Northwest Branch

3.4 Dumont Oaks Stream Restoration

3.4.1 Introduction

The Dumont Oaks Stream Restoration and Stormwater Pond retrofit project was constructed in 2004. The project site is located along the Dumont Oaks tributary to Northwest Branch, between Symphony Woods Lane and Oak Leaf Drive, in White Oak, Maryland (***Figure 3.4.2***). The stormwater pond is at the upstream limit of the project and drains into the Dumont Oaks tributary which has been classified by the Code of Maryland Regulations (COMAR) as a Use IV, recreational trout waters. Prior to restoration, this site had severely eroded streambanks, degraded aquatic habitat, and an antiquated stormwater pond. The goal of the project was to upgrade the existing pond facility in order to improve water quality and quantity controls of the Dumont Oaks Stormwater Management Pond, and to address severely degraded conditions along the Dumont Oaks tributary through stream channel restoration, stabilization, aquatic habitat enhancement, and reforestation. ***Figure 3.4.1*** depicts the site following restoration in 2004.

Figure 3.4.1 – Dumont Oaks Stream Restoration in 2004, picturing log veins and streambank stabilization

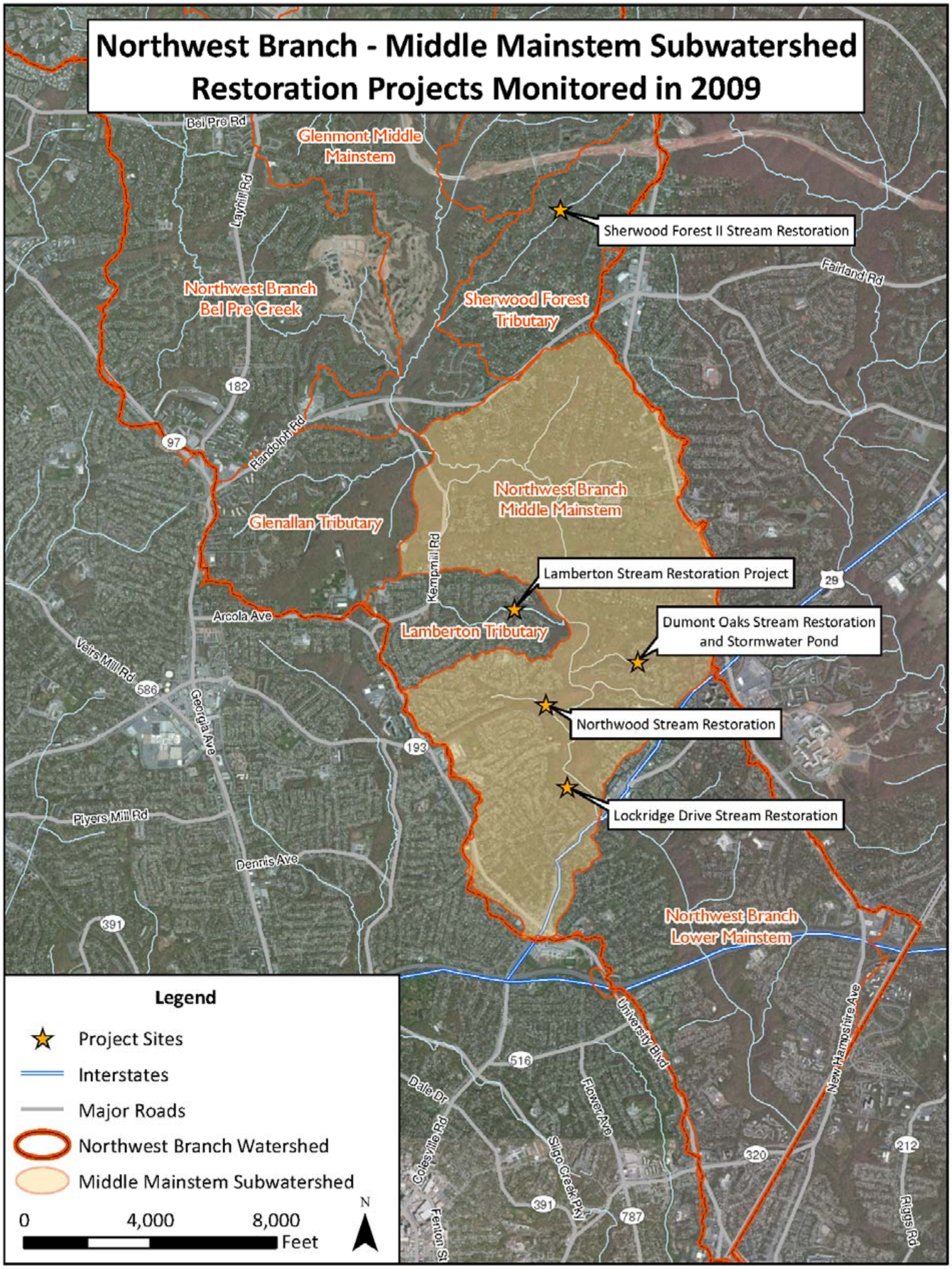


Figure 3.4.2 – Northwest Branch Watershed Restoration Projects Monitored in 2009, Including Dumont Oaks Stream Restoration and Stormwater Pond Retrofit

Subwatershed facts

Subwatershed Drainage Area: 69 acres
Subwatershed Imperviousness: 30 Percent

Project Facts

Project Area: The project captures stormwater drainage from the townhome communities to the east of Columbia Pike (Route 29) as well as a portion of the single family homes along the stream corridor within the Dumont Oaks Subdivision. The project included stabilizing approximately 2,112 linear feet of stream, planting native vegetation, and upgrading the existing stormwater facility.
Costs: Structural ($577,300), Reforestation ($4,000), Funded in part through the Maryland Department of Natural Resources.
Completion Date: January, 2004
Property Ownership: Private

Project Selection

The Anacostia Watershed Agreement of 1987 committed local and state agencies to restore aquatic habitat and water quality in tributaries to the Anacostia River that were seriously degraded by uncontrolled stormwater runoff from prior urbanization. The Northwest Branch Watershed in Montgomery County is one of four major watersheds draining to the Anacostia River.

In 2000, as part of a continuing commitment to the Anacostia Watershed agreement, the Montgomery County Department of Environmental Protection (DEP) and the U.S.Army Corps of Engineers completed a feasibility study of the Northwest Branch Watershed in the County. The study identified and prioritized 175 projects to improve stormwater runoff management and restore degraded stream habitat in critical reaches. The Dumont Oaks Project emerged from this study as a high priority project.

Pre-Restoration Conditions

Much of the lower Northwest Branch Watershed, including the Dumont Oaks subwatershed, was developed prior to regulations requiring stormwater management control, and contains a high percentage of impervious surfaces. Uncontrolled stormwater runoff from highly impervious areas creates erosive, high velocity or “flashy” flows that cause damage to receiving streams.

