Potomac River

Rock Creek

Upper Rock Creek

3.2 Olney Oaks Stormwater Pond Retrofit

3.2.1 Introduction

The Olney Oaks pond was retrofitted in 2009 and was originally constructed in 1985. The inline pond was upgraded to handle larger storm events for longer duration in an effort to reduce downstream impacts to the stream. The pond retrofit is located in a forested stream valley on Williamsburg Run to the North Branch of Upper Rock Creek that flows through a residential neighborhood (***Figure 3.2.1***). This is a first year post-restoration monitoring report and presents the stream conditions one year after the retrofit of the Olney Oaks Stormwater Pond.

Subwatershed facts

Subwatershed Drainage Area: 397 acres
Subwatershed Imperviousness: 25 percent

Project Facts

Project Area: The Olney Oaks pond retrofit is located within the North Branch tributary of the Upper Rock Creek watershed. The Olney Oaks pond provides stormwater management for approximately 397 acres that originates near Olney-Laytonsville Road. The original pond was built in 1985 at the time the surrounding neighborhood was constructed.
Costs: Structural ($121,000), Funded in part through the Maryland Department of the Environment.
Completion Date: January 2009
Property Ownership: Private (HOA)

Project Selection

In April 2001, the Rock Creek Watershed Feasibility Study evaluated over 14 miles of stream in the watershed. Twenty-three stream restoration sites were identified and prioritized, based on stream habitat and water quality data. Sites were then further ranked according to criteria such as cost of work needed, access to site, impact on wetlands, reforestation potential, and extent of severe erosion. Olney Oaks was among those sites chosen for restoration.

Pre-Restoration Conditions

The Rock Creek Watershed Feasibility Study identified several impaired conditions in North Branch Rock Creek. Uncontrolled stormwater created severely unstable banks, undercut trees, and damaged private property. Undercut trees fell into the stream and created debris jams that blocked the stream and caused further bank erosion.

Over time, the stream channel has downcut and overwidened, which limits the stream's access to the original floodplain, exposed sewer lines to potential damage, and destroyed habitat necessary for diverse aquatic life. Sediment from eroded banks and road grit has also accumulated in the stream, further degrading stream habitat.

