

## 3.9 Upper Northwest Branch Stream Restoration

### 3.9.1 Introduction

The Montgomery County Department of Environmental Protection, in collaboration with the Maryland-National Capital Park and Planning Commission (M-NCPPC) and the U.S. Army Corps of Engineers (USACE), is planning to restore approximately 1,750 feet of the Upper Mainstem of the Northwest Branch, just south of the Norbeck and Norwood Road intersection. This project is planned for construction in the summer of 2011. The Upper Northwest Branch is designated as a Use Class IV stream by the Maryland Department of Environment. The Upper Mainstem of the Northwest Branch was identified as a priority for restoration in the Northwest Branch Watershed Feasibility Study (July 2000). This stream has been degraded by years of uncontrolled storm flows, which have impacted habitat for fish and other aquatic life. The County plans to stabilize eroded streambanks, restore stable habitat, create wetlands, and reforest stream buffer areas.

#### *Subwatershed facts*

Subwatershed Drainage Area: 4.7 square miles (drainage area to site)

Subwatershed Imperviousness: 6 percent

#### *Project Facts*

**Project Area:** Approximately 1,750 linear feet of stream south (downstream) of the Norbeck/Norwood Road crossing.

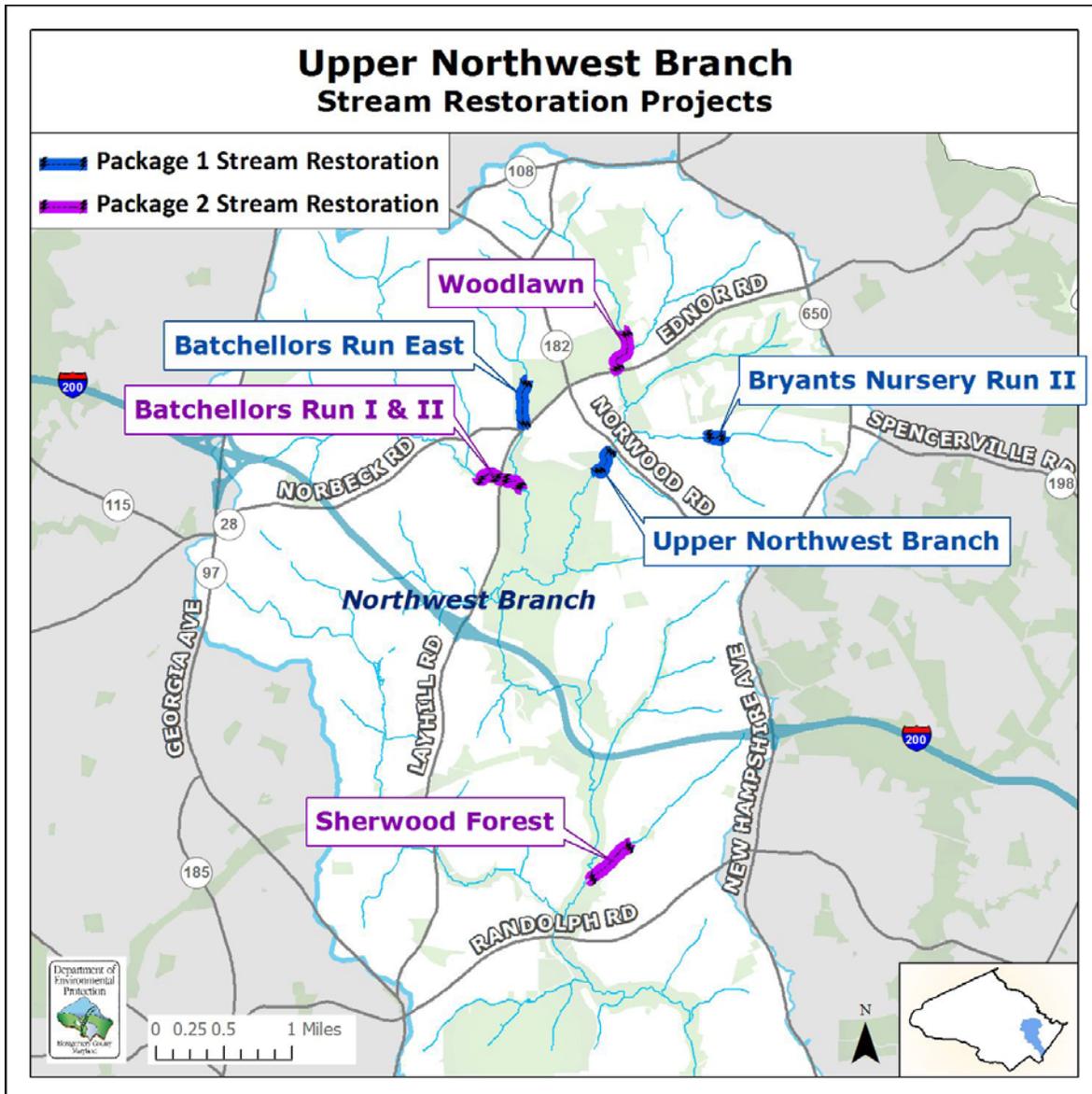
**Costs (Projected):** Construction \$480,000, funded in part by the USACE

