

New River Basinwide Water Quality Plan

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North Carolina Department of Environment and Natural Resources Division of Water Quality Basinwide Planning Unit



TABLE OF CONTENTS

Executive Summary

River Basin Description	ES.1
Water Quality Data Overview	ES.4
Stream Flow	ES.4
Biological Data Benthic Macroinvertebrate Sampling Fish Community Sampling	ES.4 ES.5 ES.6
Ambient Data Turbidity pH Fecal Coliform Bacteria (FCB)	ES.7 ES.7 ES.7 ES.8
Population & Land Cover	ES.9
Population	ES.9
Land Cover	ES.9
Watershed Water Quality Summaries	ES.10
North Fork New River Watershed (0505000101) Hydrologic Unit Codes (HUC):	ES.10 ES.10
South Fork New River/Fox Creek Watersheds (0505000102 & 03)	ES.11
Little River/Chestnut Creek Watersheds (0505000104 & 06)	ES.11
Basinwide Water Quality Issues & Other Information	ES.11
Rising pH Levels Throughout the Basin	ES.11
Formation of the New River Coalition	ES.12
Christmas Tree Farming	ES.12
Primary & Supplemental Freshwater Classifications Approval of North Fork New River Watershed Reclassification:	ES.13 ES.14
On-Site Wastewater Treatment Systems (Septic Systems)	ES.14
DWQ Basinwide Recommendations & Priorities	ES.14
Basinwide Recommendations Update of 7Q10 Flows in NPDES Permits Conduct Study to Determine the Source of Increasing pH Levels Elimination of Straight Pipes & Failing Septic Systems Basinwide Riparian & Trout Water Buffer Educational Efforts	ES.14 ES.14 ES.14 ES.14 ES.14 ES.15

CHAPTER 1 - North Fork New River Watershed

HUC 0505000101 Includes: Three Top Creek, Big Laurel Creek, Buffalo & Little Buffalo Creeks, Little & Big Horse Creeks & Helton Creek

General Watershed Description	1.1
Watershed Water Quality Overview	1.3
Water Quality Data Summary for this Watershed	1.3
Understanding the Data	1.3
Biological & Ambient Rating Converted to Use Support Category	1.3
Stream Flow	1.4
Biological Data	1.4
Benthic Macroinvertebrate Sampling	.1.4
Fish Community Sampling	.1.5
Fish Kills/Spill Events	1.6
Ambient Data	1.7
Long Term Ambient Monitoring	. 1.7
рН	. 1.7
Turbidity	.1.8
Dissolved Oxygen	1.8
Temperature	.1.9
Fecal Coliform Bacteria	.1.9
Additional Studies1	.10
North Fork New River Sampling to Support Potential Reclassification	1.10
Recommendations & Action Plans at the Watershed Scale1	.13
DWQ Priority Summary1	.13
Status & Recommendations for Monitored Waters1	.14
North Fork New River (NFNR)1	.14
North Fork New River [AU#: 10-2-(1)]1	1.14
Understanding this Section1	.14
Use Support & Monitoring Box:1	1.14
North Fork New River [AU#: 10-2-(12)]1	1.15
Three Top Creek (050500010101)1	.16
<i>Three Top Creek</i> [AU#: 10-2-13]	1.16
Big Laurel Creek (050500010102)	16
Big Laurel Creek [AU#: 10-2-14]	1.17

Headwaters North Fork New River (050500010103)	
North Fork New River [AU#: 10-2-(1) & (12)]	
Hoskin Fork [AU#: 10-2-7]	1.17
Little Horse Creek (050500010104)	1.18
Middle Fork Little Horse Creek [AU#: 10-2-21-8-1]	
Little Horse Creek [AU#: 10-2-21-8]	1.18
Big Horse Creek (050500010105)	1.19
Big Horse Creek [AU#: 10-2-21-(7), (4.5) & (1.5)]	1.19
Upper North Fork New River (050500010106)	1.19
Rich Hill Creek [AU#: 10-2-15]	
Little Buffalo Creek [AU#: 10-2-20-1]	
Buffalo Creek [AU#: 10-2-20]	
North Fork New River [AU#: 10-2-(12)]	1.21
Middle North Fork New River (050500010107)	1.21
Long Shoals Creek [AU#: 10-2-25]	
Little Phoenix Creek [AU#: 10-2-23]	1.22
Helton Creek (050500010108)	1.24
Includes: Helton Creek [AU#: 10-2-27]	
Helton Creek [AU#: 10-2-27]	
Lower North Fork New River (050500010109)	1.25
North Fork New River [AU#: 10-2-(12)]	1.25
References	

CHAPTER 2 - South Fork New River & Fox Creek Watersheds

HUCs 0505000102 & 0505000103 Includes: Meat Camp Creek, Elk Creek, Pine Swamp Creek, Beaver Creek, Naked Creek, Peak Creek, Cranberry Creek, Prather Creek, Grassy Creek & Bridle Creek

General Watershed Description	2.1
Watershed Water Quality Overview	2.3
Water Quality Data Summary for these Watersheds	2.3
Understanding the Data	2.3
Biological & Ambient Rating Converted to Use Support Category	2.3
Stream Flow	2.4
Biological Data	2.4
Benthic Macroinvertebrate Sampling	2.4
Fish Community Sampling	2.5
Fish Kills/Spill Events	2.6
Ambient Data	2.6

Long Term Ambient Monitoring	2.7
рН	2.7
Turbidity	
Dissolved Oxygen	
Temperature	2.9
Fecal Coliform Bacteria	2.9
Recommendations & Action Plans at the Watershed Scale	2.10
DWQ Priority Summary	2.10
Status & Recommendations for Monitored Waters	2.13
Understanding this Section	2.13
Use Support & Monitoring Box:	
South Fork New River (SFNR)	2.14
AU#'s: 10-1-(1), 10-1-(3.5)a & 10-1-(3.5)b	
AU#'s: 10-1-(3.5)c & 10-1-(14.5)	2.15
AU#'s: 10-1-(20.5) & 10-1-(26)a	2.15
AU#'s: 10-1-(26)b & 10-1-(30)	
AU#: 10-1-(33.5)	
South Fork New River Headwaters (HUC: 050500010201)	2.17
Middle Fork South Fork New River [AU#: 10-1-2-(1), (6), (14) & (15)]	2.17
East Fork South Fork New River [AU#: 10-1-3-(1), (7) & (8)]	
Winkler Creek [AU#:10-1-4-(1), (2), (3.5)a & (3.5)b]	2.19
Boone Creek (Kraut Creek) [AU#: 10-1-4-4]	
South Fork New River [AU#: 10-1-(1), (3.5)a & (3.5)b]	2.21
Meat Camp Creek-South Fork New River (050500010202)	2.21
Howard Creek [AU#: 10-1-9]	2.21
Norris Fork [AU#: 10-1-10-2]	2.22
Meat Camp Creek [AU#: 10-1-10]	2.22
Cobb Creek [AU#: 10-1-10-3]	
South Fork New River [AU#: 10-1-(3.5)c]	2.22
Elk Creek-South Fork New River (050500010203)	
Pine Orchard Creek [AU#: 10-1-15-1]	2.23
Unnamed Tributary to South Fork New R. [AU#: 10-1-(14.5)ut4]	2.23
South Fork New River [AU#: 10-1-(3.5)c]	2.23
Old Fields Creek-South Fork New River (050500010204)	
Unnamed Tributary to Mill Creek [AU#: 10-1-18ut4]	2.24
South Fork New River [AU#: 10-1-(14.5)]	2.24
Pine Swamp-South Fork New River (050500010205)	2.24
Pine Swamp Creek [AU#: 10-1-24]	2.24
South Fork New River [AU#: 10-1-(20.5)]	2.24

Beaver Creek-South Fork New River (050500010206)	2.25
South Beaver Creek [AU#: 10-1-25-2]	2.25
Obids Creek [AU#: 10-1-27]	2.25
South Fork New River [AU#: 10-1-(20.5), (26)a & (26)b]	2.25
Naked Creek-South Fork New River (050500010207)	2.26
Roan Creek [AU#: 10-1-31]	2.26
Naked Creek [AU#: 10-1-32]	2.26
South Fork New River [AU#: 10-1-(26)b, (30), (31.5) & (33.5)]	2.28
Cranberry Creek (050500010208)	2.28
Piney Fork [AU#: 10-1-37-3]	2.28
Cranberry Creek (Mulberry Creek) [AU#: 10-1-37]	2.28
Peak Creek-South Fork New River (050500010209)	2.29
Nathans Creek [AU#: 10-1-36]	2.29
Little Peak Creek [AU#: 10-1-35-4]	2.29
Ore Knob Branch [AU#: 10-1-35-3]	2.29
<i>Peak Creek</i> [AU#: 10-1-35-(1) & (2)a & b]	2.30
South Fork New River [AU#: 10-1-(33.5)]	2.30
Prather Creek-South Fork New River (050500010210)	2.31
Prathers Creek [AU#: 10-1-38]	2.31
South Fork New River [AU#: 10-1-(33.5)]	2.31
Grassy Creek-New River (050500010302)	2.31
Grassy Creek [AU#: 10-3]	2.31
New River [AU#: 10a]	2.32
References	2.33

CHAPTER 3 - Little River & Chestnut Creek Watersheds

HUC 0505000104 & 0505000106 Includes: Elk Creek, Bledsoe Creek, Pine Swamp Creek, Glade Creek, Brush Creek & Crab Creek

General Watershed Description	3.1
Watershed Water Quality Overview	3.3
Water Quality Data Summary for these Watersheds	3.3
Understanding the Data	3.3
Biological & Ambient Rating Converted to Use Support Category	
Stream Flow	3.4
Biological Data	3.4
Benthic Macroinvertebrate Sampling	
Fish Community Sampling	
Fish Kills/Spill Events	

Ambient Data	
Long Term Ambient Monitoring	
рН	
Turbidity	
Dissolved Oxygen	
Temperature	
Fecal Coliform Bacteria	
Recommendations & Action Plans at the Watershed Scale	
DWQ Notable Waters & Priority Summary	
	0.40
Status & Recommendations for Monitored Waters	3.12
Little River	
<i>Little River</i> [AU#: 10-9-(1)a, (1)b, (6), & (11.5)]	
Understanding this Section	
Use Support & Monitoring Box:	
AU#: 10-9-(1)a	
AU#: 10-9-(6)	
Elk Creek (050500010401)	
Elk Creek [AU#: 10-6-(1) & (2)]	
Brush Creek - New River (050500010403)	3 1/
New River [A1]#: 10b]	3 1/
Little River (050500010404)	
Waterfalls Creek [AU#: 10-9-4]	
Pine Swamp Creek [AU#: 10-9-5]	
Little River [AU#: 10-9-(1)a]	
Brush Creek (050500010405)	
<i>Laurel Branch</i> [AU#: 10-9-10-2]	3.17
Brush Creek [AU#: 10-9-10]	
Glade Creek - Little River (050500010406)	
Bledsoe Creek [AU#: 10-9-7]	
<i>Little River</i> [AU#: 10-9-(1)b & (6)]	3.19
Crab Creek - Little River (050500010407)	3 19
Moccasin Creek [AU#: 10-9-11]	3 19
Unnamed Tributary to Crab Creek [AU#: 10-9-12ut8 & 12ut8ut4]	
Crab Creek [AU#: 10-9-12]	
Little River [AU#: 10-9-(6) & (11.5)]	
Chestaut Creek (050500010603)	2 22
References	3.22

Chapter 4 - Ore Knob Mine

Water Quality Issues & Restoration Efforts

Ore Knob Mine	4.1
Mine History	4.1
Description of Contaminated Area & Impacts	4.3
Restoration Activity History (1990's to 2005)	4.3
Recent Activity (2005 to 2010)	4.3
DWQ & Environmental Protection Agency Region 4 Activity	4.6
References	4.7
CHAPTER 5 - Water Quantity	
Understanding Stream Flow	5.1
Managing Flow from Impoundments	5.1
Minimum Release Requirements	5.1
Water Supply, Demand, Availability & Planning	5.2
Water Withdrawals	5.2
Local Water Supply Plan (LWSP)	5.3
The Town of Sparta The Town of Boone	5.3 5.3
Source Water Assessment & Protection (SWAP) of	
Public Water Supplies in the New River Basin	5.4
Introduction	5.4
Delineation of Source Water Assessment Areas	5.4
Wellhead Protection (WHP) Program	5.4
Susceptibility Determination – NC's Overall Approach	5.5
Inherent Vulnerability Rating	5.5
Contaminant Rating	5.5
Inventory of Potential Contaminant Sources (PCSs)	5.5
Source Water Protection	5.5
Public Water Supply Susceptibility Determinations in the New River Basin	5.6

CHAPTER 6 - Local Initiatives & Voluntary Incentive Programs

Local Initiatives	6.1
The Importance of Local Initiatives	6.1
National Committee for the New River	6.2
Land Protection	6.2
Restoration	6.2
Advocacy	
New River Builder Program	6.2
Alleghany County/NRCS	6.3
Alleghany County Envirothon	6.3
Federal, State & Local Incentive Programs	6.3
Construction Grants & Loans (CG&L)	6.3
Section 319 - Grant Program	6.4
Soil & Water Conservation	6.5
Agricultural Cost Share Program (ACSP)	6.5
Community Conservation Assistance Program	6.6
Clean Water Management Trust Fund (CWMTF)	6.8

CHAPTER 7 - Other Natural Resource Programs

Natural Resource Programs	7.1
Ecosystem Enhancement Program (EEP)	7.1
River Basin Restoration Priorities	7.1
Local Watershed Planning	7.2
EEP Projects in the New River Basin	7.2
Forestry	7.3
Forestland Ownership*	7.3
Forest Water Quality Regulations	7.3
Other Water Quality Regulations	7.4
Water Quality Foresters	7.4
Forestry Best Management Practices	7.4
Protecting Stream Crossings with Bridgemats	7.4
Christmas Tree Production	7.5

Forest Regeneration & Planning	7.5
Education & Outreach	7.5
Contacts	7.5
References	7.6
CHAPTER 8 - 2010 Use Support & Methodology	
CHAPTER 9 - Maps	
CHAPTER 10 - Acronyms, Definitions, & Hyperlinks	
Definitions	
Acronyms	
Hyperlink Index	

TABLE OF TABLES

EXECUTIVE SUMMARY

Table ES-1: HUC Quick Reference	ES.10
Table ES-2: Summary of Waterbody Classifications in the New River Basin	ES.13
Table ES-3: Prioritization of Waters in the New River Basin (Highest to Lowest Priority)	ES.16
Chapter 1	
Table 1-1: Prioritization of Waters in the North Fork New River Watershed (Highest to Lowest F	Priority)1.13
Table 1-2: Example of a Use Support and Monitoring Box	1.14
Chapter 2	
Table 2-1: Prioritization of Waters in the South Fork New River & Fox Creek Watersheds (High Priority)	est to Lowest 2.11
Table 2-2: Example of a Use Support and Monitoring Box	2.13
Chapter 3	
Table 3-1: Prioritization of Waters in the Little River & Chestnut Creek Watersheds (Highest to	Lowest
Table 3-2: Example of a Use Support and Monitoring Box	
CHAPTER 4	
Table 4-1: Monitoring Locations for Five of Nine Sites Sampled During 319 Project	4.3
Chapter 5	
Table 5-1: Minimum Release from Impoundments in the New River Basin	5.2
Table 5-2: Current Surface Water Withdrawals by Local Water Supply Systems*	5.3
Table 5-3: SWAP Results for Surface Water Sources in the New River Basin	5.6
Chapter 6	
Table 6-1: 319 Grant Contracts in the New River Basin Between 2003 & 2008	6.4
Table 6-2: Clean Water Management Trust Fund Projects Between 2003 - 2009	6.8
Chapter 7	
Table 7-1: New River Basin TLWS & LWP Summary	7.2
Table 7-2: EEP Projects in Some Stage of Completion in the New River Basin (8-Digit HU 050	50001)7.3
Table 7-3: North Carolina DFR Contacts for the New River Basin	7.5
PERMIT TABLES	
Table 14-1: NPDES Point Source Discharger Permits in the New River Basin	4-A.2
Table 14-2: NPDES Non-Discharger Permits in the New River Basin	4-A.3
Table 14-3: Communities in the New River Basin Subject to Stormwater and/or Water Supply V Stormwater Requirements.	Vatershed 4-A.4
Table 14-4: Stormwater Permits in the New River Basin	4-A.4
Table 14-5: Permitted Animal Operations in the New River Basin as of July 2010	4-A.6

TABLE OF FIGURES

EXECUTIVE SUMMARY

Figure ES-1: The Entire New River - Kanawh River Basin (Hydrologic Unit Code 050500) ES.2
Figure ES-2: North Carolina Portion of the New River Basin ES.3
Figure ES-3: Yearly Average Flow Rates of the USGS Gage Station in the New River Basin, 1997-2008ES.4
Figure ES-4: Use Support Category Chart for Biological Ratings ES.4
Figure ES-5: Benthic Stations Color Coded by Current Rating in the New River Basin ES.5
Figure ES-6: Percents of Current Benthic Ratings in the New River Basin ES.5
Figure ES-7: Percent Change in Benthic Ratings in the New River Basin ES.5
Figure ES-8: Fish Community Stations Color Coded by Current Rating in the New River Basin ES.6
Figure ES-9: Percents of Current Fish Community Ratings in the New River Basin ES.6
Figure ES-10: Percent Change in Fish Community Ratings in the New River Basin ES.6
Figure ES-11: Percentage of Samples Exceeding the Turbidity Standard (2004-2008) ES.7
Figure ES-12: Percentage of Samples Exceeding the pH Standard (2004-2008) ES.7
Figure ES-14: Yearly Geometric Mean of All FCB Samples in the New River Basin ES.8
Figure ES-13: Percentage of Samples Exceeding the FCB Screening Criteria (2004-2008) ES.8
Figure ES-15: 2000 Population Per Square Mile by 10-Digit HUCs ES.9
Figure ES-16: 2010 Population Per Square Mile by 10-Digit HUCs ES.9
Figure ES-17: 2001 Land Cover in the New River Basin ES.10
Figure ES-18: Land Cover Percentage in the New River Basin ES.10
Figure ES-19: Yearly Mean & Median of All pH Samples in the New River Basin (1997-2009) ES.12
Chapter 1
Figure 1-1: North Fork New River Watershed (0505000101)
Figure 1-3: Example of a Use Support and Monitoring Box1.3
Figure 1-2: Use Support Categories for Biological Ratings
Figure 1-4: Yearly Average Flow Rates (cfs) of the USGS Gage Station in the New River Basin Between 1997 & 2008
Figure 1-6: Current Benthic Site Ratings

Figure 1-6: Current Benthic Site Ratings	1.5
Figure 1-5: Benthic Stations Color Coded by Current Rating in the North Fork New River Watershed	1.5
Figure 1-7: Change in Benthic Site Ratings	1.5
Figure 1-9: Current Fish Community Site Ratings	1.6
Figure 1-8: Fish Community Stations Color Coded by Current Rating in the North Fork New River Wat	ershed 1.6
Figure 1-10: Change in Fish Community Site Ratings	1.6
Figure 1-11: Percentage of Samples Exceeding the pH Standards (2003-2008)	1.7
Figure 1-12: Summarized pH Values for All Data Collected at Ambient Sampling Stations in HUC	
0505000101	1.7
Figure 1-13: Percentage of Samples Exceeding the Turbidity Standard (2003-2008)	1.8
Figure 1-15: Percentage of Samples Exceeding the DO Standard (2003-2008)	1.8
Figure 1-14: Summarized Turbidity Values for All Data Collected at Ambient Sampling Stations in HUC 0505000101	; 1.8

Figure 1-16: Summarized DO Values for All Data Collected at Ambient Sampling Stations in HUC 0505000101
Figure 1-17: Percentage of Samples Exceeding Temperature Standard (2003-2008)
Figure 1-18: Summarized Temperature Values for All Data Collected at Ambient Sampling Stations in HUC 0505000101
Figure 1-19: Percentage of Samples with Elevated FCB Levels (2003-2008)1.9
Figure 1-20: Summarized Fecal Coliform Bacteria Values for All Data Collected at Ambient Sampling Stations in HUC 0505000101 with Overlaying Flow1.10
Figure 1-21: North Fork New River Approved ORW & HQW Reclassification
Figure 1-22: Impacts from Improper Land Clearing Activity Upstream. Looking Upstream (Left), Looking Downstream (Right)
Figure 1-23: Post Streambank Stabilization Restoration Project. Looking Upstream (Left), Looking Downstream (Right)
CHAPTER 2
Figure 2-1: South Fork New River/Fox Creek Watersheds (0505000102 & 0505000103)2.2
Figure 2-3: Example of a Use Support and Monitoring Box
Figure 2-2: Use Support Categories for Biological Ratings
Figure 2-4: Yearly Average Flow Rates (cfs) of the USGS Gage Station in the New River Basin Between 1997 & 2008
Figure 2-6: Current Benthic Site Ratings

Figure 2-5: Benthic Stations Color Coded by Current Rating in the South Fork New River Watershed	2.5
Figure 2-7: Change in Benthic Site Ratings	2.5
Figure 2-9: Current Fish Community Site Ratings	2.6
Figure 2-8: Fish Community Stations Color Coded by Current Rating in the South Fork New River Watershed	2.6
Figure 2-10: Change in Fish Community Site Ratings	2.6
Figure 2-11: Percentage of Samples Exceeding the pH Standards (2003-2008)	2.7
Figure 2-12: Summarized pH Values for All Data Collected at Ambient Sampling Stations in HUC 0505000102	2.7
Figure 2-13: Percentage of Samples Exceeding the Turbidity Standard (2003-2008)	2.8
Figure 2-15: Percentage of Samples Exceeding the DO Standard (2003-2008)	2.8

5	0 1	5	(/	
Figure 2-14: Sum 0505000102	marized Turbidity	Values for All Dat	a Collected at Am	bient Sampling Stations in Hl	JC 2.8
Figure 2-16: Sum 0505000102	marized DO Valu	es for All Data Col	llected at Ambient	Sampling Stations in HUC	2.8
Figure 2-17: Perce	entage of Sample	es Exceeding Tem	perature Standard	d (2003-2008)	2.9
Figure 2-18: Sum 0505000102	marized Tempera	ture Values for All	Data Collected a	t Ambient Sampling Stations i	n HUC 2.9
Figure 2-19: Perce	entage of Sample	es with Elevated F	CB Levels (2003-	2008)	2.9
Figure 2-20: Sum Stations in HU	marized Fecal Co C 0505000102 w	oliform Bacteria Va rith Overlaying Flo	alues for All Data (w	Collected at Ambient Sampling	g 2.10

Figure 2-21: Yearly pH Averages for K3250000 Between 1998 and 2009	2.16
Figure 2-22: Stream & Buffer Restoration Efforts Along South Fork (Left: March 2010; Right: May 20	10) 2.17
Figure 2-23: Stream Restoration Efforts Along East Fork (Left: Before; Right: After)	2.19

Figure 2-24: Riparian Buffer Restoration Efforts Along Boone Creek (Left: March 2007; Right: Octobe	r 2008)
CHAPTER 3	Z.Z I
Figure 3-1: Little River Watershed (0505000104 & 0505000106)	3.2
Figure 3-3: Example of a Use Support and Monitoring Box	3.3
Figure 3-2: Use Support Categories for Biological Ratings	3.3
Figure 3-4: Yearly Average Flow Rates (cfs) of the USGS Gage Station in the New River Basin Betwee 1997 & 2008	en 3.4
Figure 3-6: Current Benthic Site Ratings	3.5
Figure 3-5: Benthic Stations Color Coded by Current Rating in the Little River Watershed	3.5
Figure 3-7: Change in Benthic Site Ratings	3.5
Figure 3-9: Current Fish Community Site Ratings	3.6
Figure 3-8: Fish Community Stations Color Coded by Current Rating in the Little River Watershed	3.6
Figure 3-10: Change in Fish Community Site Ratings	3.6
Figure 3-11: Percentage of Samples Exceeding the pH Standards (2003-2008)	3.7
Figure 3-12: Summarized pH Values for All Data Collected at Ambient Sampling Stations in HUC 0505000104	3.7
Figure 3-13: Percentage of Samples Exceeding the Turbidity Standard (2003-2008)	3.8
Figure 3-15: Percentage of Samples Exceeding the DO Standard (2003-2008)	3.8
Figure 3-14: Summarized Turbidity Values for All Data Collected at Ambient Sampling Stations in HU0 0505000104	C 3.8
Figure 3-16: Summarized DO Values for All Data Collected at Ambient Sampling Stations in HUC 0505000104	3.8
Figure 3-17: Percentage of Samples Exceeding Water Temperature Standard (2003-2008)	3.9
Figure 3-18: Summarized Temperature Values for All Data Collected at Ambient Sampling Stations in 0505000104	HUC 3.9
Figure 3-19: Percentage of Samples with Elevated FCB Levels (2003-2008)	3.9
Figure 3-20: Summarized Fecal Coliform Bacteria Values for All Data Collected at Ambient Sampling Stations in HUC 0505000102 with Overlaying Flow	3.10
Figure 3-21: EEP Stream Restoration. (Left: Before; Right: Mid Construction)	3.21
CHAPTER 4	

Снар	Т	ER	4	

Figure 4-1: Photos Taken of the Waste/Tailings Piles During a Site Visit in December 2006 by DWQ. (Top Left: Top of Impoundment Facing the Settling Pond; Top Right: Looking North East Across the Impoundment; Bottom: On Impoundment Looking Back Across Tailings Pile.)
Figure 4-2: Tailings Impoundment and Ponds Features and Longitudinal Profile (Black & Veatch, 2008)4.2
Figure 4-3: Sample Locations for the 319 Watershed Restoration Plan Project Funded by the 319 Grant* 4.4
Figure 4-4: Averages for Five Monitoring Sites Sampled for the Ore Knob 319 Project
Figure 4-5: Photos of Tailings Pile and Downstream Taken During a Site Visit in July 2007 by DWQ. (<u>Top</u> <u>Left</u> : Top of Larger Dam Facing the Settling Basin; <u>Top Right</u> : Settling Basin Looking Back Towards Larger Dam; <u>Bottom Left</u> : Top of Larger Dam Looking Back Across Tailings Pile; <u>Bottom Right</u> : Ore Knob Branch Downstream of Settling Basin Culvert.)
CHAPTER 6

Figure 6-1: Results of the NCNR's New River Builder Program (Left: 2005; Right: 2009)......6.2 Figure 6-2: NC ACSP BMPs Implemented in the New River Basin Between 1-2003 & 10-2010......6.7

TABLE OF APPENDICES

Appendix 1: North Fork New River Watershed (0505000101)

- 6 1-A: Use Support Ratings for All Monitored Waters
- 6 1-B: Biological (Benthic & Fish) Sampling Site Data Sheets
- 6 1-C: Ambient Monitoring Systems Station Data Sheets

Appendix 2: South Fork New River & Fox Creek Watersheds (0505000102 & 0505000103)

- & 2-A: Use Support Ratings for All Monitored Waters
- & 2-B: Biological (Benthic & Fish) Sampling Site Data Sheets
- 6 2-C: Ambient Monitoring Systems Station Data Sheets
- ♦ 2-D: 12-Digit Subwatershed Maps

Appendix 3: Little River & Chestnut Creek Watersheds (0505000104 & 0505000106)

- **b** 3-A: Use Support Ratings for All Monitored Waters
- & 3-B: Biological (Benthic & Fish) Sampling Site Data Sheets
- **& 3-C: Ambient Monitoring Systems Station Data Sheets**
- 𝔄 3-D: 12-Digit Subwatershed Maps

Appendix 4: Permit Tables

- **b** NPDES: Point Source Discharge Permits
- **b** NPDES: Non-Discharge Permits
- **Stormwater Permits**
- **6** Animal Operation Permits

EXECUTIVE SUMMARY

FOR THE NEW RIVER BASIN PLAN



RIVER BASIN DESCRIPTION

Despite its name, the New River is part of the oldest river system in North America and flows through rugged terrain containing metamorphic rocks that are 1.1 billion years old. The basin is located within the Blue Ridge Province of the Appalachian Mountains in the northwest corner of the state in Watauga, Ashe and Alleghany counties (Figure ES-2). It is the state's fourth smallest river basin, encompassing a 765 square-mile watershed drained by approximately 825 miles of streams.

The New River originates at the confluence of the North Fork New River and South Fork New River in northeastern Ashe County, flowing northeast into Virginia before eventually flowing into the Kanawha River (Figure ES-1). The New River meanders across the North Carolina-Virginia state line four times before its confluence with the Little River, the only other major tributary originating in North Carolina, which also flows north into Virginia. Eventually, waters in this basin flow to the Gulf of Mexico via the Ohio and Mississippi Rivers.

The New River is in the Kanawh River basin, which has nine 8-digit (subbasin) Hydrologic Units (HUs). Of those, only the lower portion of the Upper New River subbasin is located in North Carolina (Figure ES-1). For this reason, this basin plan is segmented by 10-digit Watersheds. There are five 10-digit HUs within the North Carolina portion of the basin (Figure ES-2). The South Fork New River and the Fox Creek watersheds are combined into one chapter, as are the Little River and the Chestnut Creek watersheds.

This plan includes detailed water quality information for each watershed in New River Basin in Chapters 1 through 3. Other topics concerning water quality in the North Carolina portion of the basin are discussed in Chapters 4 through 7.

Throughout this Executive Summary are little blue boxes containing success stories from the Winston-Salem Regional Office (WSRO) which occurred during this planning cycle (2005-2010). These success stories represent only a small portion of what the WSRO has accomplished in its efforts to restore and protect water quality in this basin.

BASIN AT A GLANCE

Alleghany, Ashe & Watauga

MUNICIPALITIES

Blowing Rock, Boone, Jefferson, Lansing, Sparta, & West Jefferson

ECOREGIONS

Amphibolite Mountains, New River Plateau, Southern Crystaline Ridges and Mountains, Southern Metasedimentary Mountains & Southern Sedimentary Ridges

PERMITTED FACILITIES

NPDES WWTP:23 Major: 3
Minor:20
Non-Discharge Facilities:13
Stormwater:10
General:10 Individual:0
Animal Operations:9
POPULATION
2000: 61 713

2000:	 61,713
2010:	 Coming Soon

LAND COVER

Developed:	6.8%
Forest:	66.4%
Agriculture:	26.8%
Agriculture:	





WATER QUALITY DATA OVERVIEW

Monitoring stream flow, aquatic biology and chemical/physical parameters are a large part of the basinwide planning process. More detailed information about DWQ monitoring and the effects each parameter has on water quality is discussed in Chapters 2 and 3 of the <u>Supplemental</u> <u>Guide to North Carolina's Basinwide Planning</u> document.

STREAM FLOW

During the past 10 years, the basin experienced prolonged droughts, in 1998-2002 and 2007-2008, and exceptionally high flows resulting from the remnants of hurricanes (Figure ES-3). During a three week period in September 2004, the tropical storm remnants of Hurricanes Frances, Ivan, and Jeanne lead to wide-spread flooding throughout the central and northern mountains in the Catawba, French Broad, New, and Watauga River basins. Rainfall estimates for the combined three storms totaled more than 20-30 inches in certain watersheds.



BIOLOGICAL DATA

Biological samples were collected during the spring and summer months of 2004 and 2008 by DWQ-Environmental Sciences Section as part of the five year cycle basinwide sampling efforts and for special studies. Overall, 93 biological sampling sites were monitored and rated within the New River Basin. Each site is given a rating/bioclassification which is then used to determine the streams aquatic life use support category (Figure ES-4). That category is listed on the Integrated Report.

FIGURE ES-4: USE SUPPORT CATEGORY CHART FOR BIOLOGICAL RATINGS

Biological Ratings	Aquatic Life Use Support		
Excellent			
Good	Supporting (Categories 1-2)		
Good-Fair			
Not Impaired			
Not Rated	Not Rated (Category 3)		
Fair	Impaired		
Poor	(Categories 4-5)		

Benthic Macroinvertebrate Sampling

Each benthic station monitored during the current cycle is shown in Figure ES-5 and color coded based on its current rating. As seen in the map, the majority of samples taken in the basin received an Excellent or Good rating. The few Fair or Poor ratings are found around urban areas. These sites and their corresponding ratings are discussed in further detail in the watershed chapters.

BENTHIC SAMPLING SUMMARY

- ♦ Total Stations Monitored71
- ♦ Total Samples Taken......82
- ♦ Stations Monitored Twice....10
- ♦ Number of New Stations.....32



As seen in Figure ES-6, 78% of the 82 benthic sampling events received a Supporting rating (See Figure ES-4) and only 5% received an Impaired rating. These ratings are similar to the previous sampling cycle. Figure ES-7 is a comparison of benthic site ratings sampled during the last two cycles to determine if there are any overall basinwide shifts in ratings. Thirteen percent of the samples improved their rating from the previous cycle and 11% declined in rating. Majority of the stations (not including new stations) showed no change, indicating a somewhat stable community throughout the basin over the past ten years.



Fish Community Sampling

Each fish community station monitored during the current cycle is shown in Figure ES-8 and color coded based on its current rating. Ten of the sites were new monitoring sites located in rural watersheds with no NPDES dischargers. These sites were selected to determine their potential for becoming fish community regional reference sites.

FISH COM. SAMPLING SUMMARY

- Total Stations Monitored22
- **b** Total Samples Taken.....22
- Number of New Stations 10



As shown in Figure ES-9, 64% of the 22 fish community sampling events received a Supporting rating (See Figure ES-4). Six of the samples were Not Rated; therefore, the segments are neither Impaired nor Supporting. Figure ES-10 is a comparison of fish community site ratings sampled during the last two cycles to determine if there are any overall basinwide shifts in ratings. The fish community in this basin has remained stable with nearly no change in ratings between the last sampling cycle and the current cycle.





For more information about biological data in this basin, see the <u>2009 New River Basinwide</u> <u>Assessment Report</u>. Detailed data sheets for each sampling site can be found in the corresponding Watershed Chapter Appendix.

AMBIENT DATA

During the 2004-2008 sampling cycle, DWQ collected samples at six Ambient Monitoring System (AMS) stations with ten or more samples to be used for use support assessment. None of these stations were exceeding the state standards and are Supporting for all parameters sampled. However, there are a few parameters of concern within the New River Basin, including turbidity, pH, fecal coliform bacteria and copper, which are discussed below.

Turbidity

All six stations had at least a small percent of samples that exceeded the state standard of 50 NTUs. As seen in Figure ES-11, the North Fork New River station and the New River station both had between 7 and 10% of samples exceeding the standard.

Overall, turbidity exceedances in the basin have not increased or declined in number of occurrences; however, the value of those exceedances did increase. This indicates either an increase in land disturbances, insufficient sediment and erosion control measures, or a combination of both.



Construction sites, mining operations, agricultural operations, logging operations and excessive stormwater flow off impervious surfaces are all potential sources. Turbidity violations demonstrates the importance of <u>protecting and conserving stream buffers and natural areas</u>.



рΗ

Three of the six stations in the basin had between 1 and 7% of samples exceeding the high end of the state's pH standard of 9 (Figure ES-13). Even though there were minimal exceedances during this cycle, the basinwide pH level is increasing. Figure ES-14 shows the average pH levels in 1998 around 6.7 and increasing to above 7.7 by 2008.

Possible causes of this steady increase in pH levels are discussed later in this Chapter under Basinwide Water Quality Issues and Other Information.





Fecal Coliform Bacteria (FCB)

The FCB standard for freshwater streams is not to exceed the geometric mean of 200 colonies/100 ml or 400 colonies/100 ml in 20% of the samples where five samples have been taken in a span of 30 days (5-in-30). Only results from a 5-in-30 study are to be used to indicate whether the stream is Impaired or Supporting. Waters with a use classification of B (primary recreational waters) receive priority for 5-in-30 studies. Other waters are studied as resources permit.



FIGURE ES-15: PERCENTAGE OF SAMPLES EXCEEDING

DWQ uses a screening criteria of 400 colonies/100 ml to determine the need for a 5-in-30 study. Figure ES-15 shows the percentage of samples at each station that exceeded this screening criteria. Stations with over 20% of samples exceeding this criteria that are also recreational waters are placed on the priority list. None of the stations in the New River Basin exceeded the 20%. While the North Fork New River station had exactly 20%, it is not a recreational water and therefore will not be placed on the priority list.

The geometric mean is used to calculate the average of FCB values. This average for the basin between 1997 and 2009 can be seen in Figure ES-16. The chart shows that even though there were fewer number of screening criteria exceedances, the overall geometric mean is slightly higher during this sampling cycle than the previous cycle.

This could be due to a number of reasons including an increase in animal operations with stream access, sanitary sewer overflows, failing septic systems, or straight pipes as noted in the <u>Water Quantity Chapter</u>. However, the specific reasons for the increase during this cycle is unknown at this time.



Specific information about ambient monitoring methodology, seasonal variation and data sheets for ambient stations in this basin can be found in the <u>New River Basin Ambient Monitoring</u> <u>System Report</u>. Each ambient parameter and its potential effects on water quality and aquatic life are discussed in Chapter 3 of the <u>Supplemental Guide to North Carolina's Basinwide</u> <u>Planning.</u>

POPULATION & LAND COVER

Urbanization poses one of the greatest threats to aquatic resources. Small towns and communities are usually not considered urban centers, but even small concentrations of urbanization can have significant impacts on local waterways. For example, a one-acre parking lot produces 16 times more runoff than a one-acre meadow (Schueler and Holland, 2000). A wide variety of studies over the past decade converge on a central point: when more than 10 percent of the acreage in a watershed is covered in roads, parking lots, rooftops, and other impervious surfaces, the rivers and streams within the watershed become seriously degraded. Studies show that if urbanized areas cover more than 25 percent of a watershed, the decline in the health of the ecosystem is irreversible (Beach, 2002; Galli, 1991).

POPULATION

The 2000 census evaluated the population of the North Carolina portion of the New River basin is 61,713. This is an increase of roughly 5,000 from the 1990 census. The figures shows how the population is distributed throughout the basin by 10-digit watersheds in 2000 and 2010. All three counties in the basin (Alleghany, Ashe and Watauga) are estimated to grow by 7 to 8 percent by 2010, based on the 2000 census. This section will be updated when the 2010 census data becomes available.





FIGURE ES-18: 2010 POPULATION PER SQUARE MILE BY 10-DIGIT HUCS

Coming Soon

Hydrologic Unit Codes (HUC):

DWQ has recently made a change from the State-designated subbasin lines (e.g., 05-07-02) to the nationally recognized HUC lines. This Plan is organized by HUCs to provide, not only a detailed look at a particular waterbody, but also how that waterbody fits into the larger watershed picture. Table ES-1 provides a brief description of the different HUCs. There are five 10-digit watersheds within the New River Basin

(0505000101, 0505000102, 0505000103, 0505000104 & 0505000106). Watersheds 0505000102 and 0505000103 are grouped together into one chapter because of the small size of 0505000103. This is done for 0505000104 & 0505000106, as well. Each chapter is then broken down even further into 12-digit subwatersheds, providing a more local water quality analysis. A comparison map of the State designated subbasin lines used in the past verses the new nationally recognized HUC lines is included in the Maps Chapter.

TABLE ES-1: HUC QUICK REFERENCE						
HUC HUC NAME AVERAGE						
2-digit	2-digit Region 177,560					
4-digit Subregion 16,800						
6-digit Basin 10,596						
8-digit Subbasin 700						
10-digit	10-digit Watershed 227					
12-digit Subwatershed 40						
¹ In approximate square miles						

LAND COVER

A large portion of land cover in the basin is forested (Figure ES-19). The North Fork New River watershed has the largest percent of forested area, as well as the largest amount of land conservation acreage (16,000 ac.). Moving east across the basin, the forested areas begin to transition into agriculture. The Little River watershed has the highest percent of agriculture. which is largely Christmas tree production, and contains all nine animal operation permits. Majority of developed land in this basin is in the South Fork New River watershed (8%). Figure ES-20 shows the percentage of each land cover category and Figure ES-19 displays the location of those categories.



WATERSHED WATER QUALITY SUMMARIES

NORTH FORK NEW RIVER WATERSHED (0505000101)

The North Fork New River watershed has some of the best water quality in the basin and has had little change between the last planning cycle and the current cycle. The large areas of forest, minimal agriculture and minimal developed areas have produced a minimal human impact to water quality. In efforts to protect the pristine nature of this watershed, a watershedwide study was conducted to determine if these waters could be reclassified as High Quality

Waters (HQW) or Outstanding Resource Waters (ORW) (BF-20090316). As a result, almost the entire watershed was reclassified as ORW. For a map of the affected area and a more detailed discussion see the Additional Studies section in the North Fork New River Watershed Chapter. Only one stream in this watershed is on the Impaired Waters list. The Little Buffalo Creek was originally listed in 2000.

SOUTH FORK NEW RIVER/FOX CREEK WATERSHEDS (0505000102 & 03)

The South Fork New River/Fox Creek watershed contains seven out of the nine Impaired stream segments within the New River basin. Four of those segments include Naked Creek, Ore Knob Branch, Peak and Little Peak Creeks

SUCCESS STORY #1

7% Barren 0%

Five hundred feet of a UT to the North Fork, which is a class C+ water, was being impacted by sedimentation. The WSRO's DWQ staff worked closely with their Land Quality Section counterparts to ensure proper measures were taken to bring the site back into compliance with sites permits. The sediment was removed from the stream and all 500 feet of the UT were properly restored.

which have been on the Impaired Waters list for several years. The remaining three Impaired segments (two segments of the South Fork New River and the East Fork South Fork New River) were added to the 2008 Impaired Waters list.

These two watersheds have the largest population of the five watersheds in the New River basin and contain more of an urban and agriculture land cover mix. Several waterbodies in the

SUCCESS STORY #2

It was brought to the attention of the WSRO DWQ staff that a 2,000 foot stretch of a UT to Three Top Creek, which is classified as Trout Waters, was being impacted by sedimentation. DWQ and Land Quality Section staff in the WSRO worked closely to ensure all erosion control measures were properly installed and adequate vegetation was in place. After those efforts were made, the 2,000 feet of stream began recovering. watershed currently have pristine water quality conditions and are in need of protection to maintain that level of quality as land cover changes from forest to urban or agriculture areas.

LITTLE RIVER/CHESTNUT CREEK WATERSHEDS (0505000104 & 06)

The Little River & Chestnut Creek Watersheds combined are the smallest watersheds in the New River basin. The only municipality is the Town of Sparta. It has the highest percent of agricultural land cover of any watershed in the basin and contains all nine animal operation permits within the basin. Waters in these watersheds are slightly impacted by human activities, but are of relatively good quality.

Crab Creek [AU#: 10-9-12] is the only Impaired water in these watersheds and was added to the Impaired Waters list in 2010. This is the first Impaired water in these watersheds since Laurel Branch [AU#: 10-9-10-2] appeared on the 1998 list but was removed from the 2000 list. Crab Creek's impairment and other information is discussed in the Crab Creek-Little River 12-digit section in Little River & Chestnut Creek Watershed Chapter.

BASINWIDE WATER QUALITY ISSUES & OTHER INFORMATION

RISING PH LEVELS THROUGHOUT THE BASIN

Data collected between 1997 and 2009 at the six AMS stations within the basin all showed a similar increases in pH levels. pH levels in surface water are influenced by many different natural factors: drought; heavy rains; algae or other aquatic plant growth; and decomposition of organic material among others. These levels are also affected by human influences such as discharging acidic effluent; atmospheric deposition; and stormwater runoff containing excessive nutrients. Monthly data at each of the six site were averaged per year and graphed in Figure ES-14 where this increase can clearly be seen.

The presence of periphyton was noted several times during this sampling cycle. This algaelike growth flourishes in water columns with elevated nutrient levels and ample sunlight. These conditions during periods of drought can greatly accelerate aquatic plant growth. The photosynthesis process uses CO_2 within the water column, which can cause pH levels to increase. Some areas within the basin have recorded somewhat elevated nutrient levels and many of the basin's streams are exposed to full sunlight. This may be one possible cause of the increasing pH levels.

Other possible causes of the increasing levels in the basin could be atmospheric deposition, groundwater influences or precipitation influences. However, the exact reasons for this basinwide increase is unknown at this time.

Proper riparian buffers are recommended throughout the basin to reduce the impact of stormwater runoff, which can include nutrients from farm or lawn fertilizers, as well as impacts from acid rain. Trees planted within the riparian buffers are also beneficial for shading streams and reducing water temperatures. It is recommended to continue monitoring pH levels within the basin and investigate possible causes.

FORMATION OF THE NEW RIVER COALITION

In June 2010, DWQ met with stakeholders in the basin to promote and discuss the Coalition Program. Since that time, several more meetings have occurred with a core group of environmental stewards emerging to discuss the possibilities and details of developing a monitoring coalition. This group is continuing to work with DWQ and taking the initiative to form a successful monitoring coalition that will be specific to the members interests and watershed specific issues.

Additional information about DWQ's <u>Monitoring Coalition Program</u> and current coalitions can be found on the <u>Environmental Science Section</u> web pages.

CHRISTMAS TREE FARMING

North Carolina leads the nation in Fraser fir production and is second in Christmas tree production behind the Pacific Northwest. An estimated 50 million trees were grown on 25,000 acres in 2006. The Christmas tree industry is estimated to produce \$100 million in cash receipts and \$12 million from value-added products such as wreaths, roping and greenery. Fraser fir is native to the highest elevation mountains in western NC, southwestern Virginia and eastern Tennessee. Ashe, Alleghany and Watauga counties are among the top five counties in the state, producing 88% of all Christmas trees within NC. The trees are grown at an elevation of at least 3,000 feet and on steep slopes. An average six to seven foot tall tree is harvested usually at 10 to 15 years of age.

Majority of the trees are fertilized by hand once or twice a year, though some are fertilized by airplane. Mountain soils are typically low in phosphorus and calcium and often below the

optimal pH range of 5.5 to 5.8. Therefore, farmers add nutrients, chemicals and other agents to adjust the soil to more favorable conditions.

One of the largest impacts these farms can have on water quality happens shortly after harvesting the trees as the harvest exposes acres of disturbed soil on steep slopes. The first rain fall event often causes major sedimentation and degradation of streams if proper measures are not taken. An example of this can be seen in the Little Phoenix Creek section of the <u>South Fork & Fox Creek Watershed Chapter</u>. However, extensive efforts have been made by local Soil & Water Conservation Districts, NC State University, local watershed groups, and others to produce educational materials and provide funding and BMP installation assistance to reduce those impacts.

SUCCESS STORY #3

DWQs WSRO was informed of a small amount of sediment impacting 3,000 feet of two UTs to Helton Creek, which are classified as Trout Waters. The WSRO and the Division of Forest Resources (Lenoir Office) staffs worked with the landowner to implement proper forestry and water quality best management practices to stabilize the site. Once these practices were in place, the sensitive trout waters began recovering.

In 2003, the NC Agricultural Cost Share Program (ACSP)adopted a new best management practice, Christmas Tree Conservation Cover BMP. The purpose of this practice is to plant ground cover between and under trees. This not only keeps soil in place during growth and harvesting of the trees but also help prevent tall and obnoxious weed growth. A large number of farms are now using this ground cover technic.

It is recommended that farmers continue to work with the ACSP to apply ground cover as well as taking advantage of the soil testing that is provided free-of-charge by the state. Having the soil tested will help farmers determine the appropriate amount of nutrients and other agents to apply to the soil, reducing excess amounts from running off the land during a storm event and into streams.

The agricultural community has developed several educational materials specific to environmentally safe Christmas tree farming practices that are available to the public online.

PRIMARY & SUPPLEMENTAL FRESHWATER CLASSIFICATIONS

All surface waters in the state are assigned at least one primary classification and may also be assigned one or more supplemental classifications. A list of classifications with a description of requirements can be found in Chapter 2 of the <u>Supplemental Guide to North Carolina's</u> <u>Basinwide Planning</u>. Table ES-1 provides a summary of waterbody classifications for named streams in the New River basin as of March 2011. Maps locating High Quality Waters, Outstanding Resource Waters, and Water Supply Watersheds, as well as, streams classified as Trout Waters within the basin are in the <u>Maps Chapter</u>. For the most up-to-date classifications visit DWQ's <u>Classifications and Standards Unit webpage</u>.

	Primary			SUPPLEMENTAL					
	С	В	WS-II	WS-IV	WS-V	HQW	ORW	Tr	'+' ¹
Named Stream Miles	175.6	102.9	29.8	64.1	21.8	122.8	315.7	626	360.2
1 - The '+' symbol indicates the waters subject to the New River basin special management strategy.									

