

3.5 Lamberton Stream Restoration

3.5.1 Introduction

The Lamberton Stream Restoration project was constructed in 2003. The project site is located along the Lamberton tributary to Northwest Branch (*Figure 3.5.4*). It begins near the intersection of Kemp Mill Road and Yeatman Parkway in the Grey Estates subdivision and continues downstream to the Kemp Mill Swimming Club pool (*Figure 3.5.5*). The project included stabilizing over 5,800 linear feet of stream, grading back streambanks, and planting native vegetation. The goals of the project were to improve water quality and aquatic habitat conditions, and to reduce stream erosion and erosive stream flows in the Lamberton Tributary. *Figures 3.5.1 and 3.5.2* depict the site following restoration in 2009.



Figure 3.5.1 – Lamberton Stream Before Restoration in 2001

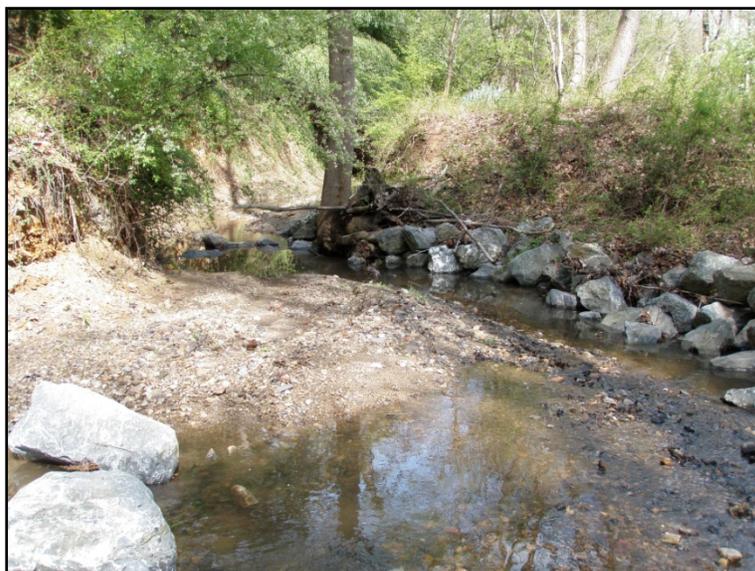


Figure 3.5.2 – Lamberton Stream After Restoration in 2009

Subwatershed facts

Subwatershed Drainage Area: 349 acres
Subwatershed Imperviousness: 24 Percent

Project Facts

Project Area: The stream restoration began near the intersection of Kemp Mill Road and Yeatman Parkway in the Grey Estates Subdivision and continued downstream to the Kemp Mill Swimming Club pool. The project included stabilizing a little over 5,800 linear feet of stream, grading back stream banks, and planting native vegetation.

Costs: Structural and Reforestation (\$450,301), Reforestation (\$74,000), Funded in part through the Maryland Department of Natural Resources

Completion Date: January 2003

Property Ownership: Maryland-National Capital Park and Planning Commission and Montgomery County

Project Selection

The Lamberton Stream Restoration Project was identified within Montgomery County's Northwest Branch Watershed Study as a good candidate for a stream restoration project due to severe stream bank erosion and significant tree loss.

Pre-Restoration Conditions

The Lamberton Tributary watershed was developed prior to regulations requiring stormwater management control and contains a high percentage of impervious surfaces. Due to these conditions, the uncontrolled stormwater runoff from highly impervious areas creates erosive, high velocity or “flashy” stormwater flows that cause damage to receiving streams. Uncontrolled stormwater created severe stream bank erosion and unstable banks, undercut trees, and damaged adjacent stream valley 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 down-cut and limited stream flow access to the original floodplain, thus destroying habitat necessary for diverse aquatic life. Sediment from eroded banks and road grit accumulated in the stream, further degrading stream habitat conditions.

Restoration Actions Taken

The project included a wide range of instream structures designed to both stabilize the stream's bed and banks and create a greater diversity of aquatic habitats. Rock and log vanes were installed to direct water away from unstable streambanks, and create downstream scour pools that provide good habitat for fish. Rock cross vanes also function as grade control, which slows the erosive process of stream down-cutting. Immediately downstream of Lovejoy Street, a series of step pools were installed to provide fish passage upstream and also provide stabilization immediately downstream of the road crossing. Instream root wad revetments were added to help stabilize streambanks, and create scour holes and overhead cover for fish. Boulder rocks installed at the toe of streambank slopes stabilized the area of the stream channel subject to the greatest erosive or “shear” stress. The slopes above the reinforced toes were graded back to create new floodplain terraces, and planted with native trees and shrubs to further stabilize the streambanks (*Figure 3.5.3*).



Figure 3.5.3 – Black Willow Tree Live Stake Plantings Stabilizing Streambanks within the Lamberton Stream Restoration Project in 2004

The project attempted to save undercut trees with supportive “rock packing”. More seriously damaged trees were cut flush with the streambank, allowing the root systems to remain in the bank for stabilization. Along the entire project reach native trees and shrubs were planted to help reestablish the stream buffer.

