3.12 Sherwood Forest I Stream Restoration

3.12.1 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, is planning to restore the Sherwood Forest tributary of Northwest Branch from Locksley Road to where the stream intersects with the mainstem of Northwest Branch. This project is planned for construction in the summer of 2013. The Sherwood Forest tributary 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 stream banks, restore stable habitat, create wetlands, and reforest stream buffer areas.

Subwatershed facts

Subwatershed Drainage Area: 0.9 square miles
Subwatershed Imperviousness: 16 percent

Project Facts

Project Area: The Sherwood Forest Stream Restoration project is planned for the Sherwood Forest tributary from the culvert downstream of Locksley Road to about a half a mile downstream to where the stream intersects with the mainstem of the Northwest Branch.
Costs (Projected): $1,025,000, funded in part by the United States Army Corps of Engineers (USACE)
Completion Date (Projected): Summer 2013
Property Ownership: M-NCPPC

Project Selection

The Sherwood Forest tributary, 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 completed three stream restoration projects for Upper Northwest Branch Package 1 in 2011, which included 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 restoration. Package 2 projects are planned to be completed from fall 2012 to summer 2013 (***Figure 3.12.1***).

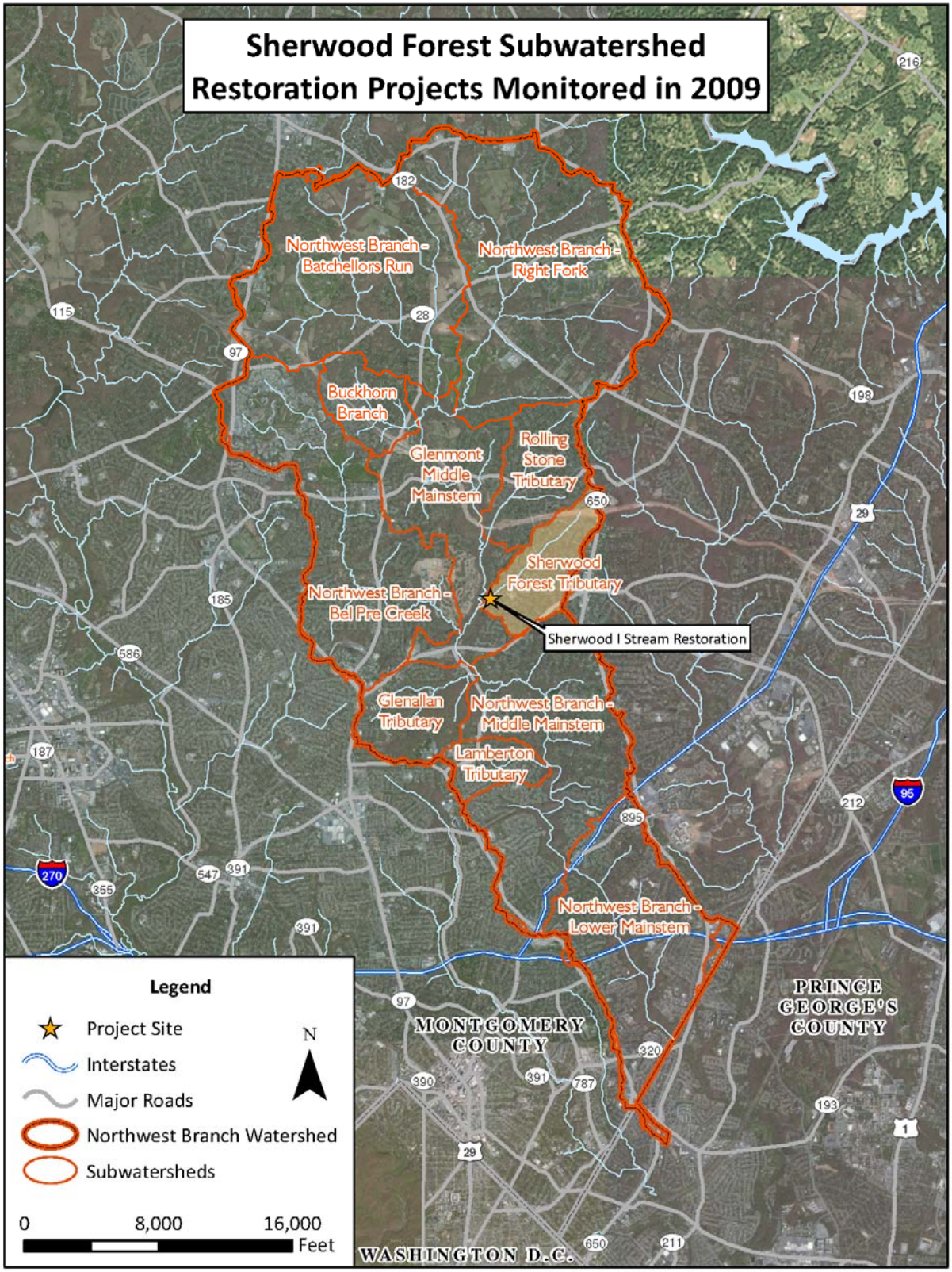


Figure 3.12.1 – Sherwood Forest Tributary Watershed Restoration Projects, Including Sherwood Forest I Stream Restoration

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 (***Figure 3.12.2***) that cause damage to receiving streams. The Sherwood Forest tributary is characterized by eroded stream banks, unstable sand and gravel channel materials, bar formation (especially around present or former debris jams), low flow conditions, minimal access to floodplain and interaction with wetlands, and a general lack of in-stream cover for fish (***Figures 3.12.3 and 4***). While the Sherwood Forest I 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.

Figure 3.12.2 – Sherwood Forest Tributary Picturing Storm Flow

Figure 3.12.3 – Sherwood Forest Tributary Picturing Eroded Streambank

Figure 3.12.4 – Sherwood Forest Tributary Picturing Eroded Streambank, Low Flow Conditions, and Unstable Sand

Restoration Actions Planned

Entrance to the site for construction is anticipated from the end of Scott Drive. Restoration activities are planned to begin on the Sherwood Forest tributary approximately 2,500 feet downstream of Locksley Lane and extend to the confluence with Northwest Branch (***Figure***