Approval of North Fork New River Watershed Reclassification:

The reclassification was presented to the EMC in September 2010, and the rule went into effect December 1, 2010. The details of the reclassifications are discussed in the <u>North Fork New</u> <u>River Watershed Chapter</u>. The majority of the North Fork New River Watershed received the Outstanding Resource Waters supplemental classification.

ON-SITE WASTEWATER TREATMENT SYSTEMS (SEPTIC SYSTEMS)

A North Carolina Agricultural Research Service report completed in 2007 provided information on potential nitrogen contributions from on-site wastewater systems for each river basin. In 1990, the New River basin had a septic system density of 24 systems/mi², less than the EPA threshold of 40 systems/mi². These results based on 1990 census data of 36,905 people using septic systems yield a maximum nitrogen (N) loading of 369,049 lbs/yr and N loading

SUCCESS STORY #4

The DWQ WSRO noticed 200 feet of a UT to Cranberry Creek was being impacted by sedimentation. After the appropriate steps were taken by the WSRO, the sediment was removed from the stream. The 200 feet of C+ classified waters began recovery once restoration efforts were completed. rate of 491 lbs/mi²/yr. These numbers reflect the total N discharged to the soil from the septic system use and does not account for N removed because of soil processes and plant uptake (Pradhan et al. 2007). The full study can be viewed at <u>Potential Nitrogen Contributions from On-site</u> <u>Wastewater Treatment Systems to North Carolina's River</u> <u>Basins and Sub-basins</u>.

DWQ BASINWIDE RECOMMENDATIONS & PRIORITIES

BASINWIDE RECOMMENDATIONS

Update of 7Q10 Flows in NPDES Permits

It is important that 7Q10 flow values be updated to include changing climatic conditions and water withdrawals that impact stream flow conditions. All NPDES permitted facilities use 7Q10s as critical flow in determining permit limits for toxicants. These critical flow values determine permit limits for all NPDES facilities and need to be reviewed as the permits come up for renewal. Currently, a 7Q10 is only evaluated in the initial application of the permit and upon expansion. Low flow conditions induced by drought impact the health of aquatic life, as demonstrated in this basin for roughly five years between 1997 and 2008 (see Figure ES-3). Droughts, as well as the demand on water resources, are very likely to increase; therefore, the reevaluation of stream flow will become more critical to water quality within the next decade or so. DWQ will work with DWR, USGS and other agencies to discuss the need and resource availability to update 7Q10 values.

Conduct Study to Determine the Source of Increasing pH Levels

Across the New River basin, pH levels have been gradually rising since about 2001. Possible reasons for this occurrence are discussed above. It is recommended that a multi-agency group, consisting of state and local level stakeholders, be formed to determine the most effective and efficient way to conduct this study.

Elimination of Straight Pipes & Failing Septic Systems

In the New River basin, wastewater from many households is not treated at a wastewater treatment plant (WWTP). Instead, it is treated on-site through the use of permitted septic systems. However, wastewater from some homes illegally discharges

directly into streams through what is known as a "straight pipe". In some cases, wastewater can also enter streams through failing septic systems. In highly susceptible areas, wastewater from failing septic systems or straight pipes can contaminate a drinking water supply or recreational waters with nutrients, disease pathogens and endocrine disturbing chemicals.

From 2000 to 2003, the Appalachian District Health Department, in partnership with DENRs Wastewater Discharge Elimination (WaDE) Program and NC Clean Water Management Trust Fund (CWMTF), inspected nearly 2,800 homes. Of those households, 625 had either a failing septic system or a straight pipe. Forty-five percent of those homes have been corrected. DWQ supports the need for additional

SUCCESS STORY #5

An 1,100 foot UT of Call Creek, which is Class Trout and ORW waters, received impacts from sedimentation after land clearing. The WSRO DWQ staff worked with the local Soil & Water Conservation District and others to determine the best way to stabilize the site. The turbidity in the Outstanding Resource and sediment sensitive waters cleared up immediately upon proper placement of vegetation and other stabilization measures.

funding assistance to complete the remaining 55% of failing septic systems and straight pipe corrections.

Basinwide Riparian & Trout Water Buffer Educational Efforts

One of the most effective ways of reducing pollutants in stormwater runoff in a non-urban setting is through riparian buffers. Many of these buffers are removed for aesthetics, farming needs, or recreational purposes. Educational efforts to promote the usefulness of riparian buffers have proven successful among some agricultural communities and should be extended to the general public and local businesses.

There are over 600 miles of designated Trout Waters in the New River basin. Educational efforts are recommended to inform the general public of the location of the Trout Waters in the basin, the importance of protecting those waters, and what actions are not allowed along these streams. A map of designated Trout Waters can be found in the <u>Maps Chapter</u>.

The Clean Water Act 205(j) Grant is a possible funding source for local Council of Governments to explore for the production of these educational materials and for local stakeholders to discuss.

BASINWIDE STREAM PRIORITIES

Table ES-2 lists waters in the New River basin that DWQ has prioritized for restoration/protection needs of a particular streams water quality and aquatic habitat. The order of priority is not based solely on the severity of the steams impairment or impacts, but rather by the need for particular actions to be taken. A stream that is currently supporting its designated uses may be prioritized higher within this table than a stream that is currently Impaired. This is based on the level of active restoration/protection work being preformed in those drainage areas. Some Supporting streams may have a more urgent need for protection than an Impaired stream with restoration needs already being implemented.

The third and fourth columns of this table list **potential** stressors and sources that may be impacting a stream based on in-field observations, monitoring data, historical evidence, permit or other violations, and other staff and public input. In many cases, additional study is needed to determine exact source(s) of the impact(s). The last column includes a list recommended actions to be taken by DWQ and/or other environmental groups to ensure good water quality.

Detailed information on each of these streams can be found in the corresponding watershed chapter. A stream's watershed is identified Stream Name & HUC # column by the last four digits of its 10-Digit HUC number.

6 Chapter 1: North Fork New River Watershed (HUC: 0505000101);

Chapter 2: South Fork New River (HUC: 0505000102) & Fox Creek (HUC: 0505000103) Watersheds; and

Chapter 3: Little River (HUC: 0505000104) & Chestnut Creek (HUC: 0505000106) Watersheds.

TABLE ES-2: PRIORITIZATION OF WATERS IN THE NEW RIVER BASIN (HIGHEST TO LOWEST PRIORITY)

Stream Name & (HUC #)	AU#	CLASS.	Stressor	Source	Status	Actions Needed
South Fork New R. (SFNR) (0102)	10-1-(1), 10-1-(3.5)a & 10-1-(3.5)b	WS-IV;CA;+ C;+ C;+	Habitat Degradation, Nutrients, pH	Construction, Impaired WWTP		SS, SEC, NMC, P (Hellbender Salamander)
Boone Cr. (Kraut Cr.) (0104)	10-1-4-4	C;Tr;+	Habitat Degradation, Temperature, Turbidity, DO, Copper	ASU Steam Station, Urban Impacts, Construction, Piped Streams	Impacted	DS, RBR, SC, E
Little Buffalo Cr. (0101)	10-2-20-1	C;Tr:+	Habitat Degradation (Riparian Zones), Elevated Nutrients	WWTP, Urban Runoff, Piped Streams, Agriculture	Impaired	RBR, WRP, DS, E, Ag, NMC
Crab Cr. (0104)	10-9-12	C;Tr	Habitat Degradation, Nutrients, Flow	Agriculture, Golf Course, Construction, Beaver Dams, Volume & Velocity	Impaired	R, SEC, Ag, NMC, RBR
Bledsoe Cr. (0104)	10-9-7	C;Tr	Habitat Degradation (Riparian Buffers), Toxins, FCB, Nutrients, Turbidity	Urban Impacts	Impacted	R, SC, SEC BMPs, RBR
SFNR (0102)	10-1-(33.5)	B;ORW	Habitat Degradation, Turbidity, pH, Nutrients, Copper	Agriculture, Abandoned Mine	Supporting	RBR, Ag, NMC
Naked Cr. (0102)	10-1-32	C;+	Habitat Degradation (Riparian Buffers) Turbidity, Toxins	Construction, Golf Course, Urban Impacts	Impaired	SC, RBR, E, WRP, DS, SEC
Middle Fork SFNR (0102)	10-1-2-(1), 10-1-2-(6), 10-1-2-(14) & 10-1-2-(15)	WS-IV;+ WS-IV;Tr;+ WS-IV;+ WS-IV;CA;+		Urban Impacts, Blowing Rock WTP	Impacted	Μ
East Fork SFNR (0102)	10-1-3-(1), 10-1-3-(7) & 10-1-3-(8)	WS-IV;Tr;+ WS-IV;+ WS-IV;CA;+	Habitat Degradation (Riparian Buffers)	Urban Impacts, Blowing Rock WTP	Impaired	RBR, M
Obids Cr. (0102)	10-1-27-(1) 10-1-27-(2)	C;Tr;+ WS-IV;Tr;+	Habitat Degradation (Riparian Buffers)	Agriculture (Livestock access)	Supporting	Ag, RBR, E
Pine Swamp Cr. (0102)	10-1-24	C;+	Turbidity	Stormwater Volume & Velocity	Supporting	RBR, Ag, E
Cranberry Cr. (Mulberry Cr.) (0102)	10-1-37	B;Tr;+	Habitat Degradation (Riparian Buffers) Nutrients	Straight Channels, Agriculture	Supporting	R, Ag, RBR, E
Prathers Cr. (0102)	10-1-38	B;Tr;+	Habitat Degradation (Riparian Buffers) Nutrients	Agriculture	Impacted	RBR, Ag, NMC

Class.: Classification (e.g., C, S, B, WS-I, WS-II, WS-III, WS-IV, WS-V, Tr, HQW, ORW, SW, UWL)

Stressor: Chemical parameters or physical conditions that at certain levels prevent waterbodies from meeting the standards for their designated use (e.g., low/high DO, nutrients, toxicity, habitat degradation, etc.).

Source: The cause of the stressor. (Volume & Velocity: when a stream receives stormwater runoff at a much higher volume and velocity than it would naturally receive due to ditching, impervious surfaces, etc.)

Status: Impaired, Impacted, Supporting, Improving

Actions Needed: Restoration (R), Protection (P), Stormwater Controls (SC), Stressor Study (SS), Education (E), Local Ordinance (LO), Best Management Practices (BMPs), Sediment and Erosion Control BMPs (SEC), Species Protection Plan (SPP), Forestry BMPs (F), Agriculture BMPs (Ag), Nutrient Mgnt Controls (NMC), Riparian Buffer Restoration (RBR), Daylight Stream (DS), Monitoring (M), Watershed Restoration Plan (WRP).

Stream Name & (HUC #)	AU#	Class.	Stressor	Source	Status	Actions Needed	
Norris Fork (0102)	10-1-10-2	C;Tr;+	Turbidity	Construction	Supporting	SEC BMPs	
Helton Cr. (0101)	10-2-27	C;ORW;Tr	Sediment, Elevated Nutrients, Over Stocking	Agriculture, Logging	Impacted	SS, Protection (Hellbender Sal.)	
SFNR (0102)	10-1-(20.5) & 10-1-(26)a	WS-V;HQW WS-IV;HQW			Supporting	RBR, E	
Roan Cr (0102)	10-1-31-(1) 10-1-31-(1.5) 10-1-31-(2)	C;Tr;+ WS-IV;Tr;+ WS-IV;CA;Tr;+	Sedimentation	Agriculture	Supporting	Ag, E, RBR	
Winkler Cr. (0102)	10-1-4-(1), 10-1-4-(2), 10-1-4-(3.5)a & 10-1-4-(3.5)b	WS-II;HQW,Tr WS-II;HQW;Tr;CA C;Tr;+ C;Tr;+		Urban Impacts, Pipped Streams	Supporting	DS, M	
Elk Cr. (0104)	10-6-(1) & 10-6-(2)	C;Tr;+ C;+	Nutrients	Agriculture	Supporting	Ag, E, NMC, SS	
Laurel Br. (0104)	10-9-10-2	C;Tr	Habitat Degradation (Riparian Buffers)	Golf Course Communities	Supporting	RBR, E, SC	
Grassy Cr. (0102)	10-3	C;Tr;+	Nutrients, pH	Agriculture, Straight Channels	Impacted	Ag, RBR	
Nathans Cr. (0102)	10-1-36	B;Tr;+	Habitat Degradation		Impacted	М	
Pine Swamp Cr. (0104)	10-9-5	C;Tr	Habitat Degradation (Riparian Buffers)		Supporting	RBR, Ag	
Three Top Cr. (0101)	10-2-13	C;ORW;Tr	Turbidity		Supporting	SEC, RBR, Protection (Hellbender Sal.)	
Little Horse Cr. (0101)	10-2-21-8	C;ORW;Tr	Habitat Degradation	Upstream Erosion	Supporting	Ag, RBR	
SFNR (0102)	10-1-(3.5)c & 10-1-(14.5)	C;+ C;+	Habitat Degradation, Turbidity, pH	Poor Riparian Buffers	Impacted	М	
SFNR (0102)	10-1-(26)b & 10-1-(30)	WS-IV;HQW WS-IV;HQW;CA	pH, Turbidity, Nutrients		Supporting	SS	
Little Peak Cr. (0102)	10-1-35-4	B;Tr;+	Toxins	Abandoned Mine	Impaired	R - Currently Underway	
Ore Knob Br. (0102)	10-1-35-3	B;Tr;+	Toxins	Abandoned Mine	Impaired	R - Currently Underway	
Peak Cr. (0102)	10-1-35-(1), 10-1-35-(2)a & 10-1-35-(2) b	C;Tr;+ B;Tr;+ B;Tr;+	Toxins	Abandoned Mine	Impaired	R - Currently Underway	
New R. (0104)	10b	C;ORW	Turbidity, Copper, Zinc		Impacted	RBR	
Waterfalls Cr. (0104)	10-9-4	C;Tr	Habitat Degradation	Agriculture	Supporting	RBR	
Class.: Classification (e.g., C, S, B, WS-I, WS-II, WS-III, WS-IV, WS-V, Tr, HQW, ORW, SW, UWL)							

Stressor: Chemical parameters or physical conditions that at certain levels prevent waterbodies from meeting the standards for their designated use (e.g., low/high DO, nutrients, toxicity, habitat degradation, etc.).

Source: The cause of the stressor. (Volume & Velocity: when a stream receives stormwater runoff at a much higher volume and velocity than it would naturally receive due to ditching, impervious surfaces, etc.)

Status: Impaired, Impacted, Supporting, Improving

Actions Needed: Restoration (R), Protection (P), Stormwater Controls (SC), Stressor Study (SS), Education (E), Local Ordinance (LO), Best Management Practices (BMPs), Sediment and Erosion Control BMPs (SEC), Species Protection Plan (SPP), Forestry BMPs (F), Agriculture BMPs (Ag), Nutrient Mgnt Controls (NMC), Riparian Buffer Restoration (RBR), Daylight Stream (DS), Monitoring (M), Watershed Restoration Plan (WRP).

Stream Name & (HUC #)	AU#	Class.	Stressor	Source	Status	Actions Needed
Moccasin Cr. (0104)	10-9-11	С	Nutrients, Low DO	Agriculture	Supporting	Ag, NMC
Middle Fork Little Horse Cr. (0101)	10-2-21-8-1	C;ORW;Tr	Habitat Degradation (Bank Erosion)		Supporting	RBR
Long Shoals Cr. (0101)	10-2-25	C;ORW;Tr			Supporting	М
Little R. (0104)	10-9-(1)a	C;Tr	Habitat Degradation, pH		Supporting	RBR
Brush Cr. (0104)	10-9-10	C;Tr	Habitat Degradation (Riparian Buffers), Nutrients	Agriculture	Supporting	RBR, Ag
Big Horse Cr. (0101)	10-2-21-(7), 10-2-21-(4.5) & 10-2-21-(1.5)	C;ORW C;ORW;Tr C;ORW;Tr	Habitat Degradation (Riparian Zones)		Supporting	RBR
North Fork New R. (NFNR) (0101)	10-2-(12)	C;ORW	Habitat Degradation, Turbidity		Supporting	Protection (Hellbender Sal.)
Pine Orchard Cr. (0102)	10-1-15-1	C;Tr;+	Turbidity		Supporting	RBR
South Beaver Cr. (0102)	10-1-25-2	C;Tr;+	Habitat Degradation (Riparian Buffers)		Supporting	RBR
UT to Crab Cr. (0104)	10-9-12ut8	C;Tr	Habitat Degradation (Riparian Buffers)	Straight Channels	Supporting	R - Currently Underway
NFNR (0101)	10-2-(1)	C;ORW;Tr			Supporting	Р
Big Laurel Cr. (0101)	10-2-14	C;ORW;Tr			Supporting	Protection (Hellbender Sal.)
Piney Fork (0102)	10-1-37-3	B;Tr;+			Improving	Μ
Hoskin Fork (0101)	10-2-7	C;ORW;Tr			Supporting	None

Class.: Classification (e.g., C, S, B, WS-I, WS-II, WS-III, WS-IV, WS-V, Tr, HQW, ORW, SW, UWL)

Stressor: Chemical parameters or physical conditions that at certain levels prevent waterbodies from meeting the standards for their designated use (e.g., low/high DO, nutrients, toxicity, habitat degradation, etc.).

Source: The cause of the stressor. (Volume & Velocity: when a stream receives stormwater runoff at a much higher volume and velocity than it would naturally receive due to ditching, impervious surfaces, etc.)

Status: Impaired, Impacted, Supporting, Improving

Actions Needed: Restoration (R), Protection (P), Stormwater Controls (SC), Stressor Study (SS), Education (E), Local Ordinance (LO), Best Management Practices (BMPs), Sediment and Erosion Control BMPs (SEC), Species Protection Plan (SPP), Forestry BMPs (F), Agriculture BMPs (Ag), Nutrient Mgnt Controls (NMC), Riparian Buffer Restoration (RBR), Daylight Stream (DS), Monitoring (M), Watershed Restoration Plan (WRP).

References

References marked with (*) indicates a DWQ special study report. These reports are not currently available online. Contact Jay Sauber by phone at (919) 743-8416 or by e-mail at Jay. Sauber@ncdenr.gov to receive a hardcopy.

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Note: URL addresses for hyperlinks found in this plan are listed in the <u>Acronyms & Definitions</u> <u>Chapter</u>.
CHAPTER 1

NORTH FORK NEW RIVER WATERSHED



HUC 0505000101

Includes: Three Top Creek, Big Laurel Creek, Buffalo & Little Buffalo Creeks, Little & Big Horse Creeks & Helton Creek

GENERAL WATERSHED DESCRIPTION

This ten-digit hydrologic unit code (HUC) watershed, with an area of about 250 square miles, is the equivalent to DWQ's old subbasin 05-07-02 and contains the North Fork New River and its tributaries (See DWQ's Old Subbasins to New HUC Conversion map in the <u>Maps Chapter</u>). The majority of the watershed lies within Ashe County, with the headwaters of the North Fork New River beginning in Watauga County and the headwaters of Big Horse Creek and Helton Creek beginning in Virginia. The North Fork New River flows in an east-northeast direction before it converges with the South Fork New River to form the New River.

The land cover within this watershed is mostly forested (80%) with areas of agriculture (14%) and the least amount of developed land in the New River basin (3.7%). Rural residential properties and pasture lands are scattered throughout this watershed. Agricultural activities have historically consisted of pasture and cultivated croplands, but within the past 20 years has expanded to include Christmas tree farming. The majority of agricultural lands in this watershed are found along streambanks.

Roughly 16,000 acres of conservation land are found in this watershed and include easements held by local watershed groups (Elk Knob State Park, Cherokee National Forest and Blue Ridge Rural Land Trust).

This watershed's population is centered mostly around the towns of Lansing and West Jefferson. Lansing's population declined by 12% between 1990 and 2000, and was estimated to decline by another one percent by 2010 according to the 2000 census. West Jefferson's population increased by 8% in 2000 and was estimated to increase by another 12% by 2010.

WATERSHED AT A GLANCE

COUNTIES:

Ashe & Watagua

MUNICIPALITIES:

Lansing & West Jefferson

ECOREGIONS:

Amphibolite Mountains, New River Plateau, Southern Crystaline Ridges and Mountains, & Southern Sedimentary Ridges

PERMITTED FACILITIES:

NPDES WWTP:	6
Major	0
Minor	6
Non-Discharge Facilities:	3
Stormwater:	2
General	2
Individual	0
Animal Operations:	0

POPULATION:

2010:		Coming	Soon
-------	--	--------	------

2006 LAND COVER:

Developed	3.81%
Forest	
Agriculture	14.98%
Wetlands	0.11%

2001 Impervious Surface .. 0.24%

WATAUGA Brush Fort kin Fork KB26 Roundado A Copy of the search of the se KB119 KF10 N. Fork New River KB141 Lintle Laurer Children Lintle Laurer Dixon Creek Roaring Fork Big Laurel Creek Long Hope Creek KB120 88 KB29 Ripshin Branch Niddle Fork HC **KB30** ASHE Ason III Hill Cleek 23111 KF23 **KB23** 💽 KF 22 KB138 Yop Creek KB86 0 LittleHorse C. KB63 North Forth New River Will CI. ·10 33845 Haal 200 Buffalo Creek KB122 Lansing 4 221 Jeffers<mark>o</mark>n **KB134** KF1 KB27 KB33 West KF 21 **KB31** 194 **KB**32 Regine 2111 KB137 റ Piney Creek KB136 **Jefferson** - Phoener KB118 Ct. Helton Concerning KB25 Old Field Cr ω KB125 Miles 163 88 KB117 wousbuo7 KB123 \triangleright \triangleright 16 **KB28** 16 N. Fork New R K7500000 KB135 **Monitoring Sites** Hydrology - Use Support **NPDES Permits** Legend Minor WW Discharge Major WW Discharge **KB12** Supporting Impaired Watershed Boundary County Boundaries No Data Municipalities Benthos Ambient Conservation Lands Fish Community Primary Roads

FIGURE 1-1: NORTH FORK NEW RIVER WATERSHED (0505000101)

WATERSHED WATER QUALITY OVERVIEW

The North Fork New River watershed has some of the best water quality in the basin and water quality has changed little in the five years since the last planning cycle. The large areas of forest and minimal agriculture and urban areas create only a minimal human impact to water quality. In DWQ's efforts to protect the pristine nature of this watershed, a watershed-wide study was conducted to determine if these waters could be reclassified as High Quality Waters (HQW) or Outstanding Resource Waters (ORW). As a result, almost the entire watershed was reclassified as ORW. For a map of the affected area and a more detailed discussion see the Additional Studies section below. Little Buffalo Creek, near West Jefferson, is the only Impaired water body in the watershed and was not included in the reclassification.

WATER QUALITY DATA SUMMARY FOR THIS WATERSHED

Monitoring stream flow, aquatic biology and chemical/physical parameters are a large part of the basinwide planning process. More detailed information about DWQ monitoring and the effects each parameter has on water quality is discussed in Chapters 2 and 3 of the Supplemental Guide to North Carolina's Basinwide Planning document.

UNDERSTANDING THE DATA

Biological & Ambient Rating Converted to Use Support Category

Biological (benthic and fish community) samples are given a bioclassification/rating based on the data collected at the site by DWQs Environmental Sciences Section (ESS). These bioclassifications include Excellent, Good, Good-Fair, Not Impaired, Not Rated, Fair and Poor. For specific methodology defining how these rating are given see Benthic Standard Operating Procedures (SOP) or the Fish Community SOP. Once a rating is given, it is then translated into a Use Support Category (see Figure 1-2).

Ambient monitoring data are analyzed based on the percent of samples exceeding the state standard for individual parameters for each site within a two-year period. If a standard is exceeded in greater than 10.0% of samples taken for a particular parameter, that stream segment is Impaired for that parameter. The fecal

coliform bacteria parameter is the exception to the rule. See the Fecal Coliform Bacteria section in the Ambient Data portion below. For the purposes of this plan, any site with greater than 7.0% to 10.0% of samples not meeting a parameter's standard will be considered Impacted.

FIGURE 1-3: EXAMPLE OF A USE SUPPORT AND MONITORING BOX

USE SUPPORT: IMPAIRED (14 MI)		
2008 IR Cat.	5	
2010 IR Cat.	5	
Benthos (CB1)	Fair (2008)	
Fish Com (CF1)	Good-Fair (2008)	
AMS (C1234500)	Turbidity - 12% FCB - 48%	

Each biological parameter (benthic and fish community) and each ambient parameter is assigned a Use Support Category based on its rating or percent exceedance. Definitions for each category can be found in Use Support Methodology Chapter. Each monitored stream segment is then given an overall category which reflects the highest individual parameter category. For example, using the data from Figure 1-3, the individual parameter categories would be as follows: Benthos - 5, Fish Community - 1, Turbidity - 5. Therefore, the overall category, which is reported on the Integrated Report, would be 5 (Impaired). An Integrated Report is developed by the state every two years and reported to the U.S. Environmental Protection Agency.

С	ATEGORIES FOR	BIOLOGICAL RATIN	GS
	Biological Ratings	Aquatic Life Use Support	
	Excellent]
	Good	Supporting	
	Good-Fair	(Categories 1-2)	
	Not Impaired		
	Not Rated	Not Rated (Category 3)	
	Fair	Impaired	
	Poor	(Categories 4-5)	



Poor

FIGURE 1-2: USE SUPPORT

STREAM FLOW

The basin experienced prolonged droughts in 1998-2002 and 2007-2008 and exceptionally high flows resulting from the remnants of several hurricanes (Figure 1-4). During a three-week period in September 2004, the tropical storm remnants of Hurricanes Frances, Ivan, and Jeanne lead to wide-spread flooding throughout the central and northern mountains in the Catawba, French Broad, New, and Watauga River basins. Rainfall estimates for the combined three storms totaled more than 20-30 inches in certain watersheds. Runoff from the storms produced flash floods throughout the region, with peak flows in excess of 10,000 cfs (approximately 500 times median flows) in upper tributary



streams; peaks flows in some tributary rivers exceeded 50,000 cfs. In the New River basin, the peak flow during Hurricane Frances (September 7th - 9th) was 14,700 cfs, which has an approximate recurrence interval of 10 to 25 years. During Hurricane Ivan (September 17th - 18th) the peak flow was 7,550 cfs, which has an approximate recurrence interval of 2 to 5 years. More detail about flows in the New River Basin can be found in the <u>2009 Basinwide Assessment Report: New River Basin</u> produced by DWQ-Environmental Science Section.

BIOLOGICAL DATA

Biological samples were collected during the spring and summer months of 2004 and 2008 by the DWQ-Environmental Sciences Section as part of the five-year basinwide sampling cycle, in addition to special studies. Overall, 30 biological sampling sites were monitored within the North Fork New River Watershed. The ratings for each station can be seen in <u>Appendix 1-B</u>.

Benthic Macroinvertebrate Sampling

Each benthic station monitored during the current cycle is shown in Figure 1-5 and color coded based on its current rating. As seen on the map, the majority of samples taken in this watershed received an Excellent rating. This is reflected in the reclassification of almost the entire watershed to either High Quality Waters or Outstanding Resource Waters. The recent reclassification is discussed in more detail in the Special Studies in this Watershed Section below.

BENTHIC SAMPLING SUMMARY

- ♦ Total Stations Monitored25
- ♦ Total Samples Taken......30
- Stations Monitored Twice..... 4
- **b** Number of New Stations 16

As seen in Figure 1-6, 90% of the 30 sampling events received a Supporting rating and only 3% received an Impaired rating. These ratings are very similar to the previous sampling cycle. Figure 1-7 is a comparison of benthic site ratings sampled during the last two cycles to determine if there are any overall shifts in ratings. Eight percent of the samples improved their rating from the previous cycle and four percent declined in rating. Twenty-four percent of the benthic ratings had no change, indicating a semi-stable community.





Fish Community Sampling

Each fish community station monitored during the current cycle is shown in Figure 1-8 and color coded based on their current rating. Two of the sites were new monitoring sites located in rural watersheds with no NPDES dischargers. These sites were selected to determine their potential for becoming fish community regional reference sites.

	FISH (<u>Сом.</u>	SAMPLING	SUMMARY
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- ♦ Total Stations Monitored5
- ♦ Total Samples Taken......5
- Number of New Stations......2

As shown in Figure 1-9, 60% of the five sampling events received a Supporting rating. Two of the samples were Not Rated; therefore, the segments are neither Impaired nor Supporting. Figure 1-10 is a comparison of fish community site ratings sampled during the last two cycles to determine if there are any overall watershed shifts in ratings. The community has remained stable with no change in ratings between the last sampling cycle and the current cycle.





For more information about biological data in this watershed, see the <u>2009 New River Basinwide Assessment</u> <u>Report</u>. Detailed data sheets for each sampling site can be found in <u>Appendix 1-B</u>.

Fish Kills/Spill Events

No fish kills were reported in this watershed during this planning cycle.

AMBIENT DATA

Chemical and physical samples were taken by DWQ once a month at six sites throughout the New River basin. One Ambient Monitoring System (AMS) station is located in the North Fork New River watershed (see Figure 1-1 for the station location). For more information about the ambient monitoring, parameters, how data are used for use support assessment and other information, see Chapter 2 of the <u>Supplemental Guide to North</u> Carolina's Basinwide Planning.

The ambient data are used to develop use support ratings biannually, which are then reported to the EPA via the Integrated Report (IR). The IR is a collection of all monitored waterbodies in North Carolina and their water quality ratings. The most current IR is the 2010 version and is based on data collected between 2004 and 2008. If a waterbody receives an Impaired rating, it is then placed on the 303(d) Impaired Waters List. The New River Basin portion of the 2010 IR can be found in <u>Appendix 1-A</u> and statewide on the <u>Modeling & TMDL</u> <u>Unit's</u> website. Additional information about data from this cycle and seasonal variation in this basin can be found in the <u>New River Basin Ambient Monitoring System Report</u>.

Long Term Ambient Monitoring

The following discussion of ambient monitoring parameters includes graphs showing the median and mean concentration values for ambient station K7500000 in this watershed by specific parameter over a 13 year period (1997-2009). Each major parameter is discussed, even if no current impairment exists. The graphs are not intended to provide statistically significant trend information, but rather give an idea of how changes in land use or climate conditions can affect parameter readings over the long term. The difference between median and mean results indicate the presence of outliers in the data set. Box and whisker plots of individual ambient stations were completed by parameter for data between 2004 and 2008 by DWQ's ESS and can be found in the <u>New River Basin Ambient Monitoring System Report</u>.

рΗ

AMS site K7500000 had no pH standard exceedances during this monitoring cycle, as shown in Figure 1-11 by a small green dot. Figure 1-12 shows the mean and median pH levels for all samples taken over the course of 13 years in the North Fork New River watershed. The pH pattern seen over these 13-years is a steady increase. This trend is seen in all three 10-digit watersheds in the New River Basin and is discussed further in the <u>Executive Summary</u>.







Turbidity

As seen in Figure 1-13, AMS site K7500000 exceeded the turbidity standard in 8.8% of the samples collected during this cycle. Possible sources of the elevated turbidity levels are discussed in the 12-digit subbwatershed section. Figure 1-14 shows the mean and median turbidity levels for all samples taken over the course of 13 years in the North Fork New River watershed. The yearly averages are well below the state standard of 50 NTUs, with the exception of the 2007 mean. There were a few turbidity samples measuring between 100 and 300 NTUs in 2007 that were not seen in any other year.

While some erosion is a natural phenomenon, human land use practices accelerate the process to unhealthy levels. Construction sites, mining operations, agricultural operations, logging operations and excessive stormwater flow from impervious surfaces are all potential sources. Turbidity violations demonstrate the importance of <u>protecting and conserving stream buffers and natural areas</u>.



Dissolved Oxygen

As seen in Figure 1-15, AMS site K7500000 had no DO standard exceedances during this monitoring cycle. Figure 1-16 shows the mean and median of DO levels for all samples taken over the course of 13 years in the North Fork New River watershed. DO at this station has been stable for the past 13 years and has seen little to no change.





Temperature

No stream segments in this watershed are Impaired or Impacted due to high temperatures (Figure 1-17). Figure 1-18 shows the mean and median of temperature levels for all samples taken over the course of 13 years in the North Fork New River watershed. The water temperature trend for this AMS station is closely linked to the stream flow levels. During low flow or drought periods, water can sit in small pools and become heated by the sun. This can especially be seen in Figure 1-18 between 2000 and 2002.



Fecal Coliform Bacteria

Fecal coliform bacteria occurs in water as a result of the overflow of domestic sewage and from other nonpoint sources of human and animal waste, including pets, wildlife and farm animals. The FCB standard for freshwater streams is not to exceed the geometric mean of 200 colonies/100 ml or 400 colonies/100 ml in 20% of the samples where five samples have been taken in a span of 30 days (5-in-30). Only results from a 5-in-30 study are to be used to indicate whether a stream is Impaired or Supporting. Waters with a use classification of B (primary recreational waters) receive priority for 5-in-30 studies. Other waters are studied as resources permit.

As seen in Figure 1-19, 20% of samples taken at station K7500000 during this cycle, resulted in levels over 400 colonies/100 ml. However, the geometric mean (calculated average) was 82 colonies/100 ml, indicating only pulses of elevated levels. When the geometric mean





breaches 200 colonies/100 ml at a station, it is likely a 5-in-30 study would result in an impairment. Possible sources of the short term elevated FCB levels at this station are discussed in the subwatershed section.

Figure 1-20 shows the geometric mean of FCB levels for all samples taken over the course of 13 years in the North Fork New River watershed. The geometric mean is a type of mean or average that indicates the central tendency or typical value of a data set. The highest yearly geometric mean for FCB was recorded in 2005 (125 colonies/100 ml). The figure also includes the yearly average stream flow, as seen in Figure 1-4, to show how flow can be closely linked to FCB levels. These slightly elevated FCB levels might have been caused by livestock with access to streams, failing septic systems or leaking municipal collection systems. For more specific information about AMS station K7500000 and its subwatershed see the subwatershed discussion below.



For more information regarding any of the parameters listed above, see Section 3.3 of the <u>Supplemental</u> <u>Guide to North Carolina's Basinwide Planning</u>. For additional information about ambient monitoring data collected in this river basin, see the <u>New River Basin Ambient Monitoring System Report</u>.

Additional Studies

North Fork New River Sampling to Support Potential Reclassification

Purpose of Study:

A request for benthic sampling was received by the DWQ Biological Assessment Unit (BAU) from staff in the WSRO to support the potential reclassification of streams in the North Fork New River 10-Digit Watershed to either High Quality Waters (HQW) or Outstanding Resource Waters (ORW) (BF-20090316). Six stream sites were selected for benthic sampling in addition to those sites already scheduled for sampling in the watershed for 2008. Reclassification of streams would lead to better protection of the high water quality exhibited in much of the North Fork New River Watershed. The watershed is home to the Kanawha Minnow (*Phenacobius teretulus*) which is listed as Vulnerable by the International Union for Conservation of Nature (IUCN), the Kanawha Darter (*Etheostoma kanawhae*) listed as Near Threatened by the IUCN, as well as many other endemic fish species.

Study Results:

Twenty-five benthic samples were collected from 24 sites in the North Fork New River watershed in 2008. Eleven of the 25 samples were collected as part of routine basinwide sampling that occurs every five years in the New River basin; seven were collected at the request of staff from DWQ's Planning Section, WSRO, or Soil and Water Conservation for various studies; and one was collected as part of an internal quality assurance procedure. The remaining six samples were collected specifically to help support potential reclassification of waters in the North Fork New River Watershed. Data from all 25 samples were considered in this special study. Geographic data, habitat conditions, and physical and chemical water data are provided in the special study document.

All but one of the 12 benthic sampling events at large-stream sites requested for special studies and nine of the eleven basinwide sampling events in the North Fork New River Watershed in 2008 resulted in classifications of Excellent. The two small-stream sites collected were assigned either Not Impaired or Not Rated (no DWQ criteria currently exist for classifying small-stream sites with drainage areas under 3.0 square-miles). All five benthic collections on North Fork New River proper, from the uppermost site near the headwater to the site furthest downstream one-quarter miles from the mouth, were among those resulting in classifications of Excellent.

Recommendations for HQW status were based upon classification of Excellent following benthic sampling during 2008. ORW recommendations are based upon brook trout and hellbender records in addition to biological classification of Excellent. The recommendations were generated by the Environmental Science Section to the Planning Section within DWQ. The Planning Section examined other variables, held public hearings and based the final recommendation to the Environmental Management Commission (EMC) on all available information.

Approval of Proposed Reclassification:

In preparation of the reclassification, DWQ held a public meeting, reviewed public comments and worked closely with local governments and environmental groups. The National Committee for the New River (NCNR) was instrumental in helping DWQ spread the reclassification notice to the public and organizing the public hearings in the area. Local governments, NCNR and DWQ worked together to ensure the reclassification would sufficiently protected water quality and aquatic life while not placing an economical burden on local municipalities. The results of the public comments and meetings were all taken into consideration by the hearing officers and compiled into a collaborative conclusion to be finalized by the EMC.

The reclassification was presented to the EMC in September 2010, and the rule went into effect December 1, 2010. The approved reclassifications can be seen in Figure 1-21. The majority of the North Fork New River Watershed received the ORW supplemental classification, which is shown in green on the map. Other portions of the watershed received the supplemental designation of HQW: Buffalo Creek; a portion of the North Fork New River from the confluence of Buffalo Creek to the confluence of Big Horse Creek; a portion of Big Horse Creek from the confluence of the North Fork New River to the confluence of Little Horse Creek; and Old Field Branch (Grass Branch). These HQW waters are shown in blue on the map. Claybank Creek and Little Buffalo Creek remain C Tr +, which is shown in yellow.

Special Management Strategy (+)

The "+" is a special management strategy that will comply with the HQW Rule (15A NCAC 02B .0224) to protect the excellent water quality downstream. Therefore, all waters designated as "+" in this watershed are regulated as if the waterbody was designated as HQW.

ORW Designation

The ORW supplemental designation does not allow any new NPDES discharges or expansion of existing discharges. It also requires more stringent stormwater management measures for development activities requiring sediment and erosion control plans (15A NCAC 02B.0225).

HQW Designation

The HQW supplemental designation does not permit single family discharges to surface waters, and any new or expanded dischargers must abide by more stringent waste treatment guidelines. More stringent stormwater management measures apply for waters that are draining to and within one mile of HQW waters (15A NCAC 02B.0224).



DWQ PRIORITY SUMMARY

Table 1-1 is a list of waters in the North Fork New River Watershed that DWQ has prioritized for restoration/ protection. The order of priority is not based solely on the severity of the steams impairment or impacts, but rather by the need for particular actions to be taken. A stream that is currently supporting its designated uses may be prioritized higher within this table than a stream that is currently impaired. This is based on a more wholistic evaluation of the drainage area which includes monitoring results, current and needed restoration/ protection efforts, land use and other activities that could potentially impact water quality in the area. Some supporting streams may have a more urgent need for protections than an Impaired stream with restoration needs already being implemented.

The third and fourth columns of this table list **potential** stressors and sources that may be impacting a stream based on in-field observations, monitoring data, historical evidence, permit or other violations, and other staff and public input. In many cases, additional study is needed to determine exact source(s) of the impact(s). The last column includes a list of recommended actions.

TABLE 1-1: PRIORITIZATION OF WATERS IN THE NORTH FORK NEW RIVER WATERSHED (HIGHEST TO Lowest Priority)

STREAM NAME	AU#	CLASS.	Potential Stressor(s)	Potential Source(s)	Status	Actions Needed
Little Buffalo Cr.	10-2-20-1	C;Tr:+	Habitat Degradation (Riparian Zones), Elevated Nutrients	WWTP, Urban Runoff, Piped Streams, Agriculture	Impaired	RBR, WRP, DS, E, Ag, NMC
Helton Cr.	10-2-27	C;ORW;Tr	Sediment, Elevated Nutrients, Over Stocking	Agriculture, Logging	Impacted	SS, Protection (Hellbender Sal.)
Three Top Cr.	10-2-13	C;ORW;Tr	Turbidity		Supporting	SEC, RBR, Protection (Hellbender Sal.)
Little Horse Cr.	10-2-21-8	C;ORW;Tr	Habitat Degradation	Upstream Erosion	Supporting	Ag, RBR
Middle Fork Little Horse Cr.	10-2-21-8-1	C;ORW;Tr	Habitat Degradation (Bank Erosion)		Supporting	RBR
Long Shoals Cr.	10-2-25	C;ORW;Tr			Supporting	Μ
Big Horse Cr.	10-2-21-(7), 10-2-21-(4.5) & 10-2-21-(1.5)	C;ORW C;ORW;Tr C;ORW;Tr	Habitat Degradation (Riparian Zones)		Supporting	RBR
North Fork New R. (NFNR)	10-2-(12)	C;ORW	Habitat Degradation, Turbidity		Supporting	Protection (Hellbender Sal.)
NFNR	10-2-(1)	C;ORW;Tr			Supporting	Р
Big Laurel Cr.	10-2-14	C;ORW;Tr			Supporting	Protection (Hellbender Sal.)
Hoskin Fork	10-2-7	C;ORW;Tr			Supporting	None
Class: Classification (e.g., C. S. B. WS-I, WS-II, WS-IV, WS-V, Tr. HOW, ORW, SW, LIWL)						

on (e.g., C, S, B, WS-I, WS-II, WS-III, WS-IV, WS

Stressor: Chemical parameters or physical conditions that at certain levels prevent waterbodies from meeting the standards for their designated use (e.g., low/high DO, nutrients, toxicity, habitat degradation, etc.).

Source: The cause of the stressor. (Volume & Velocity: when a stream receives stormwater runoff at a much higher volume and velocity than it would naturally receive due to ditching, impervious surfaces, etc.)

Status: Impaired, Impacted, Supporting, Improving

Actions Needed: Restoration (R), Protection (P), Stormwater Controls (SC), Stressor Study (SS), Education (E), Local Ordinance (LO), Best Management Practices (BMPs), Sediment and Erosion Control BMPs (SEC), Species Protection Plan (SPP), Forestry BMPs (F), Agriculture BMPs (Ag), Nutrient Mgnt Controls (NMC), Riparian Buffer Restoration (RBR), Daylight Stream (DS), Monitoring (M), Watershed Restoration Plan (WRP).

UNDERSTANDING THIS SECTION

In this Section, more detailed information about stream health, special studies, aquatic life stressors and sources and other additional information is provided by each 12-digit Hydrological Unit Code (HUC). Waterbodies discussed in this Chapter include all monitored streams, whether monitored by DWQ or local agencies with approved methods. Use Support information on all monitored streams within this watershed can be seen on the map in Figure 1-1, and a Use Support list of all monitored waters in this basin can be found in the <u>Use Support Methodology Chapter</u>.

Use Support & Monitoring Box:

Each waterbody discussed in the Status & Recommendations for Monitored Waters within this Watershed section has a corresponding Use Support and Monitoring Box (Table 1-2). The top row indicates the 2010 Use Support and the length of that stream or stream segment. The next two rows indicate the <u>overall</u> Integrated Report category which further defines the Use Support for both the 2008 and the 2010 reports. These first three rows are consistent for all boxes in this Plan. The rows following are based on what type of monitoring stations are found on that stream or stream segment and may include benthic, fish community and/or ambient monitoring data. If one of these three types of monitoring sites is not shown, then that stream is not sampled for that type of data. The first column indicates the type of sampling in bold (e.g., **Benthos**) with the site

TABLE 1-2: E	XAMPLE	OF A	Use
SUPPORT AND	MONIT	ORING	Box

USE SUPPORT: IMPAIRED (14 MI)		
2008 IR Cat.	4a	
2010 IR Cat.	4	
Benthos (CB79) (CB80)	Fair (2002) Fair (2002)	
Fish Com (CF33)	Good-Fair (2002)	
AMS (C1750000)	Turbidity - 12% FCB - 48%	

USE SUPPORT: SUPPORTING

(14 мі)

2

Excellent (2008)

Good (2008)

2008 IR Cat.

2010 IR Cat.

Benthos

(KB141)

Fish Com (KF10)

ID below in parenthesis (e.g., CB79). The latest monitoring result/rating of that site is listed in the next column followed by the year that sample was taken. If there is more than one benthic site, for example, on that stream, the second site ID and site rating will be listed below the first. The last row in the sample box in Table 1-2 is the AMS data. The data window for all AMS sites listed in the boxes in this Plan is between 2004-2008. Only parameters exceeding the given standard are listed in the second column with the percent of exceedance listed beside each parameter.

Please note any fecal coliform bacteria (FCB) listing in the last row (as seen in Table 1-2) only indicates elevated levels and a study of five samples in 30 days (5-in-30) must be conducted before a stream becomes Impaired for FCB.

NORTH FORK NEW RIVER (NFNR)

The North Fork New River flows through several 12-Digit subwatersheds. Each of the two segments are discussed below.

North Fork New River [AU#: 10-2-(1)]

The North Fork New River begins at the southern most tip of the Headwaters North Fork New River subwatershed (050500010103). The river flows 50 miles northeast, where it joins the South Fork New River to create the New River. This segment of the North Fork is approximately 14 miles long.

Water Quality Status

The most upstream site (KB141) was sampled in 2008 as part of the North Fork New River Sampling to Support Potential Reclassification special study. Details

about that study can be found above. The river received an Excellent rating at this site; however, one bank was moderately eroded. A large portion of this drainage area is forested, with some agriculture along the stream banks.

A fish community sample (KF10) was taken in 2008 just downstream of the confluence with Brush Fork. The last sample taken at this station was in 1998. Results of both samples were very similar and included intolerant cool and cold water species indicating little to no change in water quality over the past ten years.

Recommendations

Protection efforts should be taken for this section of the North Fork New River to ensure the continuation of good water quality.

North Fork New River [AU#: 10-2-(12)]

This segment of the North Fork New River stretches over 36 miles across three different subwatersheds (Upper North Fork New River: 050500010106; Middle North Fork New River: 050500010107; and Lower North Fork New River: 050500010109). Land use along this segment is a mixture of agriculture along the stream banks, forest and a few scattered urban residential and commercial areas.

Water Quality Status

A benthic site (KB23), located just downstream of Three Top Creek, was sampled in 2008. This basinwide site has been sampled four times since 1993 and has consistently received an Excellent rating. The latest sample showed

Use Support: Supporting (36.5 mi)		
2008 IR Cat.	2	
2010 IR Cat.	2	
Benthos		
(KB23)	Excellent (2008)	
(KB27)	Excellent (2008)	
(KB135)	Excellent (2008)	
(KB127)	Excellent (2008)	
AMS		
(K7500000)	No Exceedances	

no impacts to the river's stable macroinvertebrate community and received a high habitat score.

The second benthic monitoring station (KB27) is located at SR-1644 (McNeil Rd), just before the river crosses into the Middle North Fork New River subwatershed (050500010107). The site has been monitored and rated Excellent every cycle since 1993, including 2008. Even though the habitat score for this site was low (65 out of 100) due to low quality riparian buffers, there is a healthy and stable benthic community. *Helicopsyche paralimnella* was found for the first time at this site in the 2008 sample. This taxa has only been collected at five other sites within the entire state by DWQ. This and other taxa collected indicate an absence of stressors and healthy water quality for aquatic life along this segment.

The third site (KB135) is located at the Millpond Branch confluence where it received an Excellent rating in 2008. Due to difficult access, this site replaces the site about two miles upstream at NC-16, which has had a long history of Excellent ratings. Even though habitat was not ideal for aquatic life (65 out of 100), the benthic community is healthy and stable.

The only AMS station in this watershed is located at the same spot on the river as benthic site KB135. Between 2004 and 2008, there were no major parameter exceedances; however, turbidity levels were elevated. Each parameter is explained in greater detail in the Ambient Data section above along with long term trends.

The fourth benthic site (KB127) is about a fourth of a mile upstream from where the North Fork and South Fork merge into the New River [AU#: 10a]. This site was specifically monitored as part of the North Fork New River Reclassification Study which is discussed in greater detail above. The benthic community and habitat were very similar to the KB135 site just upstream and resulted in an Excellent rating as well.

In September 2010, a survey was conducted to identify locations throughout the state where the Hellbender salamander is present. A population was found in the North Fork New River. More information about the Hellbender Salamander can be found on the <u>NC National Heritage Program</u> website.

THREE TOP CREEK (050500010101)



Includes: Three Top Creek [AU#: 10-2-13], Long Hope Creek [AU#: 10-2-13-3], & Ben Bolen Creek [AU#:10-2-13-2]

This subwatershed is mostly forested land with areas of agricultural activities scattered across the 24 square miles. There are no NPDES dischargers in this subwatershed and the majority of streams hold the secondary classification of Trout Waters. All streams in this 12-digit subwatershed drain to Three Top Creek.

Three Top Creek [AU#: 10-2-13]

Three Top Creek is approximately 13 miles from source to the North Fork New River [AU#: 10-2-(12)]. The majority of the drainage area is forested, with some areas of agriculture.