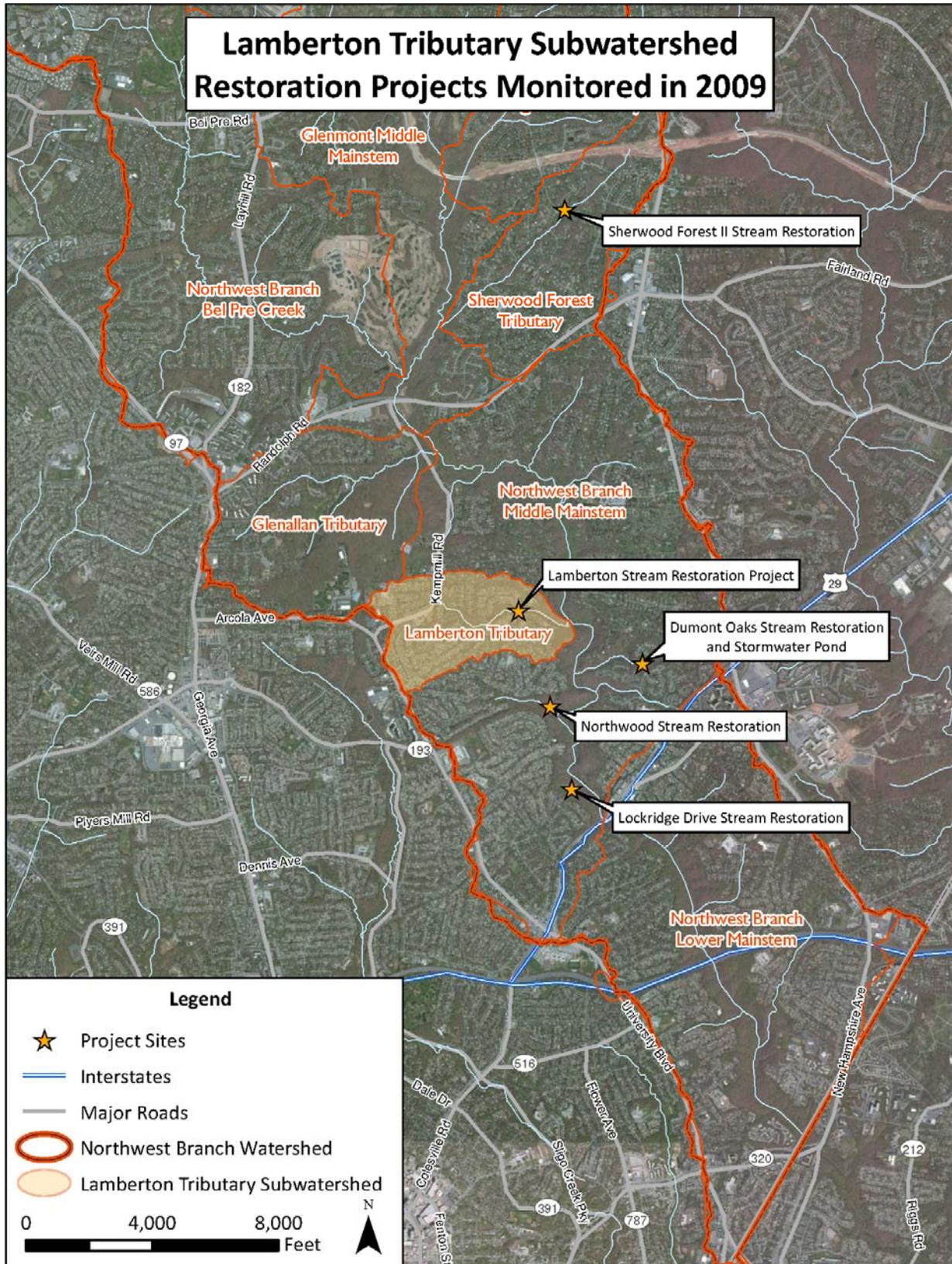


Figure 3.5.4 – Northwest Branch Watershed Including Lamberton Stream Restoration Project



Figure 3.5.5 – Map of 2009 Monitoring Locations for Lamberton Stream Restoration Project

3.5.2 Restoration Goals

Restoration goals were defined during the planning and implementation of the Lamberton Stream Restoration project. Pre- and post-restoration monitoring was conducted within the project area. This is a fifth year monitoring report and summarizes the pre- and post-restoration conditions within the Lamberton Stream Restoration project area. Table 3.5.1 below presents the restoration goals, monitoring performed to evaluate the success of the goals, and when and where the monitoring occurred.

