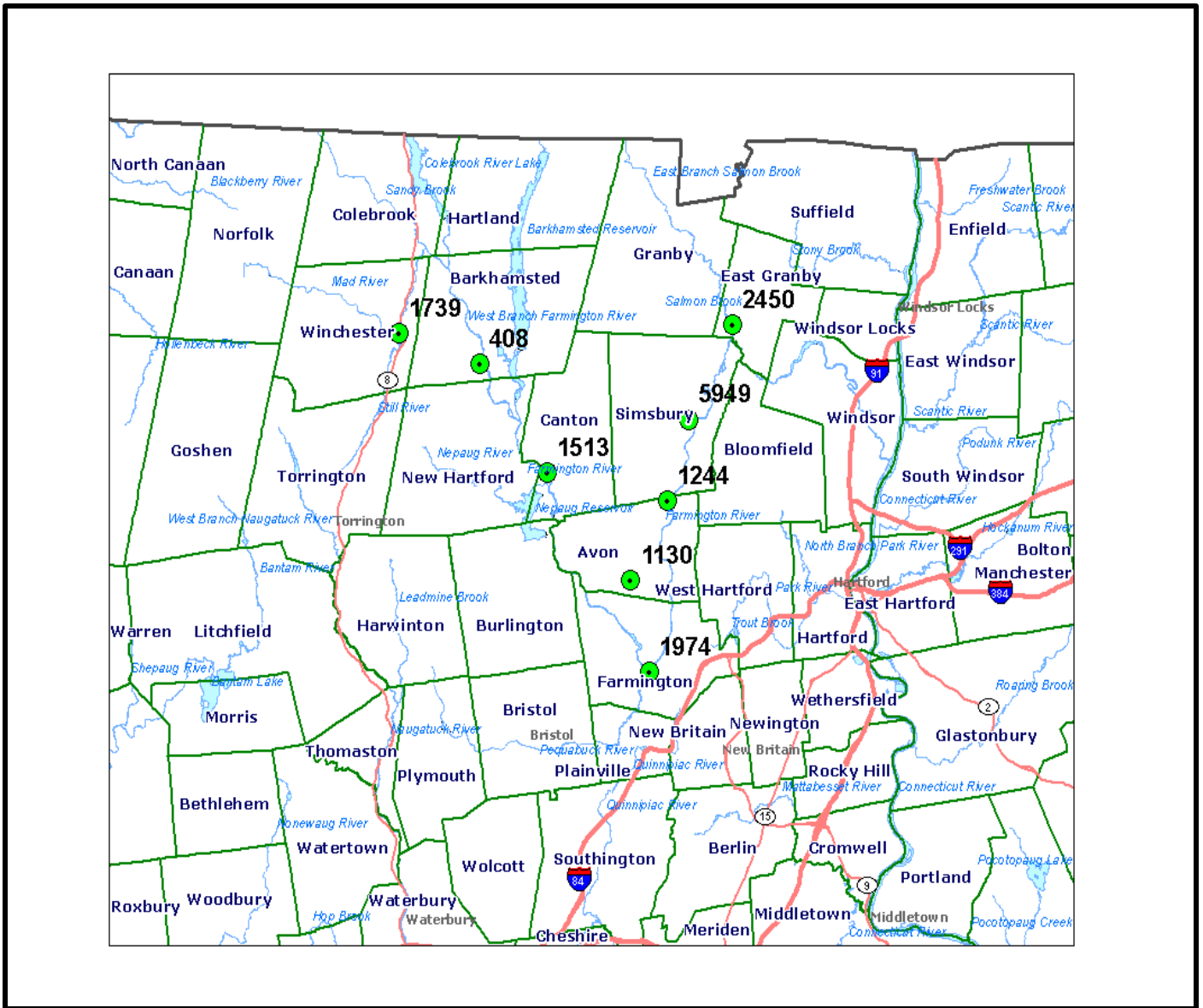


Figure 3. Location of HOB0 deployment by Farmington River Watershed Association during summer 2009. The number adjacent to the dot is the station id in Table 1 above.

Table 2. Summary statistics for each of the **FRWA locations** with a HOBO water temp pro. The hourly data are summarized between 6/1/09 and 9/30/09. Data are water temperature in Degrees C. Note 2 probes, one in Salmon Brook and one in the Pequabuck River, were not recovered.

<b>Stream</b>	<b>landmark</b>	<b>station id</b>	<b>month</b>	<b>Avg</b>	<b>Max</b>	<b>Min</b>	<b>avg max</b>	<b>Avg min</b>	<b>Max of Min</b>
<b>Cherry Brook</b>	<b>Route 44</b>	1513	June	15.5	19.6	11.1	16.6	14.6	16.5
			July	17.6	21.0	13.7	18.9	16.5	19.3
			August	18.9	22.5	15.2	20.1	17.9	20.9
			September	14.9	18.2	11.0	15.9	13.9	16.6
<b>Hop Brook</b>	<b>Route 10</b>	5949	June	16.5	20.3	12.8	17.6	15.6	17.8
			July	18.6	22.2	15.0	19.7	17.5	19.9
			August	19.5	23.5	15.5	20.7	18.5	21.2
			September	15.5	19.0	12.4	16.5	14.7	16.9
<b>Mad River</b>	<b>Mouth and Old Route 8 crossing</b>	158	June	17.6	21.4	13.0	18.9	16.5	19.0
			July	20.0	23.0	17.0	21.2	18.9	21.7
			August	21.3	25.9	17.1	22.6	20.1	22.7
			September	16.7	21.8	11.8	18.4	15.2	18.1
<b>Morgan Brook</b>	<b>mouth</b>	408	June	15.9	19.3	11.6	17.0	15.0	17.2
			July	18.2	22.1	14.6	19.2	17.2	19.9
			August	19.3	23.4	15.8	20.4	18.4	21.3
			September	14.9	19.0	10.7	16.1	13.8	16.4
<b>Nod Brook</b>	<b>Footbridge and Pond in Nod Brook FCA</b>	1244	June	17.8	22.7	13.9	19.1	16.7	19.4
			July	19.8	24.0	16.2	21.3	18.6	21.4
			August	20.5	24.5	15.9	21.8	19.5	22.4
			September	16.1	19.6	12.6	17.0	15.3	18.2
<b>Thompson Brook</b>	<b>Thompson Rd.</b>	1130	June	16.3	21.3	13.4	17.7	15.2	17.2
			July	18.0	21.8	14.7	19.7	16.8	19.1
			August	18.5	22.4	15.1	20.0	17.3	19.5
			September	15.4	19.1	12.3	16.6	14.4	16.3