**Completion Date (Projected):** Summer 2011

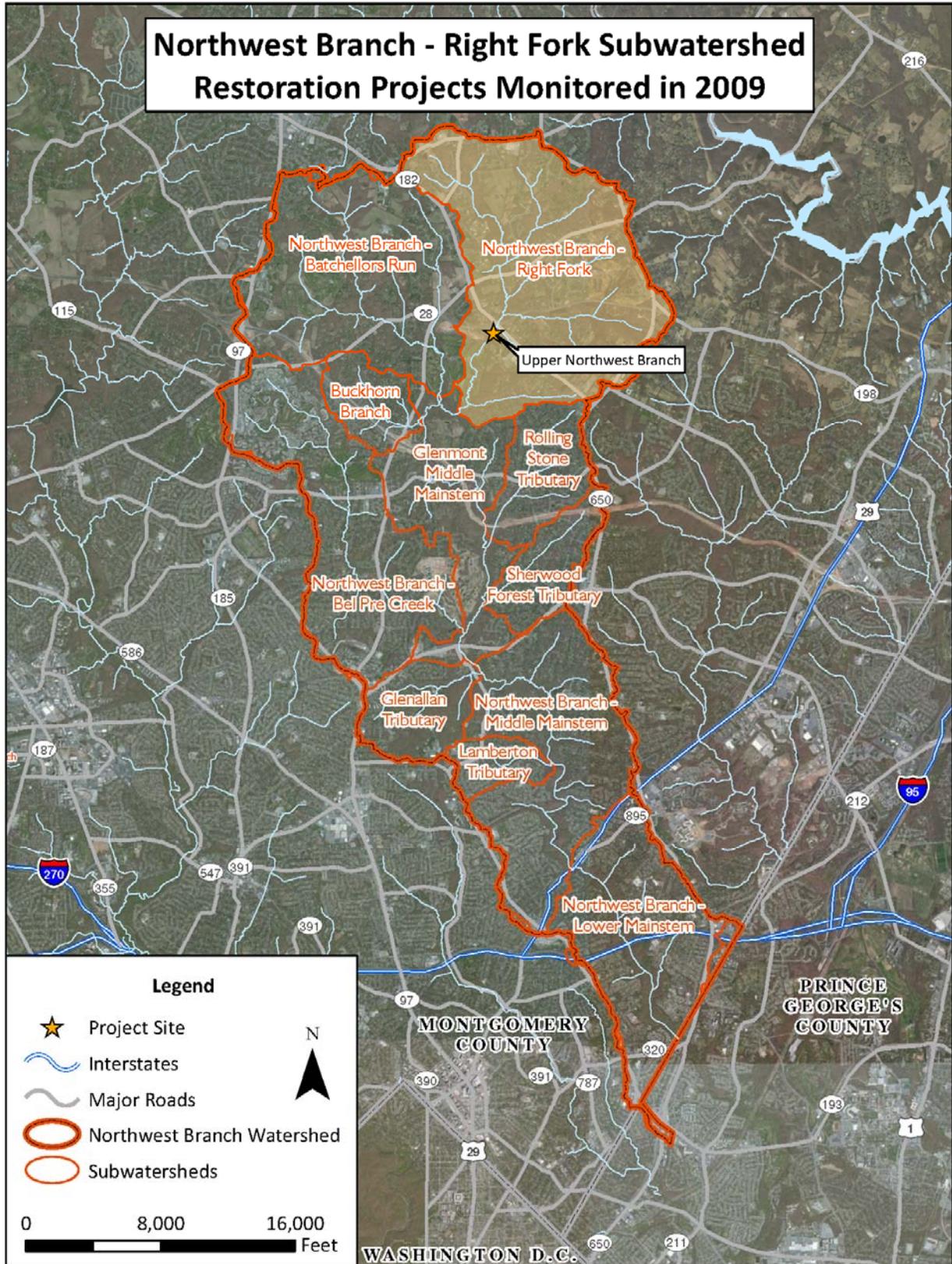
**Property Ownership:** M-NCPPC

#### *Project Selection*

The Upper Mainstem of the Northwest Branch, along with several other stream reaches, was identified as a priority for restoration in the Northwest Branch Watershed Feasibility Study (July 2000). The Montgomery County Department of Environmental Protection, in collaboration with the M-NCPPC and the USACE is planning to restore streams in the Northwest Branch watershed in two packages. Upper Northwest Branch Package 1 will be restored in 2011 and include three stream reaches, Batchellors Run East, Upper Northwest Branch, and Bryants Nursery Run. Upper Northwest Branch Package 2 projects include Sherwood Forest I, Batchellors Run I & II, and Woodlawn stream restorations, and are planned to be completed from fall 2012 to summer 2013 (*Figure 3.9.1 and 3.9.2*).



**Figure 3.9.1 – Upper Northwest Branch Stream Restoration Package 1 and Package 2 Projects, Including Bryants Nursery Run II Stream Restoration**



*Figure 3.9.2 – Northwest Branch Right Fork Subwatershed Restoration Projects, Including Upper Northwest Branch Stream Restoration*

### *Pre-Restoration Conditions*

Much of the Northwest Branch Watershed was developed prior to regulations requiring stormwater management control, and the watershed 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.