Table 3.5.1 – 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
<ul style="list-style-type: none"> • Improve water quality conditions in the Lamberton tributary to Northwest Branch • Improve aquatic habitat conditions 	<ul style="list-style-type: none"> • Aquatic communities: <ul style="list-style-type: none"> ▪ Benthic macroinvertebrates ▪ Fish • Qualitative habitat • In-situ water chemistry 	2001 and 2002 (pre) 2004, 2005, 2007, and 2009 (post)	NWLT101
<ul style="list-style-type: none"> • Reduce stream erosion • Reduce erosive stream flows 	<ul style="list-style-type: none"> • Quantitative habitat (stream morphology surveys) 	2005, 2007, and 2011 (post) ¹	NWLT101

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 2011. The 2011 report will include updates for this monitoring.

3.5.3 Methods to Measure Project Goals

The basic sampling design for the Lamberton Stream Restoration project was 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 one biological monitoring site (NWLT101) to evaluate the aquatic habitat conditions and water quality during the pre- and post-restoration periods. All data collected prior to 2004 are considered pre-restoration data and all subsequent data are considered post-restoration.

3.5.4 Results and Analysis

Benthic Macroinvertebrates

BIBI (Benthic Index of Biological Integrity) Scores

The benthic macroinvertebrate community at NWLT101, as assessed using the MCDEP Benthic Index of Biological Integrity (BIBI), was Poor during each monitoring year in both the pre- and post-restoration periods (**Figure 3.5.6**). The baseline BIBI percentage prior to restoration was 30 in 2001, but decreased to 20 in 2002, the lowest possible score. Following restoration, BIBI percentages ranged from 20 to 35 and only exceeded the 2001 baseline percentage during 2007 (35). However, the BIBI exceeded the lowest pre-restoration percentage of 20 in every year, except 2005.

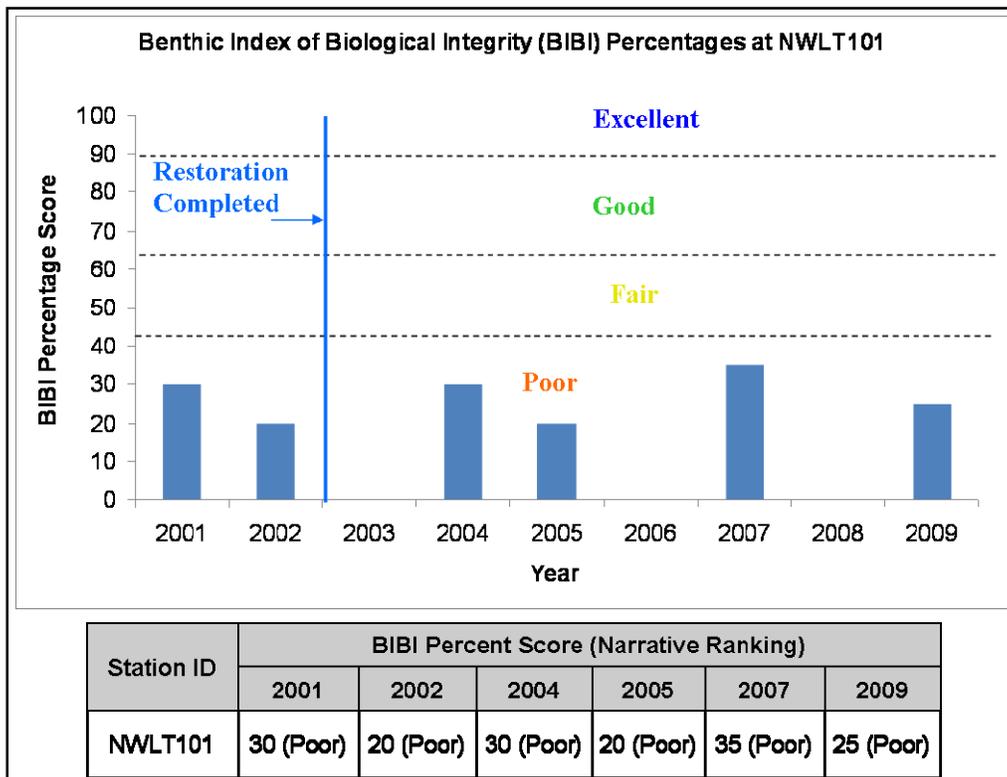


Figure 3.5.6 – Pre- and Post-Restoration Benthic Index of Biological Integrity (BIBI) Percentages at NWLT101

The relatively high BIBI percentages observed in 2004 and 2007 were due to a higher ratio of scrapers in 2004, and higher ratio of scrapers and proportion of dominant taxa in 2007. However, in 2009, the BIBI decreased to 25, with most metrics scoring in the low range, except the biotic index which scored in the median range. Field data sheets from 2009 benthic macroinvertebrate monitoring are included in *Appendix D*.

Dominant Taxa

Both pre-and post-restoration communities of benthic macroinvertebrates at NWLT101 were dominated by Chironomidae (non-biting midges), which comprised 97 percent of the community prior to restoration and declined to 74 percent after restoration. *Dolophilodes* sp. (fingernet caddisfly) was the second most dominant taxa collected prior to restoration, but only comprised 2 percent of individuals collected. Following restoration, the second most dominant taxa collected was Enchytraeidae (aquatic worms), making up 17 percent of the community.