Over time, the Dumont Oaks stream channel down-cut and became entrenched and eroded, undercutting trees and causing damage to private property. Headcuts formed and migrated upstream. Habitat features required for healthy benthic populations were limited, and silt accumulating in the Dumont Oaks stormwater management pond from upstream erosion required frequent dredging and maintenance.

Restoration Actions Taken

The Dumont Oaks Project used in-stream restoration techniques to help stabilize streambanks and enhance riparian habitat. Newly built in-stream structures included rock and log vanes, which direct water away from unstable streambanks and form downgrade scour pools that provide good habitat for fish (***Figure 3.4.1***). Rock cross vanes also function as grade controls, which slow the erosive process of stream down-cutting. Streambanks were stabilized by installing rock or coir fiber logs at the toe of the streambank slope. The slopes were then graded back to create terraces, where native plants were added to increase soil stability. Bio-engineering methods such as brush layering and live staking were also used to add vegetative stabilization above the coir logs. In some places, the stream invert, or lowest channel elevation, was raised to allow the previously entrenched stream access to the floodplain. Floodplain access allows stormwater flow energy to dissipate and sediments to be captured by riparian vegetation.

Damaged storm drain outfalls were repaired, and step pools were constructed that allow stormwater to lose erosive energy. Vernal pools were created to catch overland flow and stormwater. The vernal pools quickly established balanced aquatic communities, which added additional habitat benefits, including natural mosquito control.

The existing Dumont Oaks Stormwater Pond was dredged to re-establish its original volume capacity, and its riser was modified to improve stormwater control and manage the one-year storm, furthering benefits to its receiving stream. ***Figures 3.4.3 - 3.4.5*** show aerial images of the project before, during, and after restoration and ***Figure 3.4.6*** shows ground-level images before and after restoration.

Figure 3.4.3 – Dumont Oaks Stream Restoration and Pond Retrofit, aerial images from 1998 (pre-restoration)

Figure 3.4.4 – Dumont Oaks Stream Restoration and Pond Retrofit, aerial images from 2004 (during construction)

Figure 3.4.5 – Dumont Oaks Stream Restoration and Pond Retrofit, aerial images from 2010 (post-restoration)

Figure 3.4.6 – Dumont Oaks Stream Restoration Before (2001) and After Restoration (2004)

3.4.2 Restoration Goals

Restoration goals were defined during the planning and implementation of the Dumont Oaks Stream Restoration project. Pre- and post-restoration monitoring was conducted within the stream, downstream of the stormwater pond, in the created vernal pool, and in the riparian area of the restored stream. ***Table 3.4.1*** below presents the restoration goals, monitoring performed to evaluate the success of the goals, and when and where the monitoring occurred.

Table 3.4.1 – 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
• Improve water quality in the Dumont Oaks tributary • Improve aquatic habitat conditions	• Aquatic Communities: ▪ Benthic macroinvertebrates • Qualitative Habitat • In-situ Water Chemistry	2005, 2007, and 2010[1] (post)	NWDO102
• Avoid introduction of new thermal impacts below Dumont Oaks Pond	• Stream temperature	2005, 2007, and 2009 (post)	NWDO102
• Reduce stream erosion and sedimentation • Reduce erosive stream flows	• Quantitative habitat (stream morphology surveys)	2009 (post)[2]	N/A
• Create vernal pool to catch overland flow and stormwater	• Vernal pool	2005, 2007, and 2009 (post)	Vernal Pool in floodplain of NWDO102
• Reforest riparian zone	• Botanical survey	2005, 2007, and 2009 (post)	NWDO102

[1]Benthic macroinvertebrate, qualitative habitat, and water chemistry data were collected at an incorrect location in 2009, therefore data were collected in 2010 at the correct location and are presented in this report.
[2]Quantitative habitat surveys were scheduled for 2009, but were delayed due to missing benchmarks. These benchmarks were located and survey work was performed in 2011. The 2011 report will include updates for this monitoring.

3.4.3 Methods to Measure Project Goals

The basic sampling design for the Dumont Oaks stream restoration project was post-restoration (after) monitoring. Pre-restoration data were not available for this project, thus no comparisons will be made to baseline conditions. Post-restoration, the County monitored benthic macroinvertebrate communities, performed rapid habitat assessments (RHAB), and took in-situ water chemistry measurements at one biological monitoring site (NWDO102) to evaluate the aquatic habitat conditions and water quality during the post-restoration period in 2005, 2007, and 2010 (***Figure 3.4.7***). Additionally in 2005, 2007, and 2009, summer stream temperature was monitored downstream of the retrofitted stormwater management pond, the created vernal pool was monitored, and the botanical reforestation areas in the project area were assessed. This is a fifth year monitoring report and will summarize the post-restoration conditions within the Dumont Oaks Stream Restoration project area. For more information on how this monitoring is performed and used to measure stream health in the County, see the Methods (***Section 2***).