3.12.6). Stone toe protection with plantings will help provide stream bank stability and shade for in-stream habitat. In-stream structures will include log and rock vanes that will direct water away from unstable stream banks, 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 (***Figure 3.12.4***) and floodplain access will be created to enhance the riparian zone alongside the stream.

Figure 3.12.5 –Proposed Wetland Creation Area Alongside the Sherwood Forest Tributary

3.12.2 Restoration Goals

The goals of the Sherwood Forest I Stream Restoration Project are presented below in ***Table 3.12.1***, along with the monitoring performed to characterize 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 Sherwood Forest I Stream Restoration project area.

Table 3.12.1 – 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 aquatic habitat conditions by enhancing pool and riffle fish habitat and creating overhead cover for fish	• Qualitative Habitat • Aquatic Communities: ▪ Benthic macroinvertebrates ▪ Fish ▪ Stream Salamanders • Water Chemistry	2004, 2006, and 2009, (pre)	NWSF201
• Stabilize eroding stream banks to reduce sediment entering the stream	• Quantitative habitat (stream morphology surveys)	2009 (pre) [1]	NWSF201

Why: Restoration Goals	What: Monitoring Done to Evaluate Goal	When: Years Monitored	Where: Station or Location Monitored
• Construct wetlands to improve water quality and provide amphibian habitat	• Wetland herpetofauna surveys	Post only	Constructed wetlands
• Reforest stream banks for added stability and overhead cover	• Botanical reforestation surveys	Post only	Reforested areas

[1] Quantitative habitat surveys were scheduled for 2009, but were delayed due to missing benchmarks. These benchmarks were located and survey work was performed in 2012. The 2012 report will include updates for this monitoring.

3.12.3 Methods to Measure Project Goals

The basic sampling design for the Sherwood Forest I 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 a biological monitoring site (NWSF201) 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 2012 due to missing benchmarks. Wetland and botanical surveys are planned once the wetlands are created and trees are planted. If the project is completed as planned in summer 2013, all data collected prior to 2013 will be considered pre-restoration data and all subsequent data will be considered post-restoration. Pre-restoration monitoring was performed in 2004, 2006, and 2009 at the NWSF201 site within the proposed project limits. Post-restoration monitoring is planned for at least years one, three, and five years after restoration.