Tolerance Values

Site NWLT101 was dominated by tolerant taxa both prior to restoration (96 percent) and after restoration (89 percent). Sensitive taxa were only collected prior to restoration, but in minor amounts. Following restoration, the site experienced a slight decline in the proportion of tolerant benthic macroinvertebrate taxa and a slight increase in the proportion of intermediate taxa. **Figures 3.5.7** and **3.5.8** below present the tolerance value proportions at NWLT101 before and after restoration.

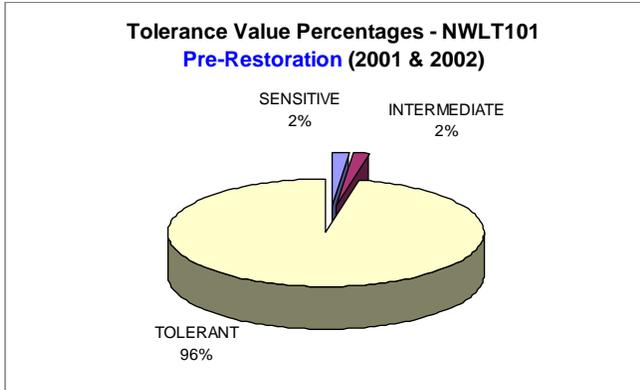


Figure 3.5.7 – Benthic Macroinvertebrate Tolerance Composition at NWLT101 Prior to Restoration

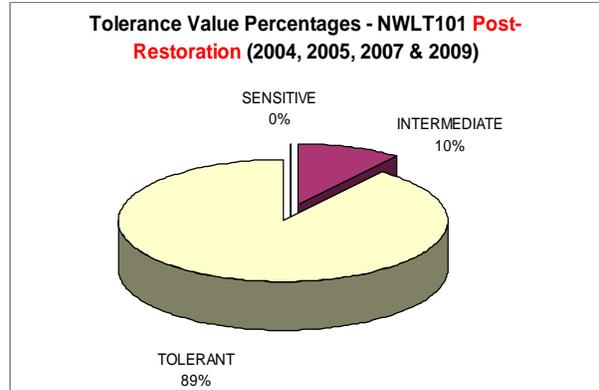


Figure 3.5.8 – Benthic Macroinvertebrate Tolerance Composition at NWLT101 After Restoration

Functional Feeding Groups

Collectors were the most dominant functional feeding group at NWLT101 both before and after restoration. More specialized feeders, including scrapers and shredders that require less degraded stream conditions or specific habitat features, were present in only minor amounts both before and after restoration (*Figures 3.5.9 and 3.5.10*).

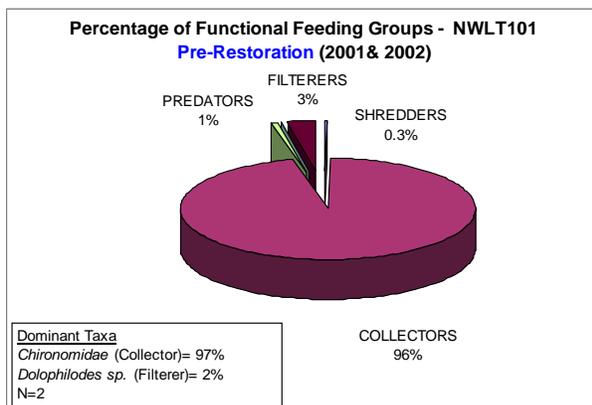


Figure 3.5.9 – Benthic Macroinvertebrate Functional Feeding Group Composition and Dominant Species at NWLT101 Prior to Restoration

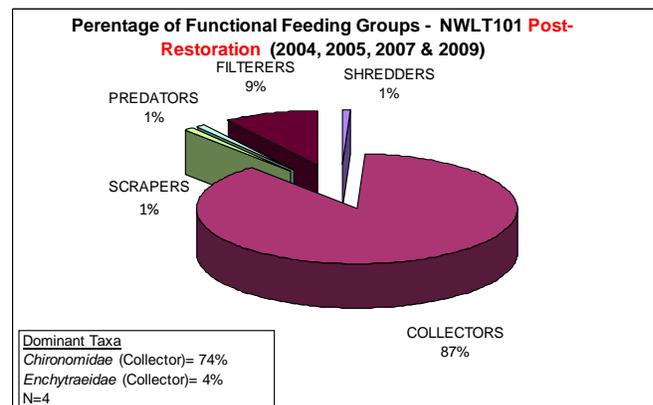


Figure 3.5.10 – Benthic Macroinvertebrate Functional Feeding Group Composition and Dominant Species at NWLT101 After Restoration