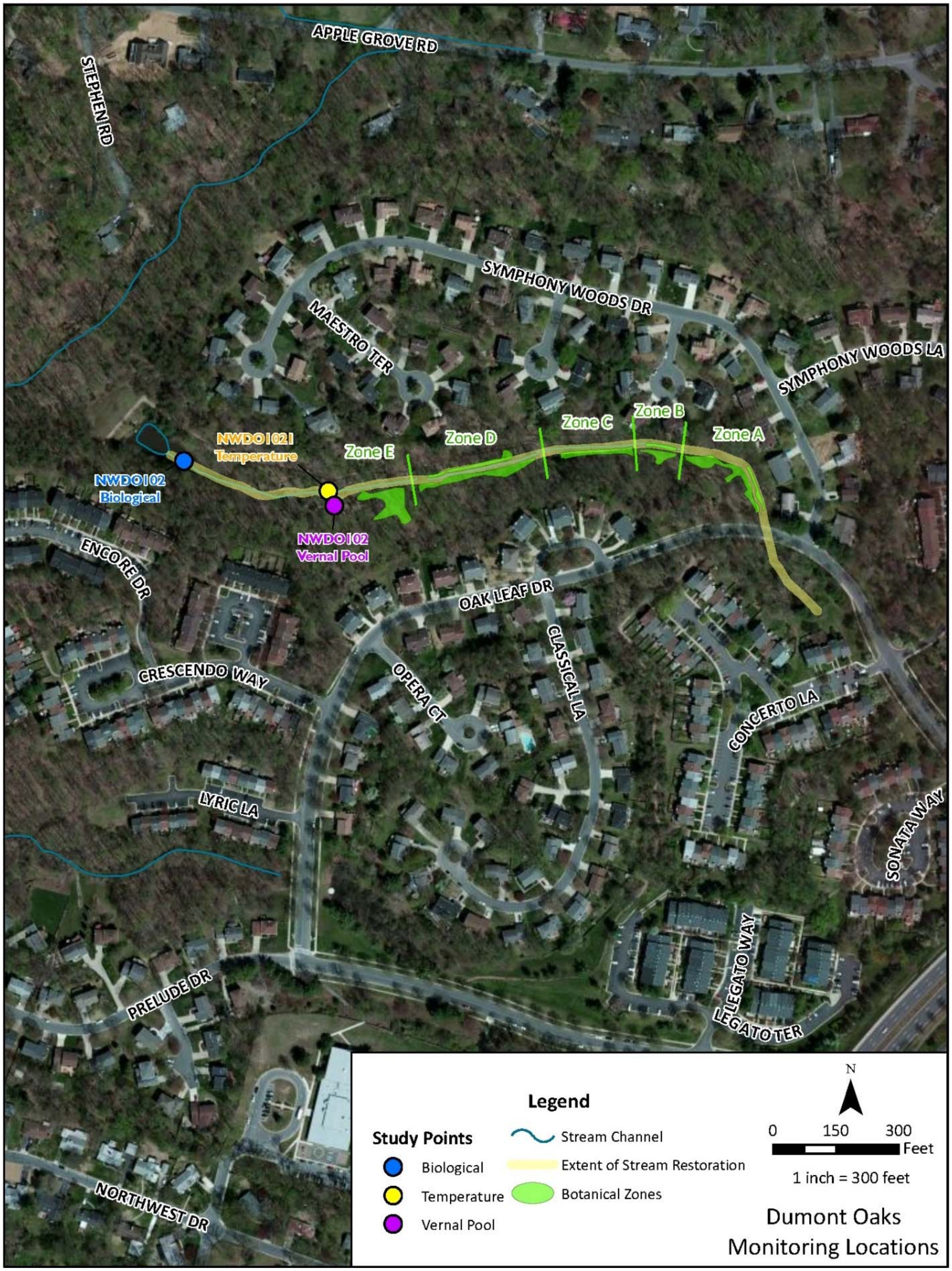


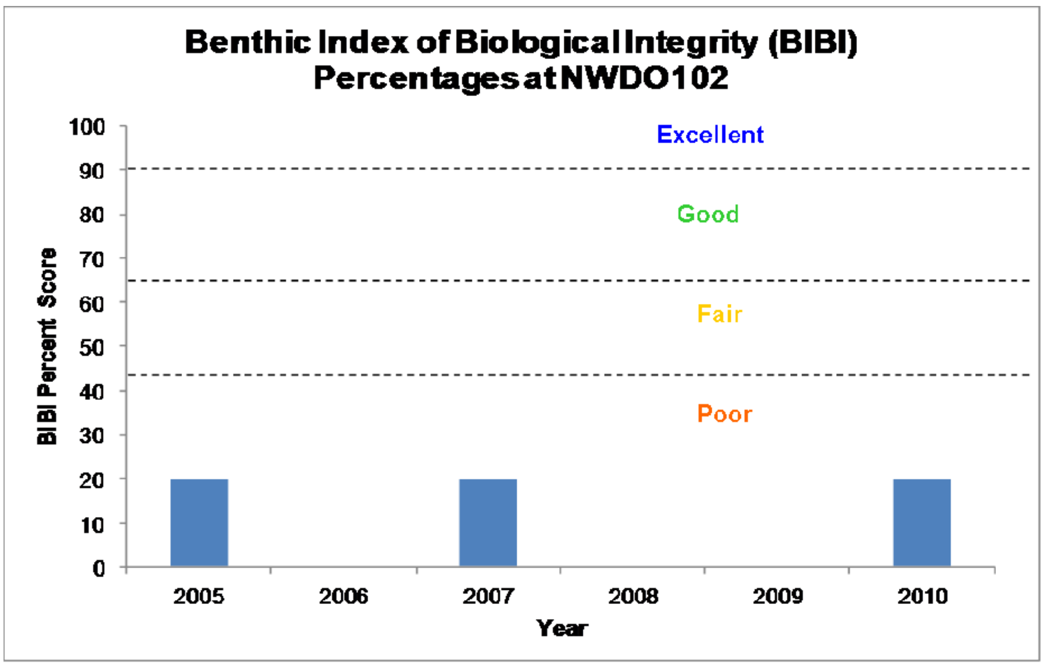
Figure 3.4.7 –Monitoring Location Map for Dumont Oaks Stream Restoration and Stormwater Pond Retrofit

3.4.4 Results and Analysis

Benthic Macroinvertebrates

BIBI (Benthic Index of Biological Integrity) Scores

The benthic macroinvertebrate community at NWDO102, as assessed using the MCDEP Benthic Index of Biological Integrity (BIBI), was rated as Poor, scoring the lowest possible BIBI percentage (20) during each monitoring year in the post-restoration period (***Figure 3.4.8***). In 2005, too few benthic macroinvertebrate individuals were collected to calculate an accurate BIBI, the site was therefore given the lowest possible score for that year. In both 2007 and 2010, NWDO102 was heavily dominated by the family Chironomidae (midges), specifically from the subfamily Orthocladiinae, with nearly 75 percent and 84 percent of the community represented by this subfamily, respectively. Field data sheets from 2010 benthic macroinvertebrate monitoring are included in ***Appendix D***.



Station ID	BIBI Percent Score (Narrative Ranking)		
	2005	2007	2010
NWDO102	20 (Poor)	20 (Poor)	20 (Poor)

Figure 3.4.8 –Post-Restoration Benthic Index of Biological Integrity (BIBI) Percentages at NWDO102

Dominant Taxa

The post-restoration community of benthic macroinvertebrates at NWDO102 was dominated by midges, which comprised 87 percent of the community after restoration. *Cheumatopsyche* sp. (net-spinning caddisflies) was the second most dominant taxon following restoration, representing five percent of the community.

Tolerance Values

Site NWDO102 was dominated by (93 percent) tolerant taxa following restoration, with 6 percent of the community represented by taxa intermediate in sensitivity (***Figure 3.4.9***). The tolerant taxa were represented by midges and several families of aquatic worms in the Subclass Oligochaeta. Intermediate taxa were represented by net spinning caddisflies, *Simulium* sp. (blackflies), *Tipula* sp. (craneflies), and *Bezzia* sp. (biting midges).