USE SUPPORT: SUPPORT (13 MI)		
2008 IR Cat.	2	
2010 IR Cat.	2	
Benthos (KB138)	Good (2008)	
Fish Com (KF23)	Not Rated (2008)	

Water Quality Status

All streams in this 12-digit subwatershed drain to Three Top Creek. The stream was sampled for both benthic and fish communities during this cycle. Both sites are new basinwide sampling stations.

The fish community sample contained a pollution intolerant population. The site was officially given a Not Rated due to absence of criteria for rating high gradient mountain trout waters. However, the combination of good habitat and a healthy stable fish population shows no indication of water quality issues.

Two benthic samples were taken at the new monitoring station (KB138). The first sample was taken as part of the regular basinwide monitoring and received a Good rating. Biologists noted the sample may have been adversely affected by extreme low flow during a record drought at the time. The creek was part of the North Fork New River Reclassification Study (discussed above); therefore, the site was resampled to determine the bioclassification during normal flow level. The results of the July 2009 sample far exceeded the minimum requirements for an Excellent rating.

In September 2010, a survey was conducted to identify locations throughout the state of the Hellbender salamander. A small population was found in Three Top Creek. Surveyors talked to local land owners who explained the population of the salamanders used to be much larger over ten years ago. This could be an indication of water quality impacts in the drainage area. Surveyors noted the stream was moderately turbid and the substrate was covered in silt at the time of sampling. More information about the Hellbender Salamander can be found on the <u>NC National Heritage Program</u> website.

Recommendations

Due to the presence of the Hellbender salamander, it is recommended that extra precautions be taken in this drainage area to prevent sediment from reaching the stream. Riparian buffers along this stream should be of adequate width and contain trees and shrubs.

BIG LAUREL CREEK (050500010102)



Includes: Big Laurel Creek [AU#: 10-2-14], **Roaring Fork** [AU#: 10-2-14-7], **& Dixion Creek** [AU#: 10-2-14-1]

This subwatershed has mixed land use of forest and agriculture spread across the 29 square miles. Small Christmas tree farms are scattered across this area with larger tree farms in the northern headwaters. There are no NPDES dischargers in this subwatershed and the majority of streams hold the secondary classification of Trout Waters.

Big Laurel Creek [AU#: 10-2-14]

Big Laurel Creek is approximately 18 miles long from source to the North Fork New River [AU#: 10-2-(12)]. The source of the creek is located near lvy Hill Road and Three Top Road, and is the collecting stream for all waters in this subwatershed. Land use in this drainage area is a mixture of forest and agriculture, with the majority of the agricultural lands lining the streambanks.

Water Quality Status

The creek was sampled for both benthic and fish communities about a tenth

of a mile upstream of its confluence with the North Fork. All waters in this subwatershed pass through this point which gives a wholistic view of water quality for the subwatershed. The first set of samples taken during this cycle occurred in 2008, resulting in an Excellent benthic rating and a Good fish community rating. Both ratings were mimicked during the 2009 samples. Benthic samples from 1998 to 2008 indicate water quality slightly improving over the years. The fish station was a new basinwide site in 2008, and was noted as having a highly-diverse and trophically-balanced population. Aquatic habitat was over all in good condition with sufficient riparian buffers, but lacked riffle habitat and pool variety.

Two Hellbender salamanders were collected during the fish community sample; one of adult age and the other young-of-year. The presence of this particular salamander and their age difference suggests high quality water.

Recommendations

Due to the presence of the Hellbender salamander, it is recommended that extra precautions be taken in this drainage area to prevent sediment from reaching the stream. Riparian buffers along this stream should be protected.

HEADWATERS NORTH FORK NEW RIVER (050500010103)



Includes: North Fork New River [AU#: 10-2-(1) & (12)], Hoskin Fork [AU#: 10-2-7], Brush Fork [AU#: 10-2-8], Rock Creek [AU#: 10-2-9] & Roundabout Creek [AU#: 10-2-10]

This subwatershed has mixed land cover of forest and agriculture spread across the 42 square miles. As seen in much of the New River Basin, agricultural lands are mostly located along the banks of major creeks. There are no NPDES dischargers in this subwatershed and the majority of streams hold the secondary classification of Trout Waters.

North Fork New River [AU#: 10-2-(1) & (12)]

Two segments of the North Fork New River flow through this subwatershed. Water quality status and other information about the full length of the river is discussed at the beginning of this section.

Hoskin Fork [AU#: 10-2-7]

Hoskin Fork is roughly five miles from source to the North Fork New River [AU#: 10-2-(2)], mostly flowing parallel to NC-88. The land use is a mix of agriculture and forest.

Use Support: Supporting		
2008 IR Cat.	2	
2010 IR Cat.	2	
Benthos (KB26)	Excellent (2008)	

Water Quality Status

The benthic station located below Wilson Branch has been monitored during each five-year cycle since 1993. Each sample taken since 1993 has received a higher score than the last, suggesting water quality is gradually improving. The 2008 sample resulted in an Excellent rating as it did in 2003.

LITTLE HORSE CREEK (050500010104)



Includes: Little Horse Creek [AU#: 10-2-21-8], & Middle Fork Little Horse Creek [AU#: 10-2-21-8-1]

This subwatershed has mixed land use of forest and agriculture. As seen in much of the New River Basin, agricultural lands are mostly located along the banks of major creeks. There are no NPDES dischargers in this subwatershed and the majority of streams hold the secondary classification of Trout Waters.

Middle Fork Little Horse Creek [AU#: 10-2-21-8-1]

Middle Fork Little Horse Creek is approximately four and a half miles from source to Little Horse Creek [AU#: 10-2-21-8]. Land use in this drainage area is mostly forest, with some agriculture along the streambanks.

Use Support: Supporting (4.5 mi)	
2008 IR Cat	
2010 IR Cat. 2	
Benthos (KB121)	Excellent (2008)

Water Quality Status

Middle Fork Little Horse Creek was monitored as part of the North Fork New River Reclassification Study. There are no historical data for the stream. The stream substrate was covered in sand and silt and banks had noticeable erosion. Vegetation in the riparian zones consisted of only grasses and had little to no tree canopy. Despite the habitat deficiencies, the site (KB121) was among the sites with the most diverse pollution intolerant benthic populations within the study. Because of the Excellent rating given, the stream was recommended for a reclassification to HQW. Results of that study and reclassification are <u>discussed above</u>.

Recommendations

Riparian buffer restoration is suggested for Middle Fork Little Horse Creek. Establishment of shrubs and trees within the riparian buffer zone will assist with stabilizing banks and reducing the amount of sediment that reaches the stream bed. Additional trees will also provide a shaded canopy, keeping the water temperature cooler to support local trout populations.

Little Horse Creek [AU#: 10-2-21-8]

Little Horse Creek is almost 11 miles from source to Big Horse Creek [AU#: 10-2-21-(7)]. This stream is the main receiving stream for this subwatershed. Land use is a mixture of forest in the head waters and agriculture along the streambanks.

USE SUPPORT: SUPPORTING (10.9 MI)	
2008 IR Cat. 2	
2010 IR Cat. 2	
Benthos (KB63)	Excellent (2008)

Water Quality Status

Little Horse Creek has been monitored since 1998 just upstream on the Middle Fork Little Horse Creek confluence. In 1998 and 2003 the creek received a Good benthic rating and displayed a stable population. The 2008 sample increased a rating to an Excellent due to a more diverse community. A stonefly (*Isogenoides hansoni*), which has only been collected at 44 sites statewide, was present in the 2008 sample and had not been previously seen in this stream.

However, despite the current rating, habitat at the site was not ideal for a thriving benthic community. The lack of riparian zone, canopy cover and root mats are likely limiting fauna. Also, a layer of sand and silt indicates erosion issues upstream.

This sample was used for the North Fork New River Reclassification Study. Little Horse Creek was recommended to be reclassified as ORW. Results of that study and reclassification are discussed above.

Recommendations

In order to maintain the water quality in Little Horse Creek, DWQ recommends local agencies work with farm owners to install agricultural best management practices to reduce sedimentation and erosion.

BIG HORSE CREEK (050500010105)



Includes: Big Horse Creek [AU#: 10-2-21-(7), (4.5) & (1.5)]

This subwatershed has a mixed land use of forest in the headwaters and agriculture scattered in the headwaters and along streambanks. There is one minor NPDES discharger in this subwatershed. Majority of streams in the subwatershed hold the secondary use classification of Trout Waters. The Town of Lansing is located in the southern portion.

Big Horse Creek [AU#: 10-2-21-(7), (4.5) & (1.5)]

Big Horse Creek is approximately 20 miles long from source to the North Fork New River [AU#: 10-2-(12)]. Shortly downstream of its source, the creek crosses the state line into Virginia for roughly two miles before flowing back into North Carolina. The creek is the major receiving stream of this subwatershed and provides a good representation of overall water quality for the area.

USE SUPPORT: SUPPORTING (19.4 MI)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos	
(KB122)	Excellent (2008)
(KB33)	Excellent (2008)
Fish Com	
(KF1)	Good (2008)

Water Quality Status

There is one benthic and one fish community basinwide sampling station on this creek, located just upstream of the North Fork confluence and downstream of the Town of Lansing. Both sites received relatively low habitat scores due to lack of pool variety and small riparian zones. The fish community received a Good rating and was noted as having a diverse and trophically-balanced community of cool and cold water fish species. The benthic sample resulted in an Excellent rating. This sample consisted of the most pollution tolerant taxa collected since sampling started at this site in 1993. However, many new taxa were collected and in greater abundance.

An additional benthic sample was collected at SR-1365 as part of the North Fork New River Reclassification Study. The sample resulted in an Excellent rating. The first two segments within North Carolina [AU#: 10-2-21-(1.5) & (4.5)] were recommended to be reclassified as ORW. Results of that study and reclassification are discussed above.

Recommendations

Riparian buffer restoration is recommended to increase tree canopy cover and to help filter pollutants in stormwater runoff.

UPPER NORTH FORK NEW RIVER (050500010106)



Includes: North Fork New River [AU#: 10-2-(12)], Rich Hill Creek [AU#: 10-2-15], Buffalo Creek [AU#: 10-2-20] & Little Buffalo Creek [AU#: 10-2-20-1]

This subwatershed has mixed land use of forest in the headwaters, some residential and agriculture scattered in the headwaters and along streambanks. There is one major and four minor NPDES dischargers in this subwatershed. Majority of streams in the subwatershed, excluding the North Fork New River, hold the secondary use classification of Trout Waters. Majority of the Town of West Jefferson is located in

the southeastern portion of this subwatershed.

Rich Hill Creek [AU#: 10-2-15]

Rich Hill Creek is approximately five miles from source to the North Fork New River [AU#: 10-2-(12)]. Land use in this drainage area is a mix of forest and agriculture in the headwaters and along streambanks with scattered residential areas.

Use Support: Supporting (4.9 mi)		
2008 IR Cat		
	2010 IR Cat.	2
	Benthos (KB86)	Excellent (2008)

Water Quality Status

Rick Hill Creek was specifically monitored as part of the North Fork New River Reclassification Study near the confluence of the North Fork. This site (KB86) was monitored once before in 1993; both events resulted in an Excellent rating. The stream was recommended for a reclassification to HQW. Results of that study and reclassification are discussed above.

Little Buffalo Creek [AU#: 10-2-20-1]

Little Buffalo Creek is approximately four and a half miles from its source within the Mt. Jefferson State Park, through the town of West Jefferson, to Buffalo Creek [AU#: 10-2-20]. Land use within this drainage area is a mixture of forest, agriculture, urban and residential. Portions of the stream that flow through urban areas of West Jefferson are piped underground. Little Buffalo Creek has been on the Impaired Waters List since 1998 when it was listed for impacts from urban

Use Support: Impaired	
2008 IR Cat. 5	
2010 IR Cat. 5	
Benthos (KB32)	Fair (2008)

runoff and municipal pretreatment. In 2006, impervious surfaces and the West Jefferson WWTP were added to the list of potential sources of impairment.

Water Quality Status

A benthic station (KB32) located at Doggett Road crossing has been sampled four times between 1993 and 2008, receiving either a Fair or a Poor rating each time. The site received a Fair rating in 2008, showing a slight increase in abundance and diversity from the 2003 Poor sample. Biologists noted each of the four samples greatly varied in types of taxa collected. High levels of specific conductivity indicate the presence of waterborne pollutants. The stream received a fairly low habitat score and portions of the stream not piped underground have little to no riparian zones.

An unnamed tributary which drains the majority of West Jefferson merges with Little Buffalo Creek near the West Jefferson WWTP. Large portions of this stream are also piped under commercial areas of West Jefferson. The majority of the town's stormwater runoff flows into this unnamed tributary with little to no natural filtering, such as a riparian buffer.

There are many possible sources for this impairment which have varied over the years. The West Jefferson WWTP was noted in the previous basin plan as having several discharge permit violations. Between 2003 and 2005, the Town had a few violation causing issues, including discovering a local industry knowingly discharging mercury and cadmium into the towns collection system. After confirming with samples, West Jefferson worked with the WSRO to conduct an unannounced inspection resulting in further confirmation of the illegal discharging. The Town issued civil penalties and pretreatment permit resolving the problem. West Jefferson also had operational issues where they failed to properly remove and land apply solids. The WSRO took enforcement actions and held meetings with the Town. The Town responded by hiring a contractor and a new operator. Discharge from the facility has been considered outstanding by the WSRO since that time. However the facility remains a possible source of Little Buffalo Creek's Impairment during this cycle. The WWTP will be removed as a possible source, providing the facility stays in good standing during the upcoming monitoring cycle.

Another possible source of impact is urban stormwater runoff. Much of West Jefferson's stormwater runoff drains into portions of the unnamed tributary which has been piped underground. Bypassing natural riparian buffer zones, which can absorb waterborne pollutants, the contaminated runoff has little to no opportunity to be filtered before reaching Little Buffalo Creek. This concentration of stormwater runoff can be toxic to aquatic life.

Downstream of West Jefferson, land use transitions to pasture land and Christmas tree farms. Agriculture is often a source of excess nutrients if proper BMPs are not utilized. Nutrients were added to the list of possible causes of impairment in 2000.

Drought-like conditions in 2007 and 2008 likely increased the impacts of the pollutants listed above on aquatic life. Samples taken during the previous cycle were also impacted by a similar drought. The slight increase in bioclassification rating (Poor in 2003 to Fair in 2008) indicates somewhat of an improvement in water quality. This is likely due to upgrades made to the WWTP, which can be seen in the few violations the facility received as compared to the previous cycle.

Recommendations

DWQ recommends developing a local stakeholder group to determine the possibility of day-lighting the full length of the creek. DWQ supports the need for funding a project of this nature that would include a Watershed Restoration Plan (WRP), as well as follow up monitoring. The WRP should also include planning for implementation of proper riparian buffers, determining the best locations for additional stormwater control measures and efforts to educate affected property owners and the local community about the purpose of this work.

Buffalo Creek [AU#: 10-2-20]

Buffalo Creek is approximately ten miles long from source to the North Fork New River [AU#: 10-2-(12)]. The drainage area consists of mostly forest with agriculture clustered along streambanks. Headwaters of Buffalo Creek and a few upstream tributaries are within the Bluff Mountain Preserve and Three Top Mountain Game Land.

Water Quality Status

In 2008, two benthic samples, including one above and below the Little Buffalo Creek confluence, were collected and rated as Excellent. The sample above

Little Buffalo Creek (KB134) was collected as part of the North Fork New River Reclassification Study, with the purpose of assessing conditions in the catchment without the urban influence of West Jefferson. There was little difference between the two benthic sites. The downstream site (KB31) had a slightly higher specific conductivity and pH level, as well as a more pollution tolerant population. However, the site received a higher habitat score due to larger, more stable riparian buffers.

A fish community sample (KF21) was also collected at the same location as the upstream benthic sample. This new basinwide site was given a Not Rated due to lack of criteria for high gradient mountain trout waters. This stretch of Buffalo Creek provides excellent habitat for a diverse and fairly trophic balance mix of cool and cold water fish. Fifty-nine percent of species collected were pollution intolerant, indicating the stream supports a reasonably healthy population and appears to have no obvious water quality issues.

North Fork New River [AU#: 10-2-(12)]

A portion of this segment flows through this subwatershed. Water quality status and other information about the full length of the river is discussed at the beginning of this section.

MIDDLE NORTH FORK NEW RIVER (050500010107)



Includes: North Fork New River [AU#: 10-2-(12)], Little Phoenix Creek [AU#: 10-2-23] & Long Shoals Creek [AU#: 10-2-25]

This subwatershed has mixed land use of forest in the headwaters, with some residential and agriculture scattered in the headwaters and along streambanks. There is one minor NPDES discharger in this subwatershed. Majority of streams in the subwatershed, excluding the North Fork New River, hold the secondary use classification of Trout Waters.

Long Shoals Creek [AU#: 10-2-25]

Long Shoals Creek is approximately three miles long from source to the North Fork New River [AU#: 10-2-(12)]. The drainage area consists of mostly forested area with agriculture clustered along streambanks.

Use Support: Supporting (2.7 mi)	
2008 IR Cat	
2010 IR Cat.	2
Benthos (KB123)	Not Impaired (2008)

Use Support: Supporting (9.7 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos	
(KB134)	Excellent (2008)
(KB31)	Excellent (2008)
Fish Com	
(KF21)	Not Rated (2008)

Water Quality Status

A one time benthic sample was taken in June 2008 to determine if the stream was being impacted by recent development. The site KB123 is located a mile upstream of the confluence with the North Fork New River and had overall good habitat; however, pools were infrequent and filling with silt and sand. The stream's drainage area is less than 3.0 square miles. The site would have received a classification of Good if criteria for larger stream sites were used. Because, criteria for small streams are still in development, the site is currently classified as Not Impaired.

<u>Recommendations</u>

The benthic site is located just upstream from its confluence with Foster Springs Branch [AU#: 10-2-25-1] and therefore does not reflect influences from that drainage area. An additional site will be considered on Foster Springs Branch for benthic sampling to assess conditions prior to further development (DWQ, B-20081007). If resources are limited, DWQ will consider moving the current site below the confluence.

Little Phoenix Creek [AU#: 10-2-23]

Little Phoenix Creek is approximately five miles long from source to the North Fork New River [AU#: 10-2-(12)]. The drainage area consists of mostly forested area with agriculture and residential areas clustered along streambanks.

USE SUPPORT: SUPPORTING (4.6 MI)	
2008 IR Cat	
2010 IR Cat. 2	
Benthos (KB125)	Excellent (2008)

Water Quality Status

A one time benthic sample was taken in June 2008 to determine if upstream land clearing activities in 2006 had any long-term impacts on the community downstream. The site was given an Excellent bioclassification and had no signs of impacts from sediment on the benthic community. However, the site was somewhat deficient of available macroinvertebrate habitat, pool frequency and riparian zone condition along one bank. (DWQ, B-20081007)

DWQ Special Study (B-20070904):

Approximately 85 acres of land in the headwaters of the unnamed tributary (UT) had been cleared for planting of Christmas trees and pasture in 2006. The resulting runoff from the steep slopes of the cleared land had caused extreme scouring of the UT, resulting in large rocks blocking a downstream culvert over a driveway. This caused flooding and sediment deposition on the property of the downstream landowner. DWQ took benthic samples at two locations to determine the water quality impacts of this land clearing activity. One sample location was just below the impacted area and the second site was located on a comparable site draining to the opposite side of Little Phoenix Creek.

The impacted sampling site (KB117) was a little over a tenth of a mile upstream of the culvert, in a heavily wooded area. Massive rocks and other debris had been washed downstream and extreme scouring, roughly five meters in height, can be seen in photos taken by biologists in the special study document. The stream wetted width was about one meter where as the channel had been scoured out to four and five meters wide. The habitat still received a relatively good score (78 out of 100); however, the bottom substrate consisted of bedrock, boulders, rubble, no leaf packs and exposed tree roots. The control site (KB118) had similar slope and substrate as the impacted site. However, K118 had no scouring and a channel with similar width as the streams wetted width (one meter) and included leaf packs and other characteristics of a small mountain stream.

Sample results from KB117 indicated the majority of the benthic community had been washed away. Only 24 total individual organisms were found at the site and none of the taxa were found in abundance. However, the control site, had 36 total taxa that were found to be in abundance. The majority of these diverse taxa were intolerant species, commonly found in small mountain streams.

The study indicated a devastating impact to the benthic community due to the recent complete rearrangement of the stream bed and the extreme streambank erosion from unusually high flow levels. Recovery of the impacted UT will be slowed by the fact that the entire stream, including the headwaters, have been scoured.

This leaves recolonization of the stream primarily to aerial recolonization as adults emerge from Little Phoenix Creek and lay eggs in the UT, rather than downstream drift of individuals from headwater fauna because that fauna has been severely reduced both in diversity and abundance.

Basinwide Planning staff visited the impacted property a month prior to the sampling event. The pictures below show the impacts on the downstream property during a light to moderate rain event which occurred at the time of the visit.

FIGURE 1-22: IMPACTS FROM IMPROPER LAND CLEARING ACTIVITY UPSTREAM. LOOKING UPSTREAM (LEFT), LOOKING DOWNSTREAM (RIGHT).



FIGURE 1-23: POST STREAMBANK STABILIZATION RESTORATION PROJECT. LOOKING UPSTREAM (LEFT), LOOKING DOWNSTREAM (RIGHT).



UT Little Phoenix Creek Stream Restoration & Success Story:

In 2007, the National Committee for the New River (NCNR) was awarded a Federal 319 Grant in the amount of \$65,400 for restoring an unnamed tributary to Little Phoenix Creek (Figure 1-22). The purpose of this project was to repair 315 feet of a UT- Little Phoenix Creek which was severely damaged by excessive flooding as the result of upstream land clearing activities.

The stream restoration was based on natural channel design concepts. Rock step-pool structures were installed in the impacted reach and streambanks reshaped to the proper profile. Once the work was completed, native riparian vegetation was planted along the streambanks to aid in bank stability and to lessen the impacts of thermal pollution on this small headwater stream.

An existing culvert was removed since it acted as a dam, interfering with proper sediment transport. A bridge that spans the entire flood plane was built that allowed the stream profile to be maintained through the reach.

The goal of the project, to stabilize the lower reach of UT Little Phoenix Creek at the property, was met. DENR officials worked with the landowner at the top of the mountain to stabilize the 85 acres that had been cleared. NCNR worked with both upstream and downstream landowners to develop and implement a site plan. The result is a functional, stable stream that is also attractive.

See the project's **<u>Final Report</u>** for more detailed information about the purpose, restoration details and final results.

Helton Creek (050500010108)



Includes: Helton Creek [AU#: 10-2-27]

This subwatershed has mixed land use of agriculture, some residential and forest in the headwaters. There are no NPDES dischargers in this subwatershed. Majority of streams in the subwatershed hold the secondary use classification of Trout Waters.

Helton Creek [AU#: 10-2-27]

Helton Creek is approximately 19 miles from the NC/ VA state line to the North Fork New River [AU#: 10-

2-(12)]. This is the main receiving creek for this subwatershed. Land use is a mixture of mostly forest on the south side of the stream and agriculture and residential on the north side.

Use Support: Supporting (19 MI)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB25) (KB136) (KB137)	Good (2008) Excellent (2008) Excellent (2008)
Fish Com (KF5)	Not Rated (2008) Good-Fair (2009)

Water Quality Status

Helton Creek was monitored at four biological sites during 2008 and 2009. Five benthic samples were taken at three locations along the creek. Two of the three

sites were sampled for purposes of a special study. The most downstream benthic site (KB25) is a basinwide site and has been sampled since 1998. Each sample since 1998 has resulted in an Excellent rating, indicating the stream has a stable benthic community. The rating at this site dropped to a Good when it was sampled a second time in 2008 and maintained that Good rating when sampled again in 2009.

The fish community site, which is in the same location as KB25 and is a fish community reference site, was monitored in 2008 and received a Not Rated. This rating was given due to unexpected nature of the number and the type of species collected until further sampling could be completed. None of the trout species were native or wild and all appeared to be stocked. The 2009 sample showed similar results and was rated Good-Fair. The large number of stocked species is either an indication of nutrient inputs upstream from nonpoint sources, or the managed trout fishery is affecting the natural fish predators so that prey species are not being controlled. The specific cause of the drop in rating is not known at this time and the stream is considered to be impacted.

In September 2010, a survey was conducted to identify locations throughout the state of the Hellbender salamander. A population was found in Helton Creek. More information about the Hellbender Salamander can be found on the <u>NC National Heritage Program</u> website.

DWQ Special Study - Helton Creek (B-20081202):

A request for benthic sampling was received from the WSRO for three sites on Helton Creek in Ashe County. Sediments from logging, farming, and other agricultural activities in the watershed have filled in the stream above a small low-head dam upstream of SR 1526/Ashe County (KB136), causing a shift in the stream channel. The banks of the new channel are unstable and are a source of additional sediments to the stream. Benthic sampling was requested to assess potential effects of the sediments on the benthic community.

The locations of the three benthic sites sampled on 13 October 2008 can be seen in Figure 1-1 (KB137, KB136 & KB25). The quarter mile segment of Helton Creek where the stream channel had shifted is located just above the middle site (KB136) and is the source of increased sedimentation. One site was selected upstream of the altered channel, one directly downstream, and a third site near the confluence with North Fork New River.

The two upstream sites rated Excellent and the downstream site rated Good. It was concluded that the benthic data did not indicate impacts to the benthic community downstream of the new channel. A more detailed summary of the biological data and resultant bioclassifications can be found in the Special Study document.

Recommendations

A stressor study is recommended to determine the source of the large amount of stocked fish.

LOWER NORTH FORK NEW RIVER (050500010109)



Includes: North Fork New River [AU#: 10-2-(12)] & Millpond Branch [AU#: 10-2-28]

This subwatershed has mixed land use of forest in the headwaters, some residential and agriculture scattered in the headwaters and along streambanks. There are no NPDES dischargers in this subwatershed.

North Fork New River [AU#: 10-2-(12)]

A portion of this segment flows through this subwatershed. Water quality status and other information about the full length of the river is discussed at the beginning of this section.

REFERENCES

References marked with (*) indicates a DWQ special study report. These reports are not currently available online. Contact Jay Sauber by phone at (919) 743-8416 or by e-mail at Jay.Sauber@ncdenr.gov to receive a hardcopy.

- North Carolina Department of Environment and Natural Resources (NCDENR). Division of Water Quality (DWQ). August 2004a. *Classifications and Water Quality Standards Applicable to Surface Waters and Wetlands of North Carolina*. North Carolina Administrative Code: 15A NCA 2B. Raleigh, NC. (<u>http://h2o.enr.state.nc.us/csu/</u>)
- _____. DWQ. Planning Section. Basinwide Planning Unit (BPU). November 2008. *Supplemental Guide to Basinwide Planning: A support document for basinwide water quality plans.* Raleigh, NC. (<u>http://portal.ncdenr.org/web/wq/ps/bpu/about/supplementalguide</u>)
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- ____. *DWQ. ESS. BAU. March 2009. (B-20070904) *Benthos Sampling below Shatley Farm land clearing, Ashe County, New River Subbasin 02, August, 2007.* Raleigh, NC.
- Pate, Travis. 2009. Watershed Assessment in North Carolina: Building a Watershed Database with Population, Land Cover, and Impervious Cover Information. Master Theses, University of North Carolina at Chapel Hill.
- Note: URL addresses for hyperlinks found in this plan are listed in the Acronyms & Definitions Chapter.

CHAPTER 2

SOUTH FORK NEW RIVER



FOX CREEK WATERSHEDS

HUCs 0505000102 & 0505000103

Includes: Meat Camp Creek, Elk Creek, Pine Swamp Creek, Beaver Creek, Naked Creek, Peak Creek, Cranberry Creek, Prather Creek, Grassy Creek & Bridle Creek

GENERAL WATERSHED DESCRIPTION

These two ten-digit hydrologic unit code (HUC) watersheds, with an area of about 351 square miles, are the equivalent to DWQ's old subbasin 05-07-01 and contain the South Fork New River, Fox Creek and its tributaries (See DWQ's Old Subbasins to New HUC Conversion map in the <u>Maps Chapter</u>). These two watersheds are combined in the same chapter due to the small size of the Fox Creek watershed (0505000103).

Majority of these watersheds lie within Watauga and Ashe Counties. When combined, the South Fork New River and Fox Creek are the largest watersheds in this basin. The river flows north northeast through fairly mountainous terrain before joining with the North Fork New River to form the New River in northern Ashe County.

The land cover within these watersheds is mostly forested (64%) and has the largest amount of developed/urban area (8.2%) within the New River basin. These areas include the Towns of Blowing Rock, Boone, and Jefferson. Outside these urban areas, the land is dotted with rural residential communities, pastures and Christmas tree farms. Agricultural activities (25% of land cover) have historically consisted of cattle grazing, but within the last 15 years have expanded to include Christmas tree farming.

Roughly 7,800 acres of conservation land are found in these watersheds, and including easements held by local watershed groups and State agencies: Elk Knob State Park, Mt. Jefferson State Natural Area, New River State Park and Blue Ridge Rural Land Trust among others.

The population in these watersheds is centered mostly around the towns of Blowing Rock, Boone and Jefferson. The population of all three municipalities increased between 1990 and 2000 by a collective 22%. Boone is estimated to increase 10%, Blowing Rock by 5% and Jefferson by 1.4% by 2010 according to the 2000 census.

WATERSHED AT A GLANCE

COUNTIES:

Alleghany, Ashe & Watagua

MUNICIPALITIES:

Jefferson, Lansing & West Jefferson

ECOREGIONS:

Amphibolite Mountains, New River Plateau, Southern Crystaline Ridges and Mountains, Southern Metasedimentary Mountains, & Southern Sedimentary Ridges

PERMITTED FACILITIES:

NPDES WWTP:	14
Major	2
Minor	12
Non-Discharge Facilities:	9
Stormwater:	6
General	6
Individual	0
Animal Operations:	0

POPULATION:

2010: Coming Soon

2006 LAND COVER:

Developed	8.42%
Forest	64.72%
Agriculture	26.74%
Wetlands	0.11%

2001 Impervious Surface .. 0.84%





WATERSHED WATER QUALITY OVERVIEW

The South Fork New River/Fox Creek watershed contains seven out of the eight Impaired stream segments within the New River basin. Four of those segments include Naked Creek, Ore Knob Branch, Peak and Little Peak Creeks, which have been on the Impaired Waters list for several years. The remaining three Impaired segments (two segments of the South Fork New River and the East Fork South Fork New River) were added to the 2008 Impaired Waters list.

This watershed has the largest population of the three watersheds in the New River basin and contains more of an of urban and agriculture land use mix. Several waterbodies in the watershed have pristine water quality conditions and are in need of protection as land use changes from forest to urban or agriculture areas.

WATER QUALITY DATA SUMMARY FOR THESE WATERSHEDS

Monitoring stream flow, aquatic biology and chemical/physical parameters is a large part of the basinwide planning process. More detailed information about DWQ monitoring and the effects each parameter has on water quality is discussed in Chapters 2 and 3 of the <u>Supplemental Guide to North Carolina's Basinwide</u> <u>Planning</u> document.

UNDERSTANDING THE DATA

Biological & Ambient Rating Converted to Use Support Category

Biological (benthic and fish community) samples are given a bioclassification/rating based on the data collected at the site by DWQ's Environmental Sciences Section (ESS). These bioclassifications include Excellent, Good, Good-Fair, Not Impaired, Not Rated, Fair and Poor. For specific methodology defining how these rating are given see <u>Benthic Standard</u> <u>Operating Procedures</u> (SOP) or the <u>Fish Community SOP</u>. Once a rating is given, it is then translated into a Use Support Category (see Figure 2-2).

Ambient monitoring data are analyzed based on the percent of samples exceeding the State standard for individual parameters for each site within a two-year period. If a standard is exceeded in greater than 10.0% of samples taken for a particular parameter, that stream segment is Impaired for that parameter. The fecal

FIGURE 2-2: USE SUPPORT CATEGORIES FOR BIOLOGICAL RATINGS

Biological Ratings	Aquatic Life Use Support
Excellent	
Good	Supporting
Good-Fair	(Categories 1-2)
Not Impaired	
Not Rated	Not Rated (Category 3)
Fair	Impaired (Categories 4-5)
Poor	

coliform bacteria parameter is the exception to the rule. See the Fecal Coliform Bacteria section in the Ambient Data portion below. For the purposes of this plan, any site with greater than 7.0% to 10.0% of samples not meeting a parameter's standard will be considered Impacted.

FIGURE 2-3: EXAMPLE OF A USE SUPPORT AND MONITORING BOX

USE SUPPORT: IMPAIRED (14 MI)	
2008 IR Cat.	5
2010 IR Cat.	5
Benthos (CB1)	Fair (2008)
Fish Com (CF1)	Good-Fair (2008)
AMS (C1234500)	Turbidity - 12% FCB - 48%

Each biological parameter (benthic and fish community) and each ambient parameter is assigned a Use Support Category based on its rating or percent exceedance. Definitions for each category can be found in <u>Use Support Methodology Chapter</u>. Each monitored stream segment is then given an overall category which reflects the highest individual parameter category. For example, using the data from Figure 2-3 the individual parameter categories would be as follows: Benthos - 5, Fish Community - 1, Turbidity - 5. Therefore, the overall category, which is reported on the Integrated Report, would be 5 (Impaired). An Integrated Report is developed by the state every two years and reported to the U.S. Environmental Protection Agency.

STREAM FLOW

The basin experienced prolonged droughts in 1998-2002 and 2007-2008, and exceptionally high flows resulting from the remnants of several hurricanes (Figure 2-4). During a three week period in September 2004, the tropical storm remnants of Hurricanes Frances, Ivan, and Jeanne lead to wide-spread flooding throughout the central and northern mountains in the Catawba, French Broad, New, and Watauga River basins. Runoff from the storms produced flash-floods throughout the region with peak flows in excess of 10,000 cfs (approximately 500 times median flows) in upper tributary streams; peaks flows in some tributary rivers exceeded 50,000 cfs. In the New River basin, the peak flow during Hurricane Frances (September





7th - 9th) was 14,700 cfs, which had an approximate recurrence interval of 10 to 25 years. During Hurricane Ivan (September 17th - 18th) the peak flow was 7,550 cfs, which had an approximate recurrence interval of 2 to 5 years. More detail about flows in the New River Basin can be found in the <u>2009 Basinwide Assessment</u> **Report:** New River Basin produced by DWQ-Environmental Science Section.

BIOLOGICAL DATA

Biological samples were collected during the spring and summer months of 2004 and 2008 by ESS as part of the five year basinwide sampling cycle, in addition to special studies. Overall, 36 biological sampling sites were monitored within the South Fork New River Watershed. The ratings for each of the sampling stations can be seen in <u>Appendix 2-B</u>.

Benthic Macroinvertebrate Sampling

Each benthic station monitored during the current cycle is shown in Figure 2-5 and color-coded based on the current rating. As seen on the map, the majority of samples taken in this watershed were Supporting. This map also shows where the Impaired benthic sites are clustered in the basin. Each of these sites are discussed in more detail in the subwatershed discussions below.

Figure 2-6 shows 81% of the 27 sampling events received a Supporting rating and 12% received an Impaired rating. Figure 2-7 is a comparison

BENTHIC SAMPLING SUMMARY

- ♦ Total Stations Monitored25
- ♦ Total Samples Taken......27
- Stations Monitored Twice..... 2
- ♦ Number of New Stations 5

of benthic site ratings sampled during the last two cycles to determine if there are any overall shifts in ratings. Twenty-four percent of ratings declined and 12% improved in rating. Majority of ratings however, did not change which indicates no watershed scale shift in water quality.





Fish Community Sampling

Each fish community station monitored during the current cycle is shown in Figure 2-8 and color coded based on the current rating. Five of the sites were new monitoring sites located in rural watersheds with no NPDES dischargers. These sites were selected to determine potential for becoming fish community regional reference sites.

As shown in Figure 2-9, 55% of the 11 sampling events were Supporting

and nine percent received an Impaired rating. Thirty-six percent of the samples were Not Rated; therefore, the segments are neither Impaired nor Supporting. These four sites were Not Rated due to their location in a small mountain trout stream which does not currently have rating criteria. DWQ is developing this criteria and will apply it to these sites once completed.

Figure 2-10 is a comparison of fish community site ratings sampled during the last two cycles to determine if there are any overall watershed shifts in ratings. It shows 10% declined and 40% had no change in rating, indicating a somewhat stable fish community.

FISH COM. SAMPLING SUMMARY

- Total Stations Monitored 11
- o Total Samples Taken 11
- A Number of New Stations 5





When comparing the changes in biological site ratings to the other watersheds in this basin, it appears this watershed had the largest overall decline. However, this watershed had almost twice as many monitoring stations that could be compared between the previous monitoring cycle and the current. For more information about biological data in this watershed, see the <u>2009 New River Basinwide Assessment Report</u>. Detailed data sheets for each sampling site can be found in <u>Appendix 2-B</u>.

Fish Kills/Spill Events

Hodges Creek [AU#: 10-1-4-4-1]:

A fish kill was reported on July 17, 2010 on Hodges Creek of roughly 100 trout, crayfish and snails. This kill was the result of parking lot sealant being applied to the parking lot, located at 2458 NC Hwy. 105, right before a rain event. The rain event caused the sealant to runoff the parking lot before it was able to dry properly.

AMBIENT DATA

The ambient data are used to develop use support ratings every two years, which are then reported to the EPA via the Integrated Report (IR). The IR is a collection of all monitored waterbodies in North Carolina and their water quality ratings. The most current IR is the 2010 version and is based on data collected between 2004 and 2008. If a waterbody receives an Impaired rating, it is then placed on the 303(d) Impaired Waters List. The New River Basin portion of the 2010 IR can be found in <u>Appendix 2-A</u> and statewide on the <u>Modeling & TMDL Unit's</u> website.

Three AMS stations are located in the South Fork New River watershed (see Figure 2-1). During the current sampling cycle (January 2004 and December 2008), samples were collected for all parameters on a monthly basis, except metals which were sampled quarterly until 2007. For more information about the ambient monitoring, parameters, how data are used for use support assessment, and other information, see Chapter 2 of the <u>Supplemental Guide to North Carolina's Basinwide Planning</u>.

Long Term Ambient Monitoring

The following discussion of major ambient monitoring parameters includes graphs showing the median and mean concentration values for the three AMS stations in this watershed by specific parameter over a 13 year period (1997-2009). Each major parameter is discussed, even if no current impairment exists. The graphs are not intended to provide statistically significant trend information, but rather an idea of how changes in land use or climate conditions can affect parameter readings over the long term. The difference between median and mean results indicate the presence of outliers in the data set. Box and whisker plots of individual ambient stations were completed by parameter for data between 2004 and 2008 by DWQ's Environmental Sciences Section (ESS) and can be found in the New River Basin Ambient Monitoring System Report.

рΗ

AMS site K3250000 (located on the South Fork New River, just southeast of the Town of Jefferson) was the only AMS site in this watershed which recorded a pH standard exceedance. Two samples were over the 9.0 standard during this monitoring cycle, as indicated in Figure 2-11 by a yellow dot. Figure 2-12 shows the mean and median pH levels for all samples taken over the course of 13 years in the South Fork New River watershed. The pH pattern seen during this 13 year period is a steady increase towards the upper 7 range. This trend is seen in all three 10-digit watersheds in the New River Basin and is discussed further in the **Executive Summary**.



Turbidity

NC

DWQ

All three AMS sites (which are located on the South Fork New River) exceeded the state's turbidity standard in three to seven percent of samples, as seen in Figure 2-13 indicated by a yellow dot. Possible sources of elevated turbidity levels are discussed in the 12-digit subbwatershed section. Figure 2-14 shows the mean and median of turbidity levels for all samples taken over the course of 13 years in the South Fork New River watershed. The yearly averages are well below the state standard of 50 NTUs. The highest two violations occurred in 2009 at sites K3250000 and K4500000, measuring at 380 NTU and 260 NTU, respectively.

While some erosion is a natural phenomenon, human land use practices accelerate the process to unhealthy levels. Construction sites, mining operations, agricultural operations, logging operations and excessive stormwater flow off impervious surfaces are all potential sources. Turbidity violations demonstrate the importance of <u>protecting and conserving stream buffers and natural areas.</u>

FIGURE 2-14: SUMMARIZED TURBIDITY VALUES FOR ALL DATA COLLECTED AT

AMBIENT SAMPLING STATIONS IN HUC 0505000102 25 FIGURE 2-13: PERCENTAGE OF Median Mean SAMPLES EXCEEDING THE TURBIDITY STANDARD (2003-2008) 20 Turbidity (NTU) 15 10 5 0% < 7 % 0 7 % - 10 % 2007 7003 7003 2005 2006 2002 > 10 % * NC Turbidity Standard: 50 NUT

Dissolved Oxygen

As seen in Figure 2-15, none of the three sites recorded DO standard exceedance during this monitoring cycle. Figure 2-16 shows the mean and median of DO levels for all samples taken over the course of 13 years in the South Fork New River watershed. These averages are well within the normal DO range.



2.8

Temperature

The NC standard for temperature is not to exceed $29^{\circ}C$ (84.2°F) in the mountain/upper piedmont regions. The discharge of heated liquids to trout waters (Tr) should not increase the natural water temperature by more than 0.5°C (0.9°F), and in no case, exceed 20°C (68°F). A map of designated Trout Waters in the New River basin can be found in the <u>Maps Chapter</u>. No stream segments in this watershed are Impaired or Impacted due to high temperatures (Figure 2-17).

Figure 2-18 shows the mean and median of temperature levels for all samples taken over the course of 13 years in the South Fork New River watershed. The change in the water temperature trend for this watershed can be linked to the change in stream flow levels. During low flow or drought periods, water can sit in small pools and become heated by the sun.



Fecal Coliform Bacteria

Fecal coliform bacteria occurs in water as a result of the overflow of domestic sewage and from other nonpoint sources of human and animal waste, including pets, wildlife and farm animals. The FCB standard for freshwater streams is not to exceed the geometric mean of 200 colonies/100 ml or 400 colonies/100 ml in 20% of the samples where five samples have been taken in a span of 30 days (5-in-30). Only results from a 5-in-30 study are to be used to indicate whether the stream is Impaired or Supporting. Waters with a use classification of B (primary recreational waters) receive priority for 5-in-30 studies. Other waters are studied as resources permit. Three AMS stations are located within this watershed which are all along the South Fork New River.

As seen in Figure 2-19, two of the sites had 0 to 7% of samples taken during this cycle result in levels over 400 colonies/100 ml and the southern most site had 7 to 10%. Possible sources of elevated levels of FCB are discussed in the subwatershed sections. Figure 2-20 shows



the geometric mean of FCB levels for all samples taken over the course of 13 years in the South Fork New River watershed. The geometric mean is a type of mean or average, which indicates the central tendency or typical value of a set of numbers. The highest yearly geometric mean for FCB was recorded in 2003. The figure also includes the yearly average stream flow, as seen in Figure 2-4, to show how flow can be linked to FCB levels.



For more information regarding any of the parameters listed above, see Section 3.3 of the <u>Supplemental</u> <u>Guide to North Carolina's Basinwide Planning</u>. For additional information about ambient monitoring data collected in this river basin, see the <u>New River Basin Ambient Monitoring System Report</u>.

RECOMMENDATIONS & ACTION PLANS AT THE WATERSHED SCALE

DWQ PRIORITY SUMMARY

Table 2-1 is a list of waters in the South Fork New River & Fox Creek Watersheds that DWQ has prioritized for restoration/protection. The order of priority is not based solely on the severity of the steams impairment or impacts but rather by the need for particular actions to be taken. A stream that is currently supporting its designated uses may be prioritized higher within this table than a stream that is currently impaired. This is based on a more wholistic evaluation of the drainage area which includes monitoring results, current and needed restoration/protection efforts, land use and other activities that could potentially impact water quality in the area. Some supporting streams may have a more urgent need for protections than an impaired stream with restoration needs already being implemented.

The third and fourth columns of this table list <u>potential</u> stressors and sources that may be impacting a stream based on in-field observations, monitoring data, historical evidence, permit or other violations, and other staff and public input. In many cases, additional study is needed to determine exact source(s) of the impact (s). The last column includes a list of recommended actions.
TABLE 2-1: PRIORITIZATION OF WATERS IN THE SOUTH FORK NEW RIVER & FOX CREEK WATERSHEDS (HIGHEST TO LOWEST PRIORITY)

STREAM NAME	AU#	Class.	Potential Stressor(s)	Potential Source(s)	Status	Actions Needed
South Fork New R. (SFNR)	10-1-(1), 10-1-(3.5)a & 10-1-(3.5)b	WS-IV;CA;+ C;+ C;+	Habitat Degradation, Nutrients, pH	Construction, WWTP	Impaired	SS, SEC, NMC, P (Hellbender Salamander)
Boone Cr. (Kraut Cr.)	10-1-4-4	C;Tr;+	Habitat Degradation, Temperature, Turbidity, DO, Copper	ASU Steam Station, Urban Impacts, Construction, Piped Streams	Impacted	DS, RBR, SC, E
SFNR	10-1-(33.5)	B;ORW	Habitat Degradation, Turbidity, pH, Nutrients, Copper	Agriculture, Abandoned Mine	Supporting	RBR, Ag, NMC
Naked Cr.	10-1-32	C;+	Habitat Degradation (Riparian Buffers) Turbidity, Toxins	Construction, Golf Course, Urban Impacts	Impaired	SC, RBR, E, WRP, DS, SEC
Middle Fork SFNR	10-1-2-(1), 10-1-2-(6), 10-1-2-(14) & 10-1-2-(15)	WS-IV;+ WS-IV;Tr;+ WS-IV;+ WS-IV;CA;+		Urban Impacts, Blowing Rock WTP	Impacted	М
East Fork SFNR	10-1-3-(1), 10-1-3-(7) & 10-1-3-(8)	WS-IV;Tr;+ WS-IV;+ WS-IV;CA;+	Habitat Degradation (Riparian Buffers)	Urban Impacts, Blowing Rock WTP	Impaired	RBR, M
Obids Cr.	10-1-27-(1) 10-1-27-(2)	C;Tr;+ WS-IV;Tr;+	Habitat Degradation (Riparian Buffers)	Agriculture (Livestock access)	Supporting	Ag, RBR, E
Pine Swamp Cr.	10-1-24	C;+	Turbidity	Stormwater Volume & Velocity	Supporting	RBR, Ag, E
Cranberry Cr. (Mulberry Cr.)	10-1-37	B;Tr;+	Habitat Degradation (Riparian Buffers) Nutrients	Straight Channels, Agriculture	Supporting	R, Ag, RBR, E
Prathers Cr.	10-1-38	B;Tr;+	Habitat Degradation (Riparian Buffers) Nutrients	Agriculture	Impacted	RBR, Ag, NMC
Norris Fork	10-1-10-2	C;Tr;+	Turbidity	Construction	Supporting	SEC BMPs
SFNR	10-1-(20.5) & 10-1-(26)a	WS-V;HQW WS-IV;HQW			Supporting	RBR, E
Roan Cr.	10-1-31-(1) 10-1-31-(1.5) 10-1-31-(2)	C;Tr;+ WS-IV;Tr;+ WS-IV;CA;Tr;+	Sedimentation	Agriculture	Supporting	Ag, E, RBR
Winkler Cr.	10-1-4-(1), 10-1-4-(2), 10-1-4-(3.5)a & 10-1-4-(3.5)b	WS-II;HQW,Tr WS- II;HQW;Tr;CA C;Tr;+ C;Tr;+		Urban Impacts, Pipped Streams	Supporting	DS, M
Grassy Cr.	10-3	C;Tr;+	Nutrients, pH	Agriculture, Straight Channels	Impacted	Ag, RBR

Class.: Classification (e.g., C, S, B, WS-I, WS-II, WS-III, WS-IV, WS-V, Tr, HQW, ORW, SW, UWL)

Stressor: Chemical parameters or physical conditions that at certain levels prevent waterbodies from meeting the standards for their designated use (e.g., low/high DO, nutrients, toxicity, habitat degradation, etc.).

Source: The cause of the stressor. (Volume & Velocity: when a stream receives stormwater runoff at a much higher volume and velocity than it would naturally receive due to ditching, impervious surfaces, etc.)

Status: Impaired, Impacted, Supporting, Improving

Actions Needed: Restoration (R), Protection (P), Stormwater Controls (SC), Stressor Study (SS), Education (E), Local Ordinance (LO), Best Management Practices (BMPs), Sediment and Erosion Control BMPs (SEC), Species Protection Plan (SPP), Forestry BMPs (F), Agriculture BMPs (Ag), Nutrient Mgnt Controls (NMC), Riparian Buffer Restoration (RBR), Daylight Stream (DS), Monitoring (M), Watershed Restoration Plan (WRP).