The Upper Mainstem of the Northwest Branch is characterized by eroded streambanks, unstable channel materials, low flow conditions, minimal access to floodplain and interaction with wetlands, and a general lack of in-stream cover for fish. While the site does not currently exhibit serious degradation, there are opportunities, through careful repair and enhancement of habitat, to maintain and improve stream stability that would otherwise continue to deteriorate (**Figures 3.9.3 and 3.9.4**).



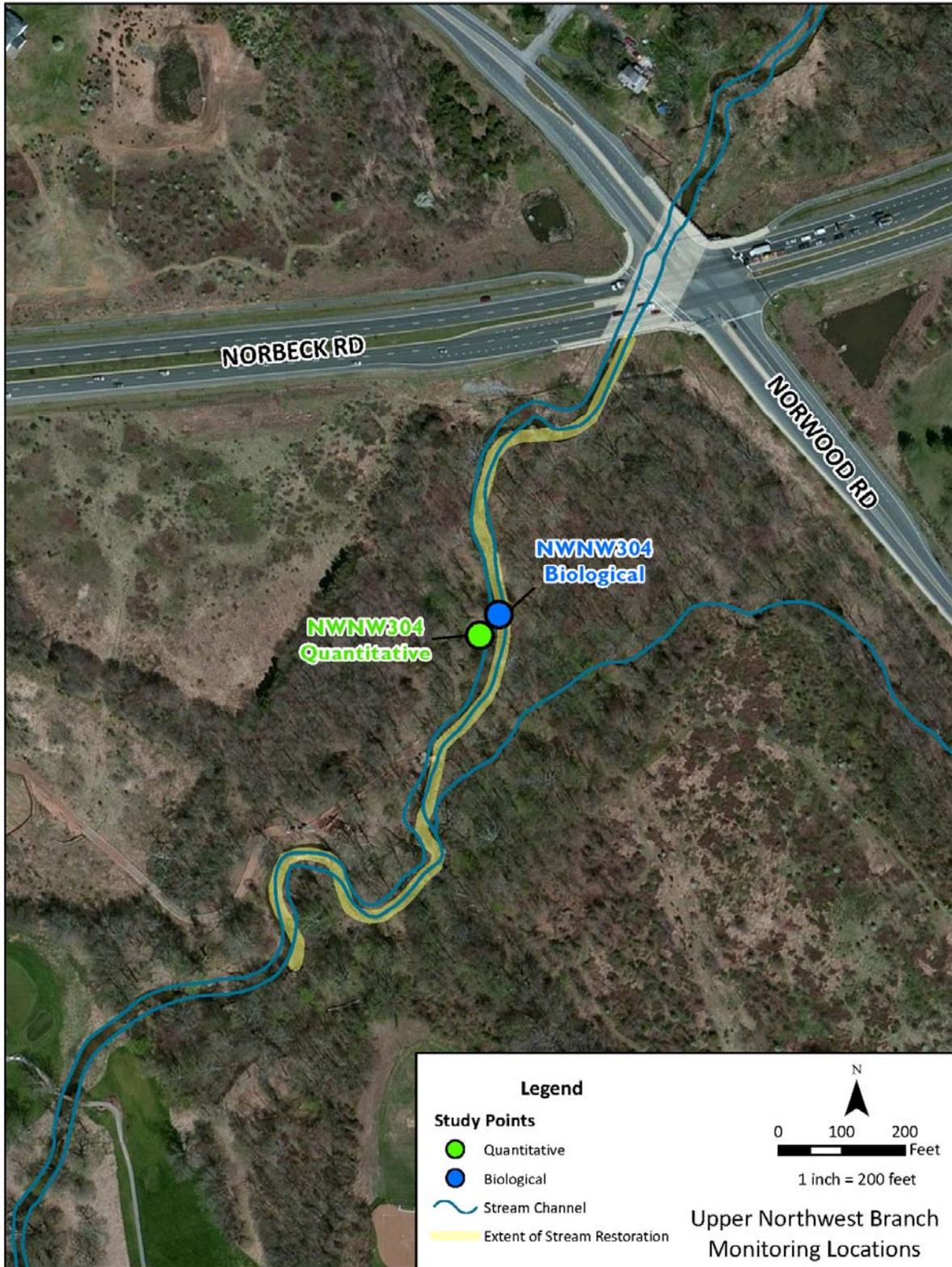
**Figure 3.9.3 – Upper Northwest Branch Picturing Eroded Streambank Prior to Restoration in 2009**



**Figure 3.9.4 – Upper Northwest Branch Picturing Poor Connection to Floodplain Prior to Restoration in 2009**

### *Restoration Actions Planned*

Restoration activities are planned to begin downstream of the Norbeck/Norwood Road crossing and extend for approximately 1,750 feet (**Figure 3.9.5**). Stone toe protection with plantings will help provide streambank stability and shade for in-stream habitat. In-stream structures will include log and rock vanes that will direct water away from unstable streambanks, form downstream scour pools, and provide habitat for fish. Other planned stream habitat features include rock wing deflectors and riffle grade controls. Trees will be planted, and vernal pool wetlands and floodplain access will be created to enhance the riparian zone alongside the stream.



*Figure 3.9.5 – Map of 2009 Monitoring Locations at the Upper Northwest Branch Restoration Site*

### 3.9.2 Restoration Goals

The goals of the Upper Northwest Branch stream restoration project are presented below in **Table 3.9.1**, along with the monitoring performed to characterize the pre-restoration conditions, and when and where monitoring has occurred or is planned to occur following restoration. This is a pre-construction monitoring report and summarizes the pre-restoration conditions within the Upper Northwest Branch Stream Restoration project area.