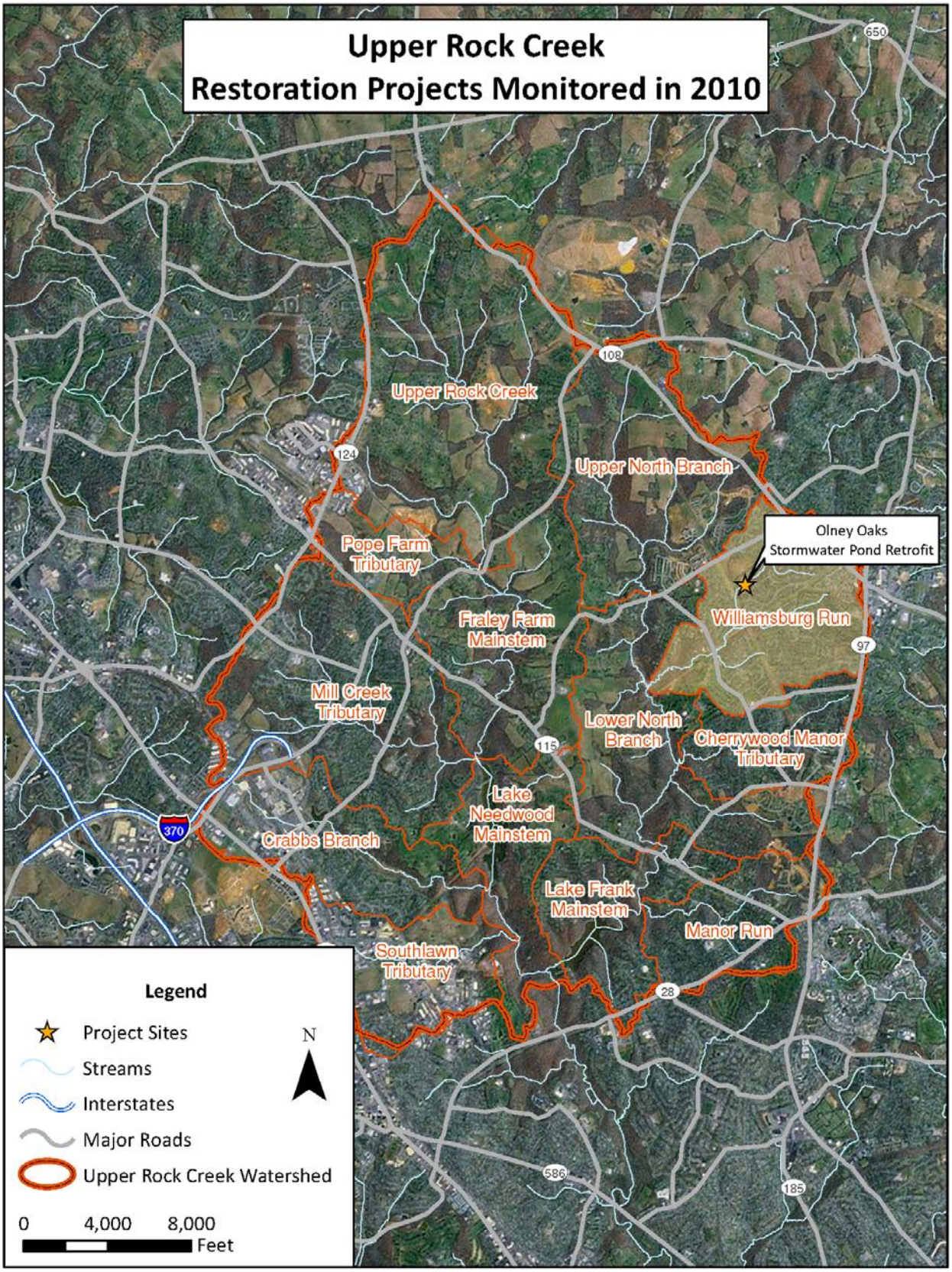

Figure 3.2.1 – Vicinity Map of Olney Oaks Stormwater Retrofit Project

Restoration Actions Taken

In an effort to reduce impacts from a development built with inadequate stormwater control, the County upgraded the Olney Oaks stormwater pond to capture and retain larger storm events (***Figures 3.2.4 – 3.2.5***) for a longer duration to further reduce stream degradation. The retained stormwater is slowly released to the receiving waters within a 24 to 48 hour period of time to reduce peak flows and help reduce streambank erosion. Prior to the retrofit, the facility captured stormwater and released it to the receiving stream within five to eight hours. To accomplish the upgrade, a new riser structure, pipe valve, trash rack, and emergency spillway weir wall were built (***Figure 3.2.2***). The retrofitted inline pond provides treatment of 55 percent of the Channel Protection Volume and provides control for a 2-year storm.

Figure 3.2.2 – Olney Oaks Stormwater Pond Pre-Retrofit (2009)

Figure 3.2.3 – Olney Oaks Stormwater Pond Post-Retrofit (2011)

Figure 3.2.4 – Flooding in the Olney Oaks Stormwater Pond After a Five Inch Storm (2010)

Figure 3.2.5 – Downstream Flow After Five Inch Storm (2010)