Stream Name	AU#	CLASS.	Potential Stressor(s)	Potential Source(s)	Status	Actions Needed
Nathans Cr.	10-1-36	B;Tr;+	Habitat Degradation		Impacted	М
SFNR	10-1-(3.5)c & 10-1-(14.5)	C;+ C;+	Habitat Degradation, Turbidity, pH	Poor Riparian Buffers	Impacted	М
SFNR	10-1-(26)b & 10-1-(30)	WS-IV;HQW WS-IV;HQW;CA	pH, Turbidity, Nutrients		Supporting	SS
Little Peak Cr.	10-1-35-4	B;Tr;+	Toxins	Abandoned Mine	Impaired	R - Currently Underway
Ore Knob Br.	10-1-35-3	B;Tr;+	Toxins	Abandoned Mine	Impaired	R - Currently Underway
Peak Cr.	10-1-35-(1), 10-1-35-(2)a & 10-1-35-(2) b	C;Tr;+ B;Tr;+ B;Tr;+	Toxins	Abandoned Mine	Impaired	R - Currently Underway
Pine Orchard Cr.	10-1-15-1	C;Tr;+	Turbidity		Supporting	RBR
South Beaver Cr.	10-1-25-2	C;Tr;+	Habitat Degradation (Riparian Buffers)		Supporting	RBR
Piney Fork	10-1-37-3	B;Tr;+			Improving	Μ
Class.: Classification (e.g., C, S, B, WS-I, WS-II, WS-III, WS-IV, WS-V, Tr, HQW, ORW, SW, UWL)						

Stressor: Chemical parameters or physical conditions that at certain levels prevent waterbodies from meeting the standards for their designated use (e.g., low/high DO, nutrients, toxicity, habitat degradation, etc.).

Source: The cause of the stressor. (Volume & Velocity: when a stream receives stormwater runoff at a much higher volume and velocity than it would naturally receive due to ditching, impervious surfaces, etc.)

Status: Impaired, Impacted, Supporting, Improving

Actions Needed: Restoration (R), Protection (P), Stormwater Controls (SC), Stressor Study (SS), Education (E), Local Ordinance (LO), Best Management Practices (BMPs), Sediment and Erosion Control BMPs (SEC), Species Protection Plan (SPP), Forestry BMPs (F), Agriculture BMPs (Ag), Nutrient Mgnt Controls (NMC), Riparian Buffer Restoration (RBR), Daylight Stream (DS), Monitoring (M), Watershed Restoration Plan (WRP).

Understanding this Section

In this Section, more detailed information about stream health, special studies, aquatic life stressors and sources and other additional information is provided by each 12-digit Hydrological Unit Code (HUC). Waterbodies discussed in this Chapter include all monitored streams, whether monitored by DWQ or local agencies with approved methods. Use Support information on all monitored streams within this watershed can be seen on the map in Figure 2-1, and a Use Support list of all monitored waters in this basin can be found in the <u>Use Support Methodology Chapter</u>.

Use Support & Monitoring Box:

Each waterbody discussed in the Status & Recommendations for Monitored Waters within this Watershed section has a corresponding Use Support and Monitoring Box (Table 2-2). The top row indicates the 2010 Use Support and the length of that stream or stream segment. The next two rows indicate the <u>overall</u> Integrated Report category which further defines the Use Support for both the 2008 and the 2010 reports. These first three rows are consistent for all boxes in this Plan. The rows following are based on what type of monitoring stations are found on that stream or stream segment and may include benthic, fish community and/or ambient monitoring data. If one of these three types of monitoring sites is not shown, then that stream is not sampled for that type of data. The first column indicates the type of sampling in bold (e.g., **Benthos**) with the site

	10		
Use Support: Impaired (14 MI)			
SUPPORT AND MONITORING BOX			
TABLE 2-2: EXAMPLE OF A USE			

2008 IR Cat.	4a
2010 IR Cat.	4
Benthos (CB79) (CB80)	Fair (2002) Fair (2002)
Fish Com (CF33)	Good-Fair (2002)
AMS (C1750000)	Turbidity - 12% FCB - 48%

ID below in parenthesis (e.g., CB79). The latest monitoring result/rating of that site is listed in the next column followed by the year that sample was taken. If there is more than one benthic site, for example, on that stream, the second site ID and site rating will be listed below the first. The last row in the sample box in Table 2-2 is the AMS data. The data window for all AMS sites listed in the boxes in this Plan is between 2004-2008. Only parameters exceeding the given standard are listed in the second column with the percent of exceedance listed beside each parameter.

Please note any fecal coliform bacteria (FCB) listing in the last row (as seen in Table 2-2) only indicates elevated levels and a study of five samples in 30 days (5-in-30) must be conducted before a stream becomes Impaired for FCB.

SOUTH FORK NEW RIVER (SFNR)

The full length South Fork New River runs from the Town of Boone 125 miles northeast to the New River confluence at the New River State Park. The river's watershed is split into ten smaller subwatersheds (12-digit HUs) that are discussed in the following sections. This section will review the South Forks water quality status by AU segments.

AU#'s: 10-1-(1), 10-1-(3.5)a & 10-1-(3.5)b

The SFNR begins at the confluence of the Middle and East Fork South Fork New Rivers in the Town of Boone. This five and a half mile stretch within the Headwaters SFNR subwatershed (050500010201) receives runoff from a wide variety of land uses, including sports fields, commercial properties, pastures and a quarry along the stream banks with residential and forested land further up the banks. The Town of Boone's WWTP also discharges to this portion of the SFNR. The two segments of the river running from Winkler Creek to US-421 [AU#: 10-1-(3.5)a & b] were added to the 2008 Impaired Waters list for ecological/biological integrity. Segment 10-1-(3.5)b was originally placed on the Impaired Waters List in 1998 for ecological/biological integrity and removed from the 2000 List.

Use Support: Impaired		
2008 IR Cat.	5	
2010 IR Cat.	5	
Benthos (KB16)	Fair (2008)	
Fish Com (KF12)	Good (2008)	
AMS (K2100000)	No Exceedances	

Water Quality Status

The majority of the SFNR located within this subwatershed, 5.1 miles of 5.5 miles, initially appeared on the Impaired Waters list in 2008. Three DWQ sampling stations, located at the US-421 bridge, monitor the benthic and fish communities as well as physical/chemical parameters (AMS). Fish community samples taken this cycle indicated an improvement in species diversity as well as the quantity of the community from the previous cycle.

However, a benthic sample collected in November of 2003, resulted in a declined rating of Fair from Good-Fair in August of 2003. The 2008 benthic rating echoed the November 2003 rating of Fair. Data from surrounding tributaries indicate the immediate drainage area is having more of an impact on the river than surrounding tributaries. Silt covered 40% of the benthos in this reach limiting habitat for aquatic macroinvertebrates. The excess silt is likely a result of stormwater runoff carrying loose sediment from a large land disturbing activity at the confluence of Hardin Creek and the SFNR.

Physical/chemical sample results also show the stream is experiencing periods of high turbidity during storm events. Nutrient levels, particularly ammonia, have been reduced as a result of upgrades to the Town of Boone's WWTP; however, reductions in total nitrogen and total phosphorus are still needed to support the river's designated uses. pH levels at this site have gradually increased from 6.6 to around 7.6 between 1997 and 2009.

In September 2010, a survey was conducted to identify locations throughout the state of the Hellbender salamander. A population was found in the SFNR near Boone. More information about the Hellbender Salamander can be found on the <u>NC National Heritage Program</u> website.

This section of the SFNR will remain on the Impaired Waters List in 2012 and will be re-sampled in 2013.

Recommendations

It is recommended that both county and municipal planning departments work cooperatively to ensure construction projects are completed in an environmentally responsible manner. Local governments are also urged to partner with local environmental groups and DWQ to determine the need for a Watershed Restoration Plan. A stressor study is recommended to pinpoint the source of nutrients and other stressors that are impacting the benthic community. DWQ supports the need for funding a Watershed Restoration Plan for this drainage area that includes an implementation plan and post implementation monitoring. The presence of the Hellbender salamander increases the priority of restoration and protection of this drainage area.

AU#'s: 10-1-(3.5)c & 10-1-(14.5)

These two segments of the SFNR are approximately 61 miles from the edge of Boone to just upstream of Couches Creek and flow through three subwatersheds (Meat Camp Creek-SFNR: 050500010202, Elk Creek-SFNR: 050500010203 and Old Fields Creek-SFNR: 050500010204). Land cover for the drainage area is a mixture of agriculture lining the stream banks, small scattered urban and forested areas.

Water Quality Status

These segments were last sampled in 1990 when the benthic community received a Good-Fair rating. There are no known water quality issues in the segments.

Recommendations

DWQ will monitor KB90 during the next sampling cycle, if resources are available, to determine if there as been a significant change in water quality of this drainage area.

AU#'s: 10-1-(20.5) & 10-1-(26)a

These two segments of the SFNR are approximately 25 miles from just upstream of Couches Creek to Obids Creek and flow through three subwatersheds (Old Fields Creek-SFNR: 050500010204, Pine Swamp-SFNR: 050500010205 and Beaver Creek-SFNR: 050500010206). Land cover for the drainage area is a mixture of agriculture and forest.

Water Quality Status

The upstream segment [AU#: 10-1-(20.5)] has been monitored for benthic health three times since 1998 and holds a secondary use classification of HQW. The first two samples rated Excellent; however, the most recent sample taken in 2008 declined to a Good rating. This decline indicates more pollution tolerant taxa inhabiting the stream. Limited instream habitat and poor riparian buffers are responsible for the low habitat score. Specific conductivity and pH levels were both higher than past samples (105µS/cm and 9.2, respectively).

Habitat conditions and an increasing pollution tolerance level combined with elevated turbidity, conductivity and pH levels indicate signs of recent impacts to the aquatic life in this segment. If impacts continue, the benthic rating for this segment is expected to decline during the next cycle.

Recommendations

Water Quality Status

Riparian buffer restoration is suggested along sections of the river that are lacking buffers of the correct width or all together. Educational efforts are also suggested for this area to inform property owners of the importance of maintaining proper width riparian buffers.

AU#'s: 10-1-(26)b & 10-1-(30)

These two segments of the SFNR [AU#: 10-1-(26)b & (30)] are approximately seven miles from just downstream of the Obids Creek to Naked Creek and flow through two subwatersheds (Beaver Creek-SFNR: 050500010206 and Naked Creek-SFNR: 050500010207). Land cover for the drainage area is a mixture of agriculture, forest and residential. Segment 10-1-(26)b was added to the 2006 Impaired Waters List for low pH violations but removed from the 2008 list.

A benthic site located at NC-16/18 has been sampled five times between 1990 and 2008. Each of these samples has resulted in an Excellent rating. The most recent sample showed a large and diverse benthic community; however, this community is slightly more pollution tolerant than of those found in the 2003 sample. This is an indication that impacts to instream water quality are present.

USE SUPPORT: SUPPORTING (7.3 mi)		
2008 IR Cat.	2	
2010 IR Cat.	2	
Benthos (KB3)	Excellent (2008)	
AMS (K3250000)	No Exceedances	

2.15

USE SUPPORT: SUPPORTING (24.6 MI)		
2008 IR Cat.	2	
2010 IR Cat.	2	
Benthos (KB2)	Good (2008)	

USE SUPPORT: SUPPORTING (60.5 mi)		
2008 IR Cat.	2	
2010 IR Cat.	2	
Benthos (KB90)	Good-Fair (1990)	

2.16

2011

An AMS station is located just downstream of the benthic station, at NC-16 and NC-88. Between 2005 and 2009, there were no parameters with exceedances greater than 10% which would cause the stream to be added back to the Impaired Waters list. However, parameters of interest at this station include turbidity, specific conductivity, nutrients and pH which were all elevated as compared to the previous cycle. Fecal coliform bacteria levels were, on average, lower than the previous cycle.

Several low pH readings, below the state water quality standard of 6.0, in the late 1990s and early 2000s placed this segment on the 2006 Impaired Waters List. It was removed from the 2008 list due to a reduction in the percent of samples with low pH violations. The last low pH violation was recorded in 2001 and the first high pH violation (greater than 9.0) was recorded in 2002. As seen in Figure 2-21, yearly averages of pH have been steadily increasing.

The specific cause of the increasing pH levels is unknown at this time.

Recommendations

A stressor study should be conducted to determine

the source of the increased pH. In western portion of the State, a downward trend is being seen in pH levels. This site does not appear to be affected by the unknown cause of low pH in the western portion; therefore, a separate study should be prioritized.

AU#: 10-1-(33.5)

This segment of the SFNR is 22.5 miles long, from Dog Creek to the confluence with the New River. The land cover in this drainage area is dominated by agriculture and forest. No permitted dischargers are located along the segment; however, it does receive flow from Peak, Little Peak Creeks and Ore Knob Branch, which are all Impaired waters. This segment holds a National Wild & Scenic River classification as well as a State use classification of ORW.

	AMS	
Water Quality Status	(K4500000)	No Exceedances
This segment includes an AMS station and a benthic macroinvertebrate station	. Both statio	ons are located
along US-221, near Scottville. The benthic station has been monitored since 198	3 and receiv	ed an Excellent
rating since 1990 as it did again in 2008. Specific conductivity and pH levels	have both i	ncreased since
the 2003 sample, indicating the presence of a water quality pollutant. Much of	the streamb	anks along the
segment lack any form of riparian buffer and are often used for agriculture activiti	es.	

Physical and chemical parameters measured at the AMS station (K4500000) were all within North Carolina's water quality standards. However, the data did show elevated levels of turbidity and copper and slightly higher nutrient levels as compared to the previous sampling cycle. A copper ore mine on Ore Knob Branch is the likely source of elevated copper. See the Peak Creek-South Fork New River subwatershed discussion for more details about the closed mine.

Recommendations

DWQ will work with SWCD to prioritize this segment of the river for the most appropriate agricultural BMPs to reduce the amount of nutrients and sediment that runs off farmlands. Educational efforts are also recommended to inform landowners of the importance of minimizing time soil is exposed between crop rotation and maintaining adequate riparian buffers.



Use Support: Supporting (22.5 mi)		
2008 IR Cat.	2	
2010 IR Cat.	2	
Benthos		
(KB10)	Excellent (2008)	
AMS (K4500000)	No Exceedances	

Local Initiatives

In 2008, the National Committee for the New River (NCNR) combined efforts with the New River State Park to work on a streambank and riparian buffer restoration project. The streambank along a reach of the South Fork river in the New River State Park had severely eroding streambanks and lacked accessible floodplain and vegetated riparian buffers. The primary goal of the project was to reduce erosion; establish functional riparian zones; stabilize streambanks; restore connection of the stream to the flood plain; provide shading of the streams, and improve aquatic habitat.

With funding from CWMTF, the NCNR stabilized 1350 linear feet of riverbank by sloping the banks, constructing in-stream structures to protect the bank, and planting a riparian buffer. The New River State Park contributed funds to plant trees on the project site, extending the average riparian buffer zone to over 200 feet.



*Pictures Provided by NCNR's Lynn Caldwell

SOUTH FORK NEW RIVER HEADWATERS (HUC: 050500010201)



Includes: South Fork New River [AU#: 10-1-(1), (3.5)a & (3.5)b], Middle Fork South Fork New River [AU#: 10-1-2-(1), (6), (14) & (15)], East Fork South Fork New River [AU#: 10-1-3-(1), (7) & (8)] & Winkler Creek [AU#:10-1-4-(1) & (3.5)]

This subwatershed has mixed land use of forest, urban and agriculture. There are five minor and one major NPDES discharger permits in this subwatershed. The majority of streams in the subwatershed hold the secondary use classification of Trout Waters. The Towns of Blowing Rock and Boone are located in the southern and northern portion of the subwatershed, respectively. The subwatershed also

includes two Impaired waterbodies (South Fork New River [AU: 10-1-(3.5)b] and East Fork South Fork New River [AU#: 10-1-3-(1)]).

Middle Fork South Fork New River [AU#: 10-1-2-(1), (6), (14) & (15)]

The Middle Fork South Fork New River runs about 11 miles from its source in the Town of Blowing Rock to the SFNR confluence in the Town of Boone. The river mostly flows north along US 221/321. Between the Towns of Blowing Rock and Boone, the river receives run off from light development along the streambanks, the Boone Golf Course and discharge from four minor NPDES facilities.

Water Quality Status

The first two segments of the river [AU#: 10-1-2-(1) & (6)], or the first nine miles, were last sampled in 2003. The 2003 benthic sample (KB67) was taken as part

 Use Support: Supporting (11.1 ml)

 2008 IR Cat.
 2

 2010 IR Cat.
 2

 Benthos (KB1)
 Good-Fair (2008)

 Fish Com (KF8)
 Not Rated (2008)
 NC

The lower portion of the river [AU#: 10-1-2-(14) & (15)] was sampled in 2008 just upstream of the SFNR confluence. This benthic site (KB1) has been sampled five times since 1993, when it received an Excellent rating. Since that time, ratings have fluctuated between Good and Good-Fair. The 2008 Good-Fair rating and analysis indicates the river has been degrading gradually over time. The largest number of pollution tolerant species were collected during this cycle. The site also had elevated specific conductivity levels and poor habitat ratings.

A fish community site is located at the same location as the benthic site and was first monitored in 1998 resulting in an Excellent rating. The fish site was not monitored in 2003 due to a sodium hydroxide spill. The 2008 sample showed a decline in number of pollution intolerant species, as well as a decline in bioclassification. The site was given a Not Rated due to the combined effects of the spill, described below, and the urban nature of this stream.

In 2003, the Blowing Rock Water Treatment Plant spilled approximately 3,000 gallons of sodium hydroxide about eight miles upstream of the sampling site, causing an estimated 14,000 to 15,000 fish kill in the Middle Fork and upper part of the SFNR. DWQ conducted a special study to determine the effect of the spill on the benthic macroinvertebrate community. Samples from three weeks after the spill indicated no significant impact to the benthic community on the Middle Fork. Other samples taken during the study on the East Fork and the SFNR; however, did show impacts. Those are discussed further in those respective stream discussions below. Due to this spill, no fish sample was taken during the last cycle.

Recommendations

DWQ will re-sample site KF8 to determine the current water quality conditions. Sampling during the upcoming cycle will also assist in evaluating if the urban land use is having an impact on the fish community.

The Boone Dam should be considered for a Dam Removal Project. American Rivers works closely with local agencies to determine whether it is environmentally beneficially to remove a particular dam or if the act of removing the dam would cause unnecessary damage to the aquatic life and it habitat. Additional information about <u>American Rivers</u> and what they do can be found online.

East Fork South Fork New River [AU#: 10-1-3-(1), (7) & (8)]

The East Fork South Fork New River is approximately three miles from source to the confluence with the SFNR. Headwaters drain pasture and other agricultural lands before transitioning to urban residential areas just before the confluence. The last mile of the river flows through the Boone Golf Course. One segment [AU#: 10-1-3-(1)] was added to the 2008 Impaired Waters list. The upstream and downstream segments are Supporting.

Use Support: Impaired		
2008 IR Cat.	5	
2010 IR Cat.	5	
Benthos (KB12) (KB103)	Good (2008) Fair (2003)	

Water Quality Status

Two segments [AU#: 10-1-3-(1) & (8)] of the river were listed for the first time on the 2008 Impaired Waters list for biological integrity; however, the most downstream segment [AU#: 10-1-3-(8)] was removed from the 2010 Impaired Waters list. The upstream two mile segment [AU#: 10-1-3-(1)] was monitored for the first time at KB103 in 2003 as part of a special study to determine impacts of a sodium hydroxide spill from the Blowing Rock WTP in November 2003. The 2003 sample rated the benthic community as Fair as a result of the WTP spill. This site has not been re-sampled; however, the biological community has likely recovered from the spill impacts.

The downstream half mile of the river [AU#: 10-1-3-(8)] has historically had an Excellent or Good benthic community at site KB12 but was rated Poor in 2003 due to the release of sodium hydroxide. The benthic community has since recovered from those impacts and received a Good rating in 2008, which removed the downstream segment from the 2010 Impaired Waters list.

2011

Recommendations

DWQ will continue to monitor the East Fork South Fork New River basinwide benthic site KB12. Special study site KB103 will be re-sampled to determine if the water quality has improved to support the rivers use sufficiently, depending on resource availability. It is also recommended that local agencies work with the Boone Golf Course to plant a proper riparian buffer along the stretch of the river that flows through the property.

Local Initiatives

Just across the river from the golf course, the National Committee for the New River (NCNR) began efforts to restore 1,442 linear feet of an unnamed tributary of the East Fork New River located on the Deerfield United Methodist Church property. This reach was incised and one section was migrating toward Deerfield Road. There was an old, degraded, and dangerous culvert under the church parking lot and another culvert through a grassy area which had dangerous sink-holes.

The upper reach of the channel was daylighted and restored to a natural dimension, pattern, and profile. A new channel was created just downstream of a garden and a new culvert placed through the parking lot, well away from the road. Natural channel structures such as crossvanes, J-hooks, log deflection jams, and rootwads were placed throughout the high stress areas of the reach to control scour/erosion, create habitat and establish a stable riffle-pool sequence. A 50-foot riparian buffer was planted along the project reach.



*Pictures Provided by NCNR's Lynn Caldwell

Winkler Creek [AU#:10-1-4-(1), (2), (3.5)a & (3.5)b]

Winkler Creek is about six and a half miles long from source to the confluence with the SFNR. Headwaters of the creek drain mostly forest with single family homes and pasture lands along the streambanks. The last two miles of the stream, before it merging with the South Fork, flows through the Town of Boone. A thin riparian buffer is present along the banks of this portion; however, the area has a significant amount of impervious surface and is channeled underground

USE SUPPORT: SUPPORTING (6.3 ml)		
2008 IR Cat.	2	
2010 IR Cat.	2	
Benthos (KB17)	Excellent (2008)	

periodically. The creek is currently supporting its designated uses according to the 2010 Integrated Report.

Water Quality Status

Winkler Creek has been monitored by DWQ since 1993 at a benthic station (KB17), located directly behind Watauga High School on the town limits of Boone. Historically, this station has had a stable, pollution intolerant benthic community. The sample taken in 2008 was rated Excellent as well.

Recommendations

DWQ will continue to monitor the basinwide benthic station KB17 or relocate the site to upstream of the South Fork confluence. Data from this station could provide information on changes in water quality as the land use shifts from agriculture to urban. DWQ supports local efforts which involve property owners and other stakeholders in the planning process of evaluating and determining the best strategy for daylighting the full length of the stream.

Boone Creek (Kraut Creek) [AU#: 10-1-4-4]

Boone Creek is just over two and a half miles running from the northwest potion of the Town of Boone to Winkler Creek. The full length of the creek runs through a dense urban area with significant impervious surfaces. Portions of the creek have been piped underground. These watershed conditions can cause, among other water quality issues, flashy conditions within the stream during and shortly

Use Support: (2.7 m)	
2008 IR Cat.	
2010 IR Cat.	

after storm events. DWQ does not currently collect data on this stream; therefore, the stream is not given a use support rating.

Water Quality Status (Special Study)

In 2006 and 2007, a study was conducted by Appalachian State University (*Baseline Monitoring Case Study of a High-Gradient, Urbanized Stream - Boone Creek, Boone, NC*) to provide a baseline for water quality data along Boone Creek. A two page summary of this study can be found <u>online</u>. Data for this study was collected between May 2006 and May 2007. Parameters sampled during this time were temperature, electrical conductivity, turbidity, dissolved oxygen, pH and pressure.

One of the main focuses of this study was evaluating thermal behavior of the stream. Between May and August of 2006, temperatures in the stream ranged from 40°F to 72°F, which is over the North Carolina standard for Trout Waters. During the full length of the study, temperature averaged a 10-12°F difference within a 24 hour period in a one mile segment of the stream. The greater temperature differences occurred mostly during and shortly after storm events, when parking lots and other impervious surfaces are heated by the sun and then transferred that heat to stormwater runoff. This drainage area has a large percentage of impervious surfaces which can also cause the stream to become flashy.

The study also discussed the stream's chemistry and impacts from sedimentation. High levels (600-800 NTU) of turbidity were seen in the stream following rain events for one to six hours and would remain around 50 NTU for several days. Land clearing for construction projects in and around the Appalachian State University are sources of these high levels. pH levels upstream were found to be around 7 (neutral) and declined to more acidic levels further downstream. During winter months, the decline may have been due to salt on the roads. Dissolved oxygen (DO) levels stayed between 0 and 5 mg/l during the summer months in 2006. The DO standard in North Carolina for instantaneous readings is 4 mg/l. Copper samples were also noted as above the State's action level.

Recommendations

Recommendations in the study discussed above suggested a major stream remediation. However, additional data is needed in combination to what was collected to plan a successful long term remediation. Other less expensive measures suggested by the study include wider riparian buffers and wetland areas located along the creek and installation of low impact development stormwater BMPs (e.g., green roofs, pervious pavements, bio-retention and collecting rain water). Daylighting the stream to increase habitat for benthic macroinvertebrates is also suggested by the study (Thaxton, 2007).

DWQ supports the recommendation for planning and implementation of an in-depth stream restoration/ remediation project which includes stream daylighting. This type of long term project which is planned in detail is more likely to have measurable and lasting results than installing BMPs individually. Stormwater BMPs and wider buffer zones are economically feasible options to start with until project funding is secure, but should also be included in a larger restoration plan.

Local Initiatives

Actions to restore the streambanks and riparian zones along Boone Creek have already begun. The National Committee for the New River (NCNR) applied for a grant to implement the Boone Creek/"Kraut Creek" Enhancement project, designed to improve 185 linear feet of the creek beginning just behind 970 Rivers Street in Boone. This site is in the downtown area of Boone where encroaching development and the resulting stormwater runoff had caused severe streambank erosion.

Part of an asphalt parking lot and a wooden fence (as seen in left picture in Figure 2-24) were removed on the right side of the creek. The banks were sloped to provide access to the floodplain. On the left side of the creek, a rock buttress and rock vanes were constructed to protect adjacent property. A riparian buffer was established to protect both sides of the creek, as seen in the picture to the right.





*Pictures Provided by NCNR's Lynn Caldwell

This project was initiated by the Kraut Creek Committee of Boone and NCNR. Clean Water Management Trust Fund (CWMTF) provided most of the funding for the project. The Boone Chamber of Commerce provided a cash match, and Appalachian State University provided both cash and in-kind donations.

South Fork New River [AU#: 10-1-(1), (3.5)a & (3.5)b]

This segment of the River flows through this subwatershed. Water quality status and other information about the full length of the river is discussed at the beginning of this section.

MEAT CAMP CREEK-SOUTH FORK NEW RIVER (050500010202)



Includes: South Fork New River [AU#: 10-1-(3.5)c], Howard Creek [AU#: 10-1-9], Meat Camp Creek [AU#: 10-1-10] & Norris Fork [AU#: 10-1-10-2]

This subwatershed has mixed land use of forest, agriculture and some urban area in the southern portion. There is one minor NPDES discharger permit in this subwatershed. The majority of streams in the subwatershed hold the secondary use classification of Trout Waters.

Howard Creek [AU#: 10-1-9]

Howard Creek is ten miles from source to the South Fork New River [AU#: 10-1-(3.5)c] and contains mostly agriculture, forest and spotted areas of residential land use.

Use Support: Supporting (10 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB18)	Excellent (2008)
Fish Com (KF6)	Not Rated (2008)

Water Quality Status

A benthic and fish community monitoring site are located on either side of NC-194. The benthic site has maintained the Excellent rating it has received since 1988, with exception to the 2003 rating of Good. Results from the fish sample shows the stream is healthy and supports a rich community of fish through good quality water and habitat. The fish community was Not Rated because DWQ does not currently have criteria for small mountain trout streams.

Norris Fork [AU#: 10-1-10-2]

Norris Fork is approximately four miles long from source to Meat Camp Creek. The stream begins in pasture lands then flows over a mile through forest before reaching more pasture and residential land.

Water Quality Status

The benthic community was first monitored on Norris Fork in 2003 when it received an Excellent rating. The 2008 sample dropped a rating to Good. Even

though the number of macroinvertebrates were similar to the previous sample, the species collected in 2008 were more pollution tolerant. High silt levels due to land clearing activities for residential properties are a possible source of this decline. Residential development is expected to continue in this area.

Recommendations

Norris Fork is a designated Trout Water. The Town of Boone is delegated responsibility from the state to implement the Sediment and Erosion Control Program which inspects land clearing activities on a regular basis to ensure the sedimentation BMPs are being properly maintained.

Meat Camp Creek [AU#: 10-1-10]

Meat Camp Creek flows from the source at the northern most point of the subwatershed ten miles southeast to the South Fork New River. As in most of this subwatershed, a mixture of pastures and residential properties line this creek and its drainage area.

Water Quality Status

This stream has historically received a Good or Excellent benthic rating since monitoring began in 1990. Results from 2008 showed little to no change. The

fish community was Not Rated because DWQ does not currently have criteria for small mountain trout streams. However, biologists noted a healthy fish community with decent habitat.

Cobb Creek [AU#: 10-1-10-3]

Cobb Creek is approximately three miles from source to Meat Camp Creek [AU#: 10-1-10]. This drainage area has a mixture of land cover of forest, agriculture and residential property further downstream. This stream holds the secondary use classification of Trout Waters.

Water Quality Status

Water quality for Cobb Creek is unknown at this time; however, a DWQ Random

Ambient Monitoring System (RAMS) station was located about two miles upstream of its confluence with Meat Camp Creek. This was a temporary station where data was collected for two years (2009-2010). A summary of that data will be discussed here when it is available.

South Fork New River [AU#: 10-1-(3.5)c]

This segment of the River flows through this subwatershed. Water quality status and other information about the full length of the river is discussed at the beginning of this section.

USE SUPPORT: SUPPORTING (4.3 mi)	
2008 IR Cat. 2	
2010 IR Cat. 2	
Benthos (KB21)	Good (2008)

Use Support: Supporting	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB20)	Excellent (2008)
Fish Com (KF24)	Not Rated (2008)

Use Support: (2.7 mi)	
2008 IR Cat.	
2010 IR Cat	
RAMS (K2500000)	Data Not Yet Available



Includes: South Fork New River [AU#: 10-1-(3.5)c & (14.5)], Pine Orchard Creek [AU#: 10-1-15-1] & Elk Creek [AU#: 10-1-15]

This subwatershed has mixed land use of forest, agriculture and some urban area in the southern portion. There is one minor NPDES discharger permit in this subwatershed. No waters in this subwatershed are on the Impaired Waters List.

Pine Orchard Creek [AU#: 10-1-15-1]

Pine Orchard Creek is three and a half miles long from source to its confluence with Elk Creek [AU#: 10-1-15]. The downstream half runs parallel to NC-194. The drainage area is mostly forested with some agriculture and residential properties on the north bank.

USE SUPPORT: SUPPORTING (3.5 MI)	
2008 IR Cat. 2	
2010 IR Cat. 2	
Benthos (KB22)	Not Impaired (2008)

Water Quality Status

This creek has been monitored since 2003 when it received an Excellent benthic rating. Over the past five years the creek has seen little to no change in water quality. However, there was an increase in silt covering the stream floor. This indicates sediment is entering the creek during storm events.

Recommendations

Riparian buffer restorations is suggested for any reaches of the creek that is lacking proper vegetation.

Unnamed Tributary to South Fork New R. [AU#: 10-1-(14.5)ut4]

Water Quality Status

This unnamed tributary was sampled as part of a special study to evaluate possible impacts on water quality by Rockwater Farms. Two benthic samples were collected at an upstream and downstream location from the farm. The two sites were about 300 meters apart in distance. The upstream site (KB130) had habitat score of 32 out of 100 and was described by biologists as a ditch. The downstream site (KB140) had double the habitat score (66) of the upstream site and a much higher quality benthic community. Both sites were given a Not

Use Support: Supporting (1.0 mi)	
2008 IR Cat.	
2010 IR Cat.	2
Benthos	Not Pated (2007)
(KB104)	Not Rated (2007)

Rated because the drainage area was not large enough to meet rating criteria; otherwise, the tributary would have been Impaired.

Taxa found at the downstream site indicate the issue is being caused by poor habitat verses the instream water quality. For more information about the results of this study, see B-20070309.

South Fork New River [AU#: 10-1-(3.5)c]

This segment of the River flows through this subwatershed. Water quality status and other information about the full length of the river is discussed at the beginning of this section.

OLD FIELDS CREEK-SOUTH FORK NEW RIVER (050500010204)



Includes: South Fork New River [AU#: 10-1-(14.5)], Mill Creek [AU#: 10-1-18], & Old Field Creek [AU#: 10-1-22]

This subwatershed has mixed land use of forest, agriculture and some urban areas. There are no NPDES discharger permits in this subwatershed. No waters in this subwatershed are on the Impaired Waters List.

Unnamed Tributary to Mill Creek [AU#: 10-1-18ut4]

This Unnamed Tributary to Mill Creek is a little over one mile from source to Mill Creek [AU#: 10-1-18]. The majority of the stream is surrounded by forest with agriculture lining the lower portion on the northern side.

Water Quality Status

This stream was monitored in 2007 as part of the special study conducted on the

unnamed tributary to the SFNR [AU#: 10-1-(14.5)ut4] discussed above. The station located on this unnamed tributary was used as a reference site for the special study (B-20070309). This site had the highest habitat score (80 out of 100) of all three sites sampled. The community collected was extremely intolerant to pollution and reflects the comparatively undisturbed nature of this drainage area. For more information about the results of this study, see B-20070309.

South Fork New River [AU#: 10-1-(14.5)]

One segment [AU#: 10-1-(14.5)] of the SFNR flows through this subwatershed. Water quality status and other information about the full length of the river is discussed at the beginning of this section.

PINE SWAMP-SOUTH FORK NEW RIVER (050500010205)

Includes: South Fork New River [AU#: 10-1-(20.5)], Gap Creek [AU#: 10-1-23], & Pine Swamp Creek [AU#: 10-1-24]

This subwatershed has mixed land use of forest, agriculture and some urban areas. There is one minor NPDES discharger permit in this subwatershed. No waters in this subwatershed are on the Impaired Waters List.

Pine Swamp Creek [AU#: 10-1-24]

Pine Swamp Creek runs five and a half miles from source to the South Fork New River [AU#: 10-1-(20.5)]. The majority of the stream is surrounded by cow pastures and Christmas tree farms.

Water	Quality	Status
valor	Quanty	otatao

This creek was monitored by DWQ in 2003 and 2008 and received a Good benthic rating for each. A large amount of silt was visible in the stream and made up 30% of the substrate. The stream also has poor riparian buffers and severe bank erosion. The silty substrate may be originating from the eroded banks or stormwater pulling sediment from the drainage area. Many farms are ditched for faster draining; however, this can cause a larger volume of sediment to enter the stream at a high velocity. This results in a stream becoming flashy which accelerates the erosion of streambanks.

Recommendations

A restoration effort is recommended for this stretch to reestablish the streams natural meandering which will reduce the velocity. Proper riparian buffers are highly encouraged to reduce the volume of runoff that reaches the stream. DWQ also recommends an local educational effort to inform property owners of the importance of allowing streams to keep their natural flow path.

South Fork New River [AU#: 10-1-(20.5)]

This segment of the River flows through this subwatershed. Water quality status and other information about the full length of the river is discussed at the beginning of this section.

2.24





USE SUPPORT: SUPPORTING (5.5 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB108)	Good (2008)

BEAVER CREEK-SOUTH FORK NEW RIVER (050500010206)



Includes: South Fork New River [AU#: 10-1-(20.5), (26)a & (26)b], South Beaver Creek [AU#: 10-1-25-2], Beaver Creek [AU#: 10-1-25], & Obids Creek [AU#: 10-1-27]

This subwatershed has mixed land use of forest, agriculture and some urban areas including the southern portion of the Town of West Jefferson. There are two minor NPDES discharger permits in this subwatershed. The majority of streams in this subwatershed, with exception to the South Fork New River, hold the secondary use classification of Trout Waters. No waters in this subwatershed are on the Impaired Waters List.

South Beaver Creek [AU#: 10-1-25-2]

South Beaver Creek runs about seven miles from source to its confluence with Beaver Creek and includes Lake Ashe about one mile upstream of Beaver Creek. The majority of this drainage area is forested with scattered rural communities.

USE SUPPORT: SUPPORTING (6.8 MI)	
2008 IR Cat.	2
2010 IR Cat. 2	
Benthos (KB5)	Good (2008)

Water Quality Status

This creeks benthic community was sampled in 2003 and 2008 and received a Good rating both years. The community appears to be stable with diverse and pollution sensitive taxa. The site had a relatively high habitat score of 75 out of 100; however, was lacking a riparian buffer on the right bank.

Obids Creek [AU#: 10-1-27]

Obids Creek runs over six miles from source to the SFNR [AU#: 10-1-(26) a]. The majority of this drainage area is agriculture and forest with scattered rural communities. Agriculture here is dominated by Christmas tree farms and pastures.

USE SUPPORT: SUPPORTING (6.3 MI)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB6)	Good (2008)
Fish Com (KF13)	Good (2008)

Water Quality Status

This creek was sampled for both benthic and fish communities in 2008 which both resulted in a Good rating. Both samples were taken at the same location

near the mouth of the creek. This was the first fish sample take on the creek. The diversity and amount of pollution intolerant species were slightly lower than expected for a site that is an optimal nursery area due to its proximity to the South Fork. The benthic sample was slightly lower than the previous sample; however, it remains a Good rating. The instream habitat was in good condition but lacks steady riparian zones and cattle have access to the stream. Riparian buffer zones with shading trees can keep the water temperature down and filter pollutant or excess nutrients from storm runoff before reaching the stream.

Recommendations

Currently, cattle have direct access to the creek which can degrade habitat impacting the aquatic life. DWQ will work with SWCD to prioritize the need for livestock fencing along this creek. It is also recommended that local agencies educate land owners in this drainage area about the importance of maintaining riparian zones which include trees along this stream.

South Fork New River [AU#: 10-1-(20.5), (26)a & (26)b]

This segment of the River flows through this subwatershed. Water quality status and other information about the full length of the river is discussed at the beginning of this section.

NAKED CREEK-SOUTH FORK NEW RIVER (050500010207)



Includes: South Fork New River [AU#: 10-1-(26)b, (30), (31.5) & (33.5)], Roan Creek [AU#: 10-1-31], Naked Creek [AU#: 10-1-32], & Dog Creek [AU#: 10-1-33]

This subwatershed has mixed land use of forest, agriculture and urban areas including almost the entire Town of Jefferson. There are three minor NPDES discharger permits in this subwatershed. The majority of streams in this subwatershed, with exception to the SFNR and Naked Creek, hold the secondary use classification of Trout Waters. The lower portion of Naked Creek is the only water in this subwatershed that is currently on the Impaired Waters List (2010 list).

Roan Creek [AU#: 10-1-31]

Roan Creek is over 13 miles long from source to the SFNR [AU#: 10-1-(30)] and holds a secondary use classification of Trout Waters. The majority of this drainage area is agriculture and forest with scattered rural communities. Portions of the stream run along NC-88.

Water Quality Status

This creek was sampled for both benthic and fish communities in 2008 which both resulted in a Good rating. Both samples were taken at the same location

near the mouth of the creek. This was the first fish sample take on the creek and included a fairly diverse and abundant community. However, the benthic rating declined from the Excellent it received in 2003. The decline in abundance and pollution sensitivity of the community could be contributed to the amounts of silt filling in benthic habitat which was not seen in the 2003 sample.

Recommendations

Even though the creek was given Good bioclassification ratings, the decline in benthic community indicates the drainage area is being impacted. There is a significant amount of Fraser Fir Christmas tree farms in this drainage area which can contribute to excessive sediment reaching the stream if not harvested correctly. DWQ will work with local agencies to provide public education related to the importance of good riparian zones and other agricultural BMPs focused on the reduction of sediment reaching the stream and impacts to aquatic life.

Additional information about tree farming and best management practices are discussed in the <u>Other Natural</u> <u>Resource Programs Chapter</u>. Online educational materials are also found within that chapter.

Naked Creek [AU#: 10-1-32]

Naked Creek is just over six miles from source, north of the Town of Jefferson, to the SFNR [AU#: 10-1-(31.5)]. The first mile of the stream flows through a tree farm with little to no riparian buffers. After flowing through the Town of Jefferson it flows through farm lands and the Jefferson Landing golf course and residential area. Extensive segments of the creek are channelized and diverted underground. The lower segment of Naked Creek [AU#: 10-1-32b], which is two and a half miles, is on the 2010 Impaired Waters List for degraded ecological/ biological integrity within the fish community.

Use Support: Impaired (6.1 mi)	
2008 IR Cat.	2
2010 IR Cat.	5
Benthos (KB8) (KB139)	Good (2008) Good-Fair (2008)
Fish Com (KF14)	Fair (2008)

Water Quality Status

Naked Creek was originally placed on the first Impaired Waters List in 1998 and stayed on the list until 2006 when it was removed. The creek's benthic community was first monitored in 1986 when it received a Good-Fair (KB8) upstream of the Town of Jefferson's WWTP and a Poor rating (KB9) downstream of the facility. The upstream site has alternated between Good-Fair and Good ratings since that time. Degradation at this site has historically been linked to urban runoff and sedimentation. The downstream site had received a Poor or Fair rating until 2003 when it rated Good-Fair. This higher rating was likely due to a combination of major

USE SUPPORT: SUPPORTING (13.4 MI)	
2	
2	
Good (2008)	
Good (2008)	

upgrades completed at the Jefferson WWTP and heavy rains. A USGS flow gage station on the South Fork just upstream of the Naked Creek confluence recorded the highest yearly average flow (cfs) in 2003 (between 1997 and 2009). This could have had a significant impact on dilution of the WWTPs effluent and other toxins from urban stormwater runoff. It was removed from the 2006 list due to the Good-Fair benthic rating at KB9 in 2003.

Town of Jefferson WWTP

The Town of Jefferson's WWTP has been a major contributing factor or source of the impairment for Naked Creek since first listed in 1998. The plant failed three toxicity tests in 1994 which was attributed to landfill leachate being processed through the plant. Other methods of leachate disposal have since been found and is no longer processed by the facility. Due to numerous other violations and recommendations by DWQ, the facility obtained funding to make approximately \$1.9 million worth of upgrades to the facility. These upgrades were completed in 2004. Latest inspections confirm the effluent discharged by the facility is no longer having an impact on the creek. Therefore, the facility will be no longer be considered a source of Naked Creek's impairment.

Current Monitoring

Naked Creek was monitored at the same upstream benthic station (KB8) in 2008; however, the downstream site (KB9) was moved in 2008 to just before the confluence with South Fork and received a new station number of KB139. The upstream site increased ratings from Good-Fair to Good in 2008 using a less intensive sampling method than the 2003 sample. The differences in ratings may be due to the type of samples taken. Despite the higher rating, aquatic habitat for this site was poor. Long sections of the creek upstream of this site completely lack riparian buffers including almost the entire downstream segment. Other upstream sections of the creek have sporadic riparian buffers of varying quality. Silt was also noted lining the substrate.

Station KB139 was moved to its current location a mile downstream because the development of a gated community blocked access to KB9. Site KB139 received a moderate habitat score; however, conductivity levels are significantly higher and water clarity was slightly turbid. The benthic surface was covered in silt and water was being withdrawn from the creek for lawn and golf course irrigation. The gated community, Jefferson Landing, includes a large golf course which was built along either side of Naked Creek spanning the last mile and a half before the South Fork confluence. During the 2008 sample, houses were being constructed along the one side of the stream.

A fish community sample was taken at the same location as KB139. This was the second sample taken at station KF14 and it received the same rating of Fair as the previous sample taken in 1998. This sample was collected about three months prior to the benthic sample at site KB139. This site received the lowest total habitat score of any other fish station in the New River Basin in 2008. This was due to turbid water, poor bank stability and lack of riparian buffers. The percent of pollution tolerant fish collected was elevated for a mountain stream. Fish populations in this stream are being stressed from instream water quality issues as well as poor habitat.

Recommendations

Naked Creek is the highest priority for stream restoration and protection in the New River basin. With exception of the 2006 and 2008 lists, Naked Creek has been on the Impaired Waters list since 1998. It is recommended that local agencies and watershed groups, with assistance from DWQ develop, a Watershed Restoration Plan that will target restoring the stream to more natural flow conditions, enhancing sediment and erosion control measures on construction sites, implementing additional controls focused on reducing volume and velocity of stormwater and establishing wider riparian zones. Riparian buffers with tree canopies would greatly assist with reducing the water temperature of the stream as well as filter pollutants before the stream reaches the SFNR. Educational efforts should be aimed towards property owners within the Naked Creek drainage area to reduce the amount of fertilizers and pesticides used as well as the need for riparian zones along the stream. DWQ supports the need to fund a Watershed Restoration Plan that includes stormwater management, post restoration monitoring and local educational efforts.

South Fork New River [AU#: 10-1-(26)b, (30), (31.5) & (33.5)]

This segment of the River flows through this subwatershed. Water quality status and other information about the full length of the river is discussed at the beginning of this section.

CRANBERRY CREEK (050500010208)



Includes: Cranberry Creek (Mulberry Creek) [AU#: 10-1-37], Meadow Fork [AU#: 10-1-37-2], Piney Fork [AU#: 10-1-37-3], Piney Branch [AU#: 10-1-37-5], & Beaver Branch [AU#: 10-1-37-6]

This subwatershed has mixed land use of forest and agriculture. There are no NPDES discharger permits in this subwatershed. Majority of the streams hold the secondary use classification of Trout Waters. There are no waters in this subwatershed currently on the Impaired Waters List.

Piney Fork [AU#: 10-1-37-3]

Piney Fork is just over five miles from source to Cranberry Creek [AU#: 10-1-37] around Laurel Springs. Land cover in this drainage area is dominated by Christmas tree farms with patches of forest.

Use Support: (5.2 mi)	
2008 IR Cat.	
2010 IR Cat	
Benthos (KB69)	Good (1998)

Water Quality Status

The stream was sampled for benthic macroinvertebrates in 1998 within the headwaters. The site received a Good rating at that time.

Local Initiatives

The Alleghany SWCD installed several agricultural BMPs in 2005 and 2006 on a property near the confluence with Cranberry Creek which included almost 3,000 feet of livestock exclusion, feed and waste storage, stream protection, stream crossings and critical area planting. These efforts will assist with reported channelization and sedimentation the SWCD noted during the previous planning cycle.

Recommendations

Depending on available resources, DWQ will monitor Piney Fork (KB69) to provide a use support rating which properly reflects any water quality improvements resulting from the implementation of these agricultural BMPs.

Cranberry Creek (Mulberry Creek) [AU#: 10-1-37]

Cranberry Creek is almost 19 miles long from source to the SFNR [AU#: 10-1-(33.5)]. This stream is the main catchment for this subwatershed which has land cover with equal parts agriculture and forest. Christmas tree farms dominate the majority of agriculture in this drainage area.

Water Quality Status

Cranberry Creek was sampled (KB15) about two miles upstream of its confluence with the South Fork. The majority of this subwatershed drains to this creek,

upstream of the benthic sampling site (KB15) which provides a wholistic view of the water quality conditions in the subwatershed. This site has been monitored since 1990 and received an Excellent benthic rating in 2008. Aquatic life and habitat conditions have remain stable at this higher rating since 1998.

About a mile and a half downstream of the benthic site is a fish community station. In 1998, the creek was given an Excellent rating for its fish community. In 2008, that rating dropped to Good. The habitat was given a score of 53 out of 100 due to unstable banks, poor riparian areas, shallow pools, straight channel and the on-going stream widening. Biologists noted the presence of an abundant cyprinid population, which are attracted to waters with algae on hard surfaces. This could be an indication of high nutrient levels; however, this area is a popular fishing location and may have been stocked with cyprinids. Cyprinids can be a favorite amongst fishermen due to the size and strength of these fish.

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Use Support: Supporting (18.9 MI)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB15)	Excellent (2008)
Fish Com (KF2)	Good (2008)

Recommendations

Riparian buffer restoration is recommended to assist in restabilizing stream banks and reducing excess nutrients reaching the stream. Educational efforts are needed to inform local land owners of ways to reduce habitat degradation to better support the fish community and ensure recreational fishing can continue. The stream would also benefit from restoring the stream to its natural meandering channel with deeper pools which attack fish.