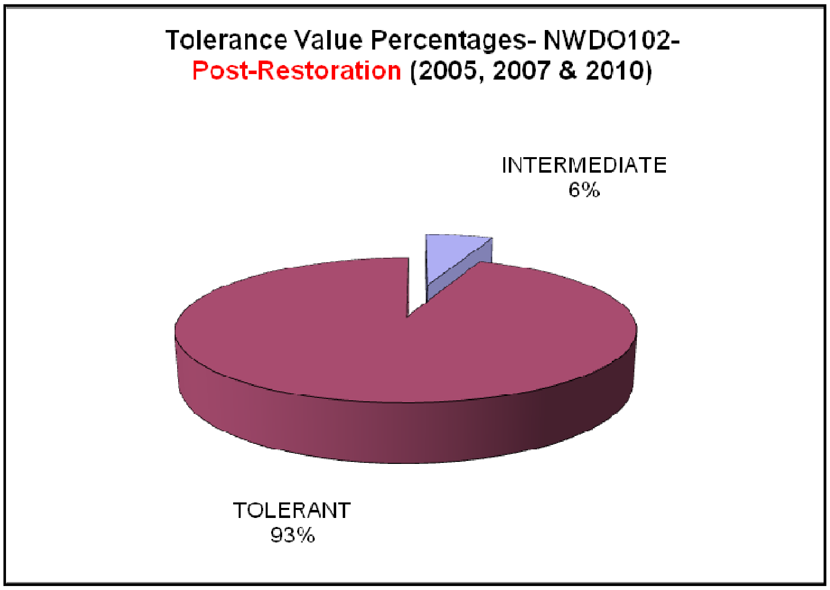


Figure 3.4.9– Benthic Macroinvertebrate Tolerance Composition at NWDO102 After Restoration

Functional Feeding Groups

Collectors were the most dominant functional feeding group at NWDO102 after restoration, representing 88 percent of the community. The remainder of the community consisted of filterers, predators, and shredders, which comprised eight percent, three percent, and 0.3 percent of the community, respectively. Specialized feeders, including scrapers and shredders that require less degraded stream conditions or specific habitat features, were present in only minor amounts (less than one percent) after restoration (***Figure 3.4.10***).

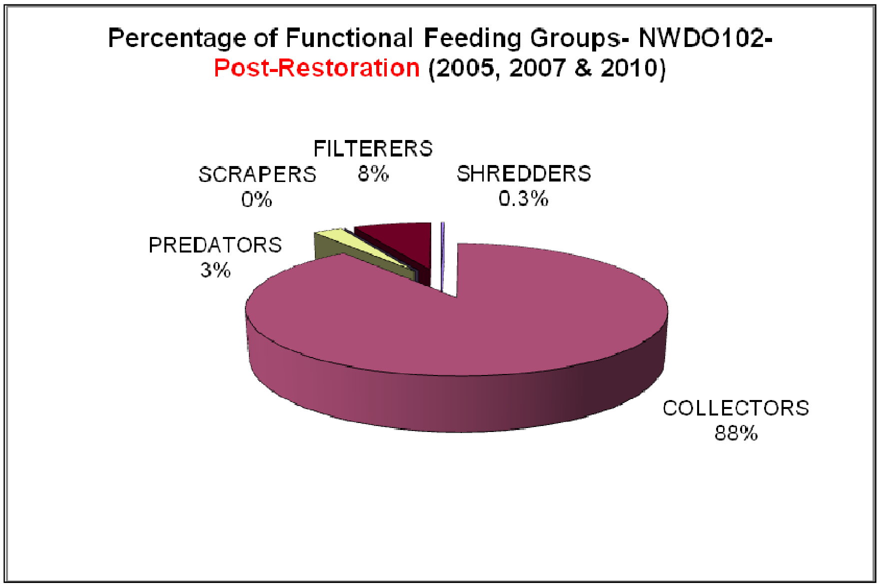


Figure 3.4.10 – Benthic Macroinvertebrate Functional Feeding Group Composition at NWDO102 After Restoration

Vernal pool

Prior to the creation of the vernal pool at this site, the landscape consisted of a forested slope and adjacent stream valley (***Figure 3.4.11***). Since floodplain species searches indicated various wetland obligate species in the Northwest Branch watershed stream valley, the County was confident the restoration of a wetland would attract these various wetland-dependent species to this area.

Figure 3.4.11 – Looking West at Created Vernal Pool at Site NWDO102 with Surface Water Present (2009)

The vernal pool was constructed in 2004 and monitored post-restoration in late-March 2005, mid-April 2007, and late-April 2009. The site is characterized by a system of three small depressions that contain large woody debris and emergent vegetation. Obligate vernal pool species were observed in 2005 and 2007, and two facultative vernal pool species were found in

2009. In 2005, three spotted salamander egg masses and 23 wood frog egg masses were observed during the site visit. Herpetofauna were documented again in 2007, including 12 spotted salamander egg masses and over 50 wood frog tadpoles (***Figure 3.4.12***). One adult spotted salamander was also found in the periphery of the pool (***Figure 3.4.13***).

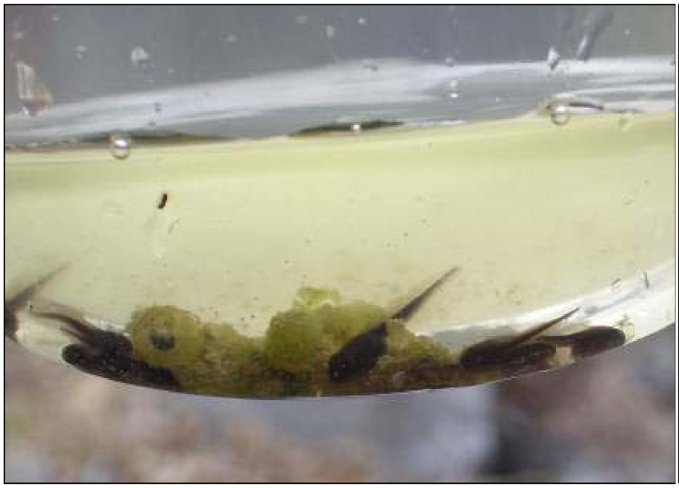


Figure 3.4.12 – Wood Frog Tadpoles and Eggs Found at NWDO102 in 2007

Figure 3.4.13 – Spotted Salamander Found in the Periphery of NWDO102 in 2007

In 2009, the vernal pool was estimated to be 67 feet long, 14 feet wide, and 10 inches deep. The vernal pool supported herbaceous vegetation, including *Ranunculus ficaria* (lesser celandine), *Boehmeria cylindrica* (smallspike falsenettle), and *Elymus virginicus* (Virginia wild rye). Compared to previous years, use of the created pool by vernal pool obligates was not evident in 2009. However, approximately 25 toad (*Anaxyrus* sp.) tadpoles and one adult frog (*Lithobates* sp.) were observed within the pool. Mosquito larvae represented the only invertebrate taxa observed. No evidence of fish or beaver activity was found. Field data sheets for wetland monitoring in 2009 are included in ***Appendix D***. ***Figure 3.4.14*** shows the number of facultative and obligate vernal pool species found at NWDO102 from 2005 to 2009; only obligate species were found in 2005 and 2007 and only facultative vernal pool species were observed in 2009.