**Table 3.9.1 – Summary of Restoration Project Goals and Associated Monitoring**

<b>Why: Restoration Goals</b>	<b>What: Monitoring Done to Evaluate Goal</b>	<b>When: Years Monitored</b>	<b>Where: Station or Location Monitored</b>
<ul style="list-style-type: none"> <li>• Improve aquatic habitat conditions by enhancing pool and riffle fish habitat and creating overhead cover for fish</li> </ul>	<ul style="list-style-type: none"> <li>• Qualitative habitat</li> <li>• Aquatic communities:               <ul style="list-style-type: none"> <li>▪ Benthic macroinvertebrates</li> <li>▪ Fish</li> </ul> </li> <li>• In-situ water chemistry</li> </ul>	2001, 2004, 2009 (pre)	NWNW304
<ul style="list-style-type: none"> <li>• Stabilize eroding streambanks to reduce sediment entering the stream</li> </ul>	<ul style="list-style-type: none"> <li>• Quantitative habitat (stream morphology surveys)</li> </ul>	2009 (pre) <sup>1</sup>	NWNW304
<ul style="list-style-type: none"> <li>• Construct wetlands to improve water quality and provide amphibian habitat</li> </ul>	<ul style="list-style-type: none"> <li>• Wetland herpetofauna surveys</li> </ul>	Post only	Constructed wetlands
<ul style="list-style-type: none"> <li>• Reforest streambanks for added stability and overhead cover</li> </ul>	<ul style="list-style-type: none"> <li>• Botanical reforestation surveys</li> </ul>	Post only	Reforested areas

<sup>1</sup> Quantitative habitat surveys were scheduled for 2009, but were delayed due to missing benchmarks. These benchmarks were located and survey work was performed in 2010. The 2010 report will include updates for this monitoring.

### 3.9.3 Methods to Measure Project Goals

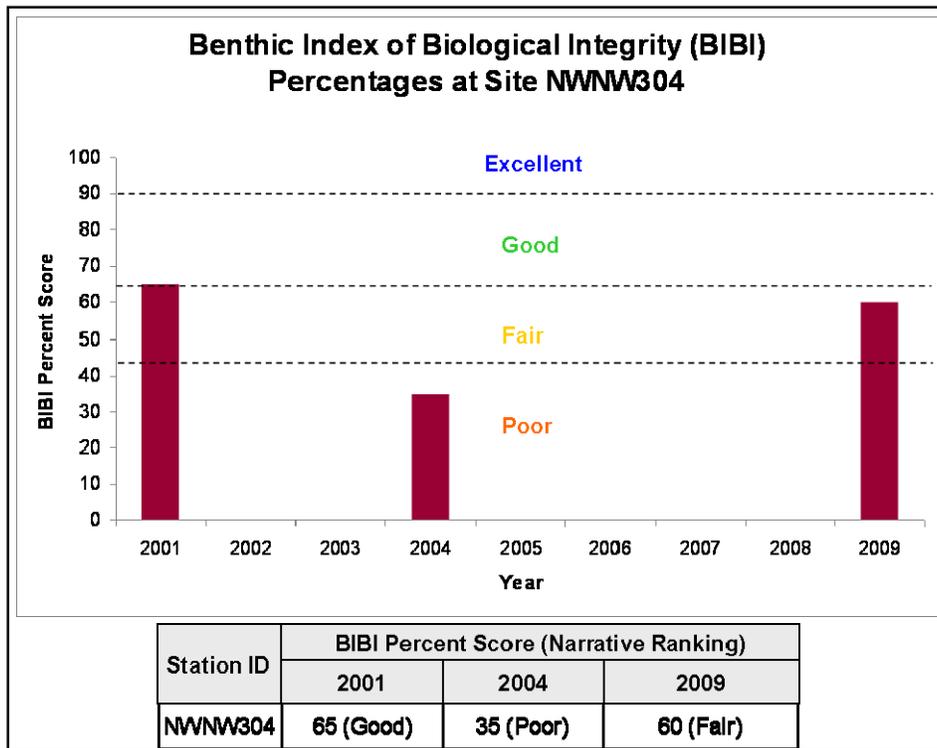
The basic sampling design for the Upper Northwest Branch Stream Restoration project is pre-restoration (before) and post-restoration (after) monitoring. The County monitored the biological communities (benthic macroinvertebrates and fish), performed rapid habitat assessments (RHAB), and took in-situ water chemistry measurements at biological monitoring site NWNW304 to evaluate the aquatic habitat conditions and water quality during the pre-restoration period. The County also performed quantitative survey for the entire project length, but this work was postponed until 2010 due to missing benchmarks. Wetland and botanical surveys are planned once the wetlands are created and trees and shrubs are planted. If the project is completed as planned in summer 2011, all data collected prior to summer 2011 will be considered pre-restoration data and all subsequent data will be considered post-restoration. Pre-restoration monitoring was performed in 2001, 2004, and 2009 at DEP’s long-term monitoring site, NWNW304, downstream of the Norbeck and Norwood Road intersection. Post-restoration monitoring is planned for at least years one, two, three, four, and five after restoration.