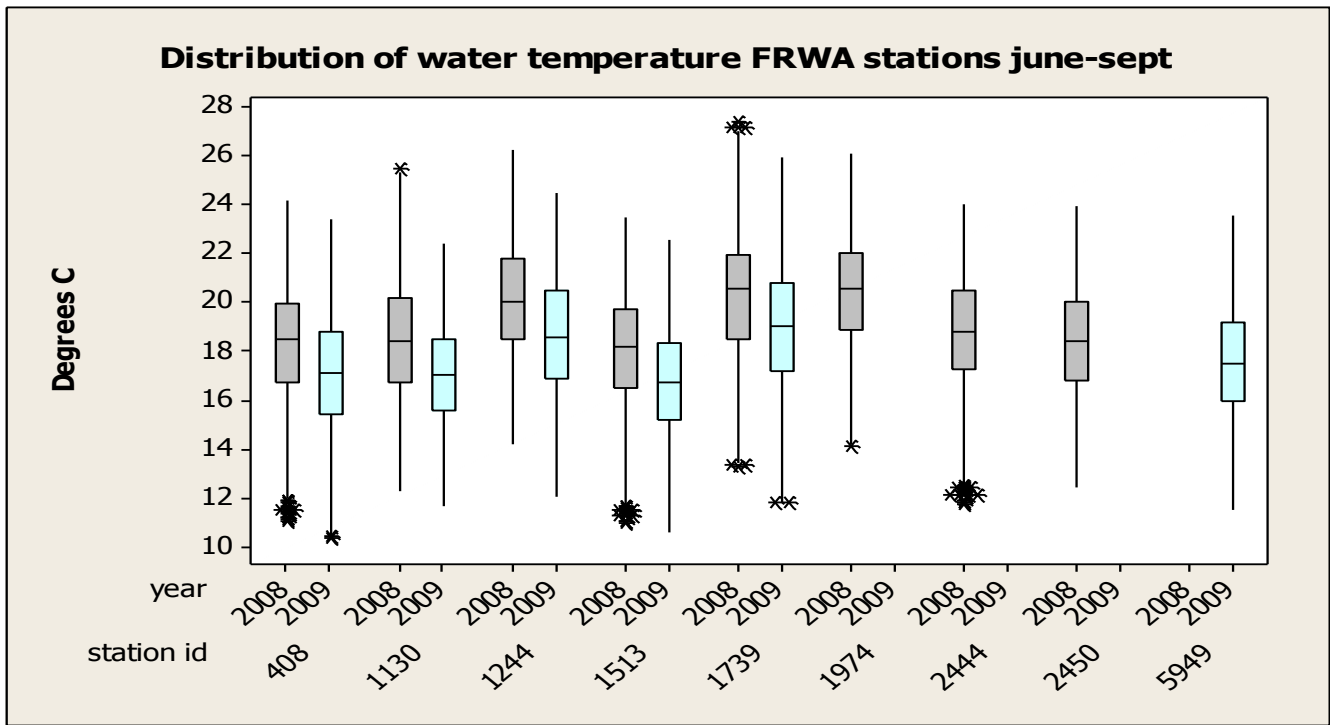


Figure 4. Box plot of water temperature data 2008 (gray) and 2009 (light blue) from stations within the **Farmington River Watershed**. Water temperatures at all sites were much cooler than 2008. The warmest site appears to be 1739 = Mad River at the Mouth in Winchester, CT. The coolest appears to be 1513 = Cherry Brook at the Mouth in Canton, CT. Note 2 probes, one in Salmon Brook and one in the Pequabuck River, were not recovered.

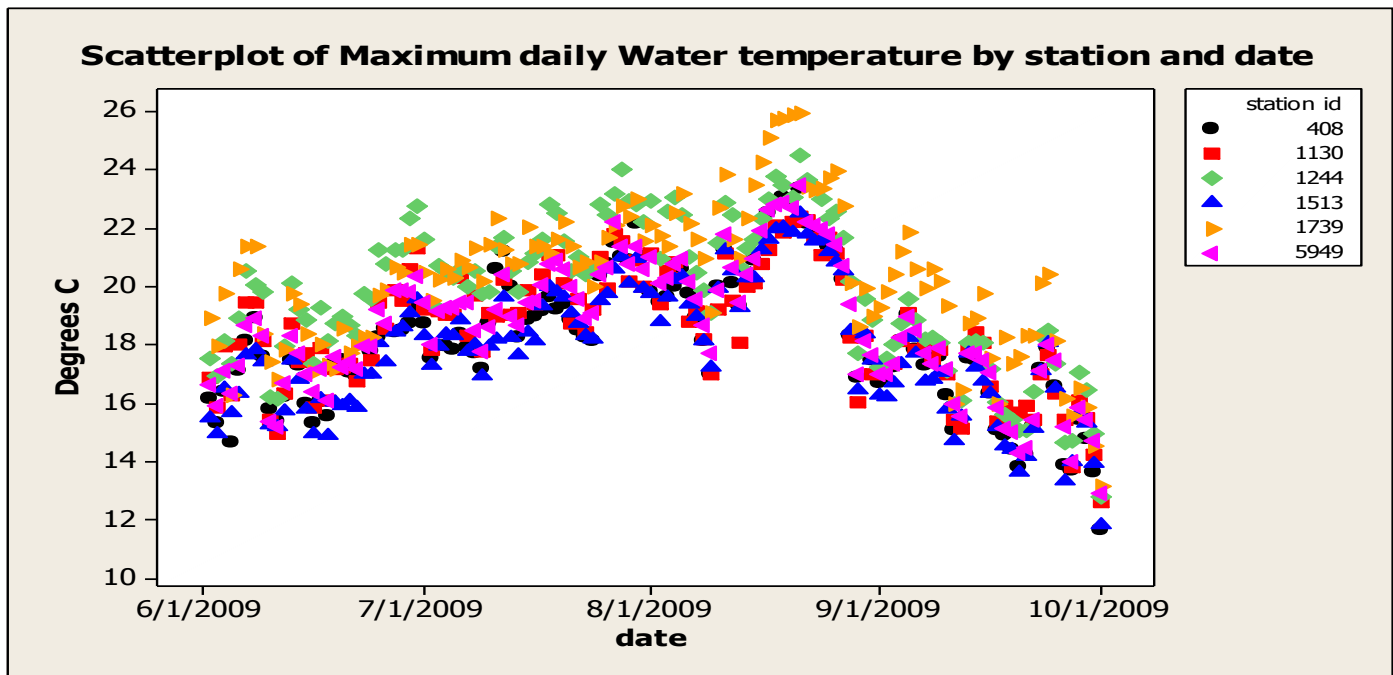


Figure 5. Daily maximum water temperatures for stations within the **Farmington River Watershed** during 2009. The Warmest stations appear to be 1244 (Nod Brook in Avon) and 1739 (Mad River at the mouth in Winchester). The coolest stations appear to be 1513 (Cherry Brook at the mouth in Canton) and 408 (Morgan Brook at the mouth in Barkhamsted). All of the streams show patterns following maximum and minimum air temperatures for the same period of time. An interesting feature on the plot is the rapid increase and decrease in late August. Note 2 probes, one in Salmon Brook and one in the Pequabuck River, were not recovered.

Table 3. Location of HOBO deployment by **The Nature Conservancy-Devils Den Preserve** during summer 2009.