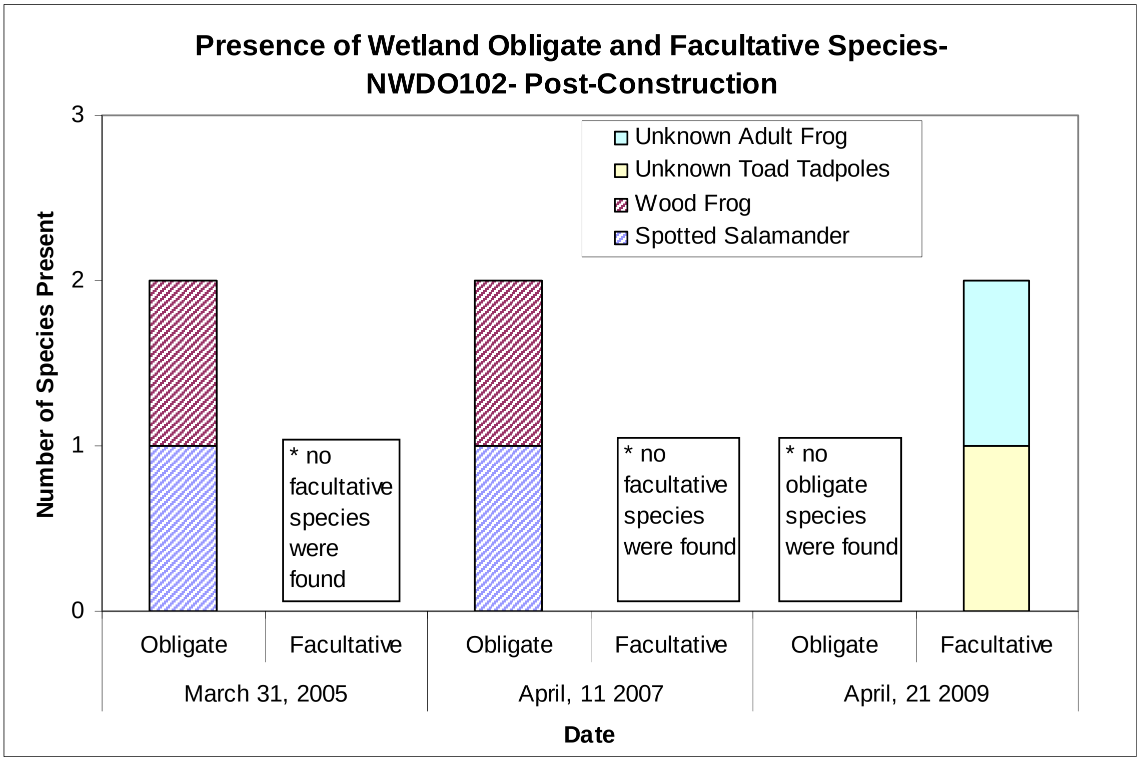
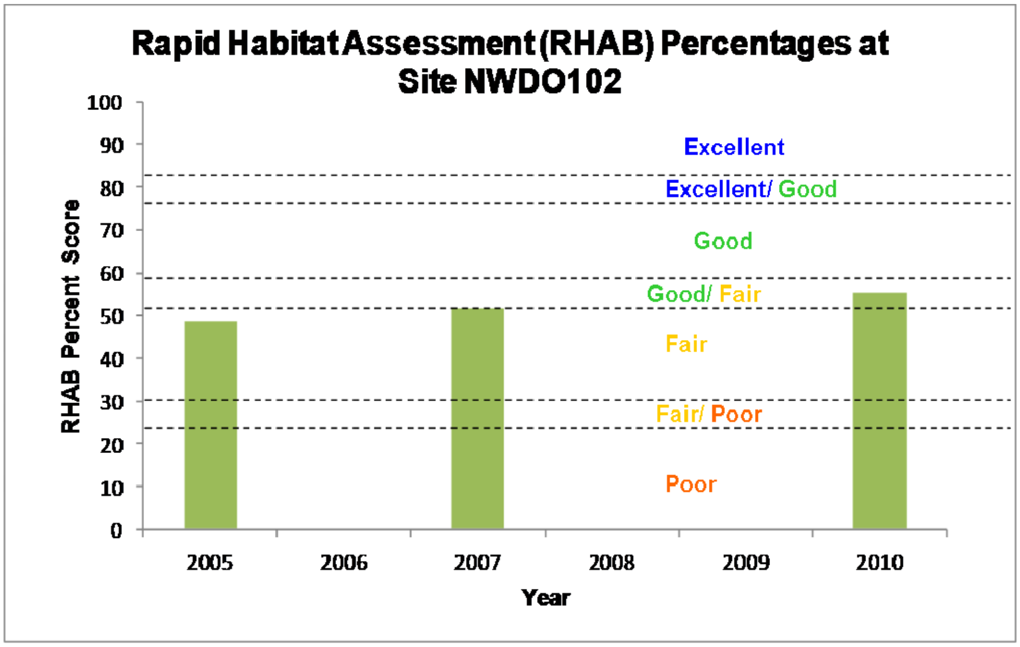


Figure 3.4.14 – Herpetofauna Collected at NWDO102

Qualitative Habitat

Post-restoration aquatic habitat was evaluated at NWDO102 in the spring of 2005, 2007, and 2010. RHAB percentages were in the Fair range in 2005 (48.5), but improved slightly to the Good/Fair range in 2007 (51.5) and 2009 (55.5). ***Figure 3.4.15*** shows aquatic habitat scores after restoration occurred at NWDO102.



Year	2005	2007	2010
RHAB Percentage	48.5	51.5	55.5
(Narrative Ranking)	(fair)	(good/fair)	(good/fair)

Figure 3.4.15 –Post-Restoration Rapid Habitat Assessment (RHAB) Percentages at NWDO102

Quantitative Habitat

Quantitative monitoring was scheduled to occur at NWDO102 in 2009, but was delayed due to problems locating the benchmarks. Data were collected in 2010 and 2011 and will be presented in the subsequent 2010 and 2011 reports.

Botanical Reforestation

A total of 115 trees and shrubs were planted in association with the 2004 restoration (***Figure 3.4.16***). These plantings were subsequently monitored in 2005, 2007, and 2009. In 2005, plantings were counted in 107, four-foot radius plots. Eight of the plots contained acceptable trees (7.48 percent). However, the majority of the trees and shrubs counted were not planted, and were dominated by *Lindera benzoin* (spicebush). In 2007, the planting area had sparse woody plantings, with over half of the observed trees in 2007 found dead. This area included 18 percent acceptable woody plants.