### 3.9.4 Results and Analysis

#### *Benthic Macroinvertebrates*

##### BIBI (Benthic Index of Biological Integrity) Scores

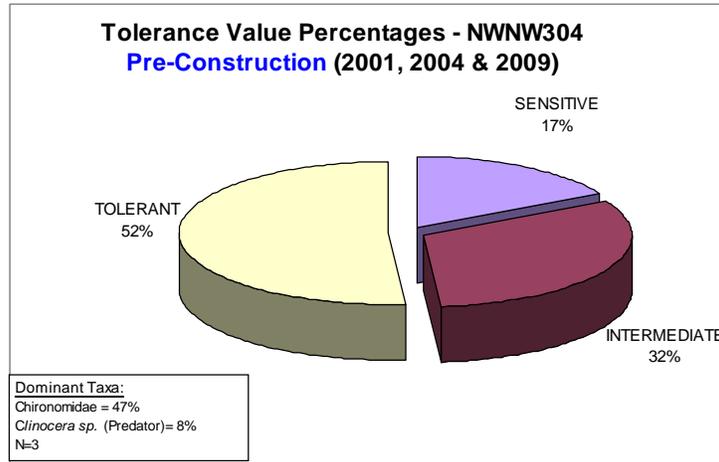
Pre-restoration benthic macroinvertebrate assessments were conducted at site NWNW304 in 2001, 2004, and 2009. This site was rated by the Benthic Index of Biological Integrity (BIBI) as Good in 2001, Poor in 2004, and Fair in 2009 (*Figure 3.9.6*). In all years, the benthic community was dominated by Chironomidae (midges), however, in 2001 and 2009, the community was more diverse and had other more sensitive taxa and specialized feeders as sub-dominants. The 2009 field data sheets for this task are included in *Appendix D*.



**Figure 3.9.6 – Pre -Restoration Benthic Index of Biological Integrity (BIBI) Percentages at NWNW304**

##### Dominant Taxa and Tolerance Values

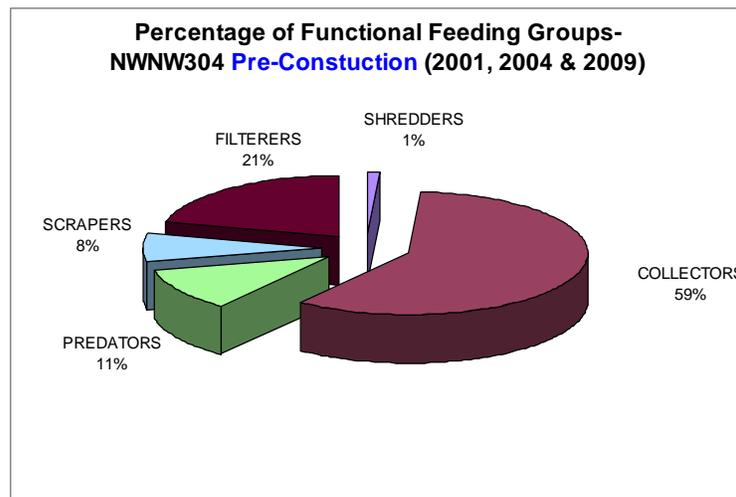
Midges dominated the benthic macroinvertebrate community at NWNW304 during the pre-restoration period (*Figure 3.9.7*). Midges are considered tolerant to degraded habitat and water quality conditions. A genus of Diptera (true fly), *Clinocera sp.* (dance fly) was second most dominant, comprising eight percent of the community; they are considered intermediate in sensitivity. Tolerant individuals were dominant (52 percent) at NWNW304 prior to restoration, individuals intermediate to sensitivity were second most dominant (32 percent), and sensitive individuals were least abundant (17 percent). Genera from the following families/orders made up the sensitive individuals found at this site: Elmidae (riffle beetle), Trichoptera (caddisfly), Ephemeroptera (mayfly), and Plecoptera (stonefly).



**Figure 3.9.7 – Pre-restoration Benthic Macroinvertebrate Tolerance Composition and Dominance at NWNW304**

Functional Feeding Groups

Collectors were the most dominant feeding group at NWNW304 (**Figure 3.9.8**). More specialized feeders, including scrapers and shredders, comprised a total of nine percent of the community in the pre-restoration period.