Sample ID	Station ID	Stream name	proximity	landmark	Basin id	Municipality	YLat	XLong
15858	1304	Aspetuck River	at	Wells Hill Road	7202	Easton	41.22871	-73.3241
15857	1	Aspetuck River	US	Bayberry Lane	7202	Fairfield	41.18643	-73.3429
15856	1294	Saugatuck River	at	Keene Park Parking Lot	7200	Weston	41.19267	-73.3617
15855	1293	Saugatuck River	at	Weston Road past Lyons Plain Road	7200	Weston	41.1756	-73.3619
15853	320	Saugatuck River	at	DS end of Fly Fishing Only Area (1 Ford Rd)	7200	Westport	41.16932	-73.367
15852	2688	Saugatuck River	at	Wood Dam off Bolton Lane	7200	Westport	41.1495	-73.3661
15859	318	Saugatuck River	DS	Davis Hill Road	7200	Weston	41.22454	-73.3469
15854	1288	West Branch Saugatuck River	at mouth	Glendenning Parking Lot	7203	Westport	41.17179	-73.3643

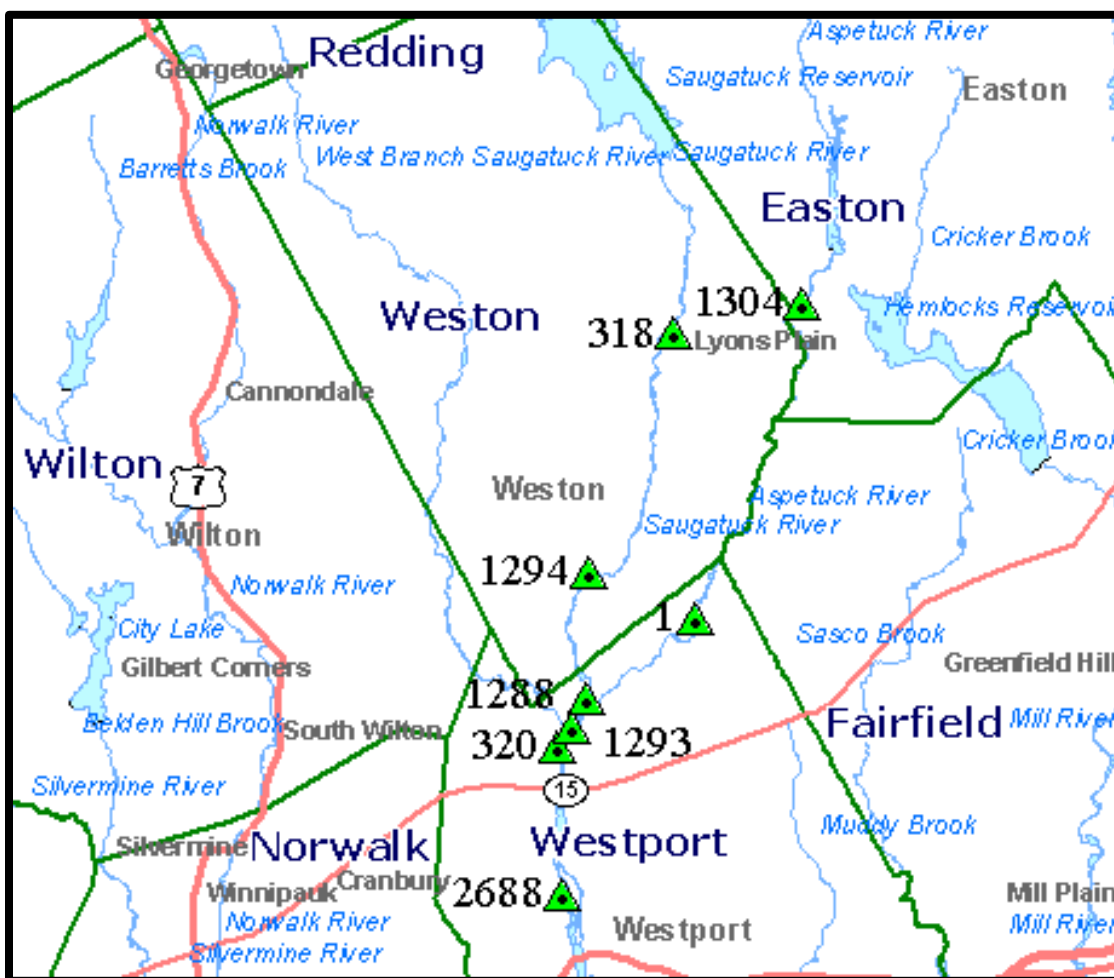


Figure 6. Location of HOBO deployment by **The Nature Conservancy-Devils Den Preserve** during summer 2009. The number adjacent to the dot is the station id in Table 2 above.

Table 4. Summary statistics for each of the **Nature Conservancy-Devils Den Preserve** locations with a HOBO water temp pro. The hourly data are summarized between 6/1/09 and 9/30/09. Data are water temperature in Degrees C.

Stream	landmark	station id	month	Avg	Max	Min	avg max	Avg min	Max of Min
<b>Aspetuck River</b>	<b>Bayberry Lane</b>	1	June	16.6	20.8	14.1	17.5	15.9	19.1
			July	20.5	24.5	17.4	21.5	19.7	23.2
			August	22.5	26.0	19.1	23.3	21.9	24.4
			September	17.7	20.8	13.9	18.6	17.0	19.2
	<b>Wells Hill Road</b>	1304	June	15.8	20.5	11.5	17.1	14.7	17.4
			July	19.9	24.4	15.7	21.4	18.6	22.8
			August	21.3	24.7	17.2	22.5	20.4	23.3
			September	17.9	23.5	14.1	19.1	16.9	19.9
<b>Saugatuck River</b>	<b>Davis Hill Road</b>	318	June	16.6	22.4	11.3	17.5	15.8	20.4
			July	18.2	23.9	13.8	19.4	17.1	21.7
			August	18.9	25.6	15.7	19.9	18.0	23.6
			September	16.0	17.7	13.9	16.7	15.2	16.8
	<b>DS end of Fly Fishing Only Area (1 Ford Rd)</b>	320	June	17.2	21.3	14.6	17.9	16.5	19.2
			July	19.9	23.8	16.5	20.8	19.1	22.0
			August	21.4	24.6	18.0	22.2	20.7	22.5
			September	17.1	19.9	13.6	17.9	16.3	18.2
	<b>Keene Park Parking Lot</b>	1294	June	17.2	21.7	13.5	17.9	16.5	20.1
			July	19.1	23.2	15.8	20.0	18.3	21.8
			August	20.3	25.0	16.7	21.1	19.7	23.2
			September	16.4	19.0	13.4	17.2	15.7	17.7
	<b>Weston Road past Lyons Plain Road</b>	1293	June	17.4	21.7	13.8	18.2	16.6	20.1
			July	19.5	23.5	15.9	20.5	18.6	21.8
			August	20.9	24.8	17.0	21.8	20.2	22.8
			September	16.7	19.3	13.4	17.5	16.0	17.7
	<b>Wood Dam off Bolton Lane</b>	2688	June	17.8	21.5	15.3	18.5	17.2	19.7
			July	21.2	24.9	18.0	22.2	20.3	23.3
			August	22.9	26.8	18.9	23.8	22.2	25.2
			September	18.5	21.2	16.0	19.3	17.9	19.6
<b>West Branch Saugatuck River</b>	<b>Glendenning Parking Lot</b>	1288	June	17.1	20.7	14.8	17.9	16.6	18.7
			July	20.2	23.6	16.9	21.1	19.5	22.4
			August	21.7	25.0	18.7	22.5	21.1	24.1