PEAK CREEK-SOUTH FORK NEW RIVER (050500010209)



Includes: South Fork New River [AU#: 10-1-(33.5)], Peak Creek [AU#: 10-1-35-(1) & (2)], Ore Knob Branch [AU#: 10-1-35-3], Little Peak Creek [AU#: 10-1-35-4], & Nathans Creek [AU#: 10-1-36]

This subwatershed has mixed land use of forest, agriculture and mining. There are no NPDES discharger permits in this subwatershed. Majority of the streams, with exception to the SFNR, hold the secondary use classification of Trout Waters. Waters on the 2010 Impaired Waters list within this subwatershed are Peak Creek, Little Peak Creek and Ore Knob Branch.

Nathans Creek [AU#: 10-1-36]

Nathans Creek is four miles long from source to the west side of the South Fork New River [AU#: 10-1-(33.5)]. This drainage area has a mixed land use of forest, agriculture and some urban.

Water Quality Status

Nathans Creek's benthic community was monitored in 1998 at KB77. At that time, the site received a rating of Good-Fair. Even though the macroinvertebrates present were pollution-sensitive, indicating higher water quality, the lower rating was given due to the low quantity collected.

Recommendations

DWQ will do a one-time sample at this site to ensure the water quality has not degraded further, depending on the availability of resources.

Little Peak Creek [AU#: 10-1-35-4]

Little Peak Creek is almost three miles from source to Peak Creek [AU#: 10-1-35-(2)b]. The drainage area is a mix of some residence, forest and agriculture, dominated by tree farming. The creek also receives runoff from the Ore Knob Mine which is discussed below in the Ore Knob Branch section.

Use Support: Impaired (2.8 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
Benthos (KB14)	Poor (2008)

Water Quality Status

Little Peak Creek has been on the Impaired Waters List since 1998 and remains on the 2010 list. This impairment is a result of impacts to aquatic life from runoff from the Ore Knob Mine. The habitat in this creek is relatively good, indicating the issues are based on the quality of water. Due to the small drainage area of this creek, DWQ would not normally assign a rating to the benthic site (KB14) located near the confluence with Peak Creek. However, the toxic situation at this site ranks it among the worst benthic sites in the state, justifying the Poor rating.

Recommendations

Information about the Ore Knob Mine and recommendations are discussed within the Ore Knob Mine Chapter.

Ore Knob Branch [AU#: 10-1-35-3]

Ore Knob Branch is just under one mile from source to Peak Creek [AU#: 10-1-35-(2)b]. The land cover is similar to the rest of the subwatershed, with exception to the presence of the Ore Knob Mine.

Use Support: Impaired	
2008 IR Cat.	5
2010 IR Cat.	5

Use Support: (4.1 mi)	
2008 IR Cat.	
2010 IR Cat.	
Benthos (KB77)	Good-Fair (1998)

Water Quality Status

Ore Knob Branch has been on the Impaired Waters List since 1998 and remains on the list in 2010 due to the Poor benthic rating at KB13 on Peak Creek. This creek is the main catchment for runoff from the abandoned Ore Knob Mine. The mining site was not properly closed, which has resulted in highly acidic and metal-laden surface water running off the property and into Ore Knob Branch and Peak Creek, subsequently causing their impairment. This issue is discussed in greater detail within the <u>Ore Knob Mine Chapter</u>.

Initiatives

Restoration on Ore Knob began in the 1990s and still continues today. The site was classified as an EPA Superfund site in September 2009. Since that time, EPA has led the restoration efforts in coordination with state and local agencies. These efforts are discussed in greater detail within the <u>Ore Knob Mine Chapter</u>.

Recommendations

The state will continue to work with all local and federal agencies involved to assist in restoration efforts of the abandoned mine.

Peak Creek [AU#: 10-1-35-(1) & (2)a & b]

Peak Creek is a total of 10.5 miles long from source to the SFNR [AU#: 10-1-(33.5)] and split into three segments. The land cover in this drainage area is mix of forest and agriculture. The creek also receives runoff from the Ore Knob Mine, which is discussed above in the Ore Knob Branch section. The most downstream segment [AU#: 10-1-35-(2)b] of Peak Creek has been on the Impaired Water List since 1998 and remains on the list in 2010.

Use Support: Impaired (10.5 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
Benthos (KB11) (KB13)	Excellent (2008) Poor (2008)

Water Quality Status

The middle segment ([AU#: 10-1-35-(2)a]: from the water supply dam at Appalachian Sulphides, Inc., to Ore Knob Branch) was monitored in 2008 and was rated Excellent for its benthic community (KB11). This site received a Good rating in 2003. The 2008 sample had an increase in pollution intolerant species, including the collection of an extremely rare caddisfly which has only been collected one other time in North Carolina by DWQ since 1983. An undisturbed riparian zone, diverse in-stream benthic surfaces and a mostly forested watershed resulted in one of the highest habitat scores within the basin (93 out of 100) during this cycle. There is no influence of the Ore Knob Mine on this segment of the creek.

The downstream segment of Peak Creek [AU#: 10-1-35-(2)b] is almost three miles from the Ore Knob Branch to the South Fork. The benthic sample result was similar to past results at this station and was rated Poor in 2008. Despite the high habitat score (82 out of 100), the community is highly stressed and borders extirpation. This site (KB13) is approximately one mile downstream of the KB11, which had a conductivity level of 38 μ S/ cm and pH of 6.3, whereas the KB13 site had levels of 170 μ S/cm and 3.1, respectively. An orange precipitate covered all instream surfaces and inhabitants at the KB13 site. This dramatic drop in water quality from what is seen upstream is due to the toxic flow coming from Ore Knob Branch which, receives runoff from the Ore Knob Mine. These severely acidic and toxic conditions will continue until the abandoned mine is stabilized.

Recommendations

Information about the Ore Knob Mine and recommendations are discussed within the Ore Knob Mine Chapter.

South Fork New River [AU#: 10-1-(33.5)]

This segment of the River flows through this subwatershed. Water quality status and other information about the full length of the river is discussed at the beginning of this section.

PRATHER CREEK-SOUTH FORK NEW RIVER (050500010210)



Includes: South Fork New River [AU#: 10-1-(33.5)], Prathers Creek [AU#: 10-1-38] & Crab Fork [AU#: 10-1-38-1]

This subwatershed has mixed land use of forest and agriculture. There are no NPDES discharger permits in this subwatershed. Majority of the streams, with exception to the South Fork New River, hold the secondary use classification of Trout Waters. There are no waters in this subwatershed on the 2010 Impaired Waters list.

Prathers Creek [AU#: 10-1-38]

Prathers Creek is approximately 11 miles from source to the SFNR [AU#: 10-1-(33.5)]. This drainage area has a mixed land use of livestock pasture agriculture and forest.

Use Support: Supporting	
2008 IR Cat.	
2010 IR Cat.	2
Fish Com (KF15)	Good-Fair (2008)

Water Quality Status

Prathers Creek's fish community was monitored for the first time during this cycle. The fish community received a rating of Good-Fair due to the pollution tolerant species collected. The high percentage of omnivores and herbivores collected indicates elevated nutrients, likely results from the combination of agricultural practices and an open tree canopy. Biologists also noted a complete lack of riparian buffer zones. A benthic site nearby was monitored in 1990 and received a Good-Fair rating.

Recommendations

DWQ will continue to monitor this location and work with the SWCD to prioritize assistance with the installation of agricultural BMP measures throughout this subwatershed as well as riparian buffer restoration.

South Fork New River [AU#: 10-1-(33.5)]

This segment of the River flows through this subwatershed. Water quality status and other information about the full length of the river is discussed at the beginning of this section.

GRASSY CREEK-NEW RIVER (050500010302)



Includes: New River [AU#: 10a], Grassy Creek [AU#: 10-3] & Piney Creek [AU#: 10-4]

This subwatershed has mixed land use of forest and agriculture. There are no NPDES discharger permits in this subwatershed. Majority of the streams, with exception to the New River, hold the secondary use classification of Trout Waters. There are no waters in this subwatershed on the 2010 Impaired Waters list.

Grassy Creek [AU#: 10-3]

Grassy Creek is approximately four miles long from the NC/VA state line to the New River [AU#: 10a]. This drainage area has a mixed land use of agriculture dominated by the growth of Christmas tress and forest.

Use Support: Supporting (4.1 mi)	
2008 IR Cat.	
2010 IR Cat.	2
Benthos (KB126)	Good (2008)
Fish Com (KF16)	Good-Fair (2008)

Water Quality Status

Both benthic and fish communities were sampled here for the first time during this cycle. The fish community site (KF16 - 50 feet from the confluence with

the New River) was given the highest habitat score (95 out of 100) of any fish site within the basin sampled this cycle. However, the species collected were pollution tolerant and indicated an elevated nutrient source. Possible sources of excess nutrients are agricultural practices upstream and inadequate riparian buffer zones. Biologists also noted increased photosynthetic activity by the upstream periphyton was causing an elevated pH level compared to other sites in the basin.

A benthic sample (KB126) was also collected as part of a special study (B-20081007) to determine effects of new development upstream. The site was rated Good and given a habitat score of 81 out of 100. However, the site had a relatively high specific conductance (101 μ S/cm) for this river basin.

Recommendations

DWQ will work with SWCD to prioritize implementation of agricultural BMPs focused towards reducing nutrient and sediment runoff, as well as riparian buffer restoration.

New River [AU#: 10a]

The New River begins in this subwatershed where the SFNR and the North Fork New River converge and continue north four and a half miles to the NC/VA state line. This segment holds the secondary use classification of ORW. Land use in this drainage area is mostly forest, with some agriculture, which dominates the headwaters of this subwatershed. This segment of the New River is not monitored by DWQ at this time. However, the river is sampled once it crosses the state line back into NC. For more information on the water quality status of that segment, see the Little River & Chestnut Creek Watersheds Chapter.

References

References marked with (*) indicates a DWQ special study report. These reports are not currently available online. Contact Jay Sauber by phone at (919) 743-8416 or by e-mail at Jay.Sauber@ncdenr.gov to receive a hardcopy.

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Note: URL addresses for hyperlinks found in this plan are listed in the Acronyms & Definitions Chapter.

CHAPTER 3

LITTLE RIVER & CHESTNUT CREEK WATERSHEDS



HUC 0505000104 & 0505000106

Includes: Elk Creek, Bledsoe Creek, Pine Swamp Creek, Glade Creek, Brush Creek & Crab Creek

GENERAL WATERSHED DESCRIPTION

These two ten-digit hydrologic unit code (HUC) watersheds, with an area of about 145 square miles, are the equivalent to DWQ's old subbasin 05-07-03 and contain the Little River and its tributaries (See DWQ's Old Subbasins to New HUC Conversion map in the <u>Maps Chapter</u>). These watersheds have been combined in the same chapter due to the small size of the Chestnut Creek watershed (0505000106).

Almost the entire watershed lies within Alleghany County. The Little River/Chestnut Creek watersheds flow northeast and drain the Town of Sparta. High, hilly plateaus can be found in these watersheds from North Carolina into the Virginia Blue Ridge Mountains.

These watersheds have the least amount of forested area (50%) as compared to other watersheds in the basin. Instead, more land is devoted to agricultural activities (40%) including pasture, orchards, cultivated cropland, livestock, dairy farms, and Christmas tree production. Developed areas (7.5%) are limited to the Town of Sparta.

Roughly 2,400 acres of conservation land are found in these watersheds and include easements held by local watershed groups and State agencies, Bullhead Mountain State Park, and the Blue Ridge Rural Land Trust.

The population of these watersheds are centered mostly around the Town of Sparta. Sparta declined in population between 1990 and 2000 by 7% and was estimated to decline another one percent by 2010, according to the 2000 census.

WATERSHED AT A GLANCE

COUNTIES:

Alleghany & Surry

MUNICIPALITIES:

Sparta

ECOREGIONS:

New River Plateau & Southern Crystaline Ridges and Mountains

PERMITTED FACILITIES:

NPDES WWTP:	3
Major	.1
Minor	.2
Non-Discharge Facilities:	.1
Stormwater:	2
General	.2
Individual	.0
Animal Operations:	9

POPULATION:

2010: Coming Soon

2006 LAND COVER:

Developed	7.72%
Forest	51.83%
Agriculture	40.24%
Wetlands	0.21%

2001 Impervious Surface .. 0.64%





WATERSHED WATER QUALITY OVERVIEW

The Little River & Chestnut Creek Watersheds combined are the smallest in the New River basin. It has the highest percent of agricultural land cover of any watershed in the basin and also contains all nine animal operation permits within the basin. While waters in these watersheds are slightly more impacted by human activities, they are of relatively good quality.

Crab Creek [AU#: 10-9-12] is the only Impaired water in these watersheds and was added to the Impaired Waters list in 2010. This is the first Impaired water in these watersheds since Laurel Branch [AU#: 10-9-10-2] appeared on the 1998 list but was removed from the 2000 list. Crab Creek's impairment and other information is discussed in the Crab Creek-Little River 12-digit section below.

WATER QUALITY DATA SUMMARY FOR THESE WATERSHEDS

Monitoring stream flow, aquatic biology and chemical/physical parameters is a large part of the basinwide planning process. More detailed information about DWQ monitoring and the effects each parameter has on water quality is discussed in Chapters 2 and 3 of the <u>Supplemental Guide to North Carolina's Basinwide</u> <u>Planning</u> document.

UNDERSTANDING THE DATA

Biological & Ambient Rating Converted to Use Support Category

Biological (benthic and fish community) samples are given a bioclassification/rating based on the data collected at the site by DWQs Environmental Sciences Section (ESS). These bioclassifications include Excellent, Good, Good-Fair, Not Impaired, Not Rated, Fair and Poor. For specific methodology defining how these rating are given see <u>Benthic Standard</u> <u>Operating Procedures</u> (SOP) or the <u>Fish Community SOP</u>. Once a rating is given, it is then translated into a Use Support Category (see Figure 2-2).

Ambient monitoring data are analyzed based on the percent of samples exceeding the state standard for individual parameters for each site within a two year period. If a standard is exceeded in greater than 10.0% of samples taken for a particular parameter, that stream segment is Impaired for that parameter. The fecal

FIGURE 3-2: USE SUPPORT CATEGORIES FOR BIOLOGICAL RATINGS

Biological Ratings	Aquatic Life Use Support	
Excellent		
Good	Supporting	
Good-Fair	(Categories 1-2)	
Not Impaired		
Not Rated	Not Rated (Category 3)	
Fair	Impaired	
Poor	(Categories 4-5)	

coliform bacteria parameter is the exception to the rule. See the Fecal Coliform Bacteria section in the Ambient Data portion below. For the purposes of this plan, any site with greater than 7.0% to 10.0% of samples not meeting a parameter's standard will be considered Impacted.

FIGURE 3-3: EXAMPLE OF A USE SUPPORT AND MONITORING BOX

USE SUPPORT: IMPAIRED (14 MI)			
2008 IR Cat.	5		
2010 IR Cat.	5		
Benthos (CB1)	Fair (2008)		
Fish Com (CF1)	Good-Fair (2008)		
AMS (C1234500)	Turbidity - 12% FCB - 48%		

Each biological parameter (benthic and fish community) and each ambient parameter is assigned a Use Support Category based on its rating or percent exceedance. Definitions for each category can be found in <u>Use Support Methodology Chapter</u>. Each monitored stream segment is then given an overall category which reflects the highest individual parameter category. For example, using the data from Figure 3-3 the individual parameter categories would be as follows: Benthos - 5, Fish Community - 1, Turbidity - 5. Therefore, the overall category, which is reported on the Integrated Report, would be 5 (Impaired). An Integrated Report is developed by the state every two years and reported to the U.S. Environmental Protection Agency.

STREAM FLOW

The basin experienced prolonged droughts in 1998-2002 and 2007-2008, and exceptionally high flows resulting from the remnants of several hurricanes (Figure 3-4). During a three week period in September 2004, the tropical storm remnants of Hurricanes Frances, Ivan, and Jeanne lead to wide-spread flooding throughout the central and northern mountains in the Catawba, French Broad, New, and Watauga River basins. Rainfall estimates for the combined three storms totaled more than 20-30 inches in certain watersheds. Runoff from the storms produced flash-floods throughout the region with peak flows in excess of 10,000 cfs (approximately 500 times median flows) in upper tributary streams; peaks flows in



some tributary rivers exceeded 50,000 cfs. In the New River basin, the peak flow during Hurricane Frances (September 7th - 9th) was 14,700 cfs, which has an approximate recurrence interval of 10 to 25 years. During Hurricane Ivan (September 17th - 18th) the peak flow was 7,550 cfs, which has an approximate recurrence interval of 2 to 5 years. More detail about flows in the New River Basin can be found in the <u>2009 Basinwide</u> <u>Assessment Report: New River Basin</u> produced by DWQ-Environmental Science Section.

BIOLOGICAL DATA

Biological samples were collected during the spring and summer months of 2004 and 2008 by the DWQ-Environmental Sciences Section as part of the five-year basinwide sampling cycle, in addition to special studies. Overall, 27 biological sampling sites were monitored within the Little River Watershed. The ratings for each of the sampling stations can be seen in <u>Appendix 3-B</u>.

Benthic Macroinvertebrate Sampling

Each benthic station monitored during the current cycle is shown in Figure 3-5 and color coded based on the current rating. As seen on the map, all samples taken in this watershed received a Supporting rating. Each of these sites are discussed in more detail in the subwatershed discussions below.

Figure 3-6 shows 100% of the 25 sampling events received a Supporting rating and 0% received an Impaired rating. Figure 3-7 is a comparison of benthic site ratings sampled during the last two cycles to determine if

BENTHIC SAMPLING SUMMARY

- Total Stations Monitored21
- ♦ Total Samples Taken......25
- Stations Monitored Twice..... 4
- Number of New Stations 11

there are any overall shifts in ratings. Five percent of ratings declined, 19% improved in rating and 24% had no change in rating. This indicates that the watershed is mostly stable with some improvements.



Fish Community Sampling

Each fish community station monitored during the current cycle is shown in Figure 3-8 and color coded based on the current rating. Three of the sites were new monitoring sites located in rural watersheds with no NPDES dischargers. These sites were selected to determine their potential for becoming fish community regional reference sites.

FISH COM. SAMPLING SUMMARY

- **b** Total Stations Monitored6
- ♦ Total Samples Taken......6
- **b** Number of New Stations......3

As shown in Figure 3-9, 83% of the six sampling events received a

Supporting rating and 17% received an Impaired rating. Figure 3-10 is a comparison of fish community site ratings sampled during the last two cycles to determine if there are any overall watershed shifts in ratings. It shows 17% improved and 33% had no change in rating indicating a stable and somewhat improving fish community.



For more information about biological data in these watersheds, see the <u>2009 New River Basinwide</u> <u>Assessment Report</u>. Detailed data sheets for each sampling site can be found in <u>Appendix 3-B</u>.

Fish Kills/Spill Events

No fish kills were reported in these watersheds during this planning cycle.

AMBIENT DATA

Ambient data are used to develop use support ratings every two years, which are then reported to the EPA via the Integrated Report (IR). The IR is a collection of all monitored waterbodies in North Carolina and their water quality ratings. The most current IR is the 2010 version and is based on data collected between 2004 and 2008. If a waterbody receives an Impaired rating, it is then placed on the 303(d) Impaired Waters List. The New River Basin portion of the 2010 IR can be found in <u>Appendix 3-A</u> and statewide on the <u>Modeling & TMDL Unit's</u> website.

Two Ambient Monitoring System (AMS) stations are located in the Little River watershed; one on the New River and the other on the Little River (see Figure 3-1 for station locations). During the current sampling cycle (January 2004 - December 2008), samples were collected for all parameters on a monthly basis, except metals which were sampled quarterly until 2007. For more information about the ambient monitoring, parameters, how data are used for use support assessment and other information, see Chapter 2 of the <u>Supplemental</u> <u>Guide to North Carolina's Basinwide Planning</u>.

Long Term Ambient Monitoring

The following discussion of ambient monitoring parameters includes graphs showing the median and mean concentration values for the two AMS stations in this watershed by specific parameter over a 13 year period (1997-2009). Each major parameter is discussed in this Section even, if no current impairment exists. The graphs are not intended to provide statistically significant trend information, but rather an idea of how changes in land use or climate conditions can affect parameter readings over the long term. The difference between median and mean results indicate the presence of outliers in the data set. Box and whisker plots of individual ambient stations were completed by parameter for data between 2004 and 2008 by DWQ's Environmental Sciences Section (ESS) and can be found in the <u>New River Basin Ambient Monitoring System Report</u>.

рΗ

The water quality standard for pH in surface freshwater is 6.0 to 9.0 su. Both AMS stations in these watersheds were each monitored 58 times and each exceeded the high pH standard of 9 once. As seen in Figure 3-11, this is less than 10% of samples taken and neither stream will be listed as Impaired for pH. Figure 3-12 shows the mean and median pH levels for all samples taken over the course of 13 years in the Little River watershed. The pH pattern seen during this 13 year period is a steady increase towards the upper 7 range. This trend is seen in all three 10-digit watersheds in the New River Basin and is discussed further in the Executive Summary.



Turbidity

Both AMS sites in this watershed had at least two records that exceeded the state standard. Site K7900000 on the New River had 7% of samples exceed the standard during this monitoring cycle, as seen in Figure 3-13. Possible sources of the elevated turbidity levels are discussed in the 12-digit subbwatershed sections below. Figure 3-14 shows the mean and median of turbidity levels for all samples taken over the course of 13 years in the Little River watershed. The yearly averages are well below the state standard of 50 NTUs with the exception of the 2007 mean. The highest violation occurred in 2007 at site K7900000, measuring at 450 NTUs.

While some erosion is a natural phenomenon, human land use practices accelerate the process to unhealthy levels. Construction sites, mining operations, agricultural operations, logging operations and excessive stormwater flow from impervious surfaces are all potential sources. Turbidity violations demonstrate the importance of protecting and conserving stream buffers and natural areas.



Dissolved Oxygen

As seen in Figure 3-15, neither site had a DO standard exceedance recorded during this monitoring cycle. Figure 3-16 shows the mean and median of DO levels for all samples taken over the course of 13 years in the Little River watershed. DO at these stations have been stable for the past 13 years and have seen little to no change.





7003

* NC Turbidity Standard: 50 NUT

Temperature

Figure 3-18 shows the mean and median of temperature levels for all samples taken over the course of 13 years in the Little River watershed. The water temperature trend for these stations are closely linked to the flow. During low flow or drought periods, the water can sit in small pools and become heated. However, no stream segments in this watershed are Impaired or Impacted due to high temperatures (Figure 3-17).



Fecal Coliform Bacteria

Fecal coliform bacteria occurs in water as a result of the overflow of domestic sewage and from other nonpoint sources of human and animal waste, including pets, wildlife and farm animals. The FCB standard for freshwater streams is not to exceed the geometric mean of 200 colonies/100 ml or 400 colonies/100 ml in 20% of the samples where five samples have been taken in a span of 30 days (5-in-30). Only results from a 5-in-30 study are to be used to indicate whether the stream is Impaired or Supporting. Waters with a use classification of B (primary recreational waters) receive priority for 5-in-30 studies. Other waters are studied as resources permit.

Two AMS stations are located within these watersheds which are located on the New and Little Rivers. As seen in Figure 3-19, the Little River site had 7 to 10% of samples taken during this cycle result in levels over 400 colonies/100 ml and the New River site had greater than 10%. Possible sources of elevated levels of FCB are discussed



in the subwatershed sections. Figure 3-20 shows the geometric mean of FCB levels for all samples taken over the course of 13 years in the Little River watershed. The geometric mean is a type of mean or average, which indicates the central tendency or typical value of a set of numbers and doesn't indicate outliers or spikes. The highest yearly geometric mean in these watersheds for FCB was recorded in 2003 and is the highest yearly geometric mean of all other watersheds. The figure also includes the yearly average stream flow, as seen in Figure 3-4, to show how flow can be closely linked to FCB levels. These elevated FCB levels could be caused by livestock with access to streams, failing septic systems, or leaking municipal collection systems.



For more information regarding any of the parameters listed above, see Section 3.3 of the <u>Supplemental</u> <u>Guide to North Carolina's Basinwide Planning</u>. For additional information about ambient monitoring data collected in this river basin, see the <u>New River Basin Ambient Monitoring System Report</u>.

Recommendations & Action Plans at the Watershed Scale

DWQ NOTABLE WATERS & PRIORITY SUMMARY

Table 3-1 is a list of waters in the Little River & Chestnut Creek Watersheds that DWQ has prioritized for restoration/protection. The order of priority is not based solely on the severity of the steam's impairment or impacts but rather by the need for particular actions to be taken. A stream that is currently supporting its designated uses may be prioritized higher within this table than a stream that is currently impaired. This is based on a more wholistic evaluation of the drainage area which includes monitoring results, current and needed restoration/protection efforts, land use and other activities that could potentially impact water quality in the area. Some supporting streams may have a more urgent need for protections than an impaired stream with restoration needs already being implemented.

The third and fourth columns of this table list **potential** stressors and sources that may be impacting a stream based on in-field observations, monitoring data, historical evidence, permit or other violations, and other staff and public input. In many cases, additional study is needed to determine exact source(s) of the impact (s). The last column includes a list of recommended actions.

TABLE 3-1: PRIO	RITIZATION OF	WATERS IN THE	LITTLE RIVER &	CHESTNUT CI	REEK WATERSH	eds (Highe	ST TO LOWEST
Priority)							

Stream Name	AU#	CLASS.	Potential Stressor(s)	Potential Source(s)	Status	ACTIONS NEEDED
Crab Cr.	10-9-12	C;Tr	Habitat Degradation, Nutrients, Flow	Agriculture, Golf Course, Construction, Beaver Dams, Volume & Velocity	Impaired	R, SEC, Ag, NMC, RBR
Bledsoe Cr.	10-9-7	C;Tr	Habitat Degradation (Riparian Buffers), Toxins, FCB, Nutrients, Turbidity	Urban Impacts	Impacted	R, SC, SEC BMPs, RBR
Elk Cr.	10-6-(1) & 10-6-(2)	C;Tr;+ C;+	Nutrients	Agriculture	Supporting	Ag, E, NMC, SS
Laurel Br.	10-9-10-2	C;Tr	Habitat Degradation (Riparian Buffers)	Golf Course Communities	Supporting	RBR, E, SC
Pine Swamp Cr.	10-9-5	C;Tr	Habitat Degradation (Riparian Buffers)		Supporting	RBR, Ag
New R.	10b	C;ORW	Turbidity, Copper, Zinc		Impacted	RBR
Waterfalls Cr.	10-9-4	C;Tr	Habitat Degradation	Agriculture	Supporting	RBR
Moccasin Cr.	10-9-11	С	Nutrients, Low DO	Agriculture	Supporting	Ag, NMC
Little R.	10-9-(1)a	C;Tr	Habitat Degradation, pH		Supporting	RBR
Brush Cr.	10-9-10	C;Tr	Habitat Degradation (Riparian Buffers), Nutrients	Agriculture	Supporting	RBR, Ag
UT to Crab Cr.	10-9-12ut8	C;Tr	Habitat Degradation (Riparian Buffers)	Straight Channels	Supporting	R - Currently Underway
Class Classification (e.g., C. S. B. WS-I, WS-II, WS-IV, WS-V, Tr. HOW, ORW, SW, LIWL)						

Stressor: Chemical parameters or physical conditions that at certain levels prevent waterbodies from meeting the standards for their designated use (e.g., low/high DO, nutrients, toxicity, habitat degradation, etc.).

Source: The cause of the stressor. (Volume & Velocity: when a stream receives stormwater runoff at a much higher volume and velocity than it would naturally receive due to ditching, impervious surfaces, etc.)

Status: Impaired, Impacted, Supporting, Improving

Actions Needed: Restoration (R), Protection (P), Stormwater Controls (SC), Stressor Study (SS), Education (E), Local Ordinance (LO), Best Management Practices (BMPs), Sediment and Erosion Control BMPs (SEC), Species Protection Plan (SPP), Forestry BMPs (F), Agriculture BMPs (Ag), Nutrient Mgnt Controls (NMC), Riparian Buffer Restoration (RBR), Daylight Stream (DS), Monitoring (M), Watershed Restoration Plan (WRP)

UNDERSTANDING THIS SECTION

In this Section, more detailed information about stream health, special studies, aquatic life stressors and sources and other additional information is provided by each 12-digit Hydrological Unit Code (HUC). Waterbodies discussed in this Chapter include all monitored streams, whether monitored by DWQ or local agencies with approved methods. Use Support information on all monitored streams within this watershed can be seen on the map in Figure 3-1, and a Use Support list of all monitored waters in this basin can be found in the <u>Use Support Methodology Chapter</u>.

Use Support & Monitoring Box:

Each waterbody discussed in the Status & Recommendations for Monitored Waters within this Watershed section has a corresponding Use Support and Monitoring Box (Table 3-2). The top row indicates the 2010 Use Support and the length of that stream or stream segment. The next two rows indicate the <u>overall</u> Integrated Report category which further defines the Use Support for both the 2008 and the 2010 reports. These first three rows are consistent for all boxes in this Plan. The rows following are based on what type of monitoring stations are found on that stream or stream segment and may include benthic, fish community and/or ambient monitoring data. If one of these three types of monitoring sites is not shown, then that stream is not sampled for that type of data. The first column indicates the type of sampling in bold (e.g., **Benthos**) with the site ID below in parenthesis (e.g., CB79). The latest monitoring result/rating of that site is listed in the

TABLE 3-2: EXAMPLE OF A USE SUPPORT AND MONITORING BOX				
USE SUPPORT: IMPAIRED (14 MI)				
2008 IR Cat.	4a			
2010 IR Cat.	4			
Benthos (CB79) (CB80)	Fair (2002) Fair (2002)			
Fish Com (CF33)	Good-Fair (2002)			
AMS (C1750000)	Turbidity - 12% FCB - 48%			

next column followed by the year that sample was taken. If there is more than one benthic site, for example, on that stream, the second site ID and site rating will be listed below the first. The last row in the sample box in Table 3-2 is the AMS data. The data window for all AMS sites listed in the boxes in this Plan is between 2004-2008. Only parameters exceeding the given standard are listed in the second column with the percent of exceedance listed beside each parameter.

Please note any fecal coliform bacteria (FCB) listing in the last row (as seen in Table 3-2) only indicates elevated levels and a study of five samples in 30 days (5-in-30) must be conducted before a stream becomes Impaired for FCB.

LITTLE RIVER

Little River [AU#: 10-9-(1)a, (1)b, (6), & (11.5)]

Little River is approximately 35 miles from source to the NC/VA state line and is the main receiving water for this 10-digit watershed. The source of Little River is found along the southwest boundary of the Little River 12-digit subwatershed (HU 050500010404) and flows 11.6 miles to the next subwatershed (Glade Creek - Little River: HU 050500010406), then through the Crab Creek - Little River subwatershed (HU 050500010407) before crossing the state line. Land use is mixed between agriculture and forestry. There are numerous large Christmas tree farms and pasture land which drain to the Little River. The Town of Sparta is also located along the banks of the Little River.

Local Watershed Planning Efforts

The Little River watershed was the subject of a recent local watershed planning effort of the NC Ecosystem Enhancement Program (EEP). The coordinated, multi agency, effort began in 2004 and ended in 2007 with the completion of the Little River - Bledsoe Creek Watershed Management Plan. Between 2004 and 2006, several biological and chemical/physical samples were taken as well as sediment and nutrient studies
completed. The data from these samples and studies were compiled and summarized in the management plan. Restoration projects are also prioritized on a watershed and subwatershed scale. For more documents and information on the advisory group and results of this effort visit EEP's <u>New River Basin Local Watershed</u> <u>Plan</u> page.

AU#: 10-9-(1)a

This 11.6 mile segment flows from source to Pine Swamp Creek and falls completely within the Little River 12-digit subwatershed (HU 050500010404). The entire length of this segment, and most streams running to it, carry a secondary use classification of Trout Waters.

Water Quality Status

The benthic site was sampled twice during this planning cycle and both times

resulted in an Excellent rating. The site has been sampled each cycle since 1993, when it received its highest rating. Samples from 1998 and 2003 dropped down to a Good rating and showed evidence of instream water quality issues, as well as some habitat issues. The 2008 sample collected more pollution intolerant taxa that had not been collected since 1998. This indicates water quality is improving; however, not to 1993 levels yet.

The 2008 fish community sample increased a rating from Good-Fair in 1998 to Good. In general, the habitat was in good condition but had a narrow riparian buffer along the right bank. Biologists noted that the percent of pollution tolerant species found was greater than expected for a mountain stream and that the site had the lowest pH (5.5) of any other fish community site in the basin.

Recommendation

Riparian buffer restoration is suggested for this segment. Buffers of adequate width can filter pollutants out of stormwater and help restore pH levels to more natural levels.

AU#: 10-9-(6)

This 17.5 mile segment flows from the Sparta Lake dam to NC-18 and is mostly within the Glade Creek - Little River subwatershed (HU 050500010406). About one mile of the segment is within the Crab Creek - Little River subwatershed (HU 050500010407). The upstream end of this segment flows along the southeast edge of the Town of Sparta.

Water Quality Status

Two benthic monitoring stations are located along this segment of the Little River. The most upstream site is KB38 which has been sampled four times since 1993. Each sample since that time, including the 2008 sample, rated Excellent. The second benthic site (KB100) has been sampled five times since

1990, all of which were also rated Excellent. The extended history of Excellent ratings at both sites indicates a very stable benthic community.

An AMS station is located between these two benthic sites. Results from this station reflect the good water quality findings in the benthic samples. A second temporary AMS station, known as Random Ambient Monitoring System station, (RAMS K9750000) is located a few miles downstream. This site was sampled for two years (2009-2010) as part of a statewide random AMS sampling effort. Results from RAMS K9750000 will be added to this plan once they are available.

USE SUPPORT: SUPPORTING (17.5 MI)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB38) (KB100)	Excellent (2008) Excellent (2008)
AMS (K9600000)	No Exceedances
RAMS (K9750000)	Data Not Yet Available

USE SUPPORT: SUPPORTING		
2008 IR Cat.	2	
2010 IR Cat.	2	
Benthos (KB37)	Excellent (2008)	
Fish Com (KF7)	Good (2008)	

ELK CREEK (050500010401)



Includes: New River [AU#: 10b] **& Elk Creek** [AU#: 10-6-(1) & (2)]

This subwatershed has mixed land use of mostly agriculture with small patches of forest and residential areas. There are no NPDES dischargers in this subwatershed.

Elk Creek [AU#: 10-6-(1) & (2)]

Elk Creek is a little over 11 miles from source to the New River [AU#: 10b]. Agriculture along this stream and its tributaries is mostly pastures and row crops. The upstream segment of Elk Creek [AU#: 10-6-(1)] from source to US-221 holds a secondary use classification of Trout Waters.

Use Support: Supporting	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB35)	Good (2008)
Fish Com (KF3)	Good (2008)

Water Quality Status

Elk Creek was monitored for benthic and fish communities in 2008 at two

locations. The most upstream site was a fish site (KF3) at State Route 1341 which was sampled one other time in 1998. Both samples taken at this location throughout the years were rated Good and received the same NCIBI value. Even though the NCIBI numbers were identical, there were differences in the types and numbers of fish found. Those differences are an indication of elevated nutrients levels from nonpoint sources which prevent survival of more pollution intolerant species.

Further downstream, about a half mile from the New River [AU#: 10b], a benthic sample was collected and rated Good in 2008. This site (KB35) has been monitored once every five years since 1993. Rating values given to this site are also similar to past years, but also had shifts similar to the fish sample. There were several taxa collected at this site for the first time which are more pollution tolerant than those collected in past samples, indicating an impact to the benthic community.

Both fish and benthic communities are showing signs of being impacted by elevated nutrient levels. Since the 1995 New River Basinwide Water Quality Plan, nutrients have been noted in this stream based on the presence of periphyton and biological sampling results.

Recommendation

DWQ will work with SWCD to prioritize the need for agricultural nutrient management controls within this drainage area. Educational efforts should focus on the importance of riparian buffers, keeping livestock out of the streams and how to reduce nutrient runoff after applying fertilizers. A stressor study may be needed to determine specific sources of elevated nutrients. A grant application to improve water quality can be more competitive when paired with a stressor study.

BRUSH CREEK - NEW RIVER (050500010403)



Includes: New River [AU#: 10b], Rock Creek [AU#: 10-7] & Dog Creek [AU#: 10-8]

This subwatershed has mixed land use of agriculture, residential and scattered forest. There are no NPDES point source dischargers within this subwatershed, but there are five cattle animal quarters in the state of the state o

New River [AU#: 10b]

This segment of the New River begins at the NC/VA state line where the river enters back into NC. The river winds back and forth across the state line several times before flowing northeast into Virginia. The drainage area contains a mix land use of agriculture, residential and scattered patches of forest.

Use Support: Supporting (6.4 mi)	
2008 IR Cat. 2	
2010 IR Cat. 2	
Benthos (KB34) Excellent (20	
AMS (K7900000)	Copper (23.1%) Zinc (15.4%)

Water Quality Status

There is one benthic monitoring site (KB34) on this segment of the New River. This site has been monitored since 1983 and has received either an Excellent or Good classification each time. The 2008 sample had similar results with an Excellent rating. Habitat at this site was lacking proper riparian buffers, with agricultural activities lining the north bank. Biologists noted the sample included several new taxa collected for this site which vary in pollution tolerance levels. One of these new taxa has only been collected by DWQ nine previous times within the state.

Just downstream of the benthic station is an AMS station (K7900000). Samples taken monthly at this site between 2005 and 2009 resulted in elevated levels of turbidity, copper and zinc. Turbidity did not exceeded the State water quality standards. Copper and zinc did exceed the state standard; however, these levels are believed to be natural. Therefore, this segment will not be placed on the Impaired Waters list for these parameters. During this time period, fecal coliform bacteria (FCB) levels declined by half of what was measured between 1998 and 2003.

Recommendation

Riparian buffer restoration is suggested for this segment of the New River to reduce impacts from stormwater runoff.

LITTLE RIVER (050500010404)



Includes: Little River [AU#: 10-9-(1)a], Waterfall Creek [AU#: 10-9-4] & Pine Swamp Creek [AU#: 10-9-5]

This subwatershed has mixed land use of forest in the headwaters, some residential and agriculture scattered in the headwaters but mostly along streambanks. There are no NPDES dischargers in this subwatershed. Majority of streams in the subwatershed hold the secondary use classification of Trout Waters.

Local Watershed Planning Efforts

The Little River watershed was the subject of a recent local watershed planning effort of EEP. The coordinated, multi agency, effort began in 2004 and ended in 2007 with the completion of the Little River - Bledsoe Creek Watershed Management Plan. Between 2004 and 2006 several biological and chemical/physical samples were taken, as well as sediment and nutrient studies were completed. The data from these samples and studies are compiled and summarized in the management plan. Restoration projects are also prioritized on a watershed and subwatershed scale. For more documents and information on the advisory group and results of this effort visit EEP's New River Basin Local Watershed Plan page.

Waterfalls Creek [AU#: 10-9-4]

Waterfalls Creek is approximately four miles from source to the Little River [AU#: 10-9-(1)a]. Just downstream of the source is a privately owned dam which creates Willis Lake. The drainage area is mostly forested with agriculture concentrated along streams.

Use Support: Supporting (4.3 mi)		
2008 IR Cat.	2	
2010 IR Cat.	2	
Benthos (KB97)	Excellent (2006)	

Water Quality Status

In 2006, a benthic sample was taken on Waterfalls Creek at Airbellows Gap Road off of Waterfall Road (KB97). The stream was monitored as part of a special study being conducted on the Little River and had not been monitored by DWQ previously. The special study and results are discussed below (B-20060815). It was chosen as a reference site and was rated Excellent. The benthic community was abundant and diverse; however, the habitat score was low because of it being in a fallow field.

Between the source of the stream and the sampling location, the stream flows through forest. The transition to farmland begins just upstream of the sampling site and continues through farmland to its confluence with the Little River. Therefore, aquatic life present at this site reflect more of the water quality within the forested area.

Recommendation

Waterfalls Creek would benefit from the installation of a riparian buffer zone along the stretch that is within a fallow field. This will allow stormwater runoff to be filtered before reaching the stream.

Pine Swamp Creek [AU#: 10-9-5]

Pine Swamp Creek is approximately five miles long from source to the Little River [AU#: 10-9-(1)a]. The major land use within this drainage area is agriculture with small scattered patches of forest.

Water Quality Status

During the last basinwide cycle Pine Swamp Creek's benthic community was monitored at site KB36 and received a Good-Fair rating in 2003. This rating was likely a reflection of impacts from a two year drought (2001-2002).

Use Support: Supporting (5 MI)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos	
(KB36)	Good (2008)
(KB82)	Excellent (2006)
Fish Com (KF19)	Good (2008)

In 2006, DWQ conducted a special study (B-20060815) which included two benthic samples on this stream. One sample was collected at the basinwide site (KB36) and the second was taken upstream at Pine Swamp Road (KB82). Both sites received an Excellent rating during this study; however, the upstream site had a slightly lower overall score. KB82 is surrounded by farmland with no riparian buffers. The higher score downstream is likely due to the larger riparian buffer zone which assists with removing pollutants and excess nutrients from the water.

In 2008, a benthic site (KB36) and a fish community site (KF19) were sampled. The benthic sample dropped a rating to Good but was borderline an Excellent rating. The fish community sample was the first fish sample collected on this stream by DWQ and resulted in a Good rating. The percent of pollution tolerant fish was slightly higher than expected for a mountain stream, indicating some water quality impact.

Recommendations

Even though it has been rated Excellent and Good, this stream is showing signs of impacted water quality. Sections of the stream have been channelized and others completely lack riparian buffer zones. Livestock also have easy access to the stream, which can result in degraded streambanks and high levels of fecal coliform bacteria in the water. DWQ will work SWCD to prioritize the implementation of fencing livestock out of the stream and stream restoration BMPs.

Little River [AU#: 10-9-(1)a]

This segment of the River flows through this subwatershed. Water quality status and other information about the full length of the river is discussed at the beginning of this section.

BRUSH CREEK (050500010405)



Includes: Brush Creek [AU#: 10-9-10], Laurel Branch [AU#: 10-9-10-2], Little Glade Creek [AU#: 10-9-10-3] & Little Pine Creek [AU#: 10-9-10-5]

Land use here is mostly agriculture with scattered residential areas throughout the subwatershed, and forested headwaters. There are two Minor NPDES dischargers and one large cattle animal operation permit in this subwatershed. Majority of streams in this subwatershed hold the secondary use classification of Trout Waters.

Local Initiatives

The EEP partnered with local agencies to begin implementing a Local Watershed Management Plan for the Little River/Brush Creek watershed areas. Work focused for this area includes identifying stream and wetland restoration and preservation sites, development of specific stormwater management recommendations for the Town of Sparta and the identification and modeling of stormwater BMP project sites. More information on this effort can be found in the <u>Other Natural Resource Program Chapter</u> or on the <u>EEP New River website</u>.

Laurel Branch [AU#: 10-9-10-2]

Laurel Branch is approximately five miles long from source to the confluence with Brush Creek [AU#: 10-9-10]. This drainage area has a mixed land use of residential, forest and a small amount of agriculture. Three large golf courses with corresponding residential properties are found in the headwaters of Laurel Branch and includes Lake Louise, a man made lake. Olde Beau Golf & Country Club and High Meadows Golf & Country Club hold a minor NPDES permit.

USE SUPPORT: SUPPORTING (5.2 MI)	
2008 IR Cat. 2	
2010 IR Cat. 2	
Benthos (KB42)	Not Impaired (2008)

Water Quality Status

Laurel Branch has been monitored by DWQ since 1988 at SR-1105. The stream has experienced significant change, mostly in the headwaters, since that time. Between 1988 and 1992 the benthic site rated either a Fair or Poor which resulted in the stream's impairment. A sample collected in 1998 showed there had been significant recovery with a Good rating. The 2008 sampled indicated little to no change in the benthic quality since the 2003 sample which also resulted in a Good rating. In 2008, habitat conditions were good; however, the recorded pH levels were low.

The gradual seven-year recovery and improvement in water quality condition can be contributed to DWQ enforced restoration activities. The construction of the Olde Beau Golf Club was responsible for large amounts of sediment filling the stream and smothering benthic habitat. Restoration efforts included removing sediment from the stream, stabilizing streambanks and adding more natural stream substrate.

There are three large golf course communities clustered in the headwaters of Laurel Branch, which have little to no riparian buffer protection along streams on those properties. These small tributary streams to Laurel Branch receive stormwater runoff from the communities, which likely carries excess nutrients from maintaining golf course turf grasses and other pollutants from residential properties into Laurel Branch.

Downstream of the golf course communities, the steam flows through about a mile and a half of forest before reaching the benthic site. This allows plants and other biological material to filter some pollutants and nutrients from the water column before reaching the benthic monitoring site and Brush Creek.

Recommendation

DWQ recommends adequate riparian buffers be installed and protected along the length of Laurel Branch and its tributaries which flow through the golf course communities. Educational efforts should also be taken by the communities to inform residents of the benefits riparian buffers have to the water in their backyard.

Brush Creek [AU#: 10-9-10]

Brush Creek is approximately 28 miles from source to the Little River [AU# 10-9-(6)]. The drainage area has a mixture of land uses which include residential, agriculture and forested area.

Water Quality Status

Four biological samples were taken during this sampling cycle. Three out of those four are benthic monitoring samples. One of the benthic samples (KB47) was collected in 2006 as part of a special study (B-20060815) and received an Excellent rating with good overall habitat. The site furthest upstream (KB42)

USE SUPPORT: SUPPORTING (27.8 MI)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB47) (KB41)	Excellent (2006) Good (2007)
(KB42)	Not Imp. (2008)
Fish Com (KF17)	Good (2008)

has been sampled five times since 1992 when it received a Fair rating. Since that first sample, the site has rated Good and has shown little to no change in water quality. The 2008 rating was Not Impaired due to the drainage area being less than 3.0 mi². The site furthest downstream (KB41) has been rated four times since 1993 and was rated Good in 2008. Biologists suspect the rating would have been higher if the sample was taken during the summer months versus in October. All sites had moderate habitats.

The fish community sample was taken just upstream of Big Pine Creek. This is the first fish sample to be taken by DWQ on Brush Creek. The results from this sample indicated some impact on the fish community by nonpoint source nutrients. The percent of pollution tolerant fish was also a little higher than expected for a mountain stream. These nonpoint source impacts are likely associated with the large amount of agriculture in this drainage area. Biologists also noted a lack of riparian buffers along this section.

Recommendation

DWQ will work with SWCD to prioritize agricultural BMPs which are needed to target nutrient runoff reductions and establishing riparian zones.

GLADE CREEK - LITTLE RIVER (050500010406)



Includes: Little River [AU#: 10-9-(1)b & (6)], Bledsoe Creek [AU#: 10-9-7] & Glade Creek [AU#: 10-9-9]

This subwatershed has mixed land use including small patches of forest, urban and agriculture. There are two minor NPDES dischargers and one large cattle animal operation permit in this subwatershed. Majority of the streams, excluding the Little River, hold the secondary use classification of Trout Waters. The Town of Sparta is located in the western portion of the subwatershed.

Local Watershed Planning Efforts

The Little River watershed was the subject of a recent local watershed planning effort of the NC Ecosystem Enhancement Program (EEP). The coordinated, multi agency, effort began in 2004 and ended in 2007 with the completion of the Little River - Bledsoe Creek Watershed Management Plan. Between 2004 and 2006 several biological and chemical/physical samples were taken as well as sediment and nutrient studies were completed. The data from these samples and studies are compiled and summarized in the management plan. Restoration projects are also prioritized on a watershed and subwatershed scale. For more documents and information on the advisory group and results of this effort visit the EEP <u>New River Basin Local Watershed</u> Plan page.

Bledsoe Creek [AU#: 10-9-7]

Bledsoe Creek is approximately six miles from source to the Little River [AU#: 10-9-(6)] and holds a secondary use classification of Trout Waters. The upstream half of the stream is mostly agriculture with one large cattle operation and the downstream half flows through the Town of Sparta.

Use Support: Supporting (5.9 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos	
(KB46)	Not Impaired (2006)
(KB101)	Excellent (2008)
(KB40)	Good-Fair (2006)

Water Quality Status

Bledsoe Creek was the main focus of an EEP Watershed Management Plan. This plan covers the entire Little River watershed and is discussed in more detail in the Little River section. In the process of developing this management plan, three benthic samples were taken along Bledsoe Creek. The most upstream site (KB46) was given a rating of Not Impaired due to the small drainage size. However, biologist noted if the drainage area was slightly larger, it would have received an Excellent rating. This site also received the highest habitat score of the three sites.

The second site (KB101) is about an eighth of a mile upstream of the Little River confluence. This site rated Good-Fair during the EEP study in 2006 and was noted as the most degraded of the three sites. Results from this sample indicated impacts from toxins which were not seen in the upstream sample. Biologist also noted a strong sewage smell in the creek. The most downstream sample had similar results but to a lesser degree. Both lower sites had insufficient habitat for a healthy benthic population.