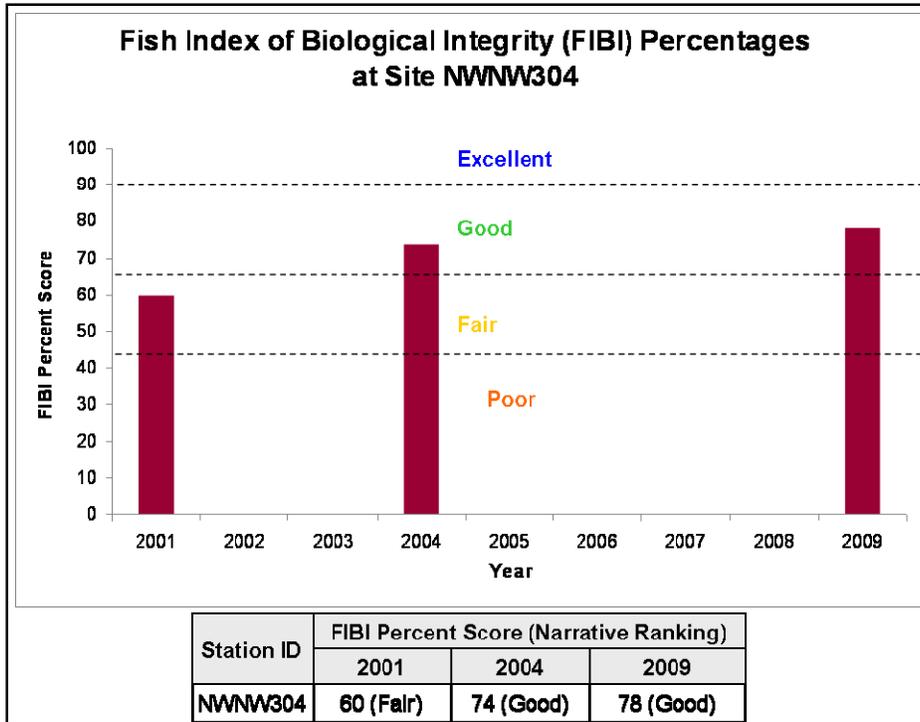


**Figure 3.9.8 – Pre-restoration Benthic Macroinvertebrate Functional Feeding Group Composition at NWNW304**

*Fish*

FIBI (Fish Index of Biological Integrity) Scores

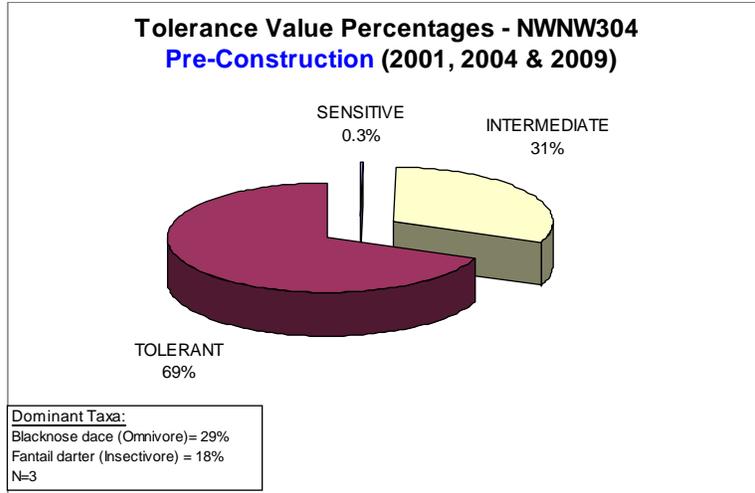
Pre-restoration fish assessments were conducted at site NWNW304 in 2001, 2004, and 2009. This site was rated by the Fish Index of Biological Integrity (FIBI) as Fair in 2001, and Good in 2004 and 2009, with percent scores improving in each year (**Figure 3.9.9**). The increases in FIBI over time were generally due to a decline in the proportion of tolerant individuals and an increase in the total number of individuals. Field data sheets from 2009 fish monitoring are included in **Appendix D**.



**Figure 3.9.9 – Pre -Restoration Fish Index of Biological Integrity (FIBI) Percentages at NWNW304**

Dominant Species and Tolerance Values

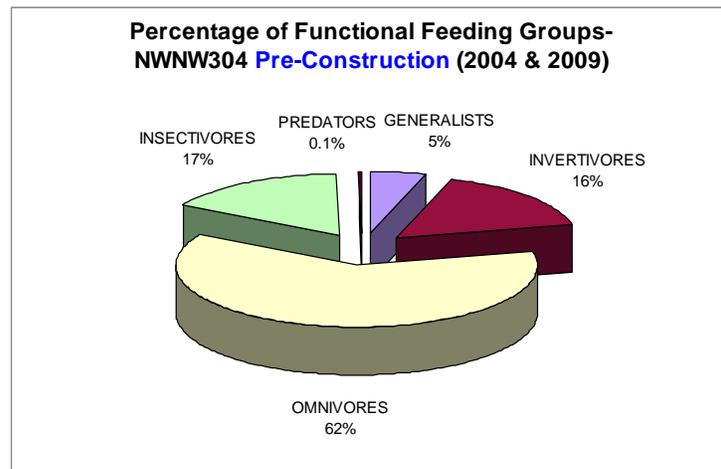
In all years, the fish community was dominated by *Rhinichthys atratulus* (blacknose dace). Blacknose dace are considered tolerant to degraded stream conditions (**Figure 3.9.10**). Several other species tolerant to degraded conditions were collected at this site. Some of the more dominant species included, *Pimephales notatus* (bluntnose minnow), *Catostomus commersoni* (white sucker), *Notropis procne* (swallowtail shiner), *Lepomis auritus* (redbreast sunfish), and *Etheostoma olmstedi* (tessellated darter). *Etheostoma flabellare* (fantail darter) was the second most dominant fish collected at this site. Fantail darters are considered intermediate in sensitivity. Only one species, *Hypentelium nigricans* (northern hogsucker), considered sensitive to degraded stream conditions, was collected at this site and was only collected in 2004.