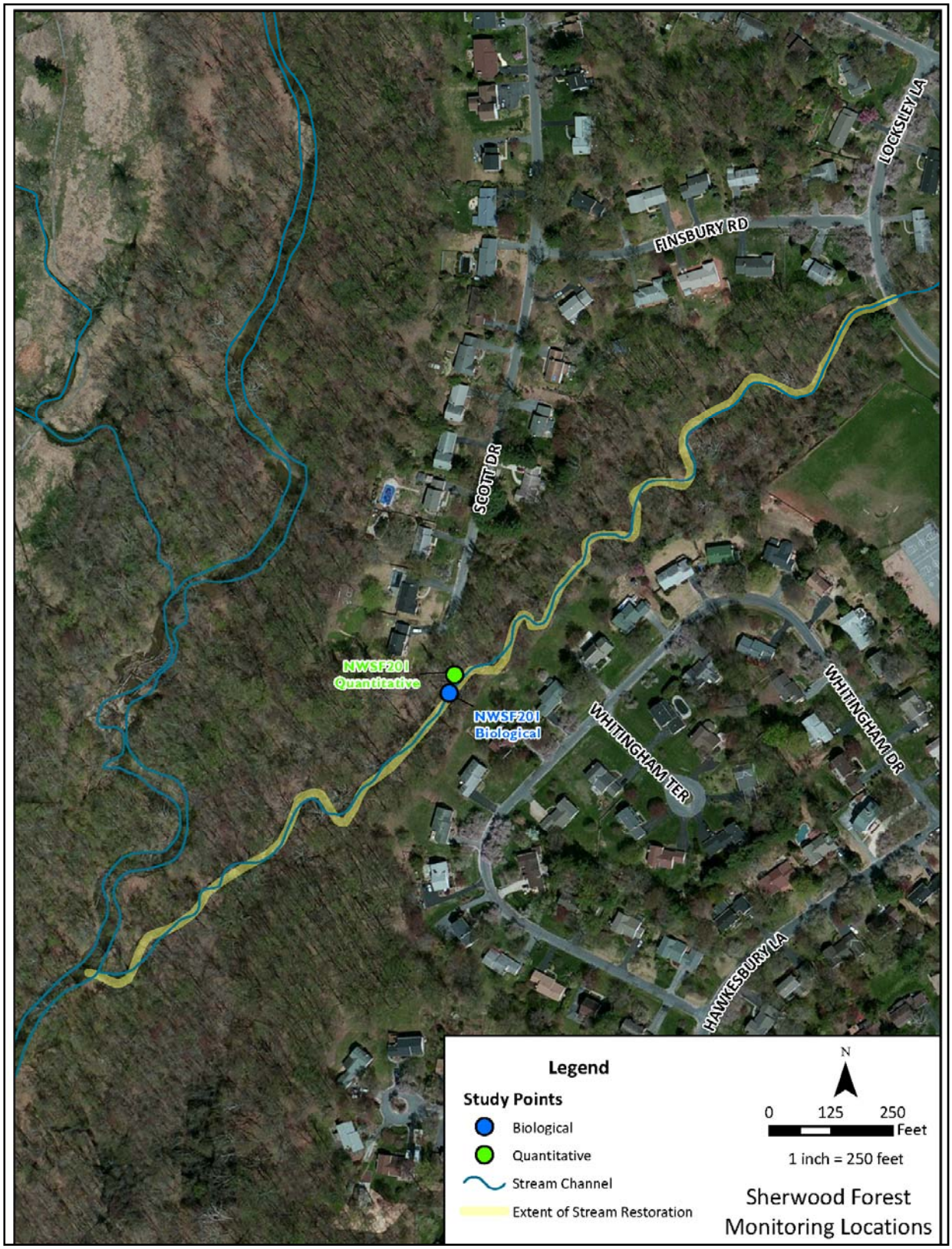


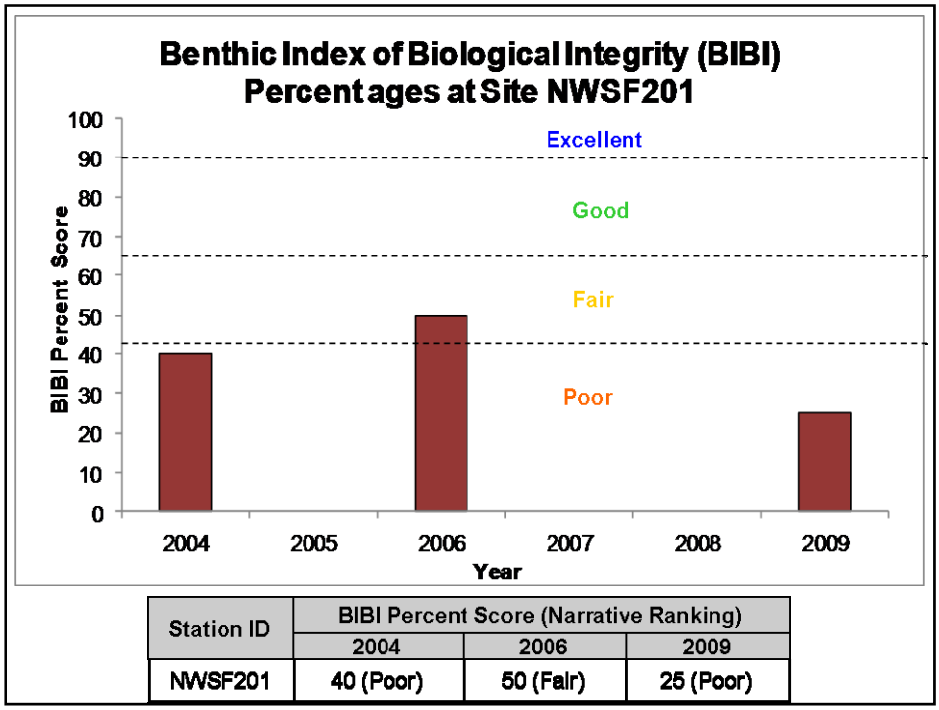
Figure 3.12.6 – Map of 2009 Monitoring Locations at the Sherwood Forest I Restoration Site

3.12.4 Results and Analysis

Benthic Macroinvertebrates

BIBI (Benthic Index of Biological Integrity) Scores

Pre-restoration benthic macroinvertebrate assessments were conducted at site NWSF201 in 2004, 2006, and 2009. This site was rated by the Benthic Index of Biological Integrity (BIBI) as Poor in 2004 and 2009, and Fair in 2006 (***Figure 3.12.7***). The increase in BIBI percentage in 2006 was due to a decrease in the biotic index and a decrease in the percentage of dominant individuals present at this site. In 2009, all individual metrics declined to the lowest level, except for the biotic index which was at a median level. 2009 field data sheets for this task are included in ***Appendix D***.



Station ID	BIBI Percent Score (Narrative Ranking)		
	2004	2006	2009