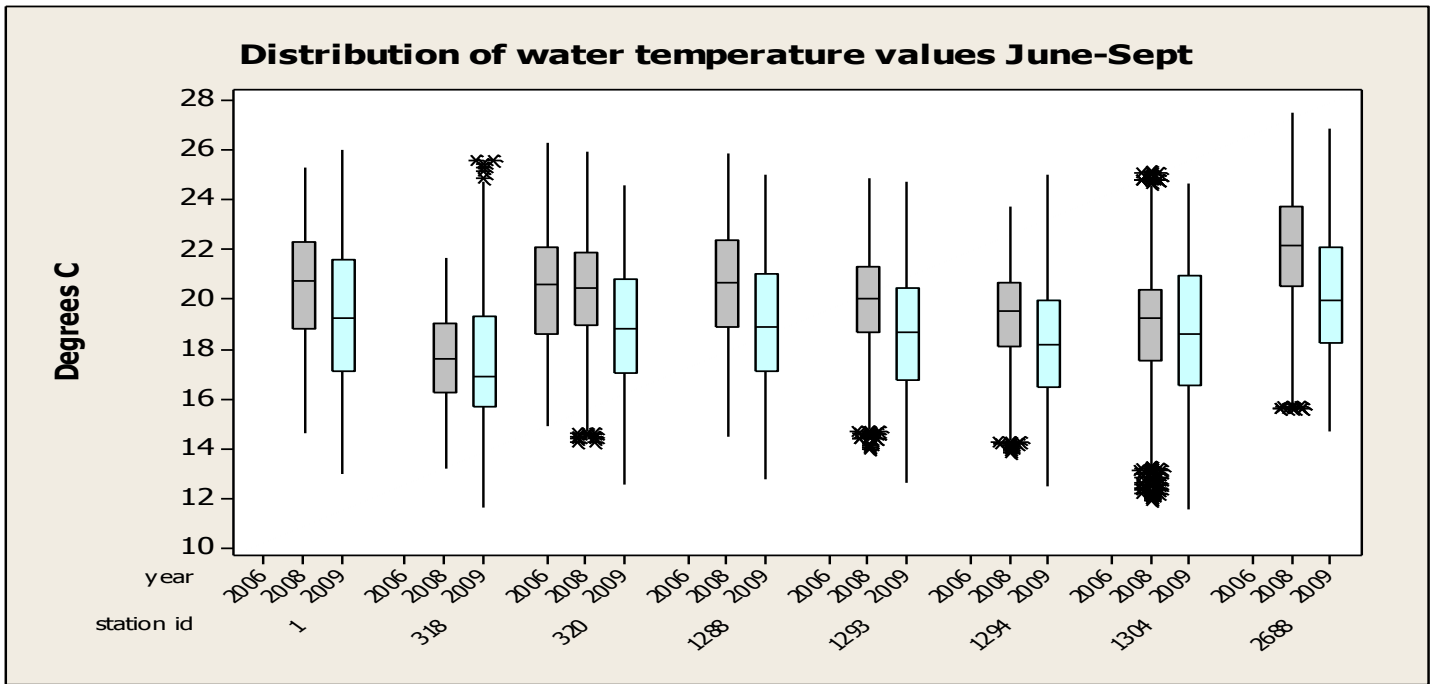


Figure 7. Box plot of water temperature data 2008 (gray) and 2009 (light blue) from stations within the **Saugatuck River Watershed**. Water temperatures at all sites were much cooler than 2008. The warmest site appears to be 2688 = Saugatuck River at the head of tide in Westport, CT. The coolest appears to be 318 = Saugatuck River Davis Hill Road in Weston, CT. This is directly related to hypolimnetic withdrawal from Saugatuck Reservoir.

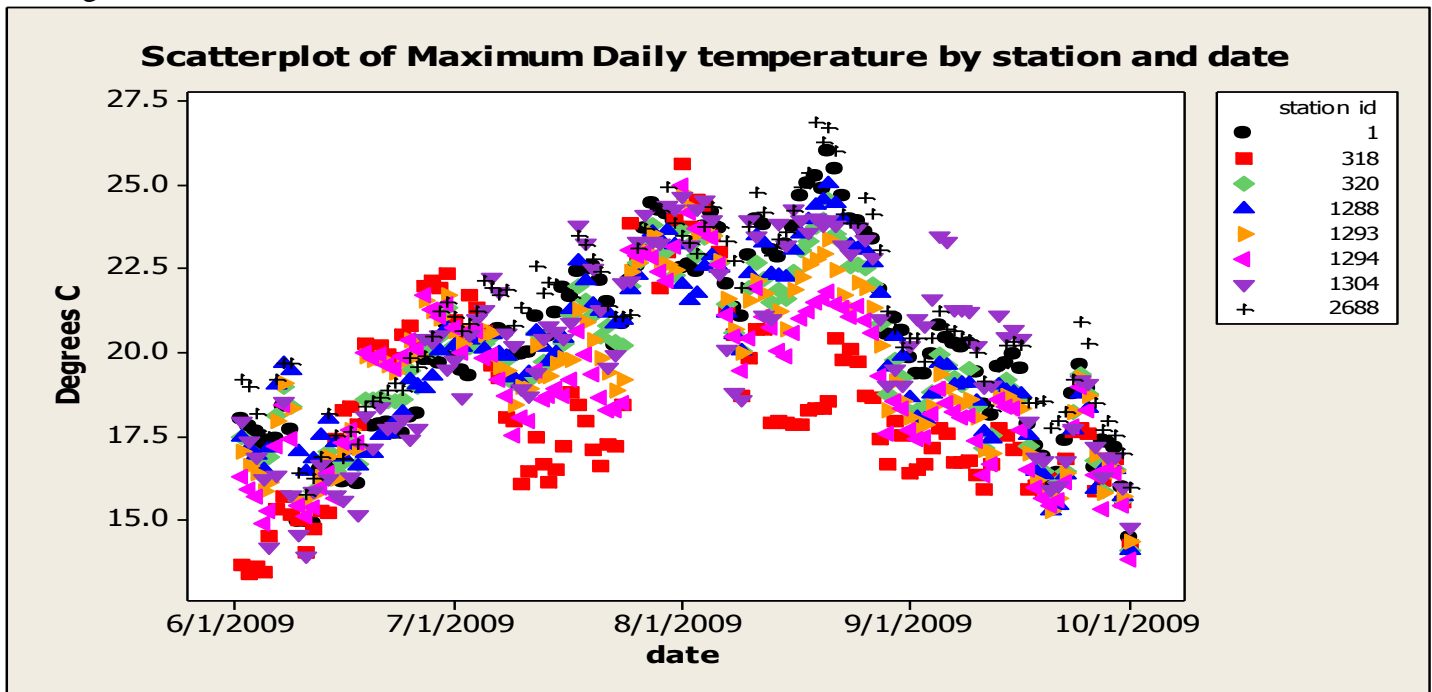


Figure 8. Box plot of water temperature data 2008 (gray) and 2009 (light blue) for stations within the **Saugatuck River Watershed**. The Warmest station appears to be 2688 (Saugatuck River at the head of tide in Westport). The coolest stations appear to be 318 (Saugatuck River at Davis Hill Road, Weston). All of the streams show patterns following maximum and minimum air temperatures for the same period of time except for 318 (Saugatuck River at Davis Hill Road, Weston due to Hypolimnetic withdrawal). The daily maximum



temperatures in late July are not consistent with air temperatures. A break in the hypolimnetic withdrawal appears to have occurred in August.