Fish

FIBI (Fish Index of Biological Integrity) Scores

The fish community at NWLT101, as assessed using the MCDEP Fish Index of Biological Integrity (FIBI), was Poor during each monitoring year in both the pre- and post-restoration periods (*Figure 3.5.11*). The baseline FIBI percentage prior to restoration was 20 in 2001, the lowest possible percentage, but increased to 38 in 2002. The increase in FIBI percentage in 2002 was due to a decrease in the proportion of omnivores/generalists and the proportion of pioneering species. These individual metrics were at the lowest possible level in all other sampled years. The FIBI did not exceed the 2002 baseline percentage following restoration, with percentages

ranging from 20-34. Even though FIBI percentages did not change much overtime at NWLT101, the abundance of fish found increased from the pre- to post-restoration period. Prior to construction, fish abundance at NWLT101 ranged from four to 21. After restoration, abundance ranged from 12 to 105, with 105 individuals collected in 2005 and 90 individuals collected in 2009. Field data sheets from 2009 fish monitoring are included in *Appendix D*.

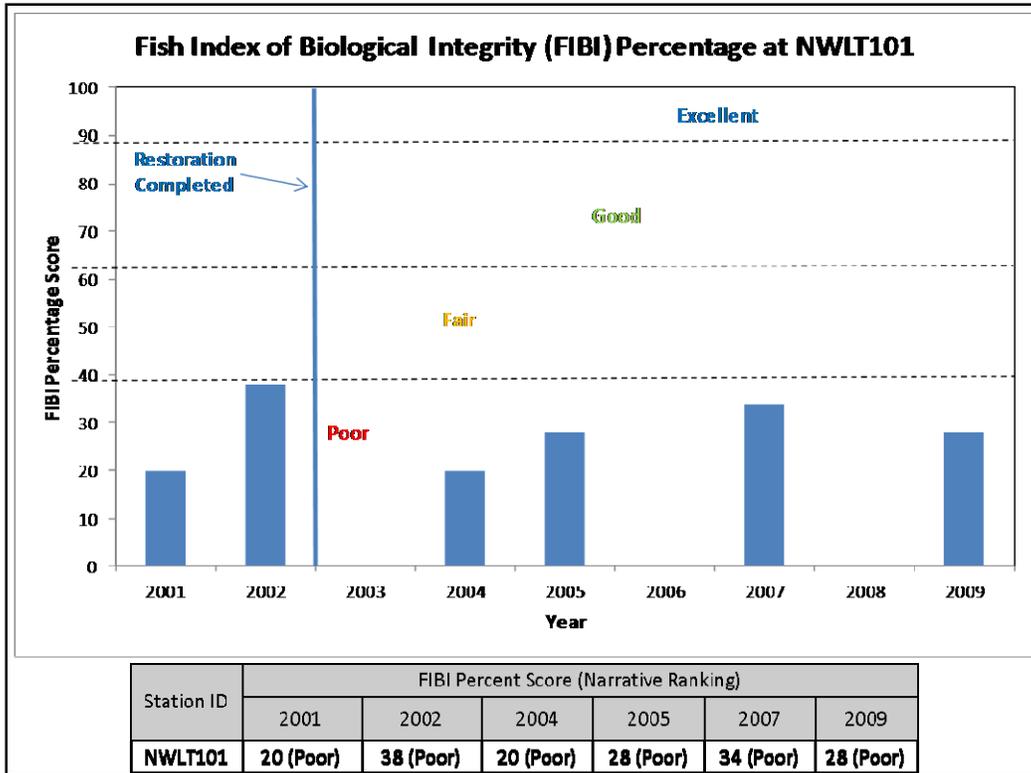


Figure 3.5.11 – Pre- and Post-Restoration Fish Index of Biological Integrity (FIBI) Percentages at NWLT101

Dominant Species

The dominant fish species in NWLT101 remained similar between the pre- and post-restoration periods, with *Semotilus atromaculatus* (creek chub) and *Rhinichthys atratulus* (blacknose dace) comprising the majority of the individuals collected. Prior to restoration, creek chub was the most dominant species comprising 52 percent of the community and blacknose dace was second most dominant comprising 44 percent of the community. *Lepomis macrochirus* (bluegill) was also collected prior to restoration, but was not a dominant species. Following restoration, blacknose dace were more dominant than creek chub, comprising 81 percent and 18 percent of the total individuals, respectively. The fish community at NWLT101 has been dominated (99 percent) by pioneer fish species both before and after restoration. The only non-pioneer fish that have been found include one bluegill pre-restoration, two *Catostomus commersonii* (white sucker) and one *Clinostomus funduloides* (rosyside dace) after restoration.

Tolerance Values

Tolerant fish species heavily dominated NWLT101 prior to and following restoration. Site NWLT101 was represented by 100 percent tolerant species prior to restoration and 99 percent tolerant species after restoration. The only species found at this site that was intermediate in

sensitivity was roside dace, represented by only one individual in 2005. *Figures 3.5.12 and 3.5.13* show the differences in tolerant fish species between pre- and post-restoration sampling periods at NWLT101.