Two chemical/physical sites were also sampled in Bledsoe Creek during the study. Those results showed elevated fecal coliform bacteria (FCB) levels, some of which were over 400 colonies per 100 ml indicating potential sewer leaks and sources of animal waste. During storm events, the Bledsoe Creek sites had some

of the highest nutrient and sediment levels of any other site during the study period. More detailed results are discussed in the <u>Assessment of Bledsoe Creek Subwatersheds</u> document prepared by WK Dickson & Company, Inc. for EEP.

The middle benthic site (KB101) discussed above is also a basinwide site which was sampled again in 2008. At that time the rating improved to Excellent from the Good-Fair it received in 2006. The difference between the two samples lies in the increased number of taxa collected and their sensitivity to pollution. More pollution intolerant taxa were collected in the 2008 sample which indicates an improvement in water quality. Even though the benthic population has improved the habitat is less than optimal with poor riparian zones and silty cover of *aufwuchs* over the cobble and boulders within the stream.

Local Initiatives

Through the Community Conservation Assistance Program the Alleghany Soil & Water Conservation District is helping to treat stormwater runoff on 1,826,850 sq/ft of impervious surface in the Bledsoe Creek priority watershed with BMPs like critical area stabilization and a stormwater wetland project through partnering with the Town of Sparta to complete. These practices will assist in reducing nitrogen and phosphorus from the stream. The Alleghany district is also assisting in installation of pet waste receptacles in the Sparta Town Park to further protect Bledsoe Creek/Little River/New River.

Recommendation

DWQ supports funding the efforts set forth in the Little River - Bledsoe Creek Watershed Restoration Plan. Stakeholders involved in the development of the plan should continue reevaluating the types and priority of BMPs as monitoring data and BMP result data become available.

Little River [AU#: 10-9-(1)b & (6)]

Two segments [AU#: 10-9-(1)b & (6)] of the Little River flow through this subwatershed. Water quality status and other information about the full length of the river is discussed at the beginning of this section.

CRAB CREEK - LITTLE RIVER (050500010407)



Includes: Little River [AU#: 10-9-(6) & (11.5)], Moccasin Creek [AU#: 10-9-11], Crab Creek [AU#: 10-9-12] & Unnamed Tributary to Crab Creek [AU#: 10-9-12ut8]

This subwatershed has a land use of small patches of forest and urban areas mixed with a large amount of agriculture. There are no NPDES dischargers but one large cattle animal operation permit is in this subwatershed. Crab Creek is the only stream listed on the 2010 Impaired Waters list within this subwatershed.

Local Initiatives

The Ecosystems Enhancement Program partnered with local agencies to begin implementing a Local Watershed Management Plan for the Little River/Crab Creek watershed areas. Work focused for this area includes identifying stream and wetland restoration and preservation sites, development of specific stormwater management recommendations for the Town of Sparta and the identification and modeling of stormwater BMP project sites. More information on this effort can be found in the <u>Other Natural Resource Program Chapter</u> or on the <u>EEP New River website</u>.

Moccasin Creek [AU#: 10-9-11]

Moccasin Creek is approximately four and a half miles long from source to Little River [AU#: 10-9-(6)]. Land cover in this drainage area is mostly agriculture with a few patches of forest.

Use Support: Supporting (4.4 mi)	
2008 IR Cat.	
2010 IR Cat.	2
Benthos (KB73)	Good (2006)

Water Quality Status

This creek was sampled for the first time by DWQ in 2006. The sample was taken as part of the EEP Little River - Bledsoe Creek Watershed Management Plan study. This plan covers the entire Little River watershed and is discussed in more detail in the Little River section. The benthic sampling was completed and analyzed by DWQ and documented in the B-20060815 special study report. The site was rated Good; however, it had the most pollution tolerant taxa of any other site in the study with exception of site KB101 on Bledsoe Creek. This site was the only one within the study to show benthic signs of nutrient enrichment and low DO indicators.

Cattle have direct and easy access to the stream just up from the sampling location and could be the source of nutrients. The entire drainage area is largely agriculture.

Recommendation

DWQ will work with SWCD and Bledsoe Creek watershed stakeholders to prioritize agricultural BMPs such as fencing out livestock and nutrient reductions BMPs. Funding for implementing of efforts spelled out in the Little River - Bledsoe Creek Watershed Management Plan are supported by DWQ.

Unnamed Tributary to Crab Creek [AU#: 10-9-12ut8 & 12ut8ut4]

This unnamed tributary (UT1) is approximately four and a half miles from source to Crab Creek [AU#: 10-9-12]. This section also covers a second UT (UT2) [AU#: 10-9-12ut8ut4] which flows to UT1. The drainage area has a mixed land use of agriculture, forest and some urban areas.

Water	Quality	Status

These two unnamed tributaries were monitored as part of a special study (B-20080129) conducted by DWQ in 2007. The study was requested by EEP to

Use Support: Supporting (4.5 mi)	
2008 IR Cat.	
2010 IR Cat.	2
Benthos	
(KB128)	Not Impaired (2007)
(KB133)	Not Impaired (2007)
(KB132)	Good (2007)

determine the current water quality status before beginning construction on a restoration project. The benthic sampling showed better water quality and habitat at the most upstream site in UT2. Further downstream on UT1, the water quality becomes impacted by channelization and total lack of riparian buffers. This was most apparent at the KB132 site, which received the lowest habitat score. The Not Impaired ratings given to the upstream sample sites (KB128-UT2 & KB133-UT1) were due to the small sized drainage areas. The lower site on UT1 (KB132) is located in a much larger drainage area and even though it received the lowest habitat score, it received the highest bioclassification. This is mainly due to the fact that in smaller drainage areas it is expected to have a much smaller benthic population than the larger drainage areas. Therefore the differences at these sites are because of size.

Local Initiatives

The 2008 EEP project (as seen in the Figure 3-21 below) was to reestablish meanders within the stream channel. This will slow flows during storm events and reduce flooding downstream as well as create a more natural habitat.



Crab Creek [AU#: 10-9-12]

Crab Creek is approximately eight miles long from source to the Little River [AU#: 10-9-(11.5)] and holds a secondary classification of Trout Waters. The land cover in this drainage area is a mixture of agriculture including one cattle animal operations permit, forest and some residential. The stream includes an impoundment built in 1973 which created a small lake (Mountain Lake). Crab Creek is Impaired due to a Fair fish community rating in 2008.

Use Support: Impaired (7.8 mi)				
2008 IR Cat.				
2010 IR Cat.	2			
Benthos (KB49)	Good-Fair (2007)			
Fish Com (KF18)	Fair (2008)			

Water Quality Status

Crab Creek was sampled for the first time by DWQ in 2003 as part of a special study to support the local watershed planning efforts of the Wetland Restoration Program. At that time, site KB49 received a Good rating; however, biologist noted streambanks were eight meters high and reinforced with old tires and other farm debris. Large amounts of periphyton growth was also noted.

The same site was sampled again in 2007 as part of the special study (B-20080129) on the Crab Creek drainage areas as mentioned above. This site was the most downstream site of that study and received the lowest rating of Good-Fair. Beaver dams were noted above and below the site which caused a significant flow reduction. When comparing the data to the previous 2003 sample, a decline in water quality is apparent by the decline in number and pollution intolerance levels of the benthic community now present. The channelization, lack of riparian buffers and overall poor habitat conditions caused this decline as predicted in the <u>2005 New</u> <u>River Basinwide Water Quality Plan</u>.

A fish community sample (KF18), located at NC18, was taken in 2008 for the first time on Crab Creek. This site had the most collected fish of any other site within the basin; however, there was limited diversity and mostly omnivores and herbivores indicative of nonpoint source nutrient loading. A large cattle farm and a row crop/pasture farm are located on either side of the stream at this sampling location. These, in addition to multiple upstream farms, a golf course and a lack of riparian buffers, could all be contributing to this low fish community rating and resulting Impairment. Satellite imagery also shows two large land disturbing activities which occurred in 2009 which could cause future sedimentation issues.

Recommendations

Riparian buffers are a significant element in reducing the impacts from nonpoint source runoff. Educational efforts should be made in this watershed to inform golf course attendants, farmers and other residence of the importance of maintaining a proper riparian buffer. Educational material for golf course owners and

maintenance crews to maintain the course in a way that protects water quality can be found on the <u>Basinwide</u> <u>Planning Unit website</u>. Approved sedimentation and erosion control measures should be in place during land disturbing activities.

Little River [AU#: 10-9-(6) & (11.5)]

Two segments [AU#: 10-9-(6) & (11.5)] of the Little River flow through this subwatershed. Water quality status and other information about the full length of the river is discussed at the beginning of this section.

CHESTNUT CREEK (050500010603)



Includes: West Fork Chestnut Creek [AU#: 10-10-1]

This subwatershed has a land cover mixture of mostly agriculture and forest. There are no NPDES dischargers in this subwatershed. The majority of this subwatershed falls in Virginia with the two most southern tips in North Carolina. No streams are monitored by DWQ at this time.

References

References marked with (*) indicates a DWQ special study report. These reports are not currently available online. Contact Jay Sauber by phone at (919) 743-8416 or by e-mail at Jay.Sauber@ncdenr.gov to receive a hardcopy.

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- Note: URL addresses for hyperlinks found in this plan are listed in the Acronyms & Definitions Chapter.

CHAPTER 4

ORE KNOB MINE



Water Quality Issues & Restoration Efforts

ORE KNOB MINE

MINE HISTORY

Ore Knob Mine is a former copper mine which was operated intensively from 1871 to 1883. Then limited mining activities took place until 1957 when it was operated by Appalachian Sulphides Inc. For the next five to six years, the mining company extracted the ore from 11 openings and one main shaft. Ore was then ground in a processing facility in the Little Peak Creak drainage area. Using a froth flotation and cyanide leaching process, Copper, gold and silver was extracted further.

The waste tailings from this process were mostly pumped into a large tailings impoundment located on Ore Knob Branch. A smaller portion of the tailings were dumped in a small hollow adjacent to the processing facility. The drainage from the processing facility and associated waste piles is an acidic toxic mix that has contaminated the surface and ground water in the drainage area.

FIGURE 4-1: PHOTOS TAKEN OF THE WASTE/TAILINGS PILES DURING A SITE VISIT IN DECEMBER 2006 BY DWQ. (TOP LEFT: TOP OF IMPOUNDMENT FACING THE SETTLING POND; TOP RIGHT: LOOKING NORTH EAST ACROSS THE IMPOUNDMENT; BOTTOM: ON IMPOUNDMENT LOOKING BACK ACROSS TAILINGS PILE.)









DESCRIPTION OF CONTAMINATED AREA & IMPACTS

The main area of the Ore Knob Mine that is impacting surface and ground water is the tailings pile which is a little over 20 acres and holds most of the waste tailings from the mining operations. This is seen in Figure 4-2 as the area outlined in red. The tailings pile, estimated at 720,000 cubic yards, is held behind a 60 foot dam. Behind the large dam is a settling basin held back by a smaller 20 foot dam. This smaller dam has a culvert which drains directly to Ore Knob Branch.

Two small streams flow into the southern portion of the pile where it intermittently ponds (two blue lines at the bottom left corner of Figure 4-2). A concrete pipe inlet drains the intermittent pond, bypassing majority of the tailings pile and the larger dam, discharging into the settling basin. Two spring fed ponds, located on either side of the northern portion of the pile, filter through the tailings and seeps through the larger dam where it then collects in the settling basin.

The tailings piles as well as the mine shafts are causing acidic metal-laden runoff to contaminate surface and groundwater on the site which then flows into Little Peak Creek, Ore Knob Branch and Peak Creek [AU#: 10-1-35-(2)b]. Multiple studies have been conducted since the early 1990's to measure the impact on water quality and the environment. These studies have detailed results within their respective study reports which are discussed below.

RESTORATION ACTIVITY HISTORY (1990'S TO 2005)

Restoration efforts to the abandoned mine and its receiving streams began in the early 1990's by the US Army Corps of Engineers (USACE) and DWQ. Under Section 206 of the Water Resources Development Act of 1996 (PL 104-303), USACE published the Ore Knob Aquatic Restoration Project: Draft Detailed Project Report and Environmental Assessment (March 2003). The goal of the project was defined "to return aquatic macrobiota and fish to Peak Creek and Little Peak Creek." Quantitatively, the project would restore up to 14.3 acres of aquatic habitat (6.9 stream miles).

In order to meet the goals and objectives of the Ore Knob project, restoration of the former processing area and reclamation of the tailings area, which include mine portals and shafts, would be necessary. This involves three distinct treatments: (1) diversion of surface water runoff away from and around tailings; (2) isolation of the tailings; and (3) passive treatment of acid discharge through the use of wetlands. Implementation of the project was expected to restore 6.9 miles of aquatic habitat and 24 acres or more of terrestrial (wetland and upland) habitat. Two million dollars was allocated for project study, design and construction, and operation and maintenance costs. Even though, due to federal budget constraints, funding for the full Ore Knob Aquatic Restoration Project was not provided, the 2003 document has been utilized in almost all Ore Knob restoration projects since.

RECENT ACTIVITY (2005 TO 2010)

319 Watershed Management Plan

In 2005, NCSU was awarded funding to develop a <u>Watershed Management Plan</u> for the Ore Knob Mine area. This study included surface water monitoring for pH, DO, temperature, acidity and numerous metal values. Averages for these values are summarized in Figure 4-4. These parameters were monitored at seven locations within the area during the study. Locations of five of those monitoring stations are listed in Table 4-1 and shown in Figure 4-3.

TABLE 4-1: MONITORING LOCATIONS FOR FIVE OF NINE SITES SAMPLED DURING 319 PROJECT

Station #	Location	Station #	Location	Station #	Location
1	Peak Creek	3	Discharge from tailings	5	Peak Creek just before
2	Southern intermittent pond	4	Ore Knob Branch	5	South Fork New River

Results of the sampling indicated pH levels at all stations except one were significantly lower than the states surface water quality standard of 6. The one station that was not below the standard was Site 1 which is the only site upstream of the mines impacted area. Acidity levels were highest were the concrete pipe discharges the tailings into the settling basin (Site 3). Copper was the only metal, sampled during this study, that showed higher levels at Site 2 (located at the intermittent pond) than Site 3. Site 2 represents runoff from the watershed area upstream (south) of the tailings pile as well as runoff that flows through the adits (a slightly sloped passage into the mine) before it enters the intermittent pond at the south end of the tailings pile. Higher copper levels at this site indicate signs of filtration of the metal as the water from the intermittent pond travels through the tailings pile. All other metals shown in Figure 4-4 had a much higher value once discharged from the tailings pile into the settling basin.

Site 4 (Figure 4-3), which is located on Ore Knob Branch just before its confluence with Peak Creek, results showed that much of the contaminates were reaching Peak Creek. And Site 5, on Peak Creek just before its confluence with the South Fork, results also showed evidence of the contaminates, but to a lesser degree.

The study concluded the primary sources of the contaminates/pollution were 1) erosion of the face of the larger dam (north side of the dam), 2) adits that release acid mine discharge (AMD) from the former underground mine that is upstream of the intermittent pond, and 3) AMD generated within the tailings pile. Due to the contaminate levels found during this study and the degree of environmental and human health hazards, the state coordinated with the EPA to have the mine designated as a Superfund site (Borden and Behrooz, 2009).



FIGURE 4-3: SAMPLE LOCATIONS FOR THE 319 WATERSHED RESTORATION PLAN PROJECT FUNDED BY THE 319 GRANT*

* Imagery by Google Earth



















DWQ & Environmental Protection Agency Region 4 Activity

DWQ and EPA Region 4 conducted site visits in 2007 to check on the degradation status of the embankment and tailings. During the February 2007 visit, the concrete pipe used to divert stream flow under the tailings pile to the settling pond was blocked at both inlet and outlets causing the flow to filter through the tailings. The 60 foot dam (Figure 4-5: top right) exhibited rills up to three feet deep along with numerous seeps. Storm runoff and water seeping from the dam face would be collected in the settling pond before reaching Ore Knob Branch; however, the settling pond had been completely filled with sediment which likely eroded from the face of the dam. This surface and groundwater was monitored in 2007 and 2008 as part of a 319 grant project.

In April 2009, the site was proposed for the <u>National Priority List</u> which became official September 23, 2009. Since that time, federal agencies developed a clean up effort based on past studies and stabilization efforts. As of July 2010, actions have included:

♦ 20,000 of 720,000 cubic yards of tailings and sediment excavated from the settling pond;

& Restored a freeboard in the settling pond so it now acts as a clarifier as water empties into Ore Knob Branch;

b Completed the diversion channel designed to reroute 200 gallons per minute of surface water around the tailings dam;

- 6 Recycled soil and sediment excavated from the site to re-use throughout the rest of the site; and
- 6 Completed a geotechnical stability analysis and a slope stability analysis for the tailings dam face.

In July of 2010, EPA Region 4 requested additional funding to complete the remaining restoration of the site. This will cover the capping of the tailings impoundment and add vegetation throughout the site, excavate tailings from Ore Knob Branch and excavate and stabilize the 1950's mine and mill site. Federal sediment and erosion controls will be put in place during the restoration efforts. However, federal measures are not as preventive as state measures; therefore, elevated turbidity levels are expected to occur in Ore Knob Branch, Peak Creek and possibly the South Fork until restoration is completed.

DWQ will continue to work with EPA as requested through the remainder of the project.

FIGURE 4-5: PHOTOS OF TAILINGS PILE AND DOWNSTREAM TAKEN DURING A SITE VISIT IN JULY 2007 BY DWQ. (TOP LEFT: TOP OF LARGER DAM FACING THE SETTLING BASIN; TOP RIGHT: SETTLING BASIN LOOKING BACK TOWARDS LARGER DAM; BOTTOM LEFT: TOP OF LARGER DAM LOOKING BACK ACROSS TAILINGS PILE; BOTTOM RIGHT: ORE KNOB BRANCH DOWNSTREAM OF SETTLING BASIN CULVERT.)



REFERENCES

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- Borden, Robert C. and Behrooz, Mehnroosh. January 1, 2009. *Ore Knob Mine Tailings Pile Watershed Restoration Plan.* Department of Civil, Construction and Environmental Engineering. North Carolina State University. NCDENR, 319 Program Funded. Raleigh, NC. (<u>http://h2o.enr.state.nc.us/basin-wide/319_Documents/documents/OreKnob_Watershed_Plan.pdf</u>)

Note: URL addresses for hyperlinks found in this plan are listed in the Acronyms & Definitions Chapter.

DWQ NEW RIVER BASIN PLAN: WATER QUANTITY

NC

CHAPTER 5

WATER QUANTITY

IN THE NEW RIVER BASIN

CHAPTER TOPICS

Understanding Stream Flow

Managing Flow from Impoundments

Water Supply, Demand, Availability & Planning

SWAP

UNDERSTANDING STREAM FLOW

Stream flow is monitored by U.S. Geological Survey gaging stations at <u>selected stations</u> across the state. Flow, often abbreviated as "Q", is measured in terms of volume of water per unit of time, usually cubic feet per second (cfs). Minimum flows are intended to be only occasional short-term events that maintain stream conditions at a survivable level for aquatic life. One example of such a minimum flow requirement is the "7Q10 flow" - the lowest flow occurring for seven consecutive days, with a probability of occurring once every 10 years. This is a drought flow statistic that is used to determine wastewater discharge effluent limits such that the pollutant load can still be assimilated and chemical water quality standards can still be maintained during the driest week occurring once every 10 years. This type of minimum flow will not protect ecological integrity if it is frequently the only flow in the stream, and/or occurs for long periods of time. The potential for global climate change to change the patterns of water availability adds to the importance of protecting ecological flows, not just maintaining minimum flows of increasing duration.

A minimum flow approach does not incorporate critical characteristics of a flow regime (magnitude, timing, frequency, duration, variability and rate of change) needed to protect ecological integrity. Minimum flows lack the variability between different times of year (monthly and seasonal), as well as the inter-annual variability between different types of years (wet, dry, average).

For additional information about stream flow see **DWR's Environmental Flows** web page.

MANAGING FLOW FROM IMPOUNDMENTS

MINIMUM RELEASE REQUIREMENTS

One of the purposes of the Dam Safety Law is to ensure maintenance of minimum streamflows below dams. Conditions may be placed on dam operations specifying mandatory minimum releases in order to maintain adequate quantity and quality of water downstream of the impoundment. The **Division of Water Resources** (DWR), in conjunction with the **Wildlife Resources Commission** (WRC), recommends conditions related to release of flows to satisfy minimum instream flow requirements. The **Division of Land Resources** (DLR) issues the permits and is responsible for enforcement. The Federal Energy Regulatory Commission (FERC) licenses most dams associated with hydropower under the Federal Power Act. Flow requirements may also be established for

non-dam projects that require a Finding of No Significant Impact to satisfy a state or federal environmental review or as a condition of a permit required by the Clean Water Act. Calculated minimum stream flows for impoundments in the New River Basin are listed in Table 5-1. If the inflow is less than the minimum release, the minimum release becomes that inflow rate.

TABLE 5-1: MINIMUM RELEASE FROM	I IMPOUNDMENTS IN THE	NEW RIVER BASIN
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NAME OF DAM	Purpose	Waterbody	DRAINAGE AREA	MINIMUM RELEASE			
Hydroelectric Dams	Hydroelectric Dams						
Sharpes Falls (FERC #: 6322)	Hydroelectricity Production	North Fork New River	112 mi ²	None ^a			
Impoundment Dams/Weirs							
Roaring Gap (Lake Louise)	Amenity & Irrigation	Laurel Branch	1.06 mi ²	1.4 cfs			
Old Beau Upper	Amenity & Irrigation	Laurel Branch	1.33 mi ²	None ^b			
Old Beau Lower	Amenity & Irrigation	Laurel Branch	1.54 mi ²	1.6 cfs			
South Fork New River Weir	Town of Boone Water Supply	South Fork	19.5 mi²	4.0 ° cfs			
Winkler Creek Dam	Town of Boone Water Supply	Winkler Creek	5.7 mi ²	2.4 ° cfs			

^a Even though there is no minimum flow, the project must operate in a run-of-river mode; i.e., instantaneous inflow equals instantaneous outflow. Note: A noncompliant project can noticeably alter the stream flow.

^b The upper and lower ponds were built in series so that the system will provide 1.6 cubic feet/second (cfs) downstream. ^c The Section 404 permit, issued by the U.S. Army Corp of Engineers, also states "the Town of Boone will in all cases be

permitted to withdraw a maximum of 4.6 cfs from the combined sources."

WATER SUPPLY, DEMAND, AVAILABILITY & PLANNING

Division of Water Resources summarized water quantity in the New River Basin in 2001 in a <u>four page document</u> on their web site. Information included in this document includes:

- ♦ Water demand and use,
- ♦ Local Water Supply Plans,
- **b** Self-Supplied use and registered water withdrawals,
- **b** Water availability, and
- ♦ Interbasin transfers of surface water.

WATER WITHDRAWALS

North Carolina General Statute G.S. 143-215.22H, originally passed in 1991, requires surface water and ground water withdrawals that meet conditions established by the General Assembly to register the water withdrawals and surface water transfers with the State and update those registrations at least every five years. Agricultural water users that withdraw one million gallons of water a day or more and non-agricultural water users that withdraw one hundred thousand gallons of water a day are required to register. Administrative rules that became effective in March 2007 (15A NCAC 02E.0600) stipulate that registrants must also report their water usage annually to the Department of Environment and Natural Resources. In its 2008 session, the General Assembly established civil penalties for failure to comply with these requirements.

In the New River Basin, there are five registered users that withdraw surface water (Table 5-2).

COUNTY	System Name	Source	Public Water Supply ID Link ¹	Ownership
Ashe	Jefferson	New River	<u>01-05-015</u>	Municipality
Watauga	Blowing Rock	Flat Top Branch	<u>01-95-020</u>	Municipality
Watauga	Boone	South Fork NR	<u>01-95-010</u>	Municipality
Watauga	Boone	Winklers Creek	<u>01-95-010</u>	Municipality
Watauga	Appalachian State University	Norris Branch	<u>01-95-101</u>	State

¹ Additional information on average water use by day and month along with a wide variety of other information about the water supply (the facilities LWSP) can be found at the Public Water Supply ID Link supplied in this table.

* Note: This is not necessarily a complete list. Omission from this list does not excuse any party from meeting their permit conditions.

LOCAL WATER SUPPLY PLAN (LWSP)

Units of local government that supply or plan to supply water to the public are required to prepare a Local Water Supply Plan (LWSP). Like the withdrawal registrations, a LWSP must be updated at least every five years and systems required to prepare a LWSP must also report water usage annually to the <u>Division of Water Resources</u>. Preparing a LWSP and keeping it updated meets a local government's obligation to register their water withdrawals under General Statute 143-215.22H. The LWSPs for the five registered users are linked in Table 5-2. Other LWSP reports can be searched on <u>DWRs Water Supply Planning</u> website.

The Town of Sparta

The Town of Sparta updated their LWSP in 2007. At that time the plan stated that "Sparta and the Town of Independence, Va. are currently pursuing an interconnection with water being drawn from the New River which will replace the existing well systems currently serving each town."

That status of that project is progressing and is projected to be completed in 2011.

The Town of Boone

A Finding of No Significant Impact (FONSI) was issued by the U.S. Department of Agriculture, Rural Development State Office for a new run-of-river withdrawal for the Town of Boone to be located on the Watauga County side of the South Fork New River just upstream of the community of Brownwood. The drainage area at the proposed intake is estimated by the applicant to be 101.7 square miles. The intakes proposed permitted capacity is 4.0 million gallons per day (MGD), or 6.18 cubic feet per second (cfs). The proposed project's purpose and need included an emergency source to the Town of Blowing Rock of 0.5 MGD, or 0.77 cfs, through an interconnection. The project is supposed to address Boone's projected 2030 maximum daily demand of 6.8 MGD, or 10.5 cfs, in combination with its existing water sources. The withdrawal mechanism will be a sub-channel infiltration gallery.

The applicant estimated the 7Q10 flow at the proposed intake to be 35.61 cfs, or 23.0 MGD. Twenty percent of this value is 7.12 cfs, or 4.6 MGD. Excepting certain circumstances, DWR has historically considered the withdrawal of a volume less than that representing 20 percent of the 7Q10 as not triggering an intensive field study. The applicant did examine the impact of withdrawals on water depth at the first riffle complex downstream of the intake in consideration of the extensive use of the river for boating.

Boone's water treatment plant's treatment capacity will also be expanded from 3.0 MGD to 4.5 MGD, or 6.95 cfs as part of the proposed project.

Source Water Assessment & Protection (SWAP) of Public Water Supplies in the New River Basin

INTRODUCTION

The Federal Safe Drinking Water Act (SDWA) Amendments of 1996 emphasize pollution prevention as an important strategy for the protection of ground and surface water resources. This new focus promotes the prevention of drinking water contamination as a cost-effective means to provide reliable, long-term and safe drinking water sources for public water supply (PWS) systems. In order to determine the susceptibility of public water supply sources to contamination, the amendments also required that all states establish a Source Water Assessment Program (SWAP). Specifically, Section 1453 of the SDWA Amendments require that states develop and implement a SWAP to:

- b Delineate source water assessment areas;
- 6 Inventory potential contaminants in these areas; and
- **b** Determine the susceptibility of each public water supply to contamination.

In North Carolina, the agency responsible for the SWAP is the Public Water Supply (PWS) Section of the DENR Division of Environmental Health (DEH). The PWS Section received approval from the EPA for their SWAP Plan in November 1999. The SWAP Plan, entitled North Carolina's Source Water Assessment Program Plan, fully describes the methods and procedures used to delineate and assess the susceptibility of more than 9,000 wells and approximately 207 surface water intakes. To review the SWAP Plan, visit the <u>PWS website</u>.

DELINEATION OF SOURCE WATER ASSESSMENT AREAS

The SWAP Plan builds upon existing protection programs for ground and surface water resources. These include the state's Wellhead Protection Program and the Water Supply Watershed Protection Program.

Wellhead Protection (WHP) Program

North Carolinians withdraw more than 88 million gallons of groundwater per day from more than 9,000 water supply wells across the state. In 1986, Congress passed Amendments to the SDWA requiring states to develop wellhead protection programs that reduce the threat to the quality of groundwater used for drinking water by identifying and managing recharge areas to specific wells or wellfields.

Defining a wellhead protection area (WHPA) is one of the most critical components of wellhead protection. A WHPA is defined as "the surface and subsurface area surrounding a water well or wellfield, supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or wellfield." The SWAP uses the methods described in the state's approved WHP Program to delineate source water assessment areas for all public water supply wells. More information related to North Carolina's WHP Program can be found on the <u>SWAP website</u>.

Water Supply Watershed Protection (WSWP) Program

DWQ is responsible for managing the standards and classifications of all water supply watersheds. In 1992, the WSWP Rules were adopted by the EMC and require all local governments that have land use jurisdiction within water supply watersheds adopt and implement water supply watershed protection ordinances, maps and management plans. SWAP uses the established

water supply watershed boundaries and methods established by the WSWP program as a basis to delineate source water assessment areas for all public water surface water intakes. Additional information regarding the <u>WSWP Program</u> can be found at their website.

SUSCEPTIBILITY DETERMINATION - NC'S OVERALL APPROACH

The SWAP Plan contains a detailed description of the methods used to assess the susceptibility of each PWS intake in North Carolina. The following is a brief summary of the susceptibility determination approach.

Overall Susceptibility Rating

The overall susceptibility determination rates the potential for a drinking water source to become contaminated. The overall susceptibility rating for each PWS intake is based on two key components: a contaminant rating and an inherent vulnerability rating. For a PWS to be determined "susceptible", a potential contaminant source must be present and the existing conditions of the PWS intake location must be such that a water supply could become contaminated. The determination of susceptibility for each PWS intake is based on combining the results of the inherent vulnerability rating and the contaminant rating for each intake. Once combined, a PWS is given a susceptibility rating of higher, moderate or lower (H, M or L).

Inherent Vulnerability Rating

Inherent vulnerability refers to the physical characteristics and existing conditions of the watershed or aquifer. The inherent vulnerability rating of groundwater intakes is determined based on an evaluation of aquifer characteristics, unsaturated zone characteristics and well integrity and construction characteristics. The inherent vulnerability rating of surface water intakes is determined based on an evaluation of the watershed classification (WSWP Rules), intake location, raw water quality data (i.e., turbidity and total coliform) and watershed characteristics (i.e., average annual precipitation, land slope, land use, land cover, groundwater contribution).

Contaminant Rating

The contaminant rating is based on an evaluation of the density of potential contaminant sources (PCSs), their relative risk potential to cause contamination, and their proximity to the water supply intake within the delineated assessment area.

Inventory of Potential Contaminant Sources (PCSs)

In order to inventory PCSs, the SWAP conducted a review of relevant, available sources of existing data at federal, state and local levels. The SWAP selected sixteen statewide databases that were attainable and contained usable geographic information related to PCSs.

Source Water Protection

The PWS Section believes that the information from the source water assessments is the basis for future initiatives and priorities for public drinking water source water protection (SWP) activities. The PWS Section encourages all PWS system owners to implement efforts to manage identified sources of contamination and to reduce or eliminate the potential threat to drinking water supplies through locally implemented protection planning.

To encourage and support local SWP, the state offers PWS system owners assistance with local SWP planning as well as materials such as:

- **b** Fact sheets outlining sources of funding and other resources for local SWP efforts.
- **b** Success stories describing local SWP efforts in North Carolina.

b Guidance about how to incorporate SWAP and SWP information in Consumer Confidence Reports (CCRs).

Information related to <u>SWP</u> can be found online.

PUBLIC WATER SUPPLY SUSCEPTIBILITY DETERMINATIONS IN THE NEW RIVER BASIN

In April 2004, the PWS Section completed source water assessments for all drinking water sources and generated reports for the PWS systems using these sources. The assessments are updated regularly; the most recent updates were published in May 2010. The results of the assessments can be viewed in two different ways, either through the interactive ArcIMS mapping tool or compiled in a written report for each PWS system. To access the ArcIMS mapping tool, simply click on the "NC SWAP Info" icon on the <u>web page</u>. To view a report, select the PWS System of interest by clicking on the "Source Water Assessment Results-2010" link found on the SWAP web page.

In the New River Basin, 201 public water supply sources were identified. Six are surface water sources, one is groundwater under the influence of surface water (i.e. a spring) and 194 are groundwater sources. Of the 194 groundwater sources, 2 of them have a Higher, 176 have a Moderate and 16 have a Lower susceptibility rating. The one groundwater under the influence of surface water has a Moderate susceptibility rating. Table 10-1 identifies the surface water sources and their overall susceptibility ratings. It is important to note that a susceptibility rating of Higher does not imply poor water quality. Susceptibility is an indication of a water supply's potential to become contaminated.

PWS ID Number	Inherent Vulnerability Rating	Contaminant Rating	Overall Susceptibility Rating	Name of Surface Water Source	PWS System Name
0105015	Н	L	М	South Fork of NR	Town of Jefferson
0195010	Н	L	М	South Fork of NR	Town of Boone
0195010	Н	L	М	Winklers Creek	Town of Boone
0195020	М	L	М	Town Lake	Town of Blowing Rock
0195101	Н	L	М	Howard's Creek	Appalachian State Univ.
0195101	М	L	М	Norris Branch	Appalachian State Univ.

TABLE 5-3: SWAP RESULTS FOR SURFACE WATER SOURCES IN THE NEW RIVER BASIN

REFERENCES

- North Carolina Department of Environment and Natural Resources (NCDENR). Division of Water Resource (DWR). March 2007. *Water Use During Droughts and Water Supply Emergencies*. North Carolina Administrative Code: 15A NCAC 2E .0600. Raleigh, NC. (http://www.ncwater.org/Rules_Policies_and_Regulations/Planning/drought_rules. pdf)
 - __. DWR. 1991. § 143-215.22H. Registration of Water Withdrawals and Transfers Required. Raleigh, NC.

Note: URL addresses for hyperlinks found in this plan are listed in the <u>Acronyms & Definitions</u> <u>Chapter</u>.

LOCAL INITIATIVES & VOLUNTARY INCENTIVE PROGRAMS

CHAPTER TOPICS Local Initiatives NCNR CG&L 319 Grant SWCD CWMTF

IN THE NEW RIVER BASIN

LOCAL INITIATIVES

The focus of this Section is to highlight some of the local initiatives that have been planned or implemented throughout this planning cycle. This Section also includes a list of watershed groups and natural resource agencies focused on improving water quality across the basin. There may be more of these groups and agencies active within the basin and as DWQ becomes aware of water quality improvement or protection activities, they will be updated within this Section. Please contact the <u>New River Basin Planner</u> to have your program/projects listed here.

THE IMPORTANCE OF LOCAL INITIATIVES

Local initiatives to protect water quality are essential to any community because local citizens make decisions that affect change in their own communities. There are a variety of limitations local initiatives can overcome including limited state government budgets and staff resources, minimal regulations for land use management, rulemaking processes and many others. Local organizations and agencies are able to combine professional expertise in a watershed, thus allowing groups to holistically understand the challenges and opportunities of different water quality efforts. Involving a wide array of people in water quality projects also brings together a wide range of knowledge and interests and encourages others to become involved and invested in these projects.

By working in coordination across jurisdictions and agency lines, more funding opportunities may be available. This will potentially allow local entities to do more work and be involved in more activities because their funding sources are diversified. The most important aspect of these local endeavors is that the more localized the project, the better the chances for success.

The collaboration of local efforts are key to water quality improvements. There are good examples of local agencies and groups using these cooperative strategies throughout the basin and specific groups and projects are discussed within each of the 10-digit watershed write ups in the three Subbasin Chapters. Some of these groups are listed below. DWQ applauds the foresight and proactive response of local watershed groups and local governments to address any number of water quality problems.

Land Protection

NCNR protects land critical for preserving important wildlife habitat, rare and endangered species, cornerstones of biodiversity, and working farmland along the New River and its tributaries, through voluntary acquisitions and conservation easements.

Restoration

NCNR works with private landowners to stabilize eroding stream banks, restore riparian buffers to preventing further erosion, and to create healthy riparian habitat for wildlife and aquatic life.

Advocacy

NCNR works to increase citizens' capacity to defend and protect the New River watershed, by working with local citizens to identify and address specific land and water use activities that threaten the New River's health, wildlife, and scenery.

New River Builder Program

The National Committee for the New River's New River Builder Program was begun in 1998 to establish or improve riparian buffers in the New River Basin. Under CWMTF 2007-407, 14.15 miles of streambank were planted with 112,870 livestakes and 1,060 trees and potted shrubs.

Sites are evaluated for suitability for planting. Severely eroded streambanks are not suitable as River Builder sites. All sites are planted with livestakes of native shrubs, potted native shrubs, and native trees. During a visit with the owner, type and location of shrubs and trees are discussed. River access points are marked and owner questions are addressed. Landowners sign an agreement for each site to leave the plantings undisturbed for 15 years. There is also a small cost share fee charged for each site. A test plot of 100 livestakes is marked at planting and survival monitoring is done at each site annually after the leaves have fallen, in autumn or winter.

To date NCNR has planted almost 70 miles of riparian buffer, including 600,000 livestakes and 18,000 trees and shrubs. Since 1998, the Clean Water Management Trust Fund has funded the River Builder Program almost continuously.



Pictures Provided by NCNR's Lynn Caldwell

ALLEGHANY COUNTY/NRCS

Between 2008 and 2010, the Alleghany County Natural Resource Conservation Service has successfully spent over one million dollars of funding from the Environmental Quality Incentives Program to protect water quality and improving animal health in Alleghany County. Listed below are some of the accomplishments the County has completed in those three years:

- ♦ 5 waste storage structures;
- 6 4 agricultural handling facilities;
- 100+ watering tanks for live stock;
- Several miles of cattle exclusion fencing;
- Several miles of pipeline installed to place tanks away from streams;
- ♦ 200+ acres of true Prescribed Grazing with stockpile winter forage;
- ♦ Several Stream Crossings;
- Heavy-Use areas protected;
- 6 2500 feet of stream restoration; and
- **b** Wetlands created and/or restored.

ALLEGHANY COUNTY ENVIROTHON

Alleghany County has been very active in the North West Envirothon competition since its inception in 1999. The first Alleghany County Envirothon was held March 2008 as a way to provide additional training and experience for local teams entering the thirteen county NW Envirothon Competition held each spring in Wilkes County. There are 52 teams registered for the 2011 regional event to be held March 31, 2011.

The spirit of competition stimulates student's interests in environmental concerns and cultivates student's desire to learn more about our natural resources and environmental issues and motivates them to further develop their skills and grow into environmentally-aware, actionoriented adults. Teams are tested on their knowledge and understanding of local natural resource issues in aquatics, forestry, soils, wildlife, and current issues.

The "Outdoor Masters" from Glade Creek Elementary and the "Green Machine" from Alleghany high school competed with 49 middle school and 51 high school teams in the North Carolina State Envirothon held April 23-24, 2010 at Cedarock Park in Alamance County. They moved on to the state level competition after winning one of the top seven seats in the Area 2 NW Envirothon competition held March 25, 2010 at the McGee Educational Resource Center in Wilkesboro, NC.

FEDERAL, STATE & LOCAL INCENTIVE PROGRAMS

CONSTRUCTION GRANTS & LOANS (CG&L)

The NC Construction Grants and Loans (CG&L) Section of DWQ provides grants and loans to local government agencies for the construction, upgrades and expansion of wastewater collection and treatment systems. As a financial resource, the section administers five major programs that assist local governments. Of these, two are federally funded programs administered by the state, the Clean Water State Revolving Fund (SRF) Program and the State and Tribal Assistance Grants (STAG). The STAG is a direct congressional appropriations for a specific "special needs" project within NC. The High Unit Cost Grant (SRG) Program, the State Emergency Loan (SEL) Program and the State Revolving Loan (SRL) Program are state funded programs, with the later two being below market revolving loan money. The Section also received an additional

Capitalization Grant authorized by the American Recovery and Reinvestment Act of 2009 in the amount of \$70,729,100. These funds are administered according to existing SRF procedures. All projects must be eligible under title VI of the Clean Water Act. For more information, please see the <u>CG&L</u> website. No funds were awarded in the New River Basin between 2003 and 2010.

SECTION 319 - GRANT PROGRAM

Section 319 of the Clean Water Act provides grant money for nonpoint source demonstration and restoration projects. Through annual base funding, there is approximately \$450,000 available for demonstration and education projects across the state. An additional \$2 million is available annually through incremental funds for restoration projects statewide. All projects must provide non-federal matching funds of at least 40% of the project's total costs. Project proposals are reviewed and selected by the North Carolina Nonpoint Source Workgroup made up of state and federal agencies involved in regulation or research associated with nonpoint source pollution. Information on the North Carolina <u>Section 319 Grant Program</u> application process is available online. Descriptions of <u>current projects</u> and general Section 319 Program information are available online.

Many 319 projects are demonstration projects and educational programs that allow for the dissemination of information to the public through established programs at NC State University (NCSU) and the NC Cooperative Extension Service. Other projects fund stream restoration activities that improve water quality. Between 2003 and 2010, there were two projects in the New River basin funded through the Section 319 Program. Managed by NCSU, the goal of one project – Anaerobic Biotreatment of Acid Mine Drainage at Ore Knob Mine – was to develop a watershed restoration plan for a watershed impaired by acid mine drainage from an abandoned copper and zinc mine. The watershed characterization included surface water and groundwater monitoring and extensive characterization of the mine tailings pile. The project also evaluated several alternative approaches to the management and cleanup of the tailings pile and the acid mine drainage being released from the pile to achieve required pollutant load reductions.

The second 319 project was coordinated by the National Committee for the New River, which restored the headwaters of an unnamed tributary to the Little Phoenix River in Ashe County. The project successfully restored the stream dimension and profile to 315 linear feet of the tributary, allowing the sediment load to be properly transported through the stream reach during high flow events. This restoration included the replacement of a culvert with a steel beam and concrete bridge. Stream banks were stabilized to prevent further erosion, with a 99% survival rate observed at the end of the project period for the trees and shrubs that were planted. Benthic habitat in the stream was greatly improved through this restoration project, as indicated by monitoring conducted by the Division of Water Quality.

Table 6-1 list the most current 319 contracts in the New River Basin. More information can be found about these contracts and the <u>319 Grant Program</u> on their website.

Fiscal Year	Contract Number	ΝΑΜΕ	DESCRIPTION	10-Digiт HUC	Agency	Funding
2004	711	Little Phoenix Creek Stream Restoration	Stream Restoration	0505000101	National Committee for New River	\$65,400
2005	EW06045	Anaerobic Biotreatment of Acid Mine Drainage of Ore Knob Mine	Innovative BMP	0505000102	NCSU	\$153,194
Total Fu	nded:					\$ 218,594

TABLE 6-1: 319 GRANT CONTRACTS IN THE NEW RIVER BASIN BETWEEN 2003 & 2008

Soil & WATER CONSERVATION

The **Division of Soil and Water Conservation** cooperates with federal and local partners to administer a comprehensive statewide program to protect and conserve the state's soil and water resources. The division serves as staff for the North Carolina Soil and Water Conservation Commission to help deliver conservation programs at the local level. The division provides leadership and assistance in locally-led conservation to the state's 96 local soil and water conservation districts and their state association by providing financial, technical and educational assistance to districts, landowners, agricultural producers and the general public. The division delivers programs in nonpoint source pollution management, cost share for agricultural best management practices, technical and engineering assistance, soil surveys, conservation easements, and environmental and conservation education.

Their mission is to provides programs, technical services and educational outreach promoting voluntary natural resource management and conservation on the private lands of North Carolina through a non-regulatory, incentive-driven approach.

Locally, the Alleghany Soil and Water Conservation District has allocated a total of \$618,757 in cost shared funding to improve water quality in the New River basin between 2006 and 2010 with the installation of several Agricultural Cost Share Program BMPs and Community Cost Share Program BMPs which are listed out below.

Agricultural Cost Share Program (ACSP)

The <u>ACSP</u> is a voluntary program to protect water quality by installing best management practices on agricultural lands. This approach is supported by financial incentives, technical and educational assistance, research, and regulatory programs provided to farmers by local soil and water conservation districts.

Alleghany County Soil & Water Conservation District

Conservation Cover BMPs:

• 399 ac. BMPs to decrease erosion by improving ground cover (pasture renovation, cropland conversion, critical area stabilization, conservation tillage)

Stream Protection BMPs:

- 6 21,435 ft livestock exclusion
- 6 48 troughs or tanks with heavy use areas
- ♦ 13 wells
- ♦ 7 stream crossings
- 5 7 spring developments

Waste Management BMPs:

- ♦ 8 feed/waste storage structures with heavy use areas
- ♦ 9 roof run off/stormwater management systems

Benefits include:

- ♦ 2070 acres affected
- 1632 tons of soil saved
- ♦ 5386 lbs of nitrogen managed/saved

Alleghany County adopted the Voluntary Farmland Preservation Program in 2003 which is administered by the Soil & Water District. As of February 2011, the county has 9,932 acres of land enrolled in the Farmland Preservation Program. The purpose of this program is to promote

the health, safety, rural agricultural values, and general welfare of the County, and more specifically, increase identity and pride in the agricultural community and its way of life; encourage the economic and financial health of farming; increase protection from undesirable, non-farm development; and increase the protection of farms from nuisance suits and other negative impacts on properly managed farms.

More information about this program can be found in the Alleghany County <u>Voluntary Farmland Preservation</u> <u>Program Ordinance</u> online.

Community Conservation Assistance Program

<u>CCAP</u> is a voluntary, incentive-based program designed to improve water quality through the installation of various best management practices (BMPs) on urban, suburban and rural lands not directly involved with agriculture production. Eligible landowners may include homeowners, businesses, schools, parks and publicly owned lands. How rapid urbanization affects water quality becomes important as North Carolina's land use continues to change. CCAP can help educate landowners on water quality, stormwater management and retrofit practices to treat stormwater runoff.

Alleghany County

Through the Community Conservation Assistance Program the district is helping to treat stormwater runoff on 1,826,850 sq/ft of impervious surface in the Bledsoe Creek priority watershed with BMPs like critical area stabilization and a stormwater wetland project through partnering with the Town of Sparta to complete. These practices will affect 500 people in the Town of Sparta by reducing N and P from the stream. The Alleghany district is also assisting in installation of pet waste receptacles in the Sparta Town Park to further protect Bledsoe Creek/Little River/New River.

The district is partnering with the local high school shop class to convert 55 gallon barrels used by local businesses into rain barrels for homeowners. This will help by treating the roof runoff and keeping the plastic barrels out of the landfill and out of the river, where they sometimes end up.

The Alleghany District also partnered with the Ecosystems Enhancement Program to find stream restoration projects on several sub-watersheds in the county. Projects on Crab Creek, Glade Creek and Little Pine Creek are currently under construction or near completion. The district is working with EEP to find willing landowners for a new project in one of the priority areas identified in the Bledsoe Creek Watershed Management Plan which was completed in 2007. (More information on projects such as benefits, acres of easement, etc. should be available through EEP.)

The district has acquired a conservation easement on a farm on the New River and hopes to hold more easements that will allow for protection of the New River watershed.



FIGURE 6-2: NC ACSP BMPs IMPLEMENTED IN THE NEW RIVER BASIN BETWEEN 1-2003 & 10-2010

CLEAN WATER MANAGEMENT TRUST FUND (CWMTF)

Created in 1996, the Clean Water Management Trust Fund (<u>CWMTF</u>) makes grants to local governments, state agencies and conservation non-profits to help finance projects that specifically address water pollution problems. The fund has made several investments in the New River Basin. Table 6-2 includes a list of recent (2003-2009) projects and their cost. These projects include several land acquisitions and restoration funding.