Table 5. Location of HOBO deployment by **Trout Unlimited-Candlewood Valley Chapter** during summer 2009.

Sample ID	Station ID	Stream name	proximity	landmark	Basin id	Municipality	YLat	XLong
15891	2765	Country Club Brook	30 feet DS	Hawley Road Pond Dam	6019-03-1	Newtown	41.40514	-73.3025
15892	2764	Country Club Brook	US	Route 302	6019-03-1	Newtown	41.40824	-73.3059
15894	1994	Deep Brook	at	Deep Brook Road	6019	Newtown	41.4007	-73.3034
15893	2473	Deep Brook	upstream	Bushy Hill Road in Dickenson park	6019	Newtown	41.3976	-73.3006
15890	2280	Deep Brook	upstream	Route 25	6019	Newtown	41.3977411	-73.2945784
15889	1993	Deep Brook	DS	Old bridge crossing	6019	Newtown	41.4022934	-73.2946709
14098	47	Deep Brook	Near	Mouth	6019	Newtown	41.4131278	73.2823028
14102	1791	Tributary to Deep Brook	At	Mouth	6019	Newtown	41.4069722	-73.2881944
14166	2278	Pootatuck River	at	Sandy Hook Center	6020	Newtown	41.4222305	-73.2820308
15895	2279	Pootatuck River	upstream	Confluence with Deep Brook (adjacent to Ag fields)	6020	Newtown	41.4123666	-73.2816845
15898	2761	Pootatuck River	at	Walnut Tree Hill Road (mouth)	6020	Newtown	41.43755	-73.2702
15900	2766	Pond Brook	300 meters DS	Intersection of Pond Brook Rd and Obtuse Rd	6018-00-3-R3	Newtown	41.44325	-73.3545
LOST	1523	Pond Brook	at	Bridge at State Boat Launch	6018	Newtown	41.45969	-73.3275
15901	2267	Halfway River	DS	Route 34 adjacent to Old Bridge Road	6022	Newtown	41.38869	-73.1885
15902	2763	Halfway River	at	High Rock Road	6022	Newtown	41.36564	-73.2284

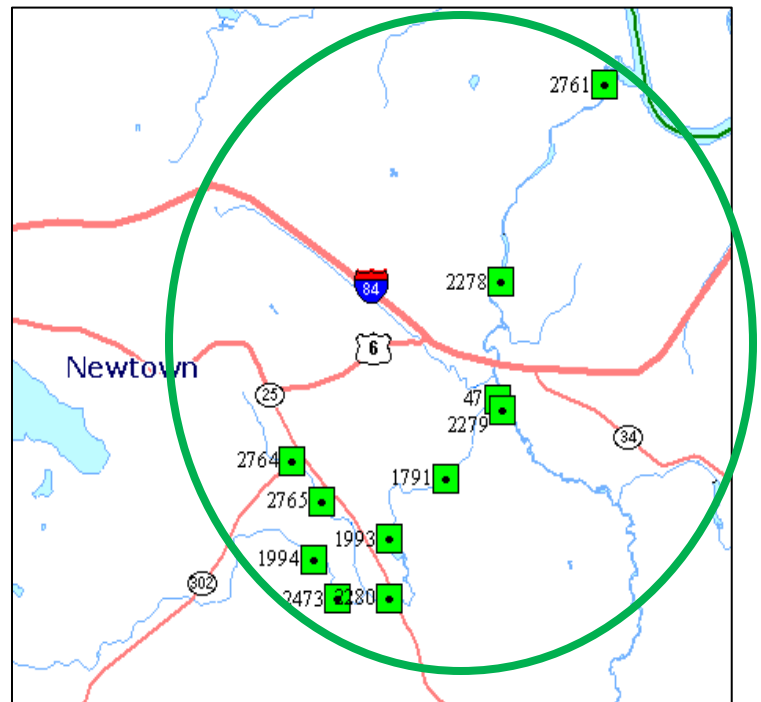
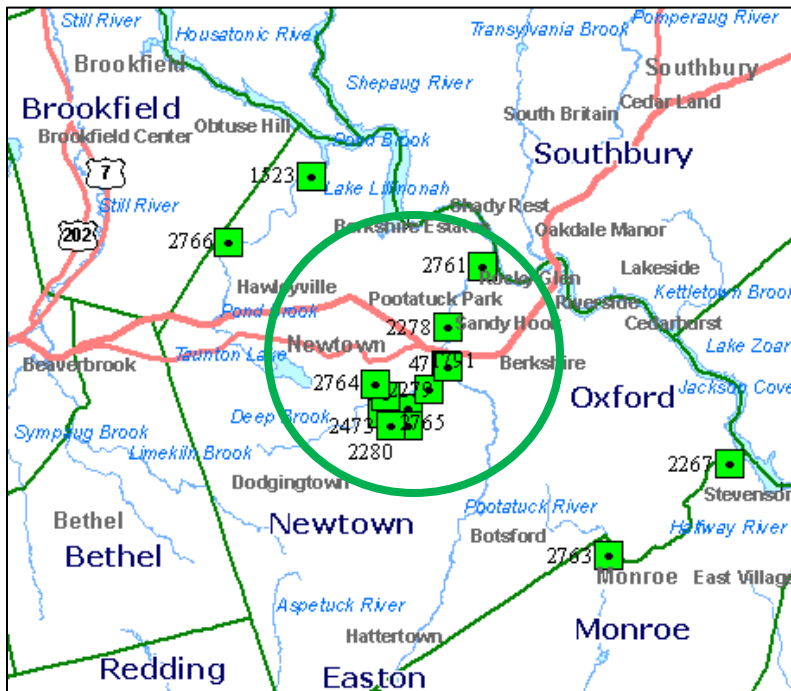


Figure 9. Location of HOBO deployment by **Trout Unlimited-Candlewood Valley Chapter** during summer 2009. The number adjacent to the dot is the station id in the Table 3 above.

Table 6. Summary statistics for each of the **Trout Unlimited-Candlewood Valley Chapter** locations with a HOBO water temp pro. The hourly data are summarized between 6/1/09 and 9/30/09. Data are water temperature in Degrees C.