**Figure 3.9.10 – Fish Tolerance Composition and Species Dominance at NWNW304 Prior to Restoration**

Functional Feeding Groups

Omnivores were the most dominant feeding group present (62 percent) at NWNW304 and were represented by several species of minnows including, blacknose dace, bluntnose minnow, *Rhinichthys cataractae* (longnose dace), and *Notropis buccatus* (silverjaw minnow) (**Figure 3.9.11**). Insectivores were second most dominant (17 percent) and were solely represented by fantail darter, while invertivores were the third most dominant feeding group (16 percent) represented by tessellated darter, *Clinostomus funduloides* (rosyside dace), northern hogsucker, cutlips minnow (*Exoglossum maxillingua*), and bluegill (*Lepomis macrochirus*).



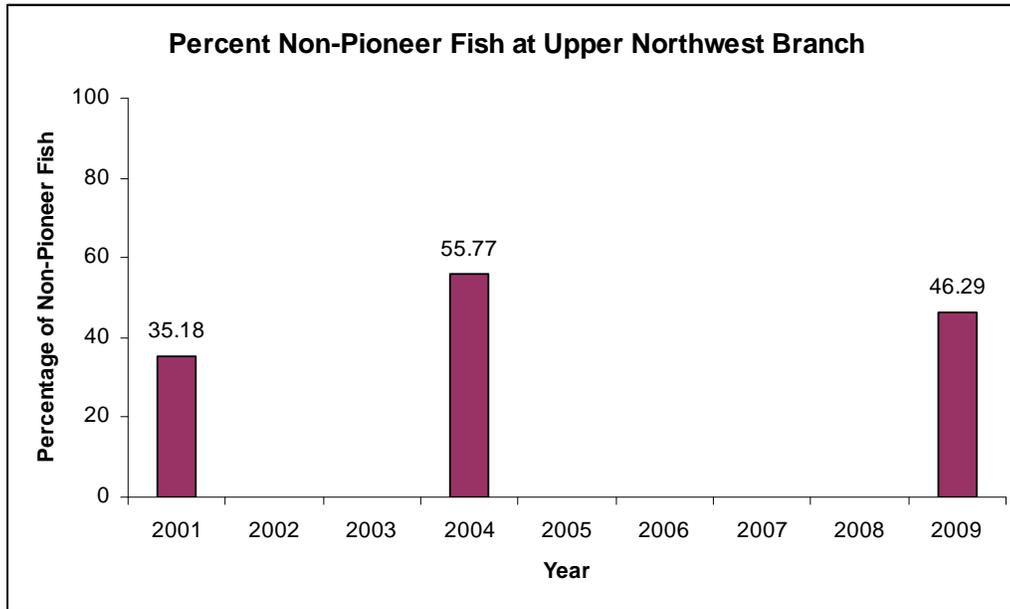
**Figure 3.9.11 – Fish Functional Feeding Group Composition at NWNW304 Prior to Restoration**

Pioneer Fish

Pioneer species of fish (such as blacknose dace and bluntnose minnow) are more capable of colonizing degraded or transient stream habitat. Non-pioneer species prefer higher quality, stable habitat to survive. Species that are considered non-pioneers are generally more sensitive

to disturbed aquatic habitats than pioneer species.

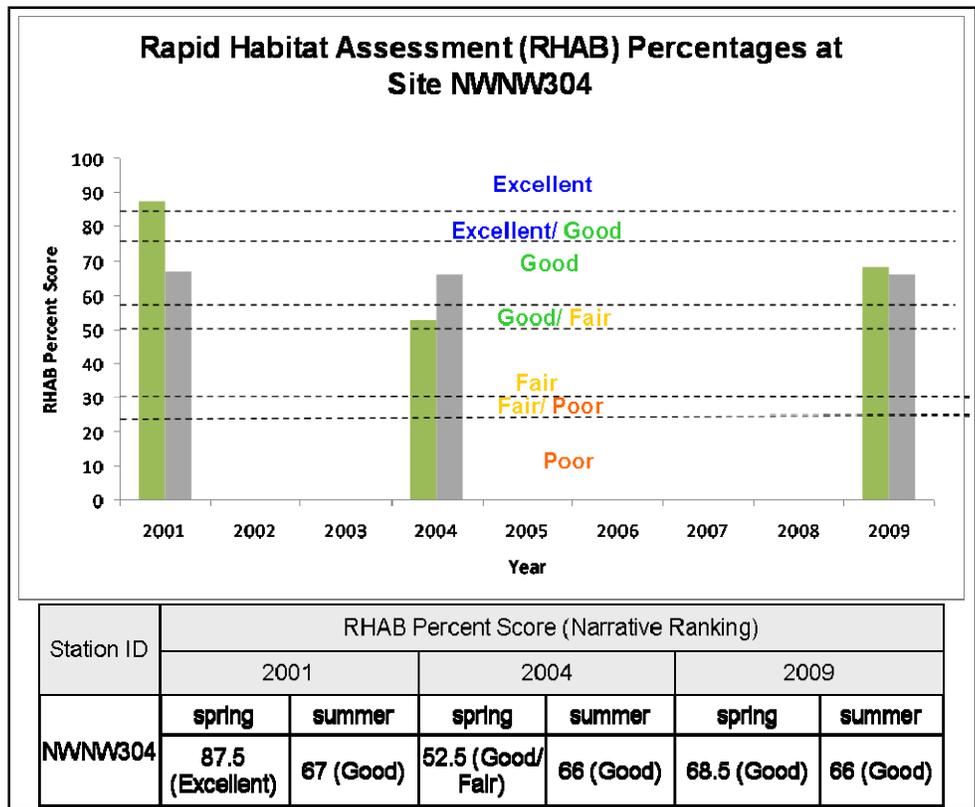
The percentage of non-pioneer fish was variable over the pre-restoration period, but generally made up between 35 and 55 percent of the community (**Figure 3.9.12**). The variation among years was generally due to the percentage composition of blacknose dace, bluntnose minnow, and tessellated darter in the communities. These were the three most dominant pioneer species found at this site and their abundances had an overall effect on the non-pioneer percentages.