NWSF201	40 (Poor)	50 (Fair)	25 (Poor)

Figure 3.12.7 – Pre -Restoration Benthic Index of Biological Integrity (BIBI) Percentages at NWSF201

Dominant Taxa and Tolerance Values

The pre-restoration benthic community was dominated by the family Chironomidae (midges), and to a lesser degree, Naididae (aquatic worms). Tolerant individuals dominated (78 percent) the community at NWSF201. Individuals intermediate in sensitivity comprised 18 percent of the community at NWSF201 and individuals sensitive to urbanization made up four percent (***Figure 3.12.7***). 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).

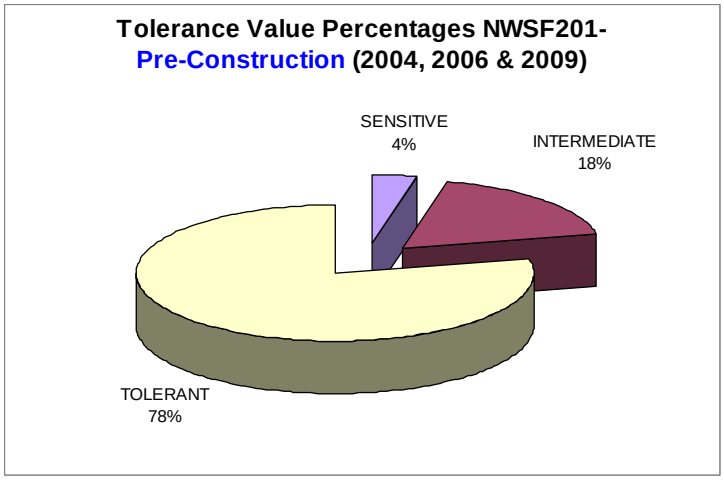


Figure 3.12.8 – Benthic Macroinvertebrate Tolerance Composition at NWSF201

Functional Feeding Groups

Collectors were the most dominant feeding group at NWSF201 (***Figure 3.12.8***). More specialized feeders, including scrapers and shredders, comprised three percent of the community in the pre-restoration period.