Stream	landmark	station id	month	Avg	Max	Min	avg max	Avg min	Max of Min
<b>Country Club Brook</b>	<b>Hawley Road Pond Dam</b>	2765	June	18.7	25.4	14.9	20.7	17.1	20.6
			July	22.1	27.4	18.2	23.9	20.6	23.8
			August	23.6	28.2	17.8	25.5	22.0	25.4
			September	18.8	23.2	14.7	20.0	17.6	20.2
	<b>Route 302</b>	2764	June	15.1	19.1	10.1	16.4	14.1	15.7
			July	17.2	21.0	13.3	18.6	16.0	18.7
			August	18.5	23.1	14.8	19.7	17.5	20.6
			September	15.2	18.0	11.3	16.3	14.2	16.6
<b>Deep Brook</b>	<b>Bushy Hill Road in Dickenson park</b>	2473	June	16.3	20.4	11.6	17.5	15.2	17.3
			July	18.5	22.6	14.2	19.7	17.3	20.7
			August	19.9	23.7	15.4	21.2	18.7	21.6
			September	15.3	19.3	10.1	16.7	13.9	17.1
	<b>Deep Brook Road</b>	1994	June	16.5	21.2	11.8	18.0	15.3	17.6
			July	18.9	23.1	14.4	20.2	17.6	21.4
			August	20.4	24.9	15.9	21.5	19.3	22.3
			September	15.4	19.3	9.8	16.7	14.0	17.0
	<b>near Pootatuck River</b>	47	June	16.3	19.4	11.9	17.3	15.6	17.7
			July	18.6	22.1	14.6	19.4	17.7	20.8
			August	20.1	24.0	16.0	21.0	19.2	22.1
			September	15.4	18.9	10.3	16.4	14.2	16.9
	<b>old bridge crossing DS Wassermann way</b>	1993	June	16.8	20.8	13.8	17.9	15.9	18.2
			July	19.2	22.8	15.8	20.2	18.3	21.8
			August	20.7	25.1	16.8	21.7	19.9	22.6
			September	16.0	19.2	11.9	16.9	15.1	17.6
	<b>Route 25</b>	2280	June	16.7	21.4	12.1	18.1	15.5	17.6
			July	19.2	23.7	14.8	20.7	17.8	21.2
			August	20.7	26.2	16.3	22.1	19.4	22.3
			September	16.0	19.7	11.4	17.2	14.8	18.0
<b>Halfway River</b>	<b>High Rock Road</b>	2763	June	15.7	19.8	12.2	16.7	14.9	17.1
			July	18.2	22.5	14.6	19.4	17.1	20.3
			August	19.7	22.9	16.0	20.9	18.8	21.2
			September	15.3	18.8	10.9	16.6	14.2	16.4
	<b>Route 34 adjacent to Old Bridge Road</b>	2267	June	15.7	19.2	11.9	16.4	15.2	17.4
			July	18.1	21.5	14.6	18.9	17.3	20.3
			August	19.5	24.8	16.0	20.4	18.9	21.4

			September	14.8	17.4	11.2	15.7	14.1	16.1
<b>Pond Brook</b>	<b>Intersection of Pond Brook Rd and Obtuse Rd</b>	2766	June	17.2	22.1	12.3	18.5	16.1	18.5
			July	19.5	23.7	15.4	20.8	18.1	21.6
			August	20.8	25.1	16.5	22.1	19.7	22.2
			September	15.9	20.2	10.7	17.3	14.6	17.5
<b>Pootatuck River</b>	<b>Confluence with Deep Brook (adjacent to Ag fields)</b>	2279	June	16.8	20.6	12.7	17.6	16.1	18.5
			July	19.0	22.5	15.4	19.8	18.1	21.0
			August	20.1	23.8	16.4	21.2	19.2	21.8
			September	15.4	18.9	11.5	16.6	14.4	16.7
	<b>Sandy Hook Center</b>	2278	June	16.6	20.4	12.5	17.4	15.8	18.2
			July	18.7	22.6	15.1	19.8	17.8	20.8
			August	19.9	24.1	16.3	21.1	19.0	21.9
			September	15.5	19.0	11.3	16.8	14.4	16.8
	<b>Walnut Tree Hill Road (mouth)</b>	2761	June	16.9	21.6	13.1	17.9	16.1	18.7
			July	19.2	23.6	15.7	20.5	18.2	21.2
			August	20.7	24.9	16.9	21.9	19.8	22.7
			September	16.1	19.8	12.5	17.2	15.2	17.5
<b>Tributary to Deep Brook</b>	<b>confluence with Deep Brook</b>	1791	June	14.3	19.3	10.1	15.4	13.5	15.1
			July	15.8	22.1	13.1	17.0	15.0	16.9
			August	17.3	23.8	14.5	18.4	16.5	18.7
			September	15.1	17.3	11.2	16.0	14.2	16.0