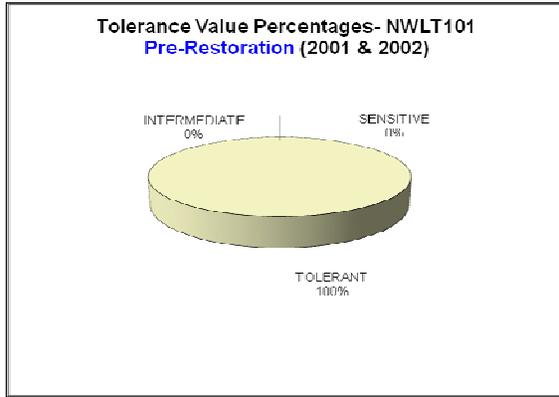


Figure 3.5.12 – Fish Tolerance Composition at NWLT101 Prior to Restoration

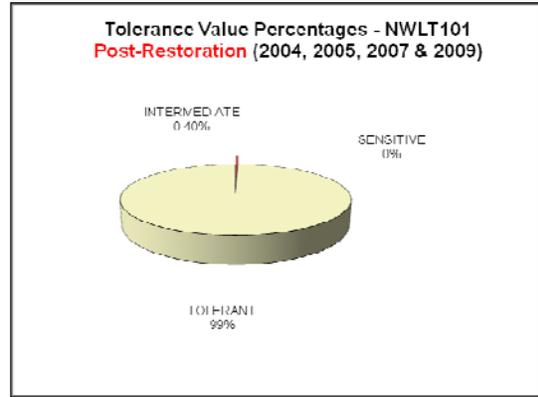


Figure 3.5.13 – Fish Tolerance Composition at NWLT101 After Restoration

Functional Feeding Groups

Site NWLT101 was dominated by generalist and omnivorous fish species both pre- and post-restoration. Prior to restoration, generalists (i.e., creek chub) comprised 52 percent of the fish community, with the remainder being comprised of mostly of omnivores (i.e., blacknose dace). Following restoration, omnivores became the most dominant feeding group, comprising 82 percent of the community, with the remainder of the community comprised mostly of generalists. This was due to an increase in the proportion of blacknose dace and a decrease in the proportion of creek chub following restoration. A small percentage of invertivores were also present at NWLT101 both pre- and post-restoration; prior to restoration invertivores were represented by bluegill and after restoration they were represented by roside dace. Figures 3.5.14 and 3.5.15 show the percentages of each functional feeding group at NWLT101 for pre- and post-restoration monitoring periods, respectively.

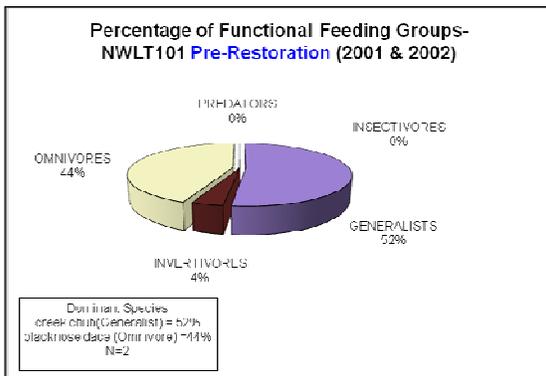


Figure 3.5.14 – Fish Functional Feeding Group Composition and Dominant Species at NWLT101 Prior to Restoration

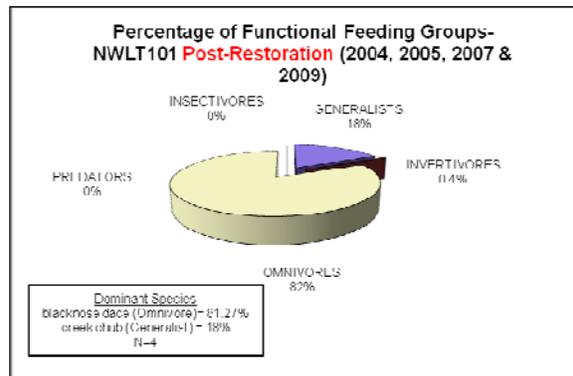


Figure 3.5.15 – Fish Functional Feeding Group Composition and Dominant Species at NWLT101 After Restoration

Qualitative Habitat

Pre-restoration aquatic habitat was evaluated at NWLT101 in the spring of 2001 and in the spring and summer of 2002. In 2001, the aquatic habitat percentage was in the Good range (59.5), but decreased to the Fair range in 2002 (40.5 and 34, respectively). During this time, NWLT101 generally had poor instream cover for fish, marginal epifaunal substrate for benthic macroinvertebrates, and scored poor for sediment deposition. Bank stability ranged from moderately stable to unstable, with only marginal streambank vegetative protection. **Figure 3.5.16** shows aquatic habitat percentages prior to and after restoration at NWLT101.