Figure 3.4.16 – Site NWDO012 in 2004 After Plantings were Installed

The overall success rate across all of these zones was 34 percent. ***Figure 3.4.17*** shows an image of the reforestation in 2009, with very few plantings evident. The most successful species planted site-wide included *Quercus palustris* (pin oak), *Quercus rubra* (northern red oak), *Acer rubrum* (red maple), *Betula nigra* (river birch), and *Ilex opaca* (American holly). Plants that fared poorest overall were *Carpinus caroliniana* (American hornbeam) and *Platanus occidentalis* (American sycamore), as well as most of the planted shrub species.

In 2009, botanical reforestation at NWDO102 was assessed at Zones A through E (***Figure 3.4.7***). Zone A, which is located at the upstream limit of the site, contained two surviving species of planted trees, pin oak and northern red oak. Of the 23 trees planted in 2004, only three trees were observed in 2009 (***Table 3.4.2***). The trees that were found alive ranged from 0.5 to 2.0 inch caliper. Of the 27 shrubs planted in 2004, none were observed in 2009.

Table 3.4.2 – Botanical Reforestation, Including Tree and Shrub Data for Planting Zone A at Dumont Oaks Site NWDO102

Scientific Name	**Common Name**	**Number Planted (2004)**	**Number Alive (2009)**	**Percent Survival**
Acer rubrum	red maple	7	0	0
Ilex opaca	American holly	3	0	0
Quercus rubra	northern red oak	4	2	50
Quercus palustris	pin oak	2	1	50
Carpinus caroliniana	American hornbeam	7	0	0
Viburnum dentatum	southern arrowwood	7	0	0
Hamamelis virginiana	witch hazel	10	0	0
Sambucus nigra ssp. americana	American black elderberry	10	0	0
Overall		**50**	**3**	**6**

Figure 3.4.17 – Site NWDO102 Botanical Planting Area in 2009, with Very Few Plantings Pictured

Zone B, which lies immediately downstream of and adjacent to Zone A, only contained pin oak in 2009. Of the 10 trees planted in 2004, only two trees were observed in 2009 (***Table 3.4.3***). The trees that were found alive ranged from 1.25 to 2.0 inch caliper. Of the six shrubs planted in 2004, none were observed in 2009.

Table 3.4.3 – Botanical Reforestation, Including Tree and Shrub Data for Planting Zone B at Dumont Oaks Site NWDO102

Scientific Name	Common Name	Number Planted (2004)	Number Alive (2009)	Percent Survival
Acer rubrum	red maple	1	0	0
Magnolia virginiana	sweetbay	1	0	0
Platanus occidentalis	American sycamore	3	0	0
Quercus palustris	pin oak	2	2	100
Carpinus caroliniana	American hornbeam	3	0	0
Hamamelis virginiana	witch hazel	4	0	0
Sambucus nigra ssp. americana	American black elderberry	2	0	0
Overall		**16**	**2**	**13**

Zone C, which is immediately downstream of and adjacent to Zone B, experienced better survival of planted trees. Although only 13 trees were planted, six of these were healthy at the time of the 2009 monitoring visit (***Table 3.4.3***). Red maple, river birch, and pin oak all fared relatively well. The caliper of the trees counted in 2009 ranged from 0.5 to 2.75 inches. American sycamore was the only species absent from this zone that was planted. Shrubs were not installed within Zone C.

Table 3.4.4 – Botanical Reforestation Data for Planting Zone C at Dumont Oaks Site NWDO102

Scientific Name	Common Name	Number Planted (2004)	Number Alive (2009)	Percent Survival
Acer rubrum	red maple	2	2	100
Betula nigra	river birch	4	3	75
Platanus occidentalis	American sycamore	5	0	0
Quercus palustris	pin oak	2	1	50
Overall		**13**	**6**	**46**

Zone D was similar to Zone C in that approximately 50 percent of the woody plantings persisted and were healthy in 2009 (***Table 3.4.3***). A total of 12 trees were installed, nine of which survived. Only American hornbeam was not observed in 2009. The caliper of the trees counted in 2009 ranged from 0.5 to 2.5 inches. One species of shrub, *Aronia arbutifolia* (red chokeberry), was planted in 2004, however none were observed during 2009.

Table 3.4.5 – Botanical Reforestation, Including Tree and Shrub Data for Planting Zone D at Dumont Oaks Site NWDO102

Scientific Name	Common Name	Number Planted (2004)	Number Alive (2009)	Percent Survival
Acer rubrum	red maple	1	1	100
Betula nigra	river birch	2	1	50
Ilex opaca	American holly	5	5	100
Quercus palustris	pin oak	2	2	100
Carpinus caroliniana	American hornbeam	2	0	0
Aronia arbutifolia	red chokeberry	7	0	0
Overall		**19**	**9**	**47**

Zone E also experienced relatively good survival of the few trees and shrubs that were planted. Of the 15 trees planted, eight persisted into 2009. The caliper range of the individuals counted in Zone E in 2009 was from 1.0 to 2.0 inches. American sycamore was the only planted species not found to persist in Zone E. Two *Viburnum dentatum* (southern arrowwood) individuals were planted, both of which were observed in 2009, although both shrubs appeared to be browsed recently by deer. Invasive plants were not observed in Zone E.

Table 3.4.6 – Botanical Reforestation Including Tree and Shrub Data for Planting Zone E at Dumont Oaks Site NWDO102

Scientific Name	Common Name	Number Planted (2004)	Number Alive (2009)	Percent Survival
Betula nigra	river birch	1	1	100
Ilex opaca	American holly	9	5	56
Platanus occidentalis	American sycamore	1	0	0
Quercus rubra	northern red oak	4	2	50
Viburnum dentatum	southern arrowwood	2	2	100
Overall		**17**	**10**	**59**

Water Chemistry

Post-restoration in-situ water quality parameters were in compliance with COMAR standards for Use IV streams (***Table 3.4.7***).

Table 3.4.7 –Post-restoration in-situ Water Chemistry Data at NWDO102

Water Quality Parameter	Monitoring Year		
	2005	**2007**	**2010**
Dissolved Oxygen (mg/L)	12.65	13.23	10.44
Dissolved Oxygen (% Saturation)	112	109	95
pH	7.78	8.37	6.98
Conductivity (µmhos)	365	397	343
Water Temperature (°F)	50.0	44.2	50.5

Temperature

Post-restoration stream temperature was monitored in the project area downstream of the retrofitted stormwater pond and adjacent to the constructed vernal pool in 2005, 2007, and 2009 using continuous data loggers. In 2005, the average temperature at NWDO102 was 69.3°F, with 6.0 percent of all readings exceeding the 75°F Use IV temperature standard. In 2007, the average temperature was 67.3°F, with 0.5 percent of the readings exceeding 75°F. In 2009, the average temperature was 65.8°F, with 3.0 percent of the readings exceeding 75°F (***Table 3.4.8***). The post-retrofit temperature profile from 2009 is plotted and presented below in ***Figures 3.4.15 and 3.4.16***. The graphs display temperature data within the Dumont Oaks tributary and five minute interval precipitation data. Precipitation data were obtained from the Turkey Branch rain gage installed at the Wheaton Woods Elementary School in the Lower Turkey Branch area, approximately five miles northwest of the Dumont Oaks stormwater ponds. As depicted in ***Figures 3.4.18 and 3.4.19***, stream temperature generally increased from June to August, reflecting the increase in summer air temperature. Similarly, as air temperatures decreased in September, stream temperatures declined as well. Additionally, stream temperatures spiked following periods of precipitation.