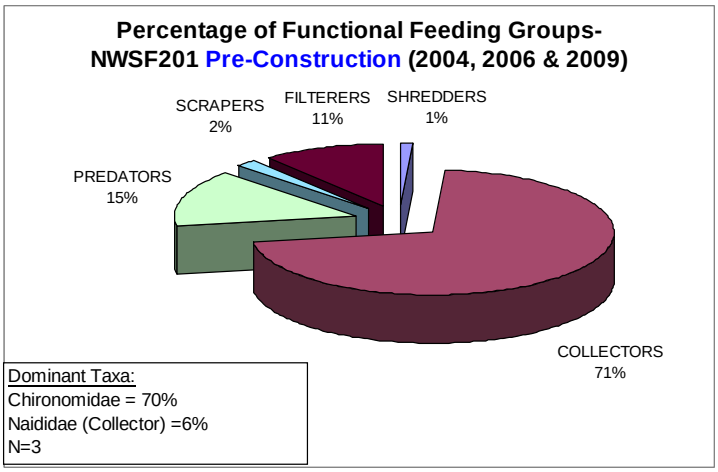
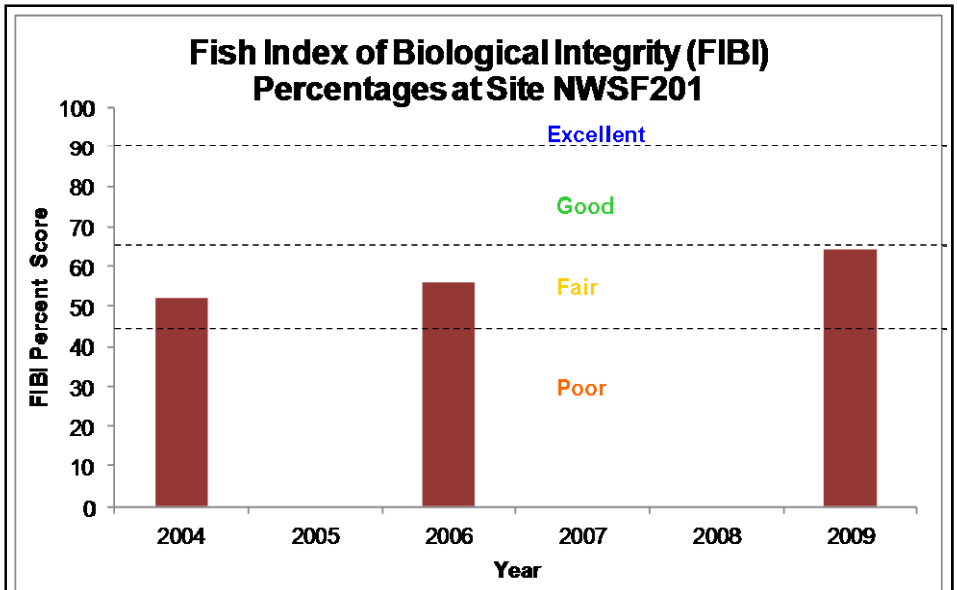


Figure 3.12.9 – Benthic Macroinvertebrate Functional Feeding Group Composition at NWSF201

Fish

FIBI (Fish Index of Biological Integrity) Scores

The fish community at site NWSF201 as assessed by the MDCEP Fish Index of Biological Integrity (FIBI) was consistently rated as Fair, with FIBI percent scores improving in each sampled year (***Figure 3.12.9***). In all years, the fish community at this site was generally dominated by several species of minnows, darters, and *Catostomus commersoni* (white sucker). Field data sheets from 2009 fish monitoring are included in ***Appendix D***.