Following restoration, aquatic habitat was evaluated in the spring and summer of 2004, 2005, 2007, and 2009. During these years, aquatic habitat percentages were mostly Fair, ranging from 31.5 to 52.5, and generally exceeded the 2002 pre-restoration percentage. The highest habitat score (52.5) was recorded in spring 2007 and falls within the Good/Fair range. The generally higher aquatic habitat percentages observed following restoration were due to minor increases in instream cover for fish and epifaunal substrate for benthic macroinvertebrates, and a decrease in embeddedness and sediment deposition. However, bank stability and vegetative protection on the left bank declined after restoration.

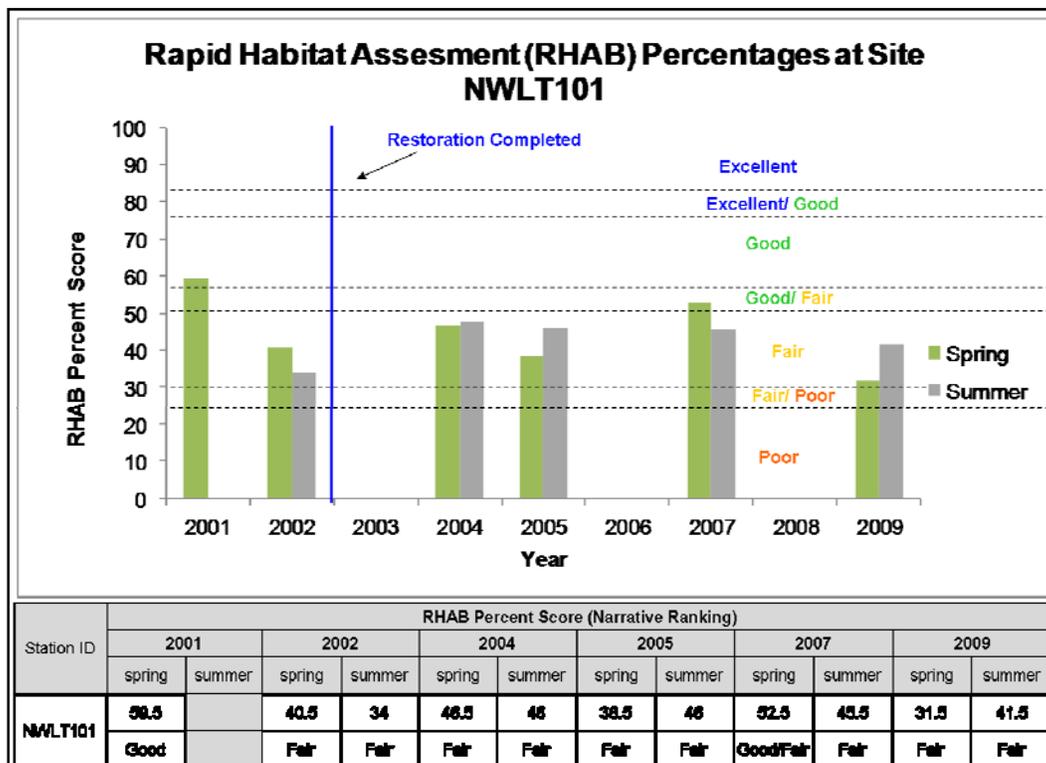


Figure 3.5.16 – Pre- and Post-Restoration Rapid Habitat Assessment (RHAB) Percentages at NWLT101

Quantitative Habitat

Quantitative monitoring was scheduled to occur at NWLT101 in 2009, but was delayed due to problems locating the benchmarks. Data were collected in 2011 and will be presented in the 2011 report.

Water Chemistry

With the exception of one dissolved oxygen reading taken during the summer of 2002, in-situ water quality parameters were in compliance with COMAR standards for Use IV streams during both pre- and post-restoration periods (*Tables 3.5.2 and 3.5.3*). During the summer of 2002, dissolved oxygen was 2.88 mg/L, which is considerably below the 5 mg/L instantaneous State standard. The County experienced a severe drought in 2002, which could explain the low dissolved oxygen levels.

In general, post-restoration in-situ water quality conditions were similar to pre-restoration conditions. Site NWLT101 was in compliance with COMAR standards in both the spring and summer seasons after restoration.

Table 3.5.2– Pre-restoration in-situ Water Chemistry Data at NWLT101

Water Quality Parameter	2001		2002	
	Spring	Summer	Spring	Summer
Dissolved oxygen (mg/L)	10.40	6.86	9.08	2.88
Dissolved oxygen (% saturation)	-	69	99	33
pH	7.80	6.84	6.99	6.52
Conductivity (µmhos)	190	214	241	222
Water temperature (°F)	60.8	60.6	67.8	69.9

Table 3.5.3– Post-restoration in-situ Water Chemistry Data at NWLT101

Water Quality Parameter	2004		2005		2007		2009	
	Spring	Summer	Spring	Summer	Spring	Summer	Spring	Summer
Dissolved oxygen (mg/L)	11.91	7.79	12.51	7.39	13.07	7.91	8.93	7.58
Dissolved oxygen (% saturation)	102	88	111	76	115	90	85	85
pH	6.78	7.29	8.05	7.18	8.73	7.64	6.97	7.07
Conductivity (µmhos)	219	189	268	258	291	269	212	270
Water temperature (°F)	48.0	69.9	50.5	62.7	49.5	70.3	55.9	69.1

3.5.5 Discussion

Table 3.5.4 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, two of the project goals were partially met following restoration, and one project goal could not be evaluated in 2009, but will be assessed in 2011.