Table 3.4.8– Min, Max, and Average Stream Temperatures at NWDO102 from 2005-2009

Date	2005	2007	2009
Average (°F)	69.3	67.3	65.8
Min (°F)	54.3	53.4	57.0
Max (°F)	81.7	77.9	80.8
Percentage of readings exceeding Use IV standard (75 °F)	6.0	0.5	3.0

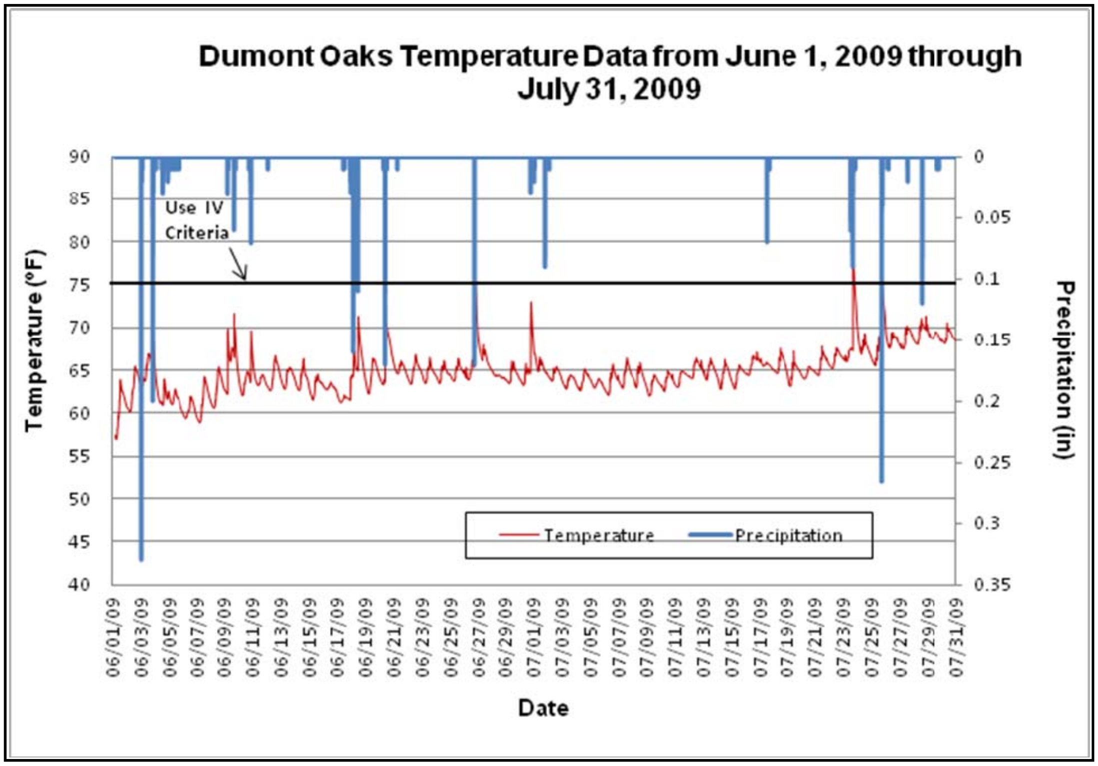


Figure 3.4.18 – Stream Temperature at NWDO102 from June 1, 2009 through July 31, 2009

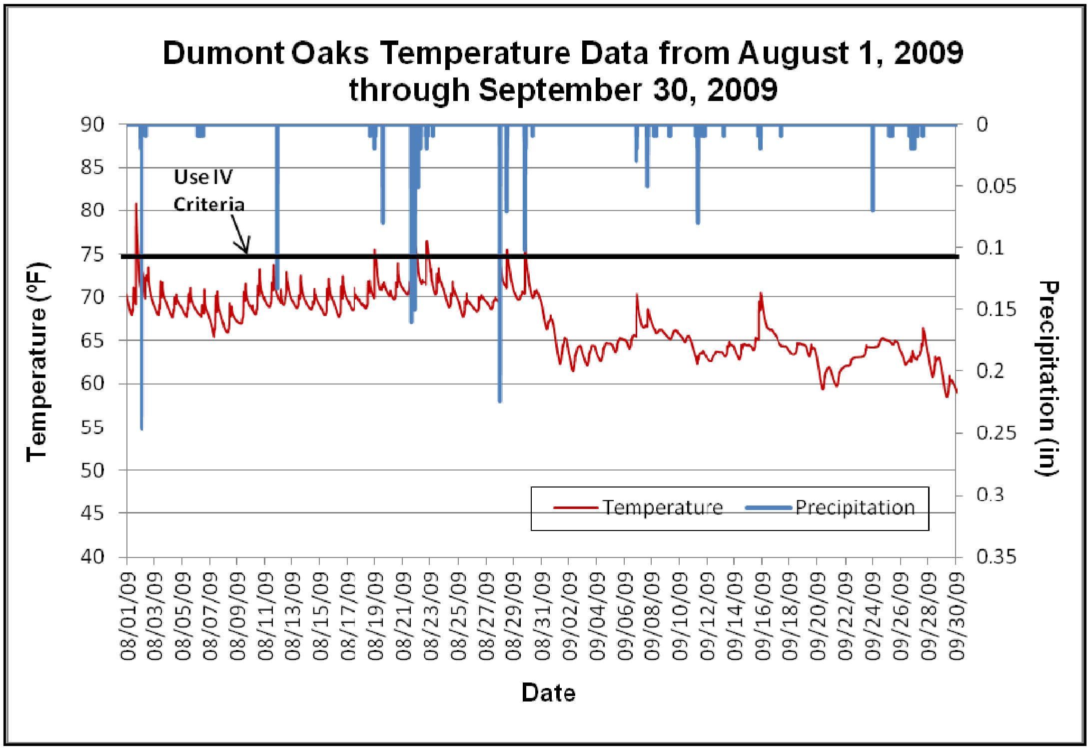


Figure 3.4.19 – Stream Temperature at NWDO102 from August 1, 2009 through September 30, 2009

3.4.5 Discussion

Table 3.4.9 below provides a summary of project goals, the results of post-restoration monitoring, and whether each project goal has been met by the restoration actions as assessed by the fifth year of post-restoration monitoring. Based on the results, one of the project goals was met by the restoration actions, one was partially met, and four of the project goals could not be evaluated in 2009 because of lack of pre-restoration data.