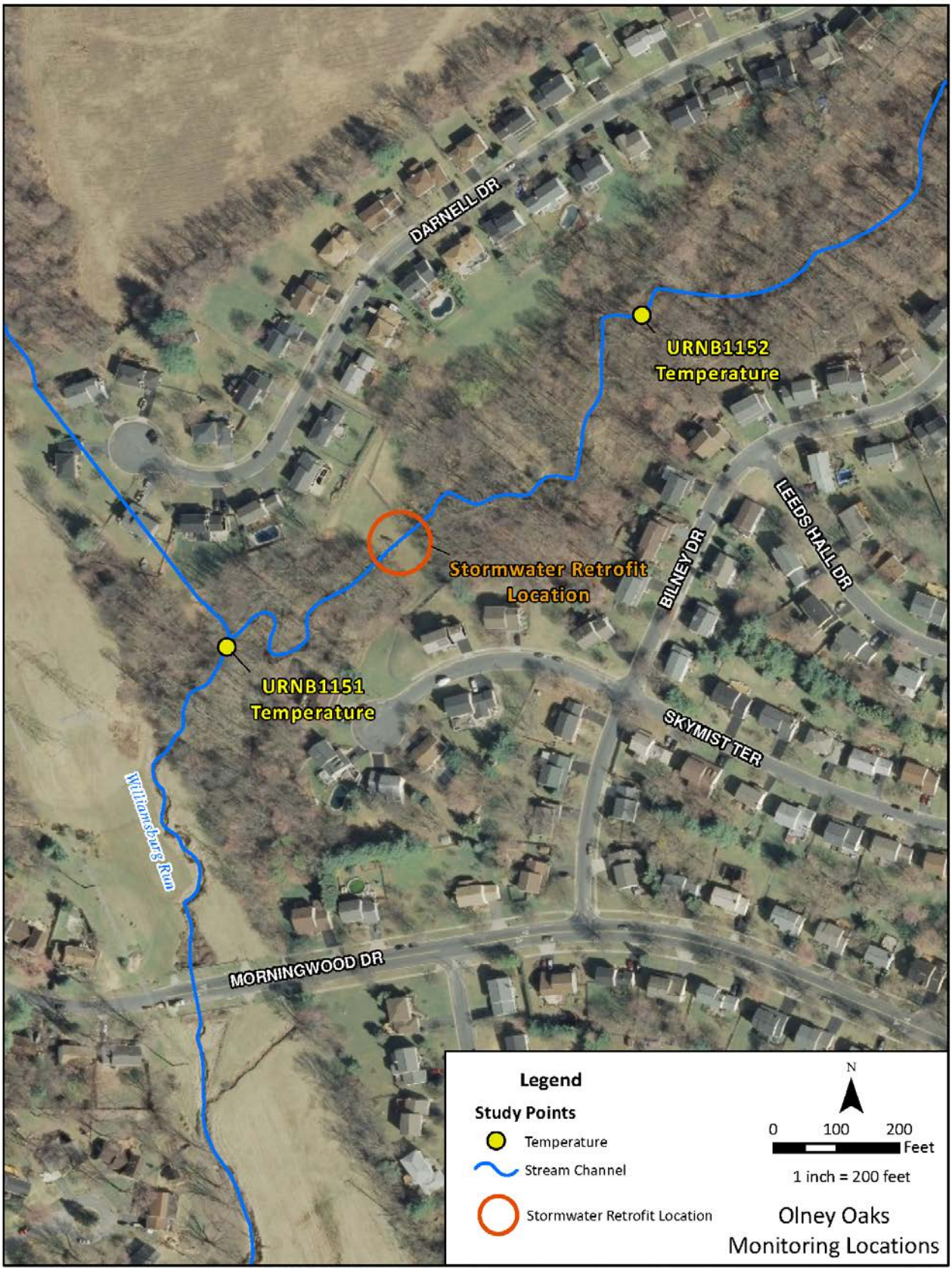

Figure 3.2.6 –Map of Monitoring Locations at Olney Oaks Stormwater Pond Retrofit

3.2.2 Restoration Goals

To determine whether there are any thermal impacts downstream of the pond, post-construction stream temperature monitoring was conducted. ***Table 3.2.1*** below presents the restoration goal, monitoring performed to evaluate the success of the goal, and when and where the monitoring occurred. This is a first year post-restoration monitoring report and presents the stream conditions one year after the retrofit of the Olney Oaks Stormwater Pond.

Table 3.2.1 – Summary of Restoration Project Goals and Associated Monitoring

Why: Restoration Goals	What: Monitoring Done to Evaluate Goal	When: Years Monitored	Where: Station or Location Monitored
Mitigate thermal impacts in the North Branch of Upper Rock Creek	Stream temperature	2010	URNB1151 (DS) URNB1152 (US)

3.2.3 Methods to Measure Project Goals

The basic sampling design for this project was to monitor temperature upstream (URNB1152) and downstream (URNB1151) of the pond retrofit (***Figure 3.2.6***). At these sites, temperature loggers were deployed to determine if the pond affected the stream temperature regime.