TABLE 6-2: CLEAN WATER MANAGEMENT TRUST FUND PROJECTS BETWEEN 2003 - 2009

ID	Applicant Name	Purpose	Amount Funded	TOTAL COST
2010D-010	Blue Ridge Conservancy - donated/ Long Branch Cr	Mini-grant- Donated	\$25,000	\$314,794
2010D-007	Blue Ridge Conservancy - donated/ Old Orchard	Mini-grant- Donated	\$19,000	\$68,500
2010D-005	National Committee for the New River - donated/ ,MacConnell Tract	Mini-grant- Donated	\$20,100	\$182,650
2010D-001	National Committee for the New River - donated/ Gentry Tract	Mini-grant- Donated	\$22,225	\$435,675
2010-414	National Committee for the New River - Rest/ Old Field Creek Stream Restoration	Restoration	\$95,100	\$208,165
2010-413	National Committee for the New River - Rest/ River Builder Project, New River	Restoration	\$285,852	\$307,000
2010-035	National Committee for the New River - Acq/ Darnell Tract,New River State Park, Roan Creek	Acquisition-Buffers	\$416,000	\$931,710
2010-004	Blue Ridge Conservancy - Acq/ Braun Tract, Big Laurel Creek	Acquisition-Buffers	\$1,621,000	\$3,819,713
2009D-017	Blue Ridge Rural Land Trust - Donated Minigrant/ Tobin Tr	Mini-grant- Donated	\$24,975	\$278,384
2009D-015	Blue Ridge Rural Land Trust - Donated Minigrant/ Black Tr	Mini-grant- Donated	\$23,800	\$205,350
2009D-014	Blue Ridge Rural Land Trust - Donated Minigrant/ Baldridge Farm	Mini-grant- Donated	\$25,000	\$86,750
2008S-003	West Jefferson, Town of - Storm Minigrant/ Planning/Little Buffalo Creek	Mini-grant- Stormwater	\$50,000	\$55,000
2008G-010	Watauga County - Mini/Greenway/Planning/ New River	Mini-grant- Greenway	\$35,000	\$42,000
2008G-005	Sparta, Town of - Greenway Planning Minigrant/ Bledsoe Cr	Other	\$35,000	\$44,000
2008D-014	Piedmont Land Conservancy - Donated Minigrant/ Davis Chapel Tr	Mini-grant- Donated	\$25,000	\$480,000
2008D-012	Blue Ridge Rural Land Trust - Donated Minigrant/ Baldwin Tr/ Helton Cr	Mini-grant- Donated	\$20,700	\$406,600
2008D-004	Blue Ridge Rural Land Trust - Donated Minigrant/ Black Tract/ UT Prathers Cr	Mini-grant- Donated	\$25,000	\$1,385,000
2008-812	National Committee for the New River - Plan/ Rest/ Old Field Creek Restoration (Withdrawn)	Planning	\$24,000	\$34,400
2008-811	National Committee for the New River - Plan/ Rest/ Lambert-Leight Tracts, North Fork New River (Withdrawn)	Planning	\$25,000	\$45,800
2008-810	National Committee for the New River - Plan/ Rest/ Boone Greenway Restoration	Restoration	\$25,000	\$75,000

ID	Applicant Name	Purpose	Amount Funded	TOTAL COST
2008-711	Pilot View RC&D, Inc - Storm/ Town of Sparta BMPs and Master Plan	Stormwater	\$297,250	\$397,424
2008-420	Resource Institute, Inc - Rest/ Pine Orchard Creek Creek Restoration	Restoration	\$374,000	\$446,612
2008-409	National Committee for the New River - Rest/ NRSP Oliver Tract, South Fork New River	Restoration	\$152,000	\$165,700
2008-408	National Committee for the New River - Rest/ Jimmy Smith Park, Boone Creek	Restoration	\$55,000	\$73,040
2008-401	Appalachian State University - Rest/ Boone Creek Restoration	Restoration	\$422,400	\$1,067,727
2008-1011	National Committee for the New River - InnovSW/ Kraut Cr Urban SW Demo	Innovative Stormwater	\$136,000	\$148,000
2008-069	Sparta, Town of - Acq/ Bledsoe Creek Greenway	Acquisition-Buffers	\$200,000	\$240,491
2008-052	NC Wildlife Resources Commission - Acq/ Miller-Hufnagel Tracts, Ben Bolen Creek (Withdrawn)	Acquisition-Buffers	\$316,000	\$872,880
2008-047	NC Div Parks & Recreation - Acq/ Snake Mountain Tract, North Fork New River (Withdrawn)	Acquisition-Buffers	\$603,000	\$3,645,370
2008-022	High Country Conservancy - Acq/ Bluff Mountain, Buffalo Creek	Acquisition-Buffers	\$710,000	\$1,402,550
2008-002	Blue Ridge Rural Land Trust - Acq/ Pond Mountain Tract, Big Horse Creek	Acquisition-Buffers	\$5,000,000	\$13,800,000
2007S-003	Boone, Town of - SStorm Minigrant/ South Fork New River	Mini-grant- Stormwater	\$50,000	\$62,000
2007D-005	National Committee for the New River - Donated Minigrant/ Peak Tract, S. Fork New River	Mini-grant- Donated	\$21,453	\$162,553
2007D-004	National Committee for the New River - Donated Minigrant/ Arrendell Tract, N. Fork New River	Mini-grant- Donated	\$21,607	\$165,607
2007D-003	National Committee for the New River - Donated Minigrant/ Earnhardt Tract, Grassy Creek (Withdrawn)	Mini-grant- Donated	\$22,334	\$412,834
2007D-002	National Committee for the New River - Donated Minigrant/ Caldwell Tract, S. Fork New River	Mini-grant- Donated	\$22,172	\$200,992
2007D-001	National Committee for the New River - Donated Minigrant/ Langer Tract, S. Fork New River	Mini-grant- Donated	\$23,241	\$326,241
2007-703	Boone, Town of - Storm/ Constructed Wetlands and Retrofits, South Fork New River	Stormwater	\$178,000	\$280,000
2007-418	Resource Institute, Inc - Rest/ Pine Orchard Creek Restoration	Restoration	\$146,000	\$236,000
2007-407	National Committee for the New River - Rest/ River Builder Program, New River Tributaries	Restoration	\$238,000	\$253,336
2007-406	National Committee for the New River - Rest/ East Fork New River Restoration	Restoration	\$189,962	\$233,307
2007-405	National Committee for the New River - Rest/ Boone Creek Restoration	Restoration	\$27,000	\$35,912
2006D-033	Blue Ridge Rural Land Trust - Donated Minigrant/ Old Fields Farm, Elk Creek	Mini-grant- Donated	\$25,000	\$1,415,000

ID	Applicant Name	Purpose	Amount Funded	TOTAL COST
2006D-032	High Country Conservancy - Donated Minigrant/ Reninger Tract, Winkler Creek	Mini-grant- Donated	\$25,000	\$415,000
2006D-023	Blue Ridge Rural Land Trust - Donated Minigrant/ Koontz Farm, Stillhouse Branch	Mini-grant- Donated	\$25,000	\$1,480,000
2006B-014	National Committee for the New River - Acq/ Main Tracts, North Fork New River and Mine Branch (Transferred to Div of Parks and Rec	Acquisition-Buffers	\$116,000	\$358,415
2006A-819	Sparta, Town of - Stormwater Minigrant/ Stormwater Drainage Study, Bledsoe Creek	Mini-grant- Stormwater	\$27,000	\$30,000
2005D-021	Blue Ridge Rural Land Trust - Donated Minigrant/ Coffey Tract, Aho Branch	Mini-grant- Donated	\$20,000	\$300,000
2005D-017	Blue Ridge Rural Land Trust - Donated Minigrant/ Tobin Farm, South Beaver Creek	Mini-grant- Donated	\$25,000	\$325,000
2005D-015	Blue Ridge Rural Land Trust - Donated Minigrant/ Tate Farm II, Ripshin Creek	Mini-grant- Donated	\$25,000	\$565,000
2005D-007	National Committee for the New River - Donated Minigrant/ Smith Farm	Mini-grant- Donated	\$20,300	\$151,300
2005D-006	National Committee for the New River - Donated Minigrant/ Kemp Tract, North Fork New River	Mini-grant- Donated	\$18,000	\$39,000
2005D-004	Blue Ridge Rural Land Trust - Donated Minigrant/ Davis Tract, Little Horse Creek *	Mini-grant- Donated	\$24,000	\$124,000
2005D-003	Blue Ridge Rural Land Trust - Donated Minigrant/ Clark/Burleson Tract, Little Horse Creek	Mini-grant- Donated	\$24,000	\$174,000
2005D-001	Blue Ridge Rural Land Trust - Donated Minigrant/ Almond Farm, Piney Creek	Mini-grant- Donated	\$15,000	\$235,000
2005B-028	NC Div Parks & Recreation - Acq/ Bower and Darnell Tracts, South Fork New River	Acquisition-Buffers	\$2,270,000	\$6,561,000
2005A-805	National Committee for the New River - Plan/ Rest/ Boone Creek Greenway and Restoration Plan	Planning	\$30,000	\$54,000
2004D-013	High Country Conservancy - Donated Minigrant/ Horseshoe Farm Tract	Mini-grant- Donated	\$24,052	\$361,552
2004D-009	Blue Ridge Rural Land Trust - Donated Minigrant/ McCarthy Tract, Little Glade Creek *	Mini-grant- Donated	\$25,000	\$207,000
2004D-005	National Committee for the New River - Donated Minigrant/ Joyner Tract, Big Horse Creek	Mini-grant- Donated	\$23,200	\$99,200
2004D-002	Blue Ridge Rural Land Trust - Donated Minigrant/ Chanlett Tract, Stillhouse Branch	Mini-grant- Donated	\$25,000	\$308,000
2004D-001	Blue Ridge Rural Land Trust - Donated Minigrant/ Stack Tract	Mini-grant- Donated	\$25,000	\$348,000
2004B-027	Nature Conservancy, The - Acq/ Trout Club Tract, Long Hope Creek	Acquisition-Buffers	\$2,967,000	\$3,418,000
2003A-016	National Committee for the New River - Acq/ New River Heights Tract, South Fork (Withdrawn)	Acquisition-Buffers	\$396,000	\$714,050
Total Amount	S		\$18,222,723	\$51,717,584

CHAPTER 7

OTHER NATURAL RESOURCE PROGRAMS

IN THE NEW RIVER BASIN

NATURAL RESOURCE PROGRAMS

The efforts of several Natural Resource Programs are discussed throughout this basin plan. Many of these programs are mentioned briefly in the Watershed Chapters as part of a coordinated effort to protect and/or restore water quality and are locally based. Other programs which have similar purposes but have a basin, state or national focus are discussed in more detail here. This chapter is by no means a complete listing of Natural Resource Programs that are active in the New River basin, but rather a discussion of a few highly active programs and their involvement in restoration and/or protection efforts within the basin. The Source Water Assessment & Protection Program is discussed in the <u>Water Quantity Chapter</u>. Additional programs may be added in the future.

Several locally based Natural Resource Programs and their efforts during this planning cycle are discussed in the <u>Voluntary Incentive Programs & Local Initiatives Chapter</u>. That chapter will also expand as additional local program efforts become known.

ECOSYSTEM ENHANCEMENT PROGRAM (EEP)

EEP uses watershed planning at two scales (basinwide and local) to identify the best locations to implement stream, wetland and riparian buffer restoration/enhancement and preservation projects. The planning process considers where mitigation is needed and how mitigation efforts might contribute to the improvement of water quality, habitat and other vital watershed functions in the state. Watershed planning requires GIS data analysis, stakeholder involvement, water quality monitoring, habitat assessment and consideration of local land uses and ordinances. It is a multi-dimensional process which considers science, policy and partnership.

RIVER BASIN RESTORATION PRIORITIES

EEP River Basin Restoration Priorities (RBRPs) are focused on the identification of Targeted Local Watersheds (TLWs) within the 8-digit Cataloging Units (subbasins) that comprise individual river basins. TLWs represent priority areas (14-digit HUCs) for the implementation of stream and wetland mitigation projects. GIS screening factors considered in the selection of TLWs include: documented water quality impairment and habitat degradation, the presence of critical habitat or significant natural heritage areas, the presence of water supply watersheds or other high-quality waters, the condition of riparian buffers, estimates of impervious cover, existing or planned transportation

projects, and the opportunity for local partnerships. Recommendations from local resource agency professionals and the presence of existing watershed projects are given significant weight in the selection of TLWs. RBRP documents (and TLW selections) for each of the 17 river basins in North Carolina are updated periodically to account for changing watershed conditions, increasing development pressures and local stakeholder priorities.

The most recent update to the New River Basin TLWs occurred in 2009. In total, eight 14-digit HUCs have been designated TLWs by EEP in the New River basin (8-digit CU 05050001). The updated RBRP, including a summary table of Targeted Local Watersheds, can be found at EEP's New River Basin website.

8-Digit HU	TLW's (#)	LWP
05050001	8	Little River & Brush Creek (including Bledsoe Creek)

LOCAL WATERSHED PLANNING

EEP Local Watershed Planning (LWP) initiatives are conducted in specific priority areas (typically a cluster of two or three Targeted Local Watersheds) where EEP and the local community have identified a need to address critical watershed issues. The LWP process typically takes place over a two-year period, covers a planning area around 50 to 150 square miles, and includes three distinct phases: I - existing data review and preliminary watershed characterization (largely GIS-based); II – detailed watershed assessment (including water quality & biological monitoring and field assessment of potential mitigation sites); and III – development of a final Project Atlas and Watershed Management Plan. EEP collaborates with local stakeholders and resource professionals throughout the process to identify projects and management strategies to restore, enhance and protect local watershed resources.

In 2005, EEP initiated a Local Watershed Planning (LWP) effort in the 111-square mile Little River and Brush Creek watersheds in Alleghany County. This LWP culminated in 2007 with the development of a Project Atlas identifying stream and wetlands restoration and preservation sites within priority sub-watersheds and a detailed Watershed Management Plan for the Bledsoe Creek focus area. This work included the development of specific stormwater management recommendations for the Town of Sparta and the identification and modeling of stormwater BMP project sites. EEP is currently working with local resource professionals and landowners to implement stream and wetland restoration/enhancement and preservation projects in the two LWP watersheds. For more information on this LWP initiative, go to the <u>EEP LWP Fact Sheet</u>.

More information about the River Basin Restoration Priorities and LWP project areas within the New River Basin can be found on the <u>EEP website</u>.

EEP PROJECTS IN THE NEW RIVER BASIN

As of September 2010, EEP had a total of 15 mitigation projects in some stage of being completed in the New River Basin. These stages include design; construction; monitoring (construction complete); and long-term stewardship. Table 7-2 provides details on these projects, which include stream and wetland restoration/enhancement and preservation projects. In total, EEP is in some stage of restoration or enhancement on over 45,000 feet of stream and approximately 20 acres of wetlands in the New River basin. In addition, the program is in some stage of preservation on over 29,000 feet of stream and 22 acres of wetlands. For additional information about EEP's Project Implementation efforts, go to the <u>EEP Project Implementation webpage</u>. To view the locations of these project sites, go to <u>EEP's Web Map site</u>.
TABLE 7-2: EEP PROJECTS IN SOME STAGE OF COMPLETION IN THE NEW RIVER BASIN (8-DIGIT HU 05050001)

HUC	Projects	Stream Restoration/	Stream	Wetland Restoration/	Wetland
	(#)	Enhancement (ft)	Preservation (ft)	Enhancement (ac)	Preservation (ac)
05050001	15	45,384	29,491	19.9	22.2

FORESTRY

FORESTLAND OWNERSHIP*

Approximately 98% of the forestland in the basin is privately-owned, with the remaining 2% comprised of publically-owned lands. The most notable public forested lands in the basin are New River State Park, and Mount Jefferson State Park. Within North Carolina's portion of this river basin, there are no State Forests or National Forest lands.

* The ownership estimates come from the most recent data published by the USDA-Forest Service ("Forest Statistics for North Carolina, 2002." Brown, Mark J. Southern Research Station Resource Bulletin SRS-88. January 2004).

FOREST WATER QUALITY REGULATIONS

Forestry operations in North Carolina are subject to regulation under the Sedimentation Pollution Control Act of 1973 (Article 4-GS113A, referred to as "SPCA"). However, forestry operations may be exempted from specific requirements of the SPCA if the operations meet the compliance performance standards outlined in the Forest Practices Guidelines Related to Water Quality (15A NCAC 11.0100 - .0209, referred to as "FPGs") and General Statutes regarding stream and ditch obstructions (GS 77-13 and GS 77-14).

The FPG performance standard rule-codes and topics include:

- 6 .0201: Streamside Management Zone (SMZ)
- 6 .0202: Prohibition of Debris Entering Streams and Waterbodies
- 6 .0203: Access Road and Skid Trail Stream Crossings
- 6 .0204: Access Road Entrances
- **b** .0205: Prohibition of Waste Entering Streams, Waterbodies, and Groundwater
- 6 .0206: Pesticide Application
- 6 .0207: Fertilizer Application
- 6 .0208: Stream Temperature
- 6 .0209: Rehabilitation of Project Site

The NC-DFR is delegated the authority to monitor and evaluate forestry operations for compliance with these aforementioned laws and/or rules. In addition, the NC-DFR works to resolve identified FPG compliance questions brought to its attention through citizen compliants. Violations of the FPG performance standards that cannot be resolved by the NC-DFR are referred to the appropriate State agency for enforcement action. During the period January 1, 2004 through December 31, 2009 there were 167 FPG inspections conducted on forestry-related sites in the basin; approximately 81% of the sites were in compliance upon the initial site inspection.

OTHER WATER QUALITY REGULATIONS

In addition to the multiple State regulations noted above, NC-DFR monitors the implementation of the following Federal rules relating to water quality and forestry operations:

- **b** The Section 404 silviculture exemption under the Clean Water Act for activities in wetlands;
- **b** The federally-mandated 15 best management practices (BMPs) related to road construction in wetlands;
- ⁶ The federally-mandated BMPs for mechanical site preparation activities for the establishment of pine plantations in wetlands of the southeastern U.S.

WATER QUALITY FORESTERS

The entire river basin is included within the coverage area of a Water Quality Forester, who is based out of the Lenoir District Office. Statewide, there is a Water Quality Forester position in 9 of NC-DFR's 13 operating districts. Water Quality Foresters conduct FPG inspections, assist with BMP implementation, develop pre-harvest plans, and provide training opportunities for landowners, loggers and the public regarding water quality issues related to forestry. These foresters also assist County Rangers on follow-up site inspections and provide enhanced technical assistance to local agency staff. Water Quality Foresters are the primary point of contact in their districts for responding to water quality or timber harvesting questions or concerns that are suspected to be related to forestry activities.

FORESTRY BEST MANAGEMENT PRACTICES

Implementing forestry Best Management Practices (BMPs) is strongly encouraged to efficiently and effectively protect the water resources of North Carolina. In 2006, the first ever revision to the North Carolina forestry BMP manual was completed. This comprehensive update to the forestry BMP manual is the result of nearly four years of effort by the NC-DFR and a DENRappointed Technical Advisory Committee consisting of multiple sector stakeholders, supported by two technical peer-reviews. The forestry BMP manual describes measures that may be implemented to help comply with the forestry regulations while protecting water quality. Copies of the forestry BMP manual can be obtained at a County or District office, or <u>online</u>.

In the basin during this period, the NC-DFR assisted with or observed 265 forestry activities in which BMPs were either implemented or recommended, encompassing a total area greater than 10,000 acres.

From March 2000 through March 2003, the DFR conducted a statewide BMP Implementation Survey on 565 active forest harvest operations to evaluate the usage of forestry BMPs. This survey evaluated 18 sites in this river basin, with a resulting BMP implementation rate of 68%. The problems most often cited in this survey across the state relate to stream crossings, skid trails and site rehabilitation. A copy of this report is available from the DFR Raleigh Central Office or can be downloaded from the Web site <u>water quality webpage</u>. A second round of BMP Implementation Surveys was conducted on additional logging sites statewide from 2006 to 2008; at this time, the data is being compiled and a report of the findings will be available in 2010. These periodic, recurring BMP surveys serve as a basis for focused efforts in the forestry community to address water quality concerns through better and more effective BMP development, implementation and training.

PROTECTING STREAM CROSSINGS WITH BRIDGEMATS

The NC-DFR provides bridgemats on loan to loggers for establishing temporary stream crossings during harvest activities in an effort to educate loggers about the benefits of installing crossings in this manner. Temporary bridges can be a very effective solution for stream crossings, since

the equipment and logs stay completely clear of the water channel. Bridgemats are available for use in this basin, and have been for several years. Periodic status reports, a list of bridgemat suppliers, and additional information are available at <u>DFR bridgemat webpage</u>.

CHRISTMAS TREE PRODUCTION

North Carolina's Christmas tree industry is predominant within the New River basin, and remains an important economic driver in this region of the state. It should be noted that the NC-DFR does not oversee regulations or land-clearing activities associated with Christmas tree production. These activities are not considered forestry ("silviculture") activities, but are instead deemed to be an agricultural or horticultural activity. County Soil & Water Conservation District or USDA-Natural Resources Conservation Service (NRCS) personnel can provide BMP assistance. Additional information about Christmas trees is available from the <u>N.C. Cooperative</u> <u>Extension Service</u>.

FOREST REGENERATION & PLANNING

Approximately 2,900 acres of land were established or regenerated with forest trees across the basin from January 1, 2004 through December 31, 2009. During this same time period the NC-DFR produced more than 700 individual forest plans for landowners that encompassed almost 31,000 acres of forestland in the basin.

EDUCATION & OUTREACH

Each year since 2004 the NC-DFR summarizes its BMP, water quality, and nonpoint source accomplishments in a color brochure entitled "Year In Review". <u>This report</u> is available on the Web.

The North Carolina Forestry Association, in cooperation with forest industry, NC-DFR, and NCSU, conducts educational programs annually at different locations in the North Carolina. The first program is called the Forestry and Environmental Camp, and is for middle and high school aged children. These 3-day long camps introduce children to the basic science and math skills needed when practicing forestry. The second program is the Sustainable Forestry Teachers Academy/Tour, and educates school teachers about forestry practices and how forest products are manufactured. For more information about these programs visit <u>NC Forestry Association</u> web page.

CONTACTS

OFFICE LOCATION	CONTACT PERSON	Рноле	Address
Lenoir District: D2	Water Quality Forester	(828) 757-5611	1543 Wilkesboro Blvd., NE Lenoir, NC 28645-8215
Western Regional Office: Region III	Asst. Regional Forester	(828) 665-8688	14 Gaston Mountain Road Asheville, NC 28806-9101
Raleigh Central Office	Nonpoint Source Branch - Forest Hydrologist	(919) 857-4856	1616 Mail Service Center Raleigh, NC 27699
Griffiths Forestry Center	Water Quality & Wetlands Staff Forester	(919) 553-6178 Ext. 230	2411 Old US Hwy 70-West Clayton, NC 27520

TABLE 7-3: NORTH CAROLINA DFR CONTACTS FOR THE NEW RIVER BASIN

References

- North Carolina Department of Environment Natural Resources (NCDENR). Division of Forest Resources (DFR). January 1990. *Forest Practices Guidelines Related to Water Quality. North Carolina Administrative Code: 15A General Statute 77-13 and 77-14*. Raleigh, NC.
 - _____. Division of Water Quality (DWQ). August 2004a. *Classifications and Water Quality Standards Applicable to Surface Waters and Wetlands of North Carolina*. North Carolina Administrative Code: 15A NCA 2B .0220. Raleigh, NC.
- ____. Division of Land Resources (DLR). 1999. *Sedimentation Pollution Control Act of 1973.* § 113A Article 4. Raleigh, NC
- USDA-Forest Service. *Forest Statistics for North Carolina, 2002.* Brown, Mark J. Southern Research Station Resource Bulletin SRS-88. January 2004.

Note: URL addresses for hyperlinks found in this plan are listed in the <u>Acronyms & Definitions</u> <u>Chapter</u>.

CHAPTER 8

2010 Use Support & Methodology

IN THE NEW RIVER BASIN

2010 IR Category	INTEGRATED REPORTING CATEGORIES FOR INDIVIDUAL ASSESSMENT UNIT/USE SUPPORT CATEGORY/ PARAMETER ASSESSMENTS. A SINGLE AU CAN HAVE MULTIPLE ASSESSMENTS DEPENDING ON DATA AVAILABLE AND CLASSIFIED USES.
1	All designated uses are monitored and supporting
1b	Designated use was impaired, other management strategy in place and no standards violations for the parameter of interest (POI)
1nc	DWQ have made field determination that parameter in exceedance is due to natural conditions
1r	Assessed as supporting watershed is in restoration effort status
1t	No criteria exceeded but approved TMDL for parameter of interest
2	Some designated uses are monitored and supporting none are impaired Overall only
2b	Designated use was impaired other management strategy in place and no standards violations Overall only
2r	Assessed as supporting watershed is in restoration effort status overall only
2t	No criteria exceeded but approved TMDL for POI Overall only
3a	Instream/monitoring data are inconclusive (DI)
3b	No Data available for assessment
3c	No data or information to make assessment
3n1	Chlorophyll a exceeds TL value and SAC is met-draft
3n2	Chlorophyll a exceeds EL value and SAC is not met first priority for further monitoring-draft
3n3	Chlorophyll a exceeds threshold value and SAC is not met first second priority for further monitoring-draft
3n4	Chlorophyll a not available determine need to collect-draft
3t	No Data available for assessment –AU is in a watershed with an approved TMDL
4b	Designated use impaired other management strategy expected to address impairment
4c	Designated use impaired by something other than pollutant
4cr	Recreation use impaired no instream monitoring data or screening criteria exceeded
4cs	Shellfish harvesting impaired no instream monitoring data-no longer used
4ct	Designated use impaired but water is subject to approved TMDL or under TMDL development
4s	Impaired Aquatic Life with approved TMDL for Aquatic Life POI or category 5 listing
4t	Designated use impaired approved TMDL
5	Designated use impaired because of biological or ambient water quality standards violations and needing a TMDL
5r	Assessed as impaired watershed is in restoration effort status

	NC 2010 Integrated Report							
	All 13,123 Waters in NC are in Category 5-303(d) List for Mercury due to statewide fish consumption advice for several fish species							
AU_	Numb	er AU_Name	AU_Description	LengthAr	ea AU_Units Clas	ssification		
Ca	egory	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year		
Ne	w Rive	er Basin		North Fork New River	Watershed 050	5000101		
Ne		ver Basin	Upper N	ew River Subbas	0.	5050001		
Ne	W RIVE	er Basin			watershed 050	5000101		
Ο	10-2	-21-(4.5) Big Horse Creek	From SR#1362 to SR#135	3 (Tuckerdale)	5.5 FW Miles	s C;1r:+		
	1	Ecological/biological Integrity Benth	excellent Bioclassification	Aquatic Life	2008			
•	10-2	-21-(7) Big Horse Creek (Horse Creek)	From SR#1353 (Tuckerda New R	le) to North Fork	6.5 FW Miles	6 C:+		
	1	Ecological/biological Integrity Benth	tos Excellent Bioclassification	Aquatic Life	2008			
	1	Ecological/biological Integrity FishC	Com Good Bioclassification	Aquatic Life	2008			
•	10-2	-14 Big Laurel Creek	From source to North Fo	rk New River	17.5 FW Miles	G C;Tr:+		
	1	Ecological/biological Integrity Benth	tos Excellent Bioclassification	Aquatic Life	2008			
	1	Ecological/biological Integrity FishC	Com Good Bioclassification	Aquatic Life	2008			
•	10-2	-8 Brush Fork	From source to North Fo	rk New River	5.1 FW Miles	G C;Tr:+		
	1	Ecological/biological Integrity Benth	tos Excellent Bioclassification	Aquatic Life	2008			
0	10-2	-20 Buffalo Creek	From source to North Fo	rk New River	9.7 FW Miles	G C;Tr:+		
	1	Ecological/biological Integrity Benth	Excellent Bioclassification	Aquatic Life	2008			
	3a	Ecological/biological Integrity FishC	Com Not Rated Bioclassification	n Aquatic Life	2008			
•	10-2	-27 Helton Creek	From NC-VA State Line to River	North Fork New	19.0 FW Miles	GC;Tr:+		
	1	Ecological/biological Integrity Benth	Good Bioclassification	Aquatic Life	2008			
	3a	Ecological/biological Integrity FishC	Not Rated Bioclassification	n Aquatic Life	2008			
⊙	10-2	-7 Hoskin Fork	From source to North Fo	rk New River	5.2 FW Miles	G C;Tr:+		
	1	Ecological/biological Integrity Benth	tos Excellent Bioclassification	Aquatic Life	2008			
⊙	10-2	-20-1 Little Buffalo Cre	ek From source to Buffalo C	reek	4.4 FW Miles	GC;Tr:+		
	5	Ecological/biological Integrity Benth	Fair Bioclassification	Aquatic Life	2008	2000		
•	10-2	-21-8 Little Horse Cree	k From source to Big Horse	e Creek	10.9 FW Miles	GC;Tr:+		
	1	Ecological/biological Integrity Benth	tos Excellent Bioclassification	Aquatic Life	2008			
⊙	10-2	-23 Little Phoenix Cro	eek From source to North Fo	rk New River	4.6 FW Miles	G C;Tr:+		
	1	Ecological/biological Integrity Benth	tos Excellent Bioclassification	Aquatic Life	2008			
⊙	10-2	-25 Long Shoals Cree	k From source to North Fo	rk New River	2.7 FW Miles	GC;Tr:+		
	1	Ecological/biological Integrity Benth	Not Impaired Bioclassifica	tion Aquatic Life	2008			

	All 13	3.123 Waters in NC are in Category	5-303(d) Li	st for Mercury due to statewi	te fish consumption ad	vice for several fish spe	cies
AU_	Numb	per AU_Name	AU_I	Description	Length/	Area AU_Units Class	ification
Ca	tegory	Parameter		Reason for Rating	Use Category	Collection Year	303(d)year
Ne	ew Riv	ver Basin			North Fork New Rive	er Watershed 0505	000101
•	10-2	2-21-8-1 Middle Fork Horse Creek	Little	From source to Little Hors	e Creek	4.5 FW Miles	C;Tr:+
	1	Ecological/biological Integrity I	Benthos	Excellent Bioclassification	Aquatic Life	2008	
•	10-2	2-28 Millpond Bra	nch	From source to North For	k New River	2.0 FW Miles	C:+
	1	Ecological/biological Integrity I	Benthos	Excellent Bioclassification	Aquatic Life	2003	
0	10-2	2-(1) North Fork N	ew River	From source to Three Top	Creek	14.1 FW Miles	C;Tr:+
	1	Ecological/biological Integrity F	Benthos	Excellent Bioclassification	Aquatic Life	2008	
	1	Ecological/biological Integrity I	ishCom	Good Bioclassification	Aquatic Life	2008	
•	10-2	2-(12) North Fork N	ew River	From Three Top Creek to	New River	36.5 FW Miles	C:+
	1	Ecological/biological Integrity I	Benthos	Excellent Bioclassification	Aquatic Life	2008	
	1	Fecal Coliform (recreation)		No Criteria Exceeded	Recreation	2008	
	1	Water Quality Standards Aqua	tic Life	No Criteria Exceeded	Aquatic Life	2008	
0	10-2	2-15 Rich Hill Cree	ek	From source to North For	k New River	4.9 FW Miles	C;Tr:+
	1	Ecological/biological Integrity I	Benthos	Excellent Bioclassification	Aquatic Life	2008	
0	10-2	2-10 Roundabout	Creek	From source to North For	k New River	4.0 FW Miles	C;Tr:+
	1	Ecological/biological Integrity I	Benthos	Excellent Bioclassification	Aquatic Life	2008	
0	10-2	2-13 Three Top Cr	eek	From source to North For	k New River	13.2 FW Miles	C;Tr:+
	1	Ecological/biological Integrity I	Benthos	Good Bioclassification	Aquatic Life	2008	
	3a	Ecological/biological Integrity I	ishCom	Not Rated Bioclassification	Aquatic Life	2008	
Ne	w Riv	er Basin			South Fork New Rive	er Watershed 0505	000102
•	10-1	-37 Cranberry Cr (Mulberry Cr	eek eek)	From source to South For	k New River	18.9 FW Miles	B;Tr:+
	1	Ecological/biological Integrity I	Benthos	Excellent Bioclassification	Aquatic Life	2008	
	1	Ecological/biological Integrity I	ĩishCom	Good Bioclassification	Aquatic Life	2008	
0	10-1	L-3-(1) East Fork Sou New River	ıth Fork	From source to Watauga	County SR 1524	2.3 FW Miles	WS-IV;Tr:+
	5	Ecological/biological Integrity I	Benthos	Fair Bioclassification	Aquatic Life	2003	2008
•	10-1	L-3-(8) East Fork Sou New River	ith Fork	From .8 mile downstream SR 1524 to S Fk New Rive	n of Watauga Co r	0.5 FW Miles	WS-IV;CA:
	1	Ecological/biological Integrity I	Benthos	Good Bioclassification	Aquatic Life	2008	

	All 13	,123 Waters in M	NC are in Category 5-303	(d) List for Mercury due to statewic	de fish consumption ad	vice for several fish spe	ecies
AU_	Numb	er AU_	Name	AU_Description	Length	Area AU_Units Class	sification
Ca	egory	Parameter		Reason for Rating	Use Category	Collection Year	303(d)year
Ne	w Riv	er Basin			South Fork New Rive	er Watershed 0505	5000102
•	10-1	-9-(6)	Howard Creek	From the Appalachian Sta Water Supply Intake Dam New River	te University Raw to South Fork	3.6 FW Miles	C;Tr,HQW
	1	Ecological/biol	ogical Integrity Bentho	s Good Bioclassification	Aquatic Life	2008	
	3a	Ecological/biol	ogical Integrity FishCo	m Not Rated Bioclassification	Aquatic Life	2008	
•	10-1	-35-4	Little Peak Creek	From source to Peak Cree	k	2.8 FW Miles	B;Tr:+
	4s	Ecological/biol	ogical Integrity Bentho	s Poor Bioclassification	Aquatic Life	2008	2000
•	10-1	-10	Meat Camp Creek	From source to South Forl	k New River	10.4 FW Miles	C;Tr:+
	1	Ecological/biol	ogical Integrity Bentho	s Excellent Bioclassification	Aquatic Life	2008	
	3a	Ecological/biol	ogical Integrity FishCo	m Not Rated Bioclassification	Aquatic Life	2008	
•	10-1	-2-(15)	Middle Fork South Fork New River	From 0.4 mile downstr of 321 to South Fk New River	US Hwy 221 & r	0.5 FW Miles	WS-IV;CA:
	1	Ecological/biol	ogical Integrity Bentho	s Good-Fair Bioclassification	Aquatic Life	2008	
	3 a	Ecological/biol	ogical Integrity FishCo	m Not Rated Bioclassification	Aquatic Life	2008	
0	10-1	-2-(6)	Middle Fork South Fork New River	From Brown Branch to Bo	one Dam	3.5 FW Miles	WS-IV;Tr:+
	1	Ecological/biol	logical Integrity Bentho	s Good-Fair Bioclassification	Aquatic Life	2003	
•	10-1	-32b	Naked Creek	From 0.4 miles above Jeffe South Fork New River	erson WWTP to	2.5 FW Miles	C:+
	1	Ecological/biol	ogical Integrity Bentho	s Good-Fair Bioclassification	Aquatic Life	2008	
	5	Ecological/biol	ogical Integrity FishCo	m Fair Bioclassification	Aquatic Life	2008	2010
•	10-1	-10-2	Norris Fork	From source to Meat Cam	p Creek	4.3 FW Miles	C;Tr:+
	1	Ecological/biol	ogical Integrity Bentho	s Good Bioclassification	Aquatic Life	2008	
•	10-1	-27-(2)	Obids Creek	From a point 0.9 mile dow Hwy 163 to South Fork Ne	vnstream of NC ew River	2.8 FW Miles	WS-IV;Tr:+
	1	Ecological/biol	ogical Integrity Bentho	s Good Bioclassification	Aquatic Life	2008	
	1	Ecological/biol	logical Integrity FishCo	m Good Bioclassification	Aquatic Life	2008	
•	10-1	-35-3	Ore Knob Branch	From source to Peak Cree	k	0.9 FW Miles	B;Tr:+
	4s	Ecological/biol	ogical Integrity Bentho	s Poor Bioclassification	Aquatic Life	2003	2000
•	10-1	-35-(2)a	Peak Creek	From Water Supply Dam a Sulphides, Inc to Ore Knob	at Appalachian 9 Branch	2.1 FW Miles	B;Tr:+
	1	Ecological/biol	ogical Integrity Bentho	s Good Bioclassification	Aquatic Life	2008	

	All 1	3,123 Waters	in NC are in Category 5-303(d) L	ist for Mercury due to statewide	e fish consumption advic	e for several fish spe	ecies
AU_	Num	ber A	U_Name AU_	Description	LengthAre	a AU_Units Class	sification
Cat	egory	Parameter		Reason for Rating	Use Category	Collection Year	303(d)year
Ne	w Riv	ver Basin		5	South Fork New River	Watershed 0505	000102
•	10-1	L-35-(2)b	Peak Creek	From Ore Knob Branch to S River	South Fork New	2.9 FW Miles	B;Tr:+
	4s	Ecological/l	oiological Integrity Benthos	Poor Bioclassification	Aquatic Life	2008	2006
•	10-1	L-15-1	Pine Orchard Creek	From source to Elk Creek		3.5 FW Miles	C;Tr:+
	1	Ecological/l	oiological Integrity Benthos	Excellent Bioclassification	Aquatic Life	2008	
•	10-1	L-24	Pine Swamp Creek (Pine Swamp)	From source to South Fork	New River	5.5 FW Miles	C:+
	1	Ecological/l	oiological Integrity Benthos	Good Bioclassification	Aquatic Life	2008	
0	10-1	L-38	Prathers Creek	From source to South Fork	New River	11.1 FW Miles	B;Tr:+
	1	Ecological/h	biological Integrity FishCom	Good-Fair Bioclassification	Aquatic Life	2008	
•	10-1	L-31-(2)	Roan Creek	From 0.5 mile upstream of Fork New River	mouth to South	0.4 FW Miles	WS- IV;Tr,CA:+
	1	Ecological/l	oiological Integrity Benthos	Good Bioclassification	Aquatic Life	2008	
	1	Ecological/l	oiological Integrity FishCom	Good Bioclassification	Aquatic Life	2008	
0	10-1	L-25-2a	South Beaver Creek(Lake Ashe)	From source to Lake Ashe		5.1 FW Miles	C;Tr:+
	1	Ecological/h	oiological Integrity Benthos	Good Bioclassification	Aquatic Life	2008	
•	10-1	L-(20.5)	South Fork New River	From a point 0.4 mile upstr Creek to a point 2.8 mile up Creek	ream of Couches pstream of Obids	21.8 FW Miles	WS-V;HQV
	1	Ecological/h	oiological Integrity Benthos	Good Bioclassification	Aquatic Life	2008	
•	10 -1	L-(26)b	South Fork New River	From Obids Creek to a poir upstream of Roan Creek	nt 0.6 miles	6.6 FW Miles	WS-IV;HQ\
	1	Ecological/l	oiological Integrity Benthos	Excellent Bioclassification	Aquatic Life	2008	
	1	Fecal Colifo	orm (recreation)	No Criteria Exceeded	Recreation	2008	
	1	Water Qua	ity Standards Aquatic Life	No Criteria Exceeded	Aquatic Life	2008	
	1	Water Qual	ity Standards Water Supply	No Criteria Exceeded	Water Supply	2008	
0	10-1	L-(3.5)a	South Fork New River	From Winkler Creek to 0.1 downstream of Hunting La	miles ne	0.3 FW Miles	C:+
	5	Ecological/l	oiological Integrity Benthos	Fair Bioclassification	Aquatic Life	2003	2008
	1	Ecological/l	oiological Integrity FishCom	Good Bioclassification	Aquatic Life	2008	
	1	Fecal Colifo	orm (recreation)	No Criteria Exceeded	Recreation	2008	
	1	Water Qua	ity Standards Aquatic Life	No Criteria Exceeded	Aquatic Life	2008	

	NC 2010 Integrated Report								
	All 13	3,123 Wate	rs in NC are in Category	5-303(d) Lis	t for Mercury due to statewide	fish consumption advice	for several fi	sh spe	cies
AU_	Numb	ber	AU_Name	AU_C	Description	LengthArea	AU_Units	Class	ification
Ca	tegory	Parameter			Reason for Rating	Use Category	Collection	Year	303(d)year
Ne	w Riv	er Basin			So	outh Fork New River W	atershed	0505	000102
•	10-1	L-(3.5)b	South Fork N	ew River	From 0.1 mile downstream H US Hwy.221/421	lunting Lane to	5.1 FW I	Viles	C:+
	5	Ecologica	l/biological Integrity B	enthos	Fair Bioclassification	Aquatic Life	2008		2008
	1	Ecologica	l/biological Integrity F	ishCom	Good Bioclassification	Aquatic Life	2008		
	1	Fecal Col	iform (recreation)		No Criteria Exceeded	Recreation	2008		
	1	Water Qu	ality Standards Aquat	ic Life	No Criteria Exceeded	Aquatic Life	2008		
⊙	10-1	l-(33.5)	South Fork N	ew River	From Dog Creek to New Rive	r	22.5 FW I	Viles	B;ORW
	1	Ecologica	l/biological Integrity B	enthos	Excellent Bioclassification	Aquatic Life	2008		
	1	Fecal Col	iform (recreation)		No Criteria Exceeded	Recreation	2008		
	1	Water Qu	ality Standards Aquat	ic Life	No Criteria Exceeded	Aquatic Life	2008		
•	10-1	L-18ut4	UT MILL CR		Source to MILL CR		1.3 FW I	Viles	
	1	Ecologica	l/biological Integrity B	enthos	Not Impaired Bioclassification	Aquatic Life	2007		
•	10-1	l-(14.5)ut	4 UT S FK NEW	R	Source to S FK NEW R		1.0 FW I	Viles	
	За	Ecologica	l/biological Integrity B	enthos	Data Inconclusive	Aquatic Life	2007		
•	10-1	L-4-(3.5)b	Winkler Cree	k	From Winkler Creek Road (SI South Fork New River	R #1549) to	1.7 FW I	Viles	C;Tr:+
	1	Ecologica	l/biological Integrity B	enthos	Excellent Bioclassification	Aquatic Life	2008		
Ne	w Riv	ver Basin			F	ox Creek-New River W	atershed	0505	000103
•	10-3	3	Grassy Creek		From North Carolina-Virginia	State	4.1 FW I	Viles	C;Tr:+
	1	Ecologica	l/biological Integrity B	enthos	Good Bioclassification	Aquatic Life	2008		
	1	Ecologica	l/biological Integrity F	ishCom	Good-Fair Bioclassification	Aquatic Life	2008		
•	10b		New River (N Carolina Port	orth ion)	From first point of crossing s point of crossing state line	tate line to last	6.4 FW I	Viles	C;ORW
	3a	Copper			Standard Violation	Aquatic Life	2006		
	1	Ecologica	l/biological Integrity B	enthos	Excellent Bioclassification	Aquatic Life	2008		
	3a	Zinc			Standard Violation	Aquatic Life	2006		
Ne	w Riv	ver Basin			Lit	tle River-New River W	atershed	0505	000104
⊙	10-9	9-7	Bledsoe Cree	k	From source to Little River		5.9 FW I	Viles	C;Tr
	1	Ecologica	l/biological Integrity B	enthos	Good-Fair Bioclassification	Aquatic Life	2008		
⊙	10-9	9-10	Brush Creek		From source to Little River		27.8 FW I	Viles	C;Tr
	1	Ecologica	l/biological Integrity B	enthos	Good Bioclassification	Aquatic Life	2007		
	1	Ecologica	l/biological Integrity F	ishCom	Good Bioclassification	Aquatic Life	2008		

	All 13	3,123 Waters in N	IC are in Category 5-303(d) Lis	st for Mercury due to statewide f	ish consumption advice	e for several fish spe	cies
AU_	Numb	er AU_I	Name AU_I	Description	LengthAre	a AU_Units Classi	ification
Cat	egory	Parameter		Reason for Rating	Use Category	Collection Year	303(d)year
Ne	w Riv	er Basin		Lit	tle River-New River \	Watershed 05050	000104
0	10-9	-12	Crab Creek	From source to Little River		7.8 FW Miles	C;Tr
	1	Ecological/biol	ogical Integrity Benthos	Good-Fair Bioclassification	Aquatic Life	2007	
	5	Ecological/biol	ogical Integrity FishCom	Fair Bioclassification	Aquatic Life	2008	2010
•	10-6	5-(2)	Elk Creek (North Carolina Portion)	From U.S. Hwy. 221 to New F	River	7.4 FW Miles	C:+
	1	Ecological/biol	ogical Integrity Benthos	Good Bioclassification	Aquatic Life	2008	
	1	Ecological/biol	ogical Integrity FishCom	Good Bioclassification	Aquatic Life	2008	
Ο	10-9	9	Glade Creek	From source to Little River		8.3 FW Miles	C;Tr
	1	Ecological/biol	ogical Integrity Benthos	Excellent Bioclassification	Aquatic Life	2008	
	1	Ecological/biol	ogical Integrity FishCom	Good Bioclassification	Aquatic Life	2008	
•	10-9	9-10-2	Laurel Branch (Laurel Creek)	From source to Brush Creek		5.2 FW Miles	C;Tr
	1	Ecological/biol	ogical Integrity Benthos	Not Impaired Bioclassification	Aquatic Life	2008	
•	10-9	9-(6)	Little River	From dam at Sparta Lake to I Crossroads)	NC 18 (Blevins	17.5 FW Miles	С
	1	Ecological/biol	ogical Integrity Benthos	Excellent Bioclassification	Aquatic Life	2008	
	1	Fecal Coliform	(recreation)	No Criteria Exceeded	Recreation	2008	
	1	Water Quality	Standards Aquatic Life	No Criteria Exceeded	Aquatic Life	2008	
•	10-9	-(11.5)	Little River (North Carolina Portion)	From NC 18 (Blevins Crossroa River (state line)	ads) to New	3.6 FW Miles	C;HQW
	1	Ecological/biol	ogical Integrity Benthos	Excellent Bioclassification	Aquatic Life	2003	
•	10-9)-(1)a	Little River (Sparta Lake)	From source to Sparta Lake a Creek	at Pine Swamp	11.6 FW Miles	C;Tr
	1	Ecological/biol	ogical Integrity Benthos	Excellent Bioclassification	Aquatic Life	2008	
	1	Ecological/biol	ogical Integrity FishCom	Good Bioclassification	Aquatic Life	2008	
•	10-9	-11	Moccasin Creek	From source to Little River		4.4 FW Miles	С
	1	Ecological/biol	ogical Integrity Benthos	Good Bioclassification	Aquatic Life	2006	
•	10-9	-5	Pine Swamp Creek	From source to Little River		5.2 FW Miles	C;Tr
	1	Ecological/biol	ogical Integrity Benthos	Good Bioclassification	Aquatic Life	2008	
	1	Ecological/biol	ogical Integrity FishCom	Good Bioclassification	Aquatic Life	2008	
•	10-9	-12ut8ut4	UT CRAB CR	Source to CRAB CR		0.7 FW Miles	
	1	Ecological/biol	ogical Integrity Benthos	Not Impaired Bioclassification	Aquatic Life	2008	

				Ν	IC 2010 Integrated	Report		
	All 13	,123 Wate	rs in NC are in Cate	egory 5-303(c	d) List for Mercury due to statev	vide fish consumption a	advice for several fish spe	cies
AU_	Numb	er	AU_Name	А	AU_Description	Lengt	hArea AU_Units Class	ification
Cat	egory	Parameter			Reason for Rating	Use Category	Collection Year	303(d)year
Ne	w Riv	er Basin				Little River-New Ri	iver Watershed 0505	000104
0	10-9	-12ut8	UT UT CF	RAB CR	Source to UT CRAB CR		4.5 FW Miles	
	1	Ecologica	l/biological Integ	rity Benthos	Not Impaired Bioclassific	ation Aquatic Life	2007	
$oldsymbol{O}$	10-9	-4	Waterfal	ls Creek	From source to Little Riv	ver	4.3 FW Miles	C;Tr
Ŭ	1	Ecologica	l/biological Integ	rity Benthos	Excellent Bioclassification	n Aquatic Life	2006	
•	10-9	-9-1	Wolf Bra	nch	From source to Glade C	reek	2.8 FW Miles	C;Tr
	1	Ecologica	l/biological Integr	rity Benthos	Not Impaired Bioclassific	ation Aquatic Life	2006	

North Carolina Division of Water Quality

2010 Use Assessment Methodology

EPA Approved August 31, 2010

2010 Integrated Report Methodology EPA Approved 8/31/2010

Page 1 of 14

Table of Contents

Purpose	3
Assessment Units and Water Quality Classifications	3
Data Window/Assessment Period	4
Data Availability and Quality	4
Use Support Categories and Water Quality Standards	4
Aquatic Life Assessment Methodology	4
Numerical Water Quality Standards	4
Dissolved Oxygen (DO) Standards	5
Freshwater Dissolved Oxygen (DO) Assessment (Class C, B, WS)	5
Saltwater Dissolved Oxygen (DO) Assessment (Class SC, SB, SA)	5
Trout Water Dissolved Oxygen (DO) Assessment (Supplemental Class Tr)	5
Swamp Water Dissolved Oxygen (DO) Assessment (Supplemental Class Sw)	5
pH	6
pH Standards	6
Low pH Assessment (Class C, SC, B, SB, SA, WS)	6
High pH Assessment (Class C, SC, B, SB, SA, WS)	6
Swamp Water Low pH Assessment (Supplemental Class Sw)	/
Temperature Use Assessment	/
Temperature Standards	/
Temperature Assessment	/
Accessment of Extreme Temperature Conditions	8
Assessment of Extreme Temperature Conditions	ŏ
Chlorophyll a Standard	0
Chlorophyll a Standards Accossmont	o
Toxic Substances and Action Levels Metals	٥
Toxic Substances Numerical Standards	9 ۵
Metals Action Level Standards	9 Q
Toxic Substances and Action Level Metals Assessment	و م
Turbidity	10
Turbidity Standards	10
Turbidity Assessment	10
Ecological/Biological Integrity	11
Aquatic Life Narrative Standards	11
Aquatic Life Assessment	11
Recreation Assessment Methodology	11
Pathogen Indicator Standards	12
Fecal Coliform Bacteria Assessment Criteria	12
Fecal Coliform Bacteria Screening Assessment	12
Enterrococci Assessment Criteria	12
Enterrococcus Screening Assessment	12
Advisory Posting Assessment	12
Shellfish Harvesting Assessment Methodology	13
Shellfish Harvesting Standards	13
Fecal Coliform Bacteria Assessment Criteria	13
DEH Shellfish Sanitation Growing Area Classification Assessment	13
Water Supply Assessment Methodology	13

2010 Integrated Report Methodology EPA Approved 8/31/2010

Page 2 of 14

Water Supply Standards	13
Water Supply Assessment	
Fish Consumption Assessment Methodology	14
Polychlorinated biphenyls (PCBs) Assessment Criteria	14
Dioxin Assessment Criteria	14
Mercury Assessment Criteria	14

Purpose

Section 303(d) of the federal Clean Water Act (CWA) which Congress enacted in 1972 requires States, Territories and authorized Tribes to identify and establish a priority ranking for waterbodies for which technology-based effluent limitations required by section 301 are not stringent enough to attain and maintain applicable water quality standards, establish total maximum daily loads (TMDLs) for the pollutants causing impairment in those waterbodies, and submit, from time to time, the list of impaired waterbodies and TMDLs to the U.S. Environmental Protection Agency (EPA). Current federal rules require states to submit 303(d) lists biennially, by April 1st of every even numbered year. The "303(d) list" is technically considered the impaired waters listed as Category 5, requiring a TMDL. EPA is required to approve or disapprove the state-developed §303(d) list within 30 days. For each water quality limited segment impaired by a pollutant and identified in the §303(d) list, a Total Maximum Daily Load (TMDL) must be developed.