Table 3.4.9 – Summary of Project Goal Results

Goal	**Result**
Improve water quality in Dumont Oaks tributary to Northwest Branch	Unable to determine – pre-restoration data was not available, thus no comparisons can be made, however, benthic macroinvertebrate communities had the lowest possible scores in all years post-restoration
Improving aquatic habitat conditions	Unable to determine – pre-restoration data was not available, thus no comparisons can be made
Reduce stream erosion and sedimentation Reduce erosive stream flows	Unable to determine – no quantitative data available
Avoid introduction of new thermal impacts below Dumont Oaks pond	Unable to determine – temperature data not available upstream of pond, thus no comparisons can be made
Create vernal pool to catch overland flow and stormwater	Successful – obligate vernal pool fauna observed in 2005 and 2007. No obligate fauna in 2009, but other facultative species noted
Reforest riparian zone	Partially successful – experienced <50% survival in all planting zones, except Zone E

Unable to Determine – Improve Water Quality and Habitat Conditions in Dumont Oaks Tributary to Northwest Branch

The goal of improving water quality and habitat conditions in the Dumont Oaks tributary to Northwest Branch was unable to be evaluated, as pre-restoration data was not available and comparisons cannot be made. However, benthic macroinvertebrate communities had the lowest possible BIBI scores in all years following restoration, thus it is not likely that the restoration contributed to a subsequently improved benthic macroinvertebrate community in the post-restoration period.

Successful – Vernal Pool

This restoration project has created a vernal pool in the floodplain of the Dumont Oaks tributary where one previously did not exist. Based on the monitoring results, the created vernal pool has provided habitat for obligate pool species such as spotted salamanders and wood frogs, which were both observed in 2005 and 2007. The presence of vernal pool obligates was not evident during the 2009 monitoring visit, but two facultative vernal pool species, one unknown frog and one unknown toad species, were observed in 2009. The 2009 observed absence of spotted salamanders and wood frogs could be due to the fact that the 2009 monitoring was performed slightly later in the spring (end of April), when these vernal pool species are typically finished with their breeding activities. The 2005 and 2007 monitoring was performed in late March and early April, respectively, when these vernal pool breeders are typically more active.

Partially Successful – Botanical Reforestation

In 2009, the overall success rate of the planted material across all zones was 34 percent. Planting Zones A through D showed greater than 50 percent mortality during the 2009 botanical monitoring, whereas planting zone E had 59 percent survival of planted material. It is unclear what factors contributed to the high planting mortality, since invasive species were not pervasive in the botanical zones and no evidence of deer was present in 2009. However, deer are common in this floodplain; therefore, it is likely that young or small plantings may have been browsed by deer prior to 2009, causing the high mortality numbers. It appears that most of the planted trees were 0.5 inch caliper. These individuals may have been too small to withstand the stress of potential deer browse or dry periods. The individuals that were counted in 2009, however, generally had larger caliper sizes than what were planted. The increase in size of the planted individuals is a measure of successful growth and a sign that these trees that have persisted to 2009 are well established. The most successful species planted at this site included pin oak, northern red oak, red maple, river birch, and American holly. Plants that fared poorest overall were American hornbeam and American sycamore, as well as most of the planted shrub species. It is recommended that more trees be planted in this area since so many of the plantings have died and a reestablishment of a forest buffer has not occurred along this project. Larger caliper trees with deer protection or deterrents are also recommended to increase the survival of future plantings.

Unable to Determine – Reduction of Stream Erosion, Sedimentation, and Erosive Stream flows

The goals of reducing stream erosion and sedimentation, erosive stream flows, and the concentration of pollutants in stormwater runoff are unable to be determined, as no pre- or post-restoration quantitative habitat data are available for this site. However, the Dumont Oaks Stormwater Pond was dredged to original volume capacity, and its riser was modified to improve stormwater control and manage the one-year storm, which should result in a reduction of stream erosion, sedimentation, and erosive stream flows.

Unable to Determine – Thermal Impacts

The goal of avoiding introduction of new thermal impacts into the tributary cannot be determined at this time. No temperature data is available upstream of the stormwater pond to compare the stream temperature flowing into the pond with the temperature flowing out of the pond, and baseline temperature data were not collected to compare pre- and post-restoration thermal regimes. However, during each monitoring year, the average temperature below the pond was below the Use IV temperature standard. It is recommended that one additional logger be placed upstream of the pond in the future and the logger station downstream of the pond be re-established to determine whether the pond is causing thermal impacts to its receiving stream. If temperature is significantly higher below the pond, then remediation measures may be advisable. It is also recommended that mowing and trimming around the pond be minimized to allow trees, shrubs, and pond-side vegetation to grow uninhibited to provide better pond shading. Without greater shading, it is unlikely that potential thermal impacts can be easily remediated.

3.4.6 Conclusions

Overall, the Dumont Oaks restoration project has met the goal of creating amphibian habitat and partially met the goal of reforesting the riparian zone with the addition of numerous trees and shrubs in the floodplain of the Dumont Oaks tributary that did not previously exist. However, because pre-restoration data was not available for this site, no comparisons can be made to baseline conditions for aquatic habitat, water quality, and thermal impacts.

Following restoration, aquatic habitat conditions were mostly within the Good/Fair range. Habitat conditions were generally suboptimal, with 50 percent or greater of the stream substrate surrounded by fine sediment, and only marginal protection of streambanks by riparian vegetation. The benthic macroinvertebrate community was rated as Poor, having the lowest possible percentage in all years, which likely indicates that improvements were not translated to the community with the restoration activities. The benthic macroinvertebrate community may be limited by the stream water quality at this site since the watershed in which the Dumont Oaks tributary flows is highly urbanized. In its current state, the basin is likely not able to assimilate impacts from impervious surface runoff or treat all of the contaminated stormwater without implementation of watershed-wide stormwater management improvements. Another possible explanation for the consistently poor condition of the benthic community is that re-colonization potential is limited. Benthic macroinvertebrates are more sedentary than fish, and predominantly recolonize from short distances upstream or via flying adults laying their eggs. Artificial introduction of healthy communities of benthic macroinvertebrates may be considered an option for this stormwater wetland and stream in the future.

It is recommended that a temperature monitoring site be established upstream of the pond and this site, as well as the downstream site, be monitored for another year to determine whether the pond is causing thermal impacts to its receiving stream. It is also recommended that mowing and trimming be minimized around the pond to allow trees, shrubs, and pond-side vegetation to grow uninhibited to provide better pond shading. Without greater shading, it is unlikely that any thermal impacts detected can be easily remediated.