3.2.4 Results and Analysis

Pre-restoration stream temperature was not monitored in the vicinity of the Olney Oaks stormwater pond retrofit, so it is not possible to know if any potential thermal impacts are new as a result of the retrofit. However, information gathered about any potential impacts will help guide future maintenance of the Olney Oaks pond and may improve upon design of future pond retrofits.

Post-restoration stream temperature was monitored upstream (URNB1152) and downstream (URNB1151) of the pond retrofit in 2010. The stream these sites are located on is classified by the Code of Maryland Regulation (COMAR) as a Use III, cold water system, that supports a naturally reproducing brown trout population. The maximum temperature standard associated with this Use class is 68^{o}F. Exceeding this threshold is considered detrimental to the cold water species that potentially inhabit this area.

Table 3.2.2 below shows the minimum, maximum, and average stream temperature, and percentage of readings that exceeded the Use III temperature threshold at both sites. Unfortunately, the downstream logger was lost mid-way through the monitoring season; therefore data are only available for part of the season at this site. The table below only shows temperature ranges and averages from when both loggers were deployed (June 1 to July 23).

In 2010, the minimum temperature during the monitoring period at both sites was 59.7^{o}F. The maximum and average temperatures were slightly higher downstream versus upstream of the pond, with temperature differences of 1.6^{o}F and 0.1^{o}F, respectively. Additionally, 68 percent of the readings exceeded the Use III standard (68^{o}F) below the pond and 64 percent exceeded the standard above the pond.

Table 3.2.2 – Minimum, Maximum, and Average Stream Temperatures at URNB1152 (US-Upstream) and URNB1151 (DS-Downstream) from June 1 to July 23, 2010

Date	**2010**		
Location	US	DS	Δ*
Minimum Temperature (^{o}F)	59.7	59.7	0.0
Maximum Temperature (^{o}F)	80.8	81.6	0.8
Average Temperature (^{o}F)	69.7	69.8	0.1
Percentage of readings exceeding Use III standard (68^{o}F)	64	68	4

A non-parametric paired t-test (Wilcoxon Signed-Rank) was also performed on the data, comparing the mean difference between the upstream and downstream site. The test detected a highly significant difference (p value <0.0001) between temperatures collected upstream verses temperatures collected downstream of the pond. ***Figures 3.2.7 and 3.2.8*** graphically display the stream temperatures up and downstream of the Olney Oaks stormwater pond in the summer of 2010. Stream temperature generally followed the same pattern at both sites. The site upstream of the pond had a wider range of daily temperature values than the downstream site, especially during one of the drier and hotter periods in July. This may have been a function of where the logger was placed, i.e. in a shallower pool or in a sunnier location upstream versus downstream.