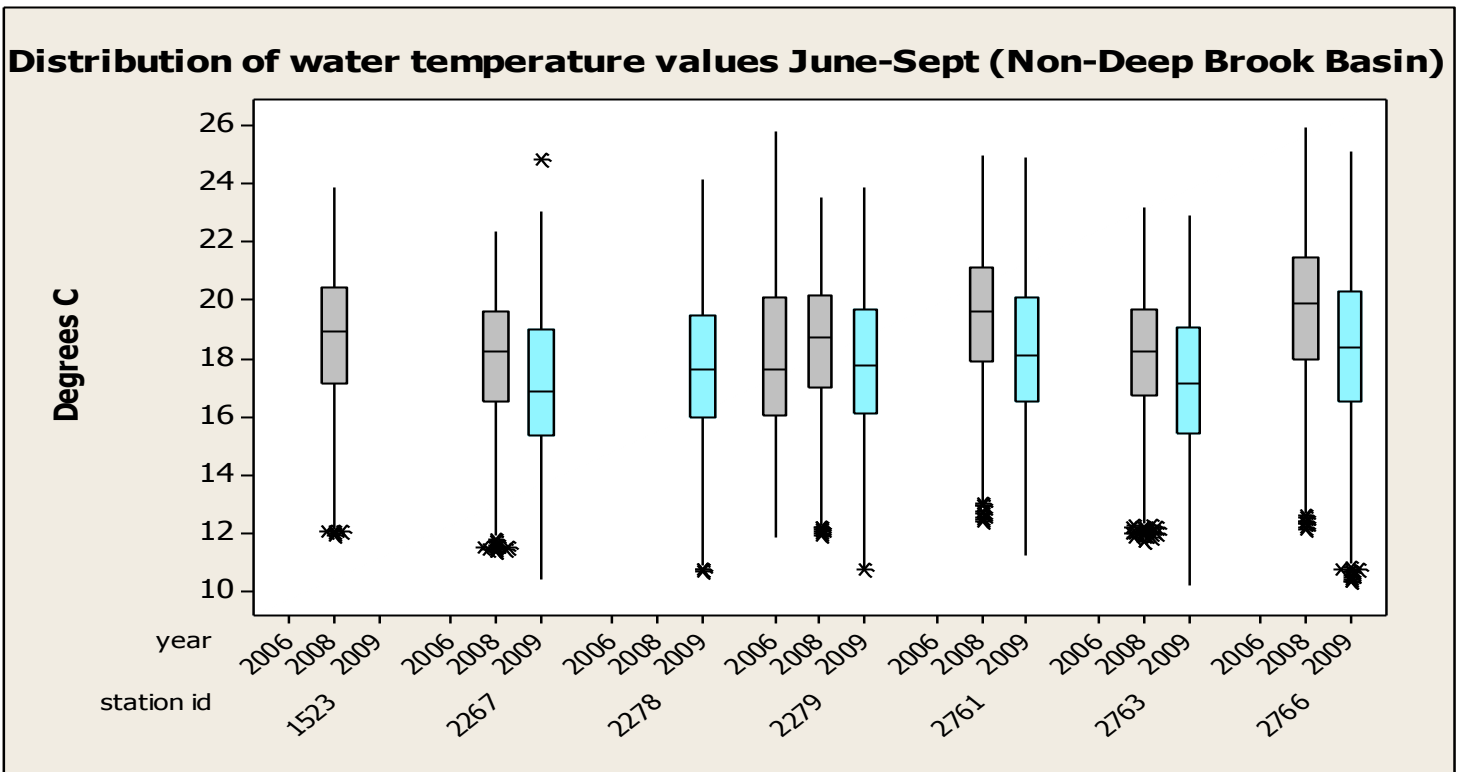
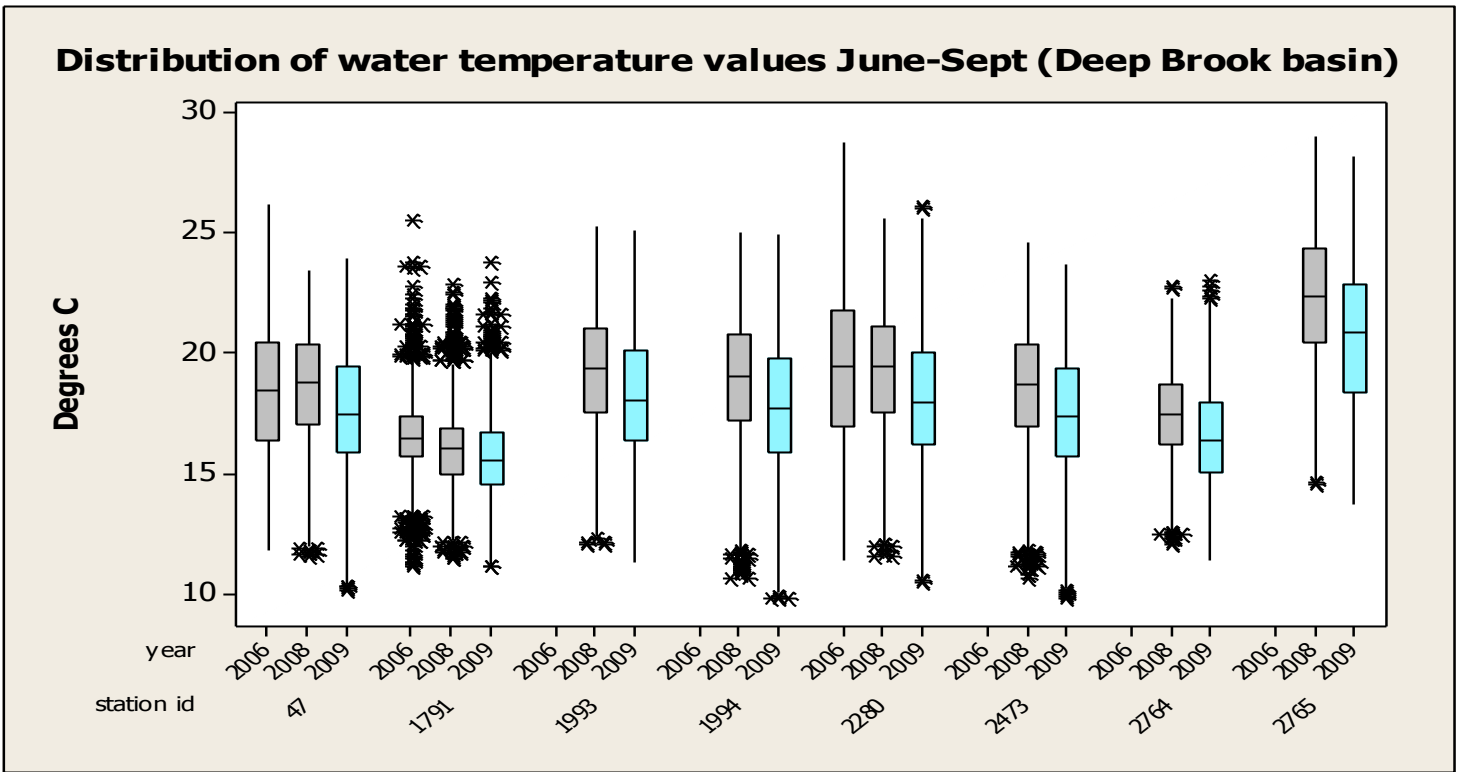


Figure 10 A and B. Box plot of water temperature data 2008 (gray) and 2009 (light blue) for stations within the **Deep Brook Watershed** (Top = A) and stations **not within the Deep Brook Watershed** (Bottom = B). The warmest site appears to be 2765 = Country Club Brook just below Hawley’s Pond in Newtown, CT. The coolest appears to be 2764 = Country Club Brook at Route 302 in Newtown, CT.