**Figure 3.9.12 – Non-Pioneering Fish Present at Upper Northwest Branch Prior to Restoration**

#### *Qualitative Habitat*

Aquatic habitat was evaluated at NWNW304 in the spring and summer of 2001, 2004, and 2009 prior to restoration. With the exception of the assessment done in the spring of 2001, which rated this site as Excellent, RHAB scores were consistently rated as Good or Good/Fair (**Figure 3.9.13**). In-stream habitat for fish was generally rated as suboptimal and epifaunal substrate for benthic macroinvertebrates was rated as marginal/suboptimal at the Upper Northwest Branch Mainstem site. Streambanks were assessed as being moderately stable to stable, and the riparian zone was generally unimpaired by human activities (**Figure 3.9.14**).



*Figure 3.9.13 – Rapid Habitat Assessment (RHAB) Percentages at NWNW304*



*Figure 3.9.14 – Site NWNW304 Picturing Suboptimal Cover for Fish and Moderately Stable Streambanks (2009)*

#### *Water Chemistry*

With the exception of one stream temperature reading that slightly exceeded the upper threshold for Use IV COMAR waters (75°F) in the summer of 2001, all in-situ water chemistry readings were in compliance with State standards (*Table 3.9.2*).

**Table 3.9.2 – In-situ Water Chemistry Data at NWNW304**

Parameter	2001		2004		2009	
	spring	summer	spring	summer	spring	summer
Dissolved Oxygen (mg/L)	10.1	8.67	13.57	10.42	11.75	9.04
Dissolved Oxygen (% Saturation)	-	96	117	114	76	93
pH	-	7.26	7.55	7.81	8.01	6.94
Conductivity (µmhos)	125	107	224	182	208	200
Water Temperature (°F)	57.2	77	48	67.1	55.6	64.9

*Quantitative Habitat*

Quantitative monitoring was scheduled to occur at this site but was delayed. Data were collected in 2010 and 2011 and will be presented in the subsequent 2010 and 2011 reports.

*Wetland/Vernal Pool*

The proposed wetland/vernal pool at NWNW304 is located in the floodplain of the upper reaches of Northwest Branch, about 700 feet southwest of the intersection of Maryland Route 28 and Norwood Road in Colesville. The site lies within a forested corridor that extends south along Northwest Branch (**Figure 3.9.15**). This site was visited in 2009 to look for herpetofauna (amphibians and reptiles), prior to the construction of the wetland/vernal pool. However, no herpetofauna were found during this time.



**Figure 3.9.15 – Location of the Proposed Wetland/Vernal Pool at Site NWNW304 (2009)**

**3.9.5 Discussion**

The pre-restoration benthic macroinvertebrate community at NWNW304 was variable with BIBI narrative rankings ranging from Poor to Good between 2001 and 2009. The benthic macroinvertebrate community was generally dominated by midges but in the higher scoring

years a more diverse community was represented at this site. Tolerant individuals were the most abundant tolerance group at NWNW304 and although sensitive individuals were the least abundant tolerance group, they did make up 17 percent of the community. Improvement in riffle habitat and decreases in sedimentation may result in a more consistent score of Good post-restoration, with increases in EPT taxa and specialized feeders.

The fish community improved in each year and was rated by the FIBI as Fair in 2001 and Good in 2004 and 2009. The fish community at this site was consistently dominated by blacknose dace, a tolerant fish species, and was comprised primarily of omnivorous individuals. Invertivores and insectivores, feeding groups that are considered specialists comprised 33 percent of the community prior to restoration. One species considered sensitive to disturbance was collected, northern hogsucker, as were several minnow species, white sucker, fantail darter, tessellated darter, and redbreast sunfish. Creation and improvement of stable fish habitat and instream cover may allow for a more diverse fish community, an increase in specialist feeders, and increase in the abundance of non-pioneer species.

Aquatic habitat at this site was generally rated as Good but was rated as Good/Fair in one assessment and Excellent in another. Generally, in-stream habitat for fish was rated as suboptimal, benthic macroinvertebrate habitat was rated as suboptimal/marginal, streambanks at this site were generally rated stable, and this site was observed to have a relatively unimpacted riparian zone. Proposed restoration will hopefully improve the fish and benthic habitat parameters and result in an improved score.

All in-situ water chemistry readings were in compliance with COMAR standards for this Use IV stream, except for one temperature reading which exceeded the State's highest allowable temperature for cold water streams (75°F). The proposed site of the wetland/vernal pool located in the floodplain of the Northwest Branch did not have any observed herpetofauna on the day of the 2009 site visit. Hopefully, the proposed wetland creation will provide suitable habitat to attract herpetofauna to the area.