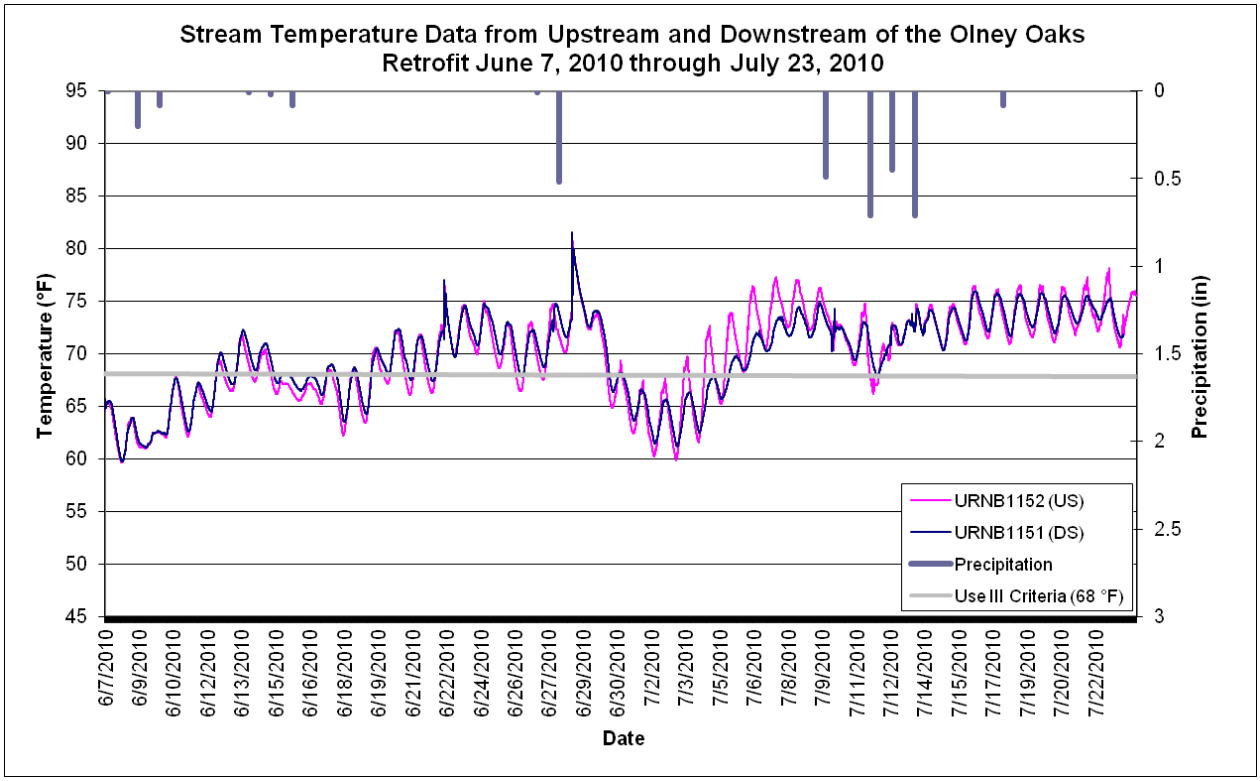

Figure 3.2.7 – Stream Temperatures Upstream and Downstream of the Olney Oaks Stormwater Pond June 7 to July 23, 2010