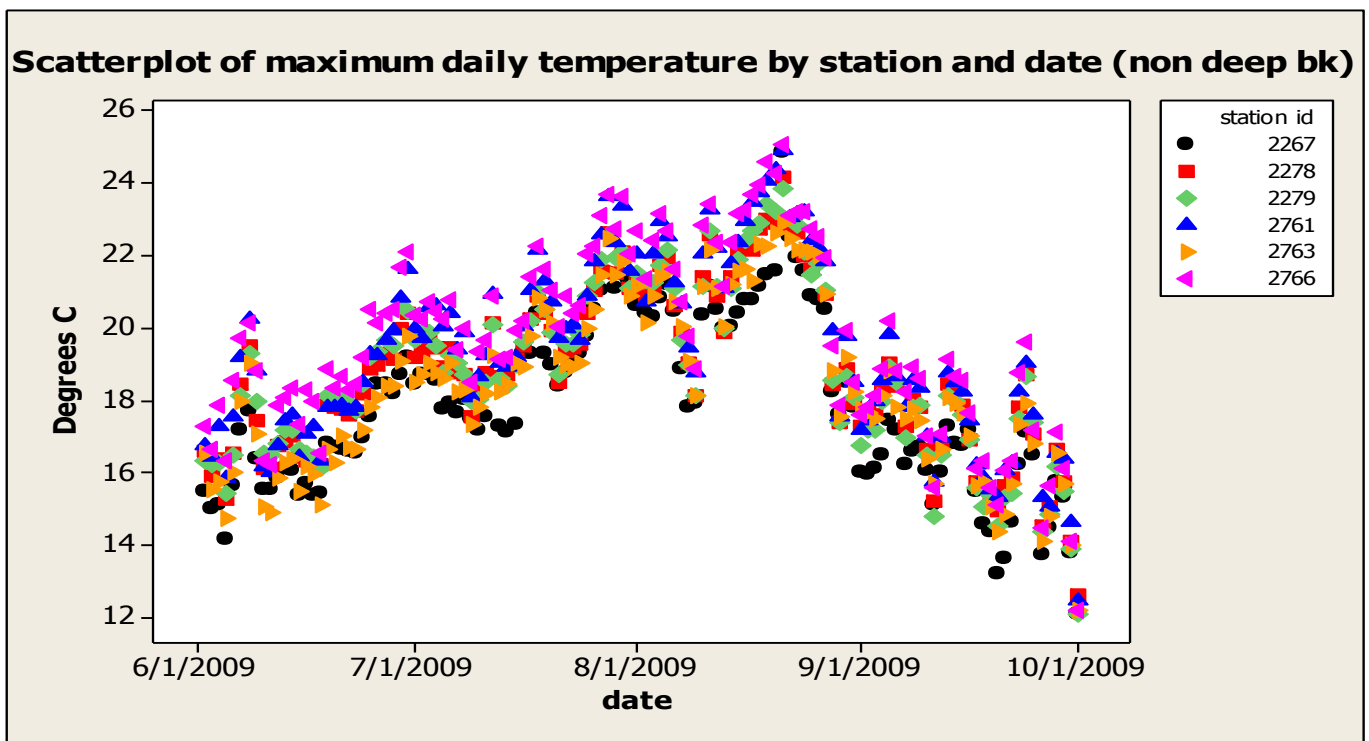
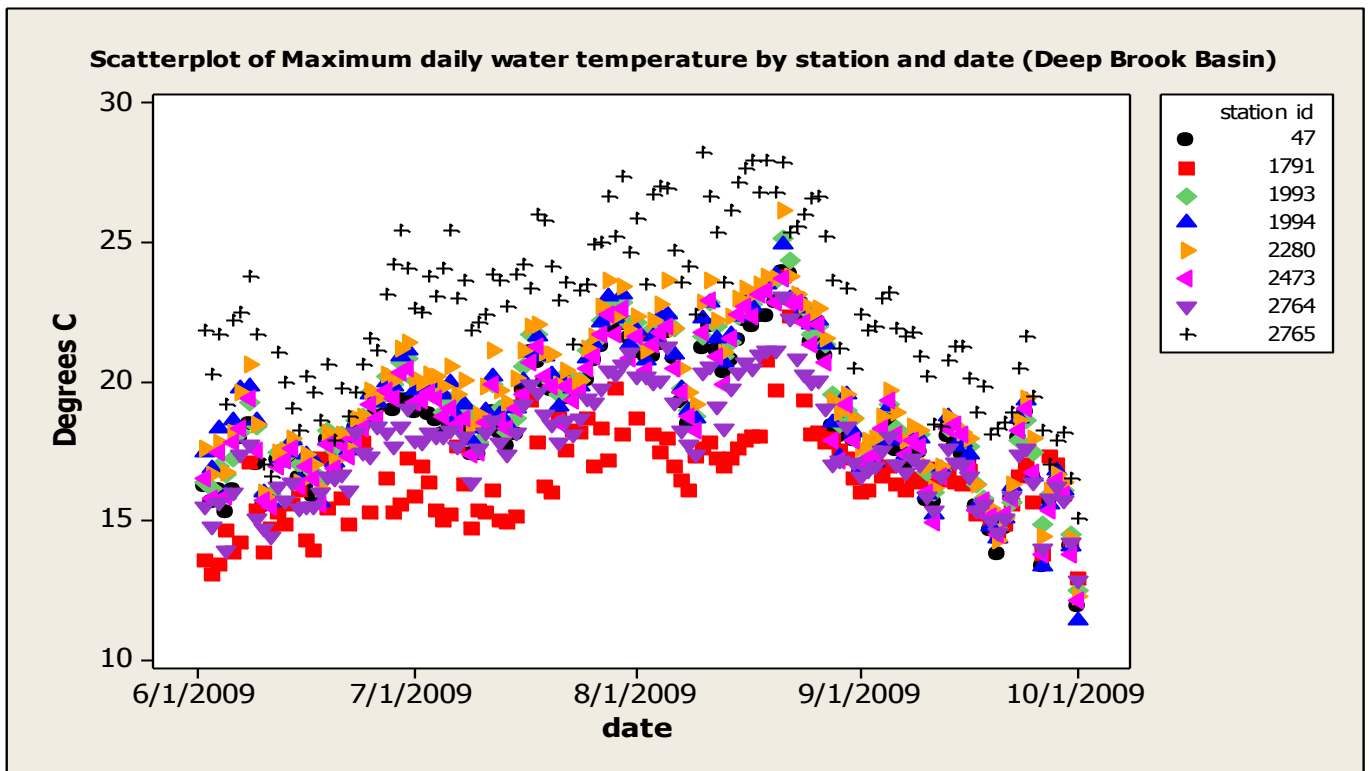


Figure 11 A and B. Daily maximum water temperatures for stations within the Deep Brook Watershed (Top = A) and those not in the **Deep Brook watershed** (Bottom = B). Within the Deep Brook watershed the Warmest station appears to be 2765 (Country Club Brook just below Hawley’s Pond in Newtown). The coolest is station 1791(Tributary to Deep Brook). This location is just below the storm water outlet for the former Fairfield Hill Complex. For the stations **outside the Deep Brook watershed**, the warmest appears to be station 2766 (Pond Brook near Obtuse Road) and 2761 (Pootatuck River at Walnut Tree Road). The coolest are 2267 (Halfway River near Route 34) and 2763 (Halfway River near High Rock Road). The very elevated temperatures at station 2765 reflect the surface warming of Hawley’s Pond, a small-shallow waterbody.

Table 7. Count of hourly observations where the daily minimum temperature was either between 22 and 25 Degrees C or was over 25 Degrees C. The worst locations for trout survival during summer 2009 were stations 1 (Aspetuck River at Bayberry lane in Weston), 1288 (West Branch Saugatuck River at mouth in Weston), 2688 (Saugatuck River at the head of tide in Westport), and 2765 (Country Club Brook below Hawley’s Pond in Newtown).

Stream	station id	landmark	basin id	Municipality	count 22C to 25C	count > 25 C
Aspetuck River	1	Bayberry Lane	7202	Westport	19	
Aspetuck River	1304	Wells Hill Road	7202	Easton	7	
Country Club Brook	2765	Hawley Road Pond Dam	6019	Newtown	18	6
Deep Brook	47	near Pootatuck River	6019	Newtown	1	
Deep Brook	1993	old bridge crossing DS Wasserman way	6019	Newtown	2	
Deep Brook	1994	Deep Brook Road	6019	Newtown	1	
Deep Brook	2280	Route 25	6019	Newtown	1	
Mad River	1739	mouth, behind Dunkin Donuts, US Rte 8	4302	Winchester	4	
Nod Brook	1244	Footbridge and Pond in Nod Brook FCA	4317	Avon	2	
Pond Brook	2766	Intersection of Pond Brook Rd and Obtuse Rd	6018	Newtown	1	
Pootatuck River	2761	Walnut Tree Hill Road (mouth)	6020	Newtown	4	
Saugatuck River	318	Davis Hill Road	7200	Weston	4	
Saugatuck River	320	DS end of Fly Fishing Only Area (1 Ford Rd)	7200	Westport	7	
Saugatuck River	1293	Weston Road past Lyons Plain Road	7200	Westport	5	
Saugatuck River	1294	Keene Park Parking Lot	7200	Weston	5	
Saugatuck River	2688	Wood Dam off Bolton Lane	7200	Westport	21	2
West Branch Saugatuck River	1288	Glendenning Parking Lot	7203	Westport	10	