Station ID	FIBI Percent Score (Narrative Ranking)		
	2004	2006	2009
NWSF201	52 (Fair)	56 (Fair)	64 (Fair)

Figure 3.12.10 – Pre -Restoration Fish Index of Biological Integrity (FIBI) Percentages at NWSF201

Dominant Species and Tolerance Values

The most dominant fish species found at NWSF201 over the pre-restoration period was *Rhinichthys atratulus* (blacknose dace), which comprised 51 percent of the community. Blacknose dace are considered tolerant to urbanization (***Figure 3.12.10***). Other tolerant species found at this site included white sucker, *Pimephales notatus* (bluntnose minnow), and *Etheostoma olmstedi* (tessellated darter). The second most dominant fish species at this site was *Clinostomus funduloides* (rosyside dace), which comprised 14 percent of the community. Rosyside dace are intermediate in sensitivity. No fish sensitive to stream degradation were present at this site prior to restoration.

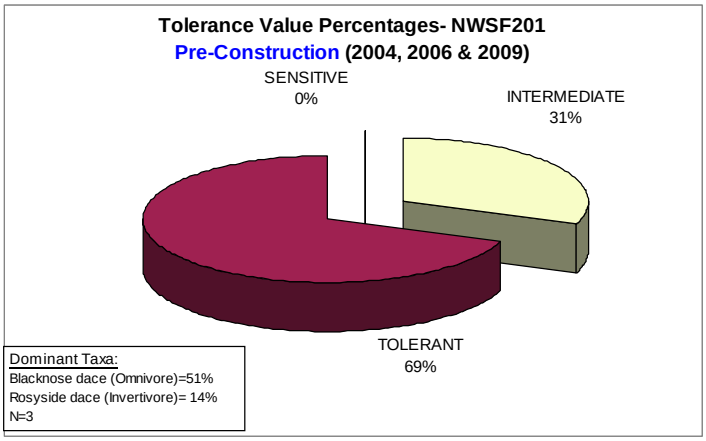


Figure 3.12.11 – Fish Tolerance Composition and Species Dominance at NWSF201 Prior to Restoration

Functional Feeding Groups

Omnivores were the most dominant feeding group (71 percent) present at NWSF201 and were represented by blacknose dace, white sucker, *Pimephales notatus* (bluntnose minnow), *Rhinichthys cataractae* (longnose dace), and *Notropis buccatus* (silverjaw minnow) (***Figure 3.12.11***). Invertivores were second most dominant and were represented by *Clinostomus funduloides* (rosyside dace) and *Etheostoma olmstedi* (tessellated darter).

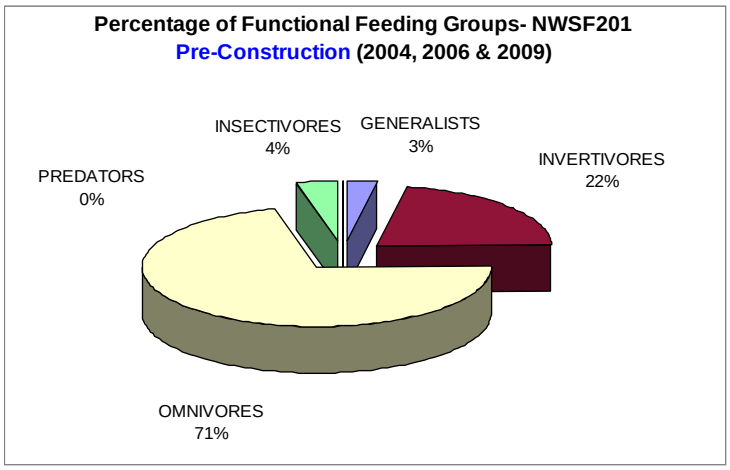
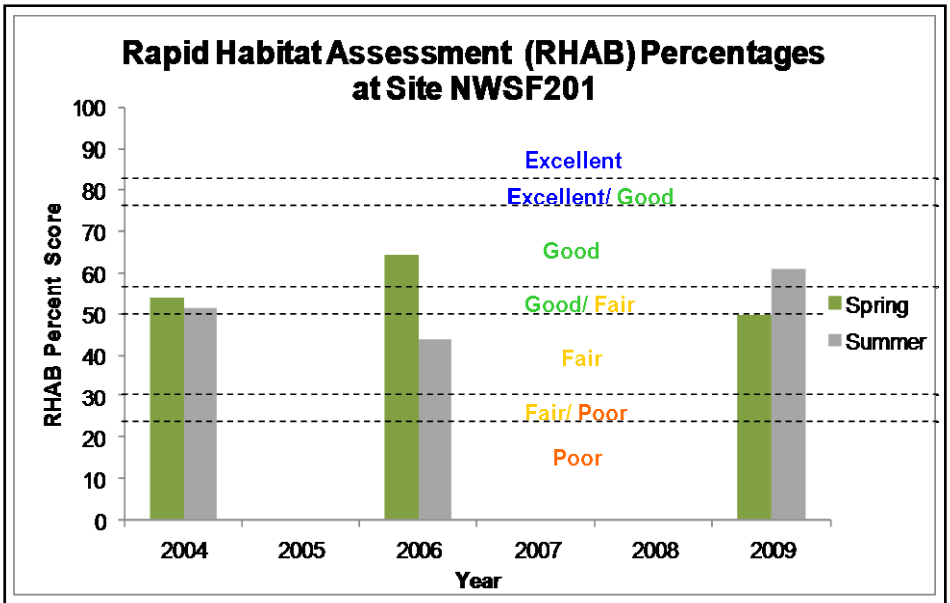