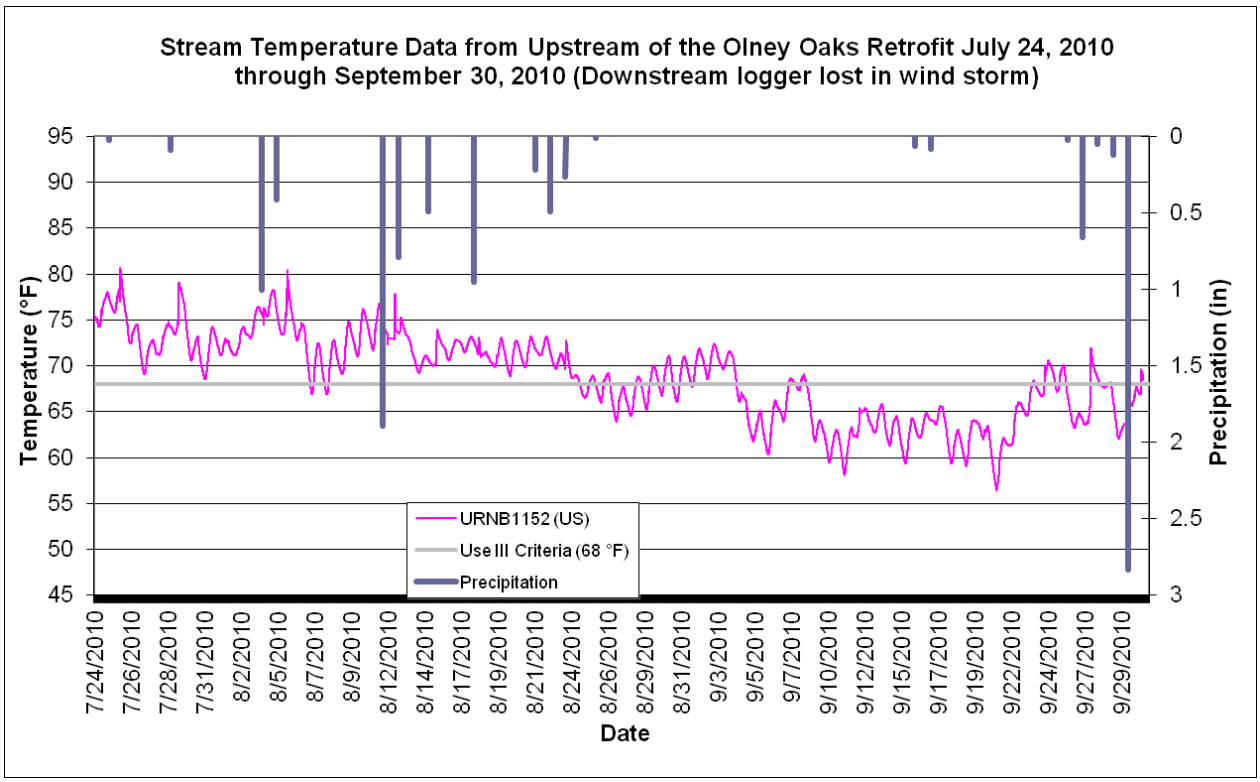

Figure 3.2.8 – Stream Temperatures Upstream of the Olney Oaks Stormwater Pond July 23 to September 30, 2010

In addition to assessing average temperatures over the summer, one rain event was analyzed to determine the impact of the stormwater pond on the downstream receiving waters. Prior to the rain event, during a dry period between June 27th and June 28th, stream temperature generally fluctuated similarly to daily air temperatures (***Figure 3.2.9***). Stream temperatures had a daily increase and subsequent decrease, generally in response to daily rises and declines in air temperature. However, stream temperatures below the pond were consistently higher than above the pond, 0.8 degrees on average (***Table 3.2.3***). During the rain event, stream temperatures at both sites spiked about five degrees at the onset of the rain, but were still higher overall at the downstream site. After the first flush, stream temperatures consistently declined at both sites. Differences in stream temperature during the rain event and 24 hours proceeding were, on average, 0.2 degrees. After the rain event, stream temperature patterns resumed with temperatures reflecting the daily air temperatures, and downstream temperatures measuring higher, on average (0.7 degrees), than upstream temperatures.