Table 3.5.4 – Summary of Project Goal Results

Goal	Result
Improving water quality conditions in the Lambertton tributary to Northwest Branch	Partially successful – some minor improvements in the benthic community and fish communities. While IBI scores remained poor for both benthics and fish for all monitoring years, benthics experienced a decrease in the dominant taxa and species richness, and fish abundance increased tenfold following restoration.
Improving aquatic habitat conditions in the Lambertton tributary to Northwest Branch	Partially successful – some aquatic habitat parameters improved slightly after restoration and some declined
Reducing stream erosion and erosive stream flows	Unable to determine – quantitative stream survey data from 2011 will suggest if these goals have been met

Partially Successful – Water Quality

Overall, the benthic macroinvertebrate community remained Poor during both pre- and post-restoration periods, and only improved above pre-restoration baseline conditions in 2007. The relatively high BIBI percentages observed in 2007 were due to a higher ratio of scrapers and proportion of dominant taxa. However, in 2009, the BIBI decreased to 25, with most metrics scoring in the low range, except the biotic index. Additionally, the proportion of the community comprised by the two most dominant taxa decreased from the pre- to the post-restoration period, from 99 percent to 78 percent, respectively, suggesting an improvement in the benthic macroinvertebrate community. Taxa richness also improved slightly after restoration ranging from three to six taxa prior to restoration and from five to 11 taxa after restoration. All other metrics analyzed did not show improvements in the benthic macroinvertebrate community.

Overall, the fish community remained poor during both the pre- and post-restoration periods and was dominated by tolerant, pioneer fish species such as blacknose dace and creek chub. The highest FIBI percentage was observed prior to restoration in 2002, suggesting a decline in the fish community condition following restoration. Dominant species comprised 96 percent of the community prior to restoration, but increased to nearly 100 percent of the community after restoration, which also indicates a slight decline in the fish community. No changes in the composition of functional feeding groups were observed following restoration, and omnivore and generalist feeders were dominant in all years. With the exception of four individual fish (one bluegill, two white suckers, and one rosyside dace), only pioneer fish species (blacknose dace and creek chub) have been found in this first order tributary. This suggests that this stream may be too small or intermittent to sustain a more diverse fish community, with or without habitat restoration. *Figure 3.5.17* shows the Lambertton tributary in summer of 2004, with low flow conditions and rip rap in the stream channel acting as potential physical barriers to fish migration and improvement. One small improvement in the fish community after restoration was due to an increase in overall fish abundance after restoration. Fish abundance increased tenfold from the pre-restoration period to the later years of the post-restoration period.

In-situ water chemistry remained similar prior to and after restoration. With the exception of the dissolved oxygen reading during the summer of 2002, in-situ water quality parameters were in

compliance with COMAR standards for Use IV streams during both pre- and post-restoration periods.



Figure 3.5.17 – Lamberton Tributary in 2004 showing low flow conditions and rip rap in stream channel as possible physical limitations to fish migration and community improvement

Partially Successful – Aquatic Habitat

Aquatic habitat conditions slightly increased following restoration due to an increase in instream cover for fish and epifaunal substrate for benthic macroinvertebrates, and a decrease in embeddedness and sediment deposition. However, bank stability and vegetative protection declined after restoration (***Figure 3.5.18***).



Figure 3.5.18 – Lamberton Stream Restoration in 2009 showing severe bank erosion in restored area

3.5.6 Conclusions

Overall, the Lamberton Stream Restoration project has partially met some of the project goals. As a result of the stream restoration, aquatic habitat appears to have generally improved. The fish community showed a decline in FIBI percentage after the restoration occurred, however FIBI improvement may not be attainable due to low or intermittent flows in this first order stream as indicated by the nearly 100 percent pioneer fish community both before and after restoration. Despite this possible limitation, overall fish abundance increased tenfold between pre- and post-restoration, which may indicate a minor community improvement. Additionally, the benthic macroinvertebrate community has also improved slightly, showing an increase in taxa richness and a decrease in dominant taxa. These minor improvements in community structure may be due to the slight improvement in aquatic habitat. In addition, in-situ water chemistry measurements were found to be in compliance with COMAR since completion of this restoration project. The lack of major improvements to the biological communities may be limited by the stream water quality and/or low or intermittent flows. The watershed in which the Lamberton tributary to Northwest Branch flows is highly urbanized and may not be able to assimilate impacts from impervious surface runoff or treat all of the contaminated stormwater without implementation of watershed wide stormwater management improvements.