Figure 3.12.12 – Fish Functional Feeding Group Composition at NWSF201 Prior to Restoration

Qualitative Habitat

Aquatic habitat was evaluated at NWSF201 in the spring and summer of 2004, 2006, and 2009 and was rated as Good, Good/Fair, or Fair (***Figure 3.12.12***). In-stream cover for fish and epifaunal substrates for benthic macroinvertebrates were generally considered suboptimal. Moderate sedimentation was documented at this site and embeddedness was also estimated as moderate (>50 percent). Bank stability on both banks was rated as moderately stable to unstable (***Figure 3.12.13***). Very little riparian vegetation was present at this site on the left bank due to the stream's proximity to maintained lawns (***Figure 3.12.14***).



Station ID	RHAB Percent Score (Narrative Ranking)					
	2004		2006		2009	
	spring	summer	spring	summer	spring	summer
NWSF201	54 (Good/Fair)	51.5 (Good/Fair)	64.5 (Good)	44 (Fair)	49.5 (Fair)	61 (Good)

Figure 3.12.13 – Rapid Habitat Assessment (RHAB) Percentages at NWSF201

Figure 3.12.14 – Site NWSF201 Picturing Bank Erosion (2009)

Figure 3.12.15 – Site NWSF201 Picturing Limited Riparian Buffer (2009)

Water Chemistry

Except for one pH reading in the spring of 2006 that exceeded the upper COMAR limit for pH, all in-situ water chemistry readings were in compliance with State standards for this Use IV stream (***Table 3.12.2***).

Table 3.12.2 – In-situ Water Chemistry Data at NWSF201

Parameter	2004		2006		2009	
	spring	summer	spring	summer	spring	summer
Dissolved Oxygen (mg/L)	11.78	8.97	22.03	8.47	10.64	8.96
Dissolved Oxygen (% Saturation)	98	92	-	94	89	93
pH	6.98	7.76	9.41	7.93	7.17	7.3
Conductivity (µmhos)	198	150	168	190	189	183
Water Temperature (ºF)	48.4	62.8	47.5	68	49.6	65.5

3.12.5 Discussion

Overall pre-restoration biological monitoring at NWSF201 reflects a Poor/Fair benthic macroinvertebrate community. Midges were the most dominant taxa collected and collectors were the most dominant feeding group at this site. Tolerant individuals were most abundant at NWSF201. The fish community at this site was dominated by blacknose dace, a tolerant fish species. The community was consistently rated by the FIBI as Fair and was comprised primarily of omnivorous individuals, with other feeding groups present in lesser amounts. Several minnow species were collected at this site as well as white sucker, and tessellated darter. Aquatic habitat at this site ranged from Fair to Good in all years. Generally, in-stream habitat for fish and

benthic macroinvertebrates were rated as suboptimal, and sedimentation, embeddedness, and erosion were rated as marginal and poor.

Monitoring will continue after completion of the Sherwood Forest stream restoration project and reports will discuss results for how the well the project achieved each monitoring goal. Reports will also include conclusions and recommendations for how to better achieve restoration goals.