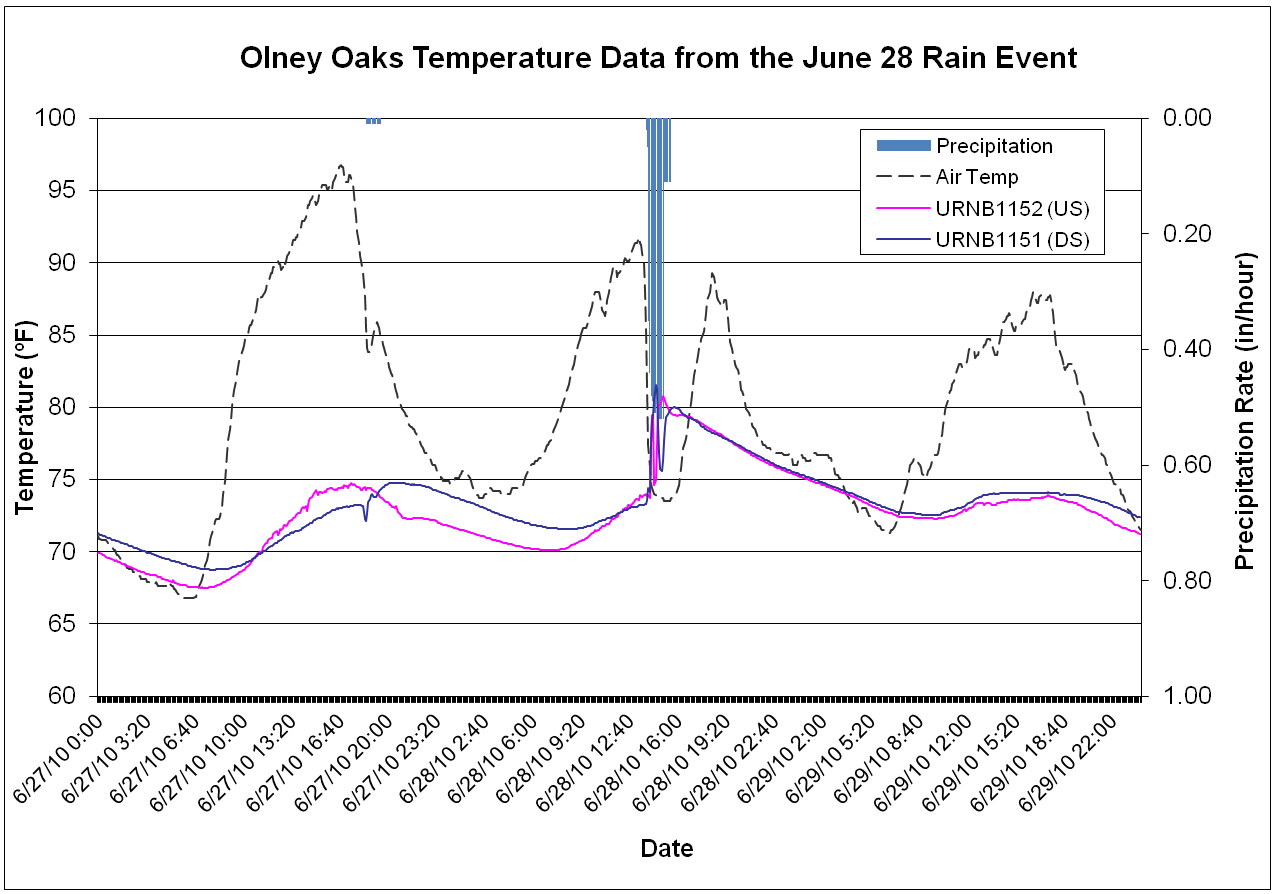

Figure 3.2.9 – Stream Temperatures Upstream and Downstream of the Olney Oaks Stormwater Pond Prior to, During, and After the June 28 2010 Rain Event

Table 3.2.3 – Min, Max, and Average Stream Temperatures June 28, 2010 Storm

Date	**27-Jun-10**			**28-Jun-10**			**29-Jun-10**		
Rainfall (in)	0.01			0.52			0		
Location	US	DS	Δ*	US	DS	Δ	US	DS	Δ
Min Temp (°F)	67.5	68.7	1.2	72.2	72.5	0.3	71.2	72.4	1.2
Max Temp (°F)	74.7	74.8	0.1	80.8	81.6	0.8	73.9	74.1	0.2
Average Temp (°F)	71	71.8	0.8	75.1	75.3	0.2	73	73.7	0.7

3.2.5 Discussion

The goal of mitigating thermal impacts to downstream waters appears to have not been met by the restoration actions (***Table 3.2.4***). Although differences were only slight, stream temperatures were higher below the Olney Oaks Stormwater Pond retrofit than they were above. However, when one rain event was isolated, the greatest differences in stream temperature were observed during the dry period that preceded the rain event (0.8 degrees). The pond should not technically be holding water after a long dry period and therefore should not have an effect on the normal baseflow conditions downstream. During the rain event and in the 24 hours after, average stream temperatures remained higher below the pond than above. However, the average difference was only 0.2 degrees, which was less than it was during the dry period. Since the differences in

temperature between the two sites were so slight, they may have been a function of where the loggers were placed in the stream. For example, one logger may have been placed in an area that received more sunlight exposure than the other, or one may have been placed in a deeper pool than the other. This site will continue to be monitored biennially for the next four years to help determine whether the pond is contributing significant thermal impacts to downstream waters.

Table 3.2.4 – Summary of Project Goal Results

Goal	Result
Mitigate thermal impacts in the North Branch of Upper Rock Creek	Unable to determine - Although differences were only slight, stream temperatures were higher below the Olney Oaks Stormwater Pond retrofit than they were above. However, when one rain event was isolated, the greatest differences in stream temperature were observed during the dry period that preceded the rain event. The pond should not technically be holding water after a long dry period and therefore should not have an effect on the normal baseflow conditions downstream. Additional years of monitoring are needed to confirm if the pond is contributing significant thermal impacts to downstream waters.