Assessment Units and Water Quality Classifications

Water quality assessments are based on water quality classifications as well as data availability. Water quality classifications are associated with a stream reach or area that is described in the schedule of classifications. Reaches vary in length or area and are sometimes split into smaller units to represent application of water quality data. Classifications are represented by a series of numbers called index numbers, 27-33-43-(1), as an example. Water quality assessments are applied to assessment units or AUs. AUs are, for the most part, the same as index numbers. When an AU is subdivided because of data applicability a letter is added to indicate this smaller unit. For example, if Index number 27-33-43-(1) (12 miles in length) is divided into three different segments because of three different available data types the new segments would be 27-33-43-(1)a, 27-33-43-(1)b and 27-33-43-(1)c. The combined mileage of the AUs would be 12 miles.

Decisions on the length or area to apply data to are based on the data type, waterbody characteristics, stations indicating similar water quality, watershed information and landmarks on which to base descriptions. The AUs where water quality concerns are evident are used as markers. Solutions to water quality concerns, including TMDLs, typically encompass entire watersheds.

Data Window/Assessment Period

The data window for the 2010 Water Quality Use Assessment (305(b) and 303(d) Integrated Reporting) includes data collected in calendar years 2004 through 2008 (five years). Some AUs may have biological data collected earlier for waters that have not been resampled during this data window or where the current impairment is based on that sample. The data collection year is noted for each AU.

Data Availability and Quality

Data are collected by various state and federal agencies. NC Department of Environment and Natural Resources (NCDENR) Division of Water Quality (DWQ) collects most of the data used for water quality assessments. There are significant data sets collected by NCDENR Division of Environmental Health (DEH) for use in coastal water quality assessment. The United States Geological Survey (USGS) also provides data in several AUs. Local governments and environmental groups as well as industry, municipal and university coalitions also provide data. Submitted data sets must include an approved Quality Assurance Project Plan (QAPP) or other documentation to assure that the data were collected in a manner consistent with agency data. A standing solicitation for data is maintained on the DWQ website. DWQ evaluates all data and information submitted.

Use Support Categories and Water Quality Standards

There are numerical and narrative water quality standards that are in place to protect the various best uses of North Carolina waters. Best uses include aquatic life or biological integrity, recreation or swimming, fish consumption, shellfish harvesting and water supply. Water quality assessments are based on the standards and data availability for the applicable use support category- aquatic life, recreation etc. Dissolved oxygen standards are used to assess aquatic life and pathogen indicators are used to assess recreation for example. Standards assessment criteria have been developed for each parameter assessed. The standards assessment criteria are used to make water quality assessments- not the standards themselves. While the standards assessment criteria are based on the standards they are different in that a frequency term is included. The details of how each standard is assessed are discussed in the following sections.

Aquatic Life Assessment Methodology

Numerical Water Quality Standards

The aquatic life numerical water quality standards are assessed using a 10% exceedance of the standard criterion. These assessments use ambient monitoring data from the five year assessment period (2004-2008). If no aquatic life numerical water quality standards exceed the 10% criterion then the AU is Supporting aquatic life water quality standards. This AU/multiple-parameters assessment is a Category 1 listing not requiring a TMDL. If greater than 10% of the

samples exceed the numerical standard and there are at least 10 samples, then the AU is Impaired for that parameter. The AU/parameter assessment is listed in Category 5, requiring a TMDL. If the 10% criterion was exceeded and fewer than 10 samples were collected the AU was Not Rated and targeted for further sampling. This is a Category 3a listing not requiring a TMDL. The NC DWQ "Redbook" contains the complete descriptions of water quality standards and surface water classifications [15a NCAC 02B .0200 - .0300]

Dissolved Oxygen (DO) Standards

Freshwater dissolved oxygen: not less than 6.0 mg/l for trout waters; for non-trout waters, not less than a daily average of 5.0 mg/l with a minimum instantaneous value of not less than 4.0 mg/l; swamp waters, lake coves or backwaters, and lake bottom waters may have lower values if caused by natural conditions.

Salt water dissolved oxygen: not less than 5.0 mg/l, except that swamp waters, poorly flushed tidally influenced streams or embayments, or estuarine bottom waters may have lower values if caused by natural conditions.

Freshwater Dissolved Oxygen (DO) Assessment (Class C, B, WS)

A fresh non-swamp water AU was assessed as Impaired for aquatic life when greater than 10% of samples were below 4 mg/l for instantaneous samples (monthly) or when greater than 10% of samples are below a daily average of 5mg/l. A minimum of 10 samples was needed to rate the water as Impaired.

Saltwater Dissolved Oxygen (DO) Assessment (Class SC, SB, SA)

A saline/estuarine non-swamp water AU was assessed as Impaired for aquatic life when greater than 10% of samples were below 5 mg/l. A minimum of 10 samples was needed to rate the water as Impaired.

Trout Water Dissolved Oxygen (DO) Assessment (Supplemental Class Tr)

A supplemental classified Trout water AU was assessed as Impaired for aquatic life when greater than 10% of samples were below 6 mg/l. A minimum of 10 samples was needed to rate the water as Impaired.

Swamp Water Dissolved Oxygen (DO) Assessment (Supplemental Class Sw)

A supplemental classified swamp (Sw) AU was Not Rated for aquatic life when greater than 10% of samples were below 4 mg/l (5 mg/l for salt) for instantaneous samples (monthly) or when greater than 10% of samples were below a daily average of 5 mg/l (freshwater only). There is not a numerical standard for these waterbodies and natural background conditions cannot be determined. This is a category 3a listing not requiring a TMDL.

A swamp like AU (not classified Sw) was Not Rated for aquatic life when greater than 10% of samples were below 4 mg/l (5 mg/l for salt) for instantaneous samples

Page 5 of 14

(monthly) or when greater than 10% of samples were below a daily average of 5mg/l (freshwater only) and when greater than 10% of samples were below a pH of 6.0 (SU) for freshwater or 6.8 (SU) for saltwater. Geographic location, biological data, tributary classifications, discharges and land use were considered when assigning use support ratings to waters considered to be swamp like or receiving significant swamp water input.

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pH Standards

Freshwater pH: shall be normal for the waters in the area, which generally shall range between 6.0 and 9.0 except that swamp waters may have a pH as low as 4.3 if it is the result of natural conditions;

Saltwater pH: shall be normal for the waters in the area, which generally shall range between 6.8 and 8.5 except that swamp waters may have a pH as low as 4.3 if it is the result of natural conditions;

Low pH Assessment (Class C, SC, B, SB, SA, WS)

A non-swamp water AU was assessed as Impaired for aquatic life when greater than 10% of samples were below a pH of 6.0 (SU) for freshwater or 6.8 (SU) for saltwater.

A swamp like AU (not classified Sw) was Not Rated for aquatic life when greater than 10% of samples were below a pH of 6.0 (SU) for freshwater or 6.8 (SU) for saltwater or when greater than 10% of samples were below a dissolved oxygen of 4 mg/l (5 mg/l for salt) for instantaneous samples (monthly) or when greater than 10% of samples were below a daily average of 5mg/l (freshwater only) Geographic location, biological data, tributary classifications, discharges and land use were considered when making use support determinations on waters considered to be swamp like or receiving significant swamp water input.

High pH Assessment (Class C, SC, B, SB, SA, WS)

An AU was assessed as Impaired for aquatic life when greater than 10% of samples were greater than a pH of 9 (SU) for freshwater or 8.5 (SU) for saltwater. A minimum of 10 samples was needed to rate the water as Impaired. This is a Category 5 listing requiring a TMDL.

If the 10% criterion was exceeded and fewer than 10 samples were collected the AU was Not Rated and targeted for further sampling. This is a Category 3a listing not requiring a TMDL.

Swamp Water Low pH Assessment (Supplemental Class Sw)

A supplemental classified swamp (Sw) AU was assessed as Impaired when greater than 10% of samples were below 4.3 (SU). A minimum of 10 samples was needed to rate the water as Impaired. This is a Category 5 listing requiring a TMDL.

If the 10% criterion was exceeded and fewer than 10 samples were collected the AU was Not Rated and targeted for further sampling. This is a Category 3a listing not requiring a TMDL.

Temperature Use Assessment

Temperature Standards

For freshwaters- Temperature: not to exceed 2.8°C (5.04°F) above the natural water temperature, and in no case to exceed 29°C (84.2°F) for mountain and upper piedmont waters and 32°C (89.6°F) for lower piedmont and coastal plain waters. The temperature for trout waters shall not be increased by more than 0.5°C (0.9°F) due to the discharge of heated liquids, but in no case to exceed 20°C (68°F).

Lower piedmont and coastal plain waters mean those waters of the Catawba River Basin below Lookout Shoals Dam; the Yadkin River Basin below the junction of the Forsyth, Yadkin, and Davie County lines; and all of the waters of Cape Fear, Lumber, Roanoke, Neuse, Tar-Pamlico, Chowan, Pasquotank, and White Oak River Basins; except tidal salt waters which are assigned S classifications.

Mountain and upper piedmont waters mean all of the waters of the Hiwassee; Little Tennessee, including the Savannah River drainage area; French Broad; Broad; New; and Watauga River Basins; and those portions of the Catawba River Basin above Lookout Shoals Dam and the Yadkin River Basin above the junction of the Forsyth, Yadkin, and Davie County lines.

For saltwaters- Temperature: shall not be increased above the natural water temperature by more than 0.8°C (1.44°F) during the months of June, July, and August nor more than 2.2°C (3.96°F) during other months and in no cases to exceed 32°C (89.6°F) due to the discharge of heated liquids.

Temperature Assessment

A mountain or upper piedmont AU was assessed as Impaired for aquatic life when greater than 10% of samples were greater than 29°C. A minimum of 10 samples was needed to rate the water as Impaired.

A lower piedmont or coastal plain stream AU was assessed as Impaired for aquatic life when greater than 10% of samples were greater than 32°C. A minimum of 10 samples was needed to rate the water as Impaired.

If the 10% criterion was exceeded and fewer than 10 samples were collected the water was Not Rated and targeted for further sampling. This is a Category 3a listing not requiring a TMDL.

Temperature Screening Criteria for Trout Waters (Supplemental Class Tr)

A supplemental classified trout water (Tr) AU was Not Rated for aquatic life when greater than 10% of samples were greater than 20°C. The presence of heated discharges was not determined. This is a Category 3a listing not requiring a TMDL.

Assessment of Extreme Temperature Conditions

A waterbody that exceeds the above criteria may be Not Rated for aquatic life because of meteorological conditions that occur on a regular basis. These conditions must be documented and reassessment will occur after more normal conditions return. This is a Category 3a listing not requiring a TMDL. Examples of extreme conditions may include extreme drought, reservoir drawdown, hurricane impacts and flooding, dam failure, and saltwater encroachment. Other extreme conditions may be documented as needed for future assessments

Chlorophyll a

Chlorophyll a Standard

Chlorophyll *a* (corrected): not greater than 40 μ g/l in sounds, estuaries, and other waters subject to growths of macroscopic or microscopic vegetation.

Other waters subject to growths are interpreted by DWQ to include dam backwaters, lakes and reservoirs.

Chlorophyll a Standards Assessment

An AU was assessed as Impaired for aquatic life when greater than 10% of samples were greater than 40 μ g/l. A minimum of 10 samples was needed to rate the water as Impaired. This is a Category 5 listing requiring a TMDL.

If the 10% criterion was exceeded and fewer than 10 samples were collected the AU was Not Rated and targeted for further sampling. Some reservoirs in North Carolina are sampled fewer than 10 times during the assessment period. These data are used to document eutrophication issues. Reservoirs are targeted for increased monitoring to determine if there are standards violations using the above methodology. This is a Category 3a listing not requiring a TMDL.

2011

Toxic Substances and Action Levels Metals

Toxic Substances Numerical Standards

Refer to the NC DWQ "Redbook" for complete text of standards Arsenic: 50 ug/l Beryllium: 6.5 ug/l; Cadmium: 0.4 ug/l for trout waters and 2.0 ug/l for non-trout waters; Chlorine, total residual: 17 ug/l; Chromium, total recoverable: 50 ug/l; Cyanide: 5.0 ug/l Fluorides: 1.8 mg/l; Lead, total recoverable: 25 ug/l; Mercury (assessed in fish consumption category) Nickel: 88 ug/l; 8.3 ug/l Chlorides: 230mg/l; (note this is an action level standard)

Metals Action Level Standards

Action Level Copper: 7 ug/l FW or 3 ug/l SW Action Level Silver: 0.06 ug/l; Action Level Zinc: 50 ug/l;

Toxic Substances and Action Level Metals Assessment

An AU was assessed as Impaired for aquatic life when greater than 10% of samples were greater than the above standards or action level standards. A minimum of 10 samples was needed to rate the water as Impaired. These are Category 5 listings requiring a TMDL.

If the 10% criterion was exceeded and fewer than 10 samples were collected the AU was Not Rated and targeted for further sampling. This is a Category 3a listing not requiring a TMDL.

The action level standard for Iron was not assessed during this assessment period because the standard is being reevaluated and the Iron exceedances of the Action Level have been shown to be a natural condition.

Action levels are used for permitting purposes and are not used as the only information to assess aquatic life uses. Copper and Zinc may be indicators of potential impacts to aquatic life. DWQ will review Copper and Zinc assessments that result in Category 5 listings. The review will be used to determine if the Category 5 listing is appropriate. The following criteria will be used to determine if a review is warranted.

1. A collocated Good, Excellent, Natural or Not Impaired biological rating or

Page 9 of 14

- 2. A collocated Good-Fair, Moderate or Not Rated biological rating and less than 25% of Copper or Zinc samples exceed the evaluation level.
- 3. There are no biological data available and less than 25% of Copper or Zinc samples exceed the evaluation level.

The Water Quality Assessment Team will evaluate and integrate the following lines of watershed information to determine if a Category 5 listing for Copper and/or Zinc is warranted.

- 1- Analysis of duration, frequency and magnitude of exceedances.
- 2- Historical data and trends for the parameter of interest.
- 3- Detailed assessment of all available biological data.
- 4- Qualitative aquatic habitat information.
- 5- Natural or background conditions assessment including current imagery.
- 6- Sample quality (note that Zinc samples can be easily contaminated)
- 7- Waterbody classifications and other designated uses.
- 8- Exceedances of other likely associated metals.
- 9- Biological data in nearby Assessment Units.
- 10- Potential Sources of metals
- 11- Site specific hardness

After review the Assessment team will determine if the AU/parameter assessment is more appropriately listed in a Category other than 5. Each reviewed assessment will require documented justification for a final Integrate Report category other than Category 5.

Turbidity

Turbidity Standards

Turbidity: the turbidity in the receiving water shall not exceed 50 Nephelometric Turbidity Units (NTU) in streams not designated as trout waters and 10 NTU in streams, lakes or reservoirs designated as trout waters; for lakes and reservoirs not designated as trout waters, the turbidity shall not exceed 25 NTU; if turbidity exceeds these levels due to natural background conditions, the existing turbidity level cannot be increased.

Turbidity Assessment

An AU was assessed as Impaired for aquatic life when greater than 10% of samples were greater than 50 NTU or 10 NTU for Tr waters or 25 NTU for lakes, reservoirs and estuarine waters. A minimum of 10 samples was needed to rate the water as Impaired. This is a Category 5 listing requiring a TMDL.

If the 10% criterion was exceeded and fewer than 10 samples were collected the AU was Not Rated and targeted for further sampling. This is a Category 3a listing not requiring a TMDL.

Ecological/Biological Integrity

Aquatic Life Narrative Standards

The aquatic life narrative water quality standard is assessed using a biological integrity index criterion (or bioclassification). Biological integrity means the ability of an aquatic ecosystem to support and maintain a balanced and indigenous community of organisms having species composition, diversity, population densities and functional organization similar to that of reference conditions. Waters shall be suitable for aquatic life propagation and maintenance of biological integrity, wildlife, secondary recreation, and agriculture. Sources of water pollution which preclude any of these uses on either a short-term or long-term basis shall be considered to be violating a water quality standard.

Aquatic Life Assessment

An AU was assessed as Impaired for aquatic life when a fish or benthic macroinvertebrate community sample received a bioclassification of Severe, Poor or Fair and there were no other Aquatic Life standards violations. This is a Category 5 listing requiring a TMDL.

An AU was assessed as Impaired for aquatic life when a fish or benthic macroinvertebrate community sample received a bioclassification of Severe, Poor or Fair and there were other Aquatic Life numeric standards violations. This is a Category 4s listing requiring a TMDL for the identified aquatic life numerical standards violation (Category 5 or 4t listing) impairing the ecological/biological integrity of the waterbody.

An AU was assessed as Impaired for aquatic life when a fish or benthic macroinvertebrate community sample received a bioclassification of Severe, Poor or Fair and an approved TMDL for an aquatic life numerical water quality standard has been completely implemented. This is a Category 5s listing requiring a TMDL.

Recreation Assessment Methodology

Recreation standards were assessed using fecal coliform bacteria data collected at DWQ ambient stations and special study sites and enterrococci data collected at DEH Recreational Monitoring sites in coastal waters. Screening criteria were used to assess areas for potential standards violations. DEH advisory postings were also used for recreation assessments as well. The following criteria were used to assess waters for recreation.

Page 11 of 14

Pathogen Indicator Standards

Organisms of coliform group: fecal coliforms not to exceed geometric mean of 200/100 ml (MF count) based on at least five consecutive samples examined during any 30-day period and not to exceed 400/100 ml in more than 20 percent of the samples examined during such period.

Enterococcus, including *Enterococcus faecalis, Enterococcus faecium, Enterococcus avium* and *Enterococcus gallinarium*: not to exceed a geometric mean of 35 enterococci per 100 ml based upon a minimum of five samples within any consecutive 30 days.

Fecal Coliform Bacteria Assessment Criteria

An AU was assessed as Impaired when the geometric mean was greater than 200 colonies/100ml or greater than 20% of the samples were higher than 400 colonies/100ml. At least 5 samples must have been collected within the same 30-day period. This is a Category 5 listing requiring a TMDL.

Fecal Coliform Bacteria Screening Assessment

An AU was Not Rated when the geometric mean was greater than 200 colonies/100ml or greater than 20% of the samples were higher than 400 colonies/100ml. Samples were not collected in the same 30-day period. This is a Category 3a listing not requiring a TMDL. These AUs are prioritized for resampling 5 times in 30 days based on classification and available resources. Data are reviewed yearly for prioritization.

Enterrococci Assessment Criteria

An AU was assessed as Impaired when the geometric mean was greater than 35 colonies/100ml. At least 5 samples must have been collected within the same 30-day period. This is a Category 5 listing requiring a TMDL.

Enterrococcus Screening Assessment

An AU was Not Rated when the geometric mean was greater than 35 colonies/100ml. Samples were not collected in the same 30-day period. This is a Category 3a listing not requiring a TMDL.

Advisory Posting Assessment

An AU was assessed as Impaired when a swimming advisory was posted for greater than 61 days in any 5 year period (includes permanent postings). This is a Category 4cr listing not requiring a TMDL.

2011

Shellfish Harvesting Assessment Methodology

Shellfish Harvesting standards were assessed using DEH growing area classifications. The following criteria were used to assess waters for shellfish harvesting.

Shellfish Harvesting Standards

Organisms of coliform group: fecal coliform group not to exceed a median MF of 14/100 ml and not more than 10% of the samples shall exceed an MF count of 43/100 ml in those areas most probably exposed to fecal contamination during the most unfavorable hydrographic and pollution conditions.

Fecal Coliform Bacteria Assessment Criteria

DEH fecal coliform data were not assessed to determine standards violations. Category 5 impairments were based on Growing Area Classifications alone.

DEH Shellfish Sanitation Growing Area Classification Assessment

An AU was assessed as Impaired when the DEH growing area classification was Prohibited or conditionally approved. This is a Category 5 listing requiring a TMDL.

Water Supply Assessment Methodology

Water Supply standards were assessed using data collected at DWQ ambient stations located in Class WSI-WSV waters. The following criteria were used to Impair waters for water supply. Category 5 listings were only made when Standards Assessment Criteria (SAC) were exceeded.

Water Supply Standards

Refer to Water Quality "Redbook" for complete text of standards Barium: 1.0 mg/l; Chloride: 250 mg/l; Manganese: 200 ug/l; (not human health or aquatic life- not assessed) Nickel: 25 ug/l; Nitrate nitrogen: 10.0 mg/l; 2,4-D: 100 ug/l; 2,4,5-TP (Silvex): 10 ug/l; Sulfates: 250 mg/l;

Water Supply Assessment

An AU was assessed as Impaired for water supply when greater than 10% of samples were greater than the above standards except for manganese. A minimum of 10 samples was needed to rate the water as Impaired. This is a Category 5 listing requiring a TMDL.

Page 13 of 14

If the 10% criterion was exceeded and fewer than 10 samples were collected the AU was Not Rated and targeted for further sampling. This is a Category 3a listing not requiring a TMDL.

Fish Consumption Assessment Methodology

Fish Consumption was assessed based on site-specific fish consumption advisories. The advisories were based on the NC Department of Health and Human Services (DHHS) consumption advisories developed using fish tissue data that exceed standards. The following criteria were used to Impair waters for fish consumption. Because of the statewide Mercury advice there were no use cases for Supporting fish consumption and therefore no overall Category 1 waters.

Polychlorinated biphenyls (PCBs) Assessment Criteria

An AU was assessed as Impaired when a site-specific advisory was posted for PCBs. This is a Category 5 listing requiring a TMDL.

Dioxin Assessment Criteria

An AU was assessed as Impaired when a site-specific advisory was posted for dioxins. This is a Category 5 listing requiring a TMDL.

Mercury Assessment Criteria

An AU was assessed as Impaired for fish consumption when greater than 10% of samples were greater than 0.012 μ g/l. A minimum of 10 samples was needed to rate the water as Impaired. This is a Category 5 listing requiring a TMDL.

If the 10% criterion was exceeded and fewer than 10 samples were collected the AU was Not Rated and targeted for further sampling. This is a Category 3a listing not requiring a TMDL.

Statewide advice for Mercury in fish tissue was not assessed because it was not associated with a specific AU but was applied to all waters of the state. All AUs are considered Impaired and in Category 5 for the statewide Mercury fish consumption advice. Previous site specific listings for Mercury will no longer be listed in Category 5. DWQ continues to monitor mercury in fish tissue, and has identified specific locations where Mercury levels exceed 0.4mg/kg of fish tissue.

MAPS

IN THE NEW RIVER BASIN

MAPS IN THIS CHAPTER INCLUDE:

- 6 Old DWQ Subbasins to 10-Digit HUC Conversion Map
- ♦ 10-Digit HUC Maps of 12-Digits
 - North Fork New River Watershed (0505000101)
 - South Fork New River & Fox River Watersheds (0505000102 & 0505000103)
 - Little River & Chestnut Creek Watersheds (0505000104 & 0505000106)
- 6 2004 Impaired Waters Map
- 6 2008 Impaired Waters Map
- **b** Designated Trout Waters
- **ORW, HQW & Water Supply Areas**
- 6 2001 Land Cover in the New River Basin
- 6 2006 Land Cover in the New River Basin
- 6 Agricultural Cost Share Program BMPs (2003-2009)
- ♦ Eco Regions
- In NPDES Discharge Permits (Point Source)
- **OVERIGATION** NON-Discharge Permits
- **Animal Operations**




















Population Density Map: Coming Soon







EPA Level IV Ecoregions in the New River Basin









ACRONYMS, DEFINITIONS, & HYPERLINKS

DEFINITIONS

Term	DEFINITION
30Q2	The minimum average flow for a period of 30 days that has an average recurrence of one in two years.
7Q10	The annual minimum 7-day consecutive low flow, which on average will be exceeded in 9 out of 10 years.
Assessment Unit (AU)	A stream segment to which data is applied in order to make determinations for use support. It can be an entire stream or just the portion for which water quality has established.
Basin	The watershed of a major river system with an average size of 10,596 square miles. There are 17 major river basins in North Carolina. (Also referred to as a 6-digit hydrologic unit.)
Benthic/Benthos Macroinvertebrates	Aquatic organisms, visible to the naked eye (macro) and lacking a backbone (invertebrate), macroinvertebrates that live in or on the bottom of rivers and streams (benthic). Examples include, but are not limited to, aquatic insect larvae, mollusks and various types of worms. Some of these organisms, especially aquatic insect larvae, are used to assess water quality. See EPT index and bioclassification for more information.
Best Management Practices (BMPs)	Techniques that are determined to be currently effective, practical means of preventing or practices reducing pollutants from point and nonpoint sources, in order to protect water quality. BMPs include, but are not limited to: structural and non-structural controls, operation and maintenance procedures, and other practices. Often, BMPs are applied as system of practices and not just one at a time.
Biochemical Oxygen Demand (BOD)	A measure of the amount of oxygen consumed by the decomposition of biological matter or chemical reactions in the water column. Most NPDES discharge permits include a limit on the amount of BOD that may be discharged.
Bioclassification	A rating of water quality based on the outcome of benthic macroinvertebrate sampling of a stream. There are five levels: Poor, Fair, Good-Fair, Good and Excellent.
Channelization	The physical alteration of streams and rivers by widening, deepening or straightening of the channel, large-scale removal of natural obstructions, and/or lining the bed or banks with rock or other resistant materials.
Chlorophyll a	A chemical constituent in plants that gives them their green color. High levels of chlorophyll a in a waterbody, most often in a pond, lake or estuary, usually indicate a large amount of algae resulting from nutrient over enrichment or eutrophication.

Тегм	Definition	
Class B	Waters protected for all Class C uses in addition to primary recreation. Primary recreational activities include swimming, skin diving, water skiing, and similar uses involving human body contact with water where such activities take place in an organized manner or on a frequent basis.	
Class C	Waters protected for uses such as secondary recreation, fishing, wildlife, fish consumption, aquatic life including propagation, survival and maintenance of biological integrity, and agriculture. Secondary recreation includes wading, boating, and other uses involving human body contact with water where such activities take place in an infrequent, unorganized, or incidental manner.	
Class SA	Tidal salt waters that are used for commercial shellfishing or marketing purposes and are also protected for all Class SC and Class SB uses. All SA waters are also HQW by supplemental classification.	
Class SB	Tidal salt waters protected for all SC uses in addition to primary recreation. Primary recreational activities include swimming, skin diving, water skiing, and similar uses involving human body contact with water where such activities take place in an organized manner or on a frequent basis.	
Class SC	All tidal salt waters protected for secondary recreation such as fishing, boating, and other activities involving minimal skin contact; fish and noncommercial shellfish consumption; aquatic life propagation and survival; and wildlife.	
Class SWL	These are saltwaters that meet the definition of coastal wetlands as defined by the Division of Coastal Management and which are located landward of the mean high water line or wetlands contiguous to estuarine waters as defined by the Division of Coastal Management.	
Class WL	Freshwater Wetlands are a subset of all wetlands, which in turn are waters that support vegetation that is adapted to life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. These waters are protected for storm and flood water storage, aquatic life, wildlife, hydrologic functions, filtration and shoreline protection.	
Coastal Counties	Twenty counties in eastern NC subject to requirements of the Coastal Area Management Act (CAMA). They include: Beaufort, Bertie, Brunswick, Camden, Carteret, Chowan, Craven, Currituck, Dare, Gates, Hertford, Hyde, New Hanover, Onslow, Pamlico, Pasquotank, Pender, Perquimans, Tyrrell and Washington.	
Coastal Plain	One of three major physiographic regions in North Carolina. Encompasses the eastern two-fifths of state east of the fall line (approximated by Interstate I-95).	
Conductivity	A measure of the ability of water to conduct an electrical current. It is dependent on the concentration of dissolved ions such as sodium, chloride, nitrates, phosphates and metals in solution.	
Degradation	The lowering of the physical, chemical or biological quality of a waterbody caused by pollution or other sources of stress.	
Drainage Area	Land surrounding and draining to a small creek, stream or river. Typically smaller than a subbwatershed.	
Dystrophic	Naturally acidic (low pH), "black-water" lakes which are rich in organic matter. Dystrophic lakes usually have low productivity because most fish and aquatic plants are stressed by low pH water. In North Carolina, dystrophic lakes are scattered throughout the Coastal Plain and Sandhills regions and are often located in marshy areas or overlying peat deposits. NCTSI scores are not appropriate for evaluating dystrophic lakes.	
Effluent	The treated liquid discharged from a wastewater treatment plant.	
Eolian	Sediment deposited, produced, or eroded by wind	
EPT Index	This index is used to judge water quality based on the abundance and variety of three orders of pollution sensitive aquatic insect larvae: Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies).	
Eutrophic	Elevated biological productivity related to an abundance of available nutrients. Eutrophic lakes may be so productive that the potential for water quality problems such as algal blooms, nuisance aquatic plant growth and fish kills may occur.	

Тегм	Definition	
Eutrophication	The process of physical, chemical or biological changes in a lake associated with nutrient, organic matter and silt enrichment of a waterbody. The corresponding excessive algal growth can deplete dissolved oxygen and threaten certain forms of aquatic life, cause unsightly scums on the water surface and result in taste and odor problems.	
Fall Line	A geologic landscape feature that defines the line between the piedmont and coastal plain regions. It is most evident as the last set of small rapids or rock outcroppings that occur on rivers flowing from the piedmont to the coast.	
Future Water Supply (FWS)	Supplemental classification for waters intended as a future source of drinking, culinary, or food processing purposes. FWS would be applied to one of the primary water supply classifications (WS-I, WS-II, WS-III, or WS-IV). Currently no water bodies in the state carry this designation.	
Geographic Information System	An organized collection of computer hardware, software, geographic data and personnel designed to efficiently capture, store, update, manipulate, analyze and display all forms of geographically referenced information.	
Habitat Degradation	Identified where there is a notable reduction in habitat diversity or change in habitat quality. This term includes sedimentation, bank erosion, channelization, lack of riparian vegetation, loss of pools or riffles, loss of woody habitat, and streambed scour.	
Headwaters	Small streams that converge to form a larger stream in a watershed.	
High Quality Waters (HQW)	Supplemental classification intended to protect waters which are rated excellent based on biological and physical/chemical characteristics through Division monitoring or special studies, primary nursery areas designated by the Marine Fisheries Commission, and other functional nursery areas designated by the Marine Fisheries Commission. The following waters are HQW by definition: WS-I, WS-II, SA, ORW, Primary nursery areas (PNA) designated by the Marine Fisheries Commission, and Waters for which DWQ has received a petition for reclassification to either WS-I or WS-II.	
Hydrilla	The genus name of an aquatic plant - often considered an aquatic weed.	
Hydrologic Unit Code	A watershed area defined by a national uniform hydrologic unit system that is sponsored by the Water Resources Council. This system divides the country into regions, subregions, basins, subbasins, watersheds and subwatersheds. A hierarchical code consisting of two digits for each of the above six levels combined to form an 12-digit hydrologic unit (subwatershed). An 12-digit hydrologic unit generally covers an average of 40 square miles.	
Hypereutrophic	Extremely elevated biological productivity related to excessive nutrient availability. Hypereutrophic lakes exhibit frequent algal blooms, episodes of low dissolved oxygen or periods when no oxygen is present in the water, fish kills and excessive aquatic plant growth.	
Impacted Waters	Any site with 7.1% to 10.0% of AMS samples over a parameter's standard will be considered Impacted as well as streams with a biological rating of Good- Fair. The term Impacted is not an official DWQ term and is used by the DWQ Planning Section to indicate streams with the potential of becoming impaired in the near future. These impacted waters are identified to allow better targeting and prioritizing of resources to prevent further degradation.	
Impaired	Term that applies to a waterbody that is not meeting the designated use criteria. See the Use Support Methodology for details as to how waters across the state are designated as Supporting, Not Rated or Impaired.	
Impervious	Incapable of being penetrated by water; non-porous.	
Loading	Mass rate of addition of pollutants to a waterbody (e.g., kg/yr)	
Macroinvertebrates	Animals large enough to be seen by the naked eye (macro) and lacking backbones (invertebrate).	
Macrophyte	An aquatic plant large enough to be seen by the naked eye.	
Mesotrophic	Moderate biological productivity related to intermediate concentrations of available nutrients. Mesotrophic lakes show little, if any, signs of water quality degradation while supporting a good diversity of aquatic life.	

Тегм	DEFINITION	
NCIBI	North Carolina Index of Biotic Integrity. A measure of the community health of a population of fish in a given waterbody.	
Nonpoint Source	A source of water pollution generally associated with rainfall runoff or snowmelt. The quality and rate of runoff of NPS pollution is strongly dependent on the type of land cover and land use from which the rainfall runoff flows. For example, rainfall runoff from forested lands will generally contain much less pollution and runoff more slowly than runoff from urban lands.	
Notice of Violation (NOV)	An NOV serve to alert the permittee of permit infractions and request that whatever caused the violation be corrected immediately. Many times these will not include a fine. Depending upon the severity of the violation, the permittee may receive a Notice of Violation and Assessment of a Civil Penalty, which will include a fine.	
Nutrient Sensitive Waters (NSW)	Supplemental classification intended for waters needing additional nutrient management due to being subject to excessive growth of microscopic or macroscopic vegetation.	
Oligotrophic	Low biological productivity related to very low concentrations of available nutrients. Oligotrophic lakes in North Carolina are generally found in the mountain region or in undisturbed (natural) watersheds and have very good water quality.	
Outstanding Resource Waters (ORW)	All outstanding resource waters are a subset of High Quality Waters. This supplemental classification is intended to protect unique and special waters having excellent water quality and being of exceptional state or national ecological or recreational significance.	
рН	A measure of the concentration of free hydrogen ions on a scale ranging from 0 to 14. Values below 7 and approaching 0 indicate increasing acidity, whereas values above 7 and approaching 14 indicate a more basic solution.	
Phytoplankton	Aquatic microscopic plant life, such as algae, that are common in ponds, lakes, rivers and estuaries.	
Piedmont	One of three major physiographic regions in the state. Encompasses most of central North Carolina from the Coastal Plain region (near I-95) to the eastern slope of the Blue Ridge Mountains region.	
Polychlorinated Biphenyls (PCBs)	PCBs are man-made chemicals that persist in the environment. There are a number of adverse health effect associated with exposure to PCBs.	
Riparian Zone	Vegetated corridor immediately adjacent to a stream or river. See also SMZ.	
Runoff	Rainfall that does not evaporate or infiltrate the ground, but instead flows across land and into waterbodies.	
Sedimentation	The sinking and deposition of waterborne particles (e.g., eroded soil, algae and dead organisms).	
Seeps	Seeps are areas that remain wet due to groundwater seepage. The plant community generally consists of a dense bed of wetland herbs.	
Silviculture	Care and cultivation of forest trees; forestry.	
SOC	Special Order by Consent. An agreement between the Environmental Management Commission and a permitted discharger found responsible for causing or contributing to surface water pollution. The SOC stipulates actions to be taken to alleviate the pollution within a defined time. The SOC typically includes relaxation of permit limits for particular parameters, while the facility completes the prescribed actions. SOCs are only issued to facilities where the cause of pollution is not operational in nature (i.e., physical changes to the wastewater treatment plant are necessary to achieve compliance).	
Species of Concern	Species of Concern are those species about which NOAA's National Marine Fisheries Service (NMFS) has some concerns regarding status and threats, but for which insufficient information is available to indicate a need to list the species under the Endangered Species Act (ESA).	
Streamside Management Zone (SMZ)	The area left along streams to protect streams from sediment and other pollutants, protect streambeds, and provide shade and woody debris for aquatic organisms.	
SU	Standard unit; measurement of pH.	

Term	Definition	
Subbasin	A river basin is broken up into smaller subbasins areas with an average size of 700 square miles. (Subbasins are also referred to as 8-digit hydrologic units.)	
Subwatershed	A watershed is broken up into smaller subwatershed areas with an average size of 40 square miles. Subwatersheds are also referred to as 12-digit hydrologic units.)	
Swamp Waters (SW)	Supplemental classification intended to recognize those waters which have low velocities and other natural characteristics which are different from adjacent streams.	
Targeted Local Watershed (TLW)	A term used by the Ecosystem Enhancement Program that identifies priority areas for planning and restoration. These watershed boundaries are based on 14-digit hydrologic units created by the National Resource Conservation Service (NRCS) that are no longer used by the NRCS.	
Total Maximum Daily Load (TMDL)	The amount of a given pollutant that a waterbody can assimilate and maintain its uses and water quality standards.	
Tributary	A stream that flows into a larger stream, river or other waterbody.	
Trophic	Trophic classification is a relative description of a lake's biological productivity, which is the ability of the lake to support algal growth, fish populations and aquatic plants. The productivity of a lake is determined by a number of chemical and physical characteristics, including the availability of essential plant nutrients (nitrogen and phosphorus), algal growth and the depth of light penetration. Lakes are classified according to productivity: unproductive lakes are termed "oligotrophic"; moderately productive lakes are termed "mesotrophic"; and very productive lakes are termed "eutrophic".	
Trout Waters (Tr)	Supplemental classification intended to protect freshwaters which have conditions which shall sustain and allow for trout propagation and survival of stocked trout on a year-round basis. This classification is not the same as the NC Wildlife Resources Commission's Designated Public Mountain Trout Waters designation.	
Turbidity	An expression of the optical property that causes light to be scattered and absorbed rather than transmitted in straight lines through a sample. All particles in the water that may scatter or absorb light are measured during this procedure. Suspended sediment, aquatic organisms and organic particles such as pieces of leaves contribute to instream turbidity.	
Unique Wetland (UWL)	Supplemental classification for wetlands of exceptional state or national ecological significance. These wetlands may include wetlands that have been documented to the satisfaction of the Environmental Management Commission as habitat essential for the conservation of state or federally listed threatened or endangered species.	
Water Supply I (WS-I)	Waters protected for all Class C uses plus waters used as sources of water supply for drinking, culinary, or food processing purposes for those users desiring maximum protection for their water supplies. WS-I waters are those within natural and undeveloped watersheds in public ownership. All WS-I waters are HQW by supplemental classification.	
Water Supply II (WS-II)	Waters used as sources of water supply for drinking, culinary, or food processing purposes where a WS-I classification is not feasible. These waters are also protected for Class C uses. WS-II waters are generally in predominantly undeveloped watersheds. All WS-II waters are HQW by supplemental classification.	
Water Supply III (WS-III)	Waters used as sources of water supply for drinking, culinary, or food processing purposes where a more protective WS-I or II classification is not feasible. These waters are also protected for Class C uses. WS-III waters are generally in low to moderately developed watersheds.	
Water Supply IV (WS-IV)	Waters used as sources of water supply for drinking, culinary, or food processing purposes where a WS-I, II or III classification is not feasible. These waters are also protected for Class C uses. WS-IV waters are generally in moderately to highly developed watersheds or Protected Areas.	

Тегм	DEFINITION
Water Supply V (WS-V)	Waters protected as water supplies which are generally upstream and draining to Class WS-IV waters or waters used by industry to supply their employees with drinking water or as waters formerly used as water supply. These waters are also protected for Class C uses.
Watershed	A subbasin is broken up into smaller watershed areas with an average size of 227 square miles. Watersheds are also referred to as 10-digit hydrologic units.)
Whole Effluent Toxicity (WET)	The aggregate toxic effect of a wastewater measured directly by an aquatic toxicity test.

ACRONYMS

ACRONYM	Meaning	
§	Section	
µg/l	Microgram per liter	
µmhos/cm	micromhos per centimeter	
µs/cm	microsiemens per centimeter	
30Q2	Annual Minimum 30-day Consecutive Low Flow	
5-in-30 Study	FCB study that measures five samples within a 30 day period.	
7Q10	Seven day, consecutive low flow with a ten year return frequency; The lowest stream flow for seven consecutive days that would be expected to occur once in ten years	
ACOE	United States Army Core of Engineers	
ACSP	Agriculture Cost Share Program	
AMS	Ambient Monitoring System	
APES	Albemarle-Pamlico Estuarine Study	
APNEP	Albemarle-Pamlico National Estuary Program	
AU	Assessment Unit	
B (Class B)	Stream Classification B: Primary Recreation, Fresh Water	
BAT	Best Available Technology	
BCT	Best Conventional Pollutant Control Technology	
BMPs	Best Management Practices	
BOD	Biochemical Oxygen Demand	
BODIt	Long-Term Biochemical Oxygen Demands	
BPJ	Best Professional Judgement	
BPU	Basinwide Planning Unit	
C (Class C)	Class C Water Quality Classification; fish waters protected for secondary recreation, fishing, wildlife, fish and aquatic life propagation and survival, and other uses	
CAFI	Concentrated Animal Feeding Operation	
CAMA	Coastal Area Management Act	
CBOD	Carbonaceous Biochemical Oxygen Demand	
CCAP	Community Conservation Assistance Program	
CES	Cooperative Extension Service	
cfs	Cubic Feet per Second	
cfu/ml	Colony Forming Units per milliliter	
CG&L	Construction, Grants & Loans	
CGIA	Center for Geographic Information and Analysis	
CMSWS	Charlotte-Mecklenburg Stormwater Services	
CMUD	Charlotte Mecklenburg Utility Department	
Cn	Cyanide	
COD	Chemical Oxygen Demand	
COG	Council of Governments	
colonies/ml	Colonies per milliliter	
CRC	Coastal Resources Commission	
CREP	Conservation Reserve Enhancement Program	
CWA	Clean Water Act	
CWMTF	Clean Water Management Trust Fund	
CWS	Community Water System	

ACRONYM	Meaning	
D	Dystrophic -Descriptive trophic state classification for lakes/reservoirs	
DAQ	Division of Air Quality	
DDD	Dichloro Diphenyl Dichloroethane	
DDE	Dichloro Diphenyl Ethylene	
DDT	Dichloro Diphenyl Tricholoroethane	
DEH	Department of Environmental Health	
DFR	Division of Forest Resources	
DHHS	Department of Health and Human Services	
DLR	Division of Land Resources	
DMF	Division of Marine Fisheries	
DO	Dissolved Oxygen	
DOT	Division of Transportation	
DWQ	Division of Water Quality	
DWR	Division of Water Resources	
E	Eutrophic -Descriptive trophic state classification for lakes/reservoirs	
EAA	Evaluation of Engineering Alternatives	
EEP	Ecosystem Enhancement Program	
EMC	Environmental Management Commission	
EPA	Environmental Protection Agency	
EPT	Ephemeroptera, Plecoptera, and Trichoptera, the three insect orders commonly used to test water quality	
EQI	Environmental Quality Institute	
ESS	Environmental Science Section	
FC	Fecal Coliform	
FCB	Fecal Coliform Bacteria	
FDA	United States Food and Drug Administration	
FMC		
FONSI	Finding of No Significant Impact	
FS	Fully Supporting	
GIS	Geographical Information Systems	
Н	Hypereutrophic -Descriptive trophic state classification for lakes/reservoirs	
HA	Hydrologic Area	
HQW	High Quality Waters	
HU	Hydrologic Unit	
HUC	Hydrologic Unit Code	
ICWW	Intracoastal Waterway	
IR	Integrated Report	
lbs	Pounds	
LCAT	Lower Creek Advisory Team	
LCWRIP	Lower Creek Watershed Restoration Implementation Plan	
LWP	Local Watershed Plan (associated with EEP)	
LWSP	Local Water Supply Plan	
Μ	Mesotrophic -Descriptive trophic state classification for lakes/reservoirs	
MCSESCO	Mecklenburg County Soil Erosion & Sedimentation Control Ordinance	
MEP	Maximum Extent Practicable	
MFC	Marine Fisheries Commission	

ACRONYM	Meaning	
mg/l	Milligrams per liter	
MGD	Million Gallons per Day	
MPN	Most Probable Number	
MRO	Mooresville Regional Office	
MS	Management Strategy	
MS4	Municipal Separate Storm Sewer Systems	
NC DENR	North Carolina Department of Environment and Natural Resources	
NCAC	North Carolina Administrative Code	
NCDEH	National Shellfish Sanitation Program	
NCDWQ	North Carolina Division of Water Quality	
NCEEP	North Carolina Ecosystem Enhancement Program	
NCIBI	North Carolina Index of Biotic Integrity	
NCRWQP	North Carolina Recreational Water Quality Program	
NCTSI	North Carolina Trophic State Index	
ND	No Data	
NH3-N	Ammonia nitrogen	
NHP	National Heritage Program	
NOV	Notice of Violation	
NPDES	National Pollution Discharge Elimination System	
NPS	Nonpoint Source Pollution	
NR	Not Rated	
NRCS	Natural Resources Conservation Service	
NRI	Natural Resources Inventory	
NSSP	National Shellfish Sanitation Program	
NSW	Nutrient Sensitive Waters	
NTU	Nephelometric Turbidity Units	
0	Oligotrophic -Descriptive trophic state classification for lakes/reservoirs	
ORW	Outstanding Resource Waters	
PCBs	Polychlorinated Biphenyls	
рН	Potential of Hydrogen	
POTWs	Pubic Owned Treatment Works	
PS	Partially Supporting	
RAMS	Random Ambient Monitoring System	
RBRPs	River Basin Restoration Priorities	
RC&D	Resource Conservation and Development Program	
SA	Class SA Water Classification; saltwaters that have sufficient water quality to support commercial shellfish harvesting	
SB	Class SB Water Classification; saltwaters with sufficient water quality for frequent and/or organized swimming or other human contact	
SBR	Sequencing Batch Reactor	
SC	South Carolina	
SCDHEC	South Carolina Department of Health and Environmental Control	
SDR	Sediment Delivery Ratio	
SEL	State Emergency Loan	
SIU	Significant Industrial Users (DWQ-Pretreatment Program)	
SMZ	Streamside Management Zone	
L	· · · · · · · · · · · · · · · · · · ·	

ACRONYM	Meaning	
SOC	Special Order of Consent	
SOD	Sediment Oxygen Demand	
SPPP	Stormwater Pollution Prevention Plan	
SRF	Clean Water State Revolving Fund	
SRG		
SRL	State Revolving Loan	
SSLW	Steady State Live Weight	
ST	Fully Supporting but Threatened	
STAG	State and Tribal Assistance Grant	
SU	Standard Units, units in which to measure pH	
Sw	Swamp Waters	
SWCD	Soil and Water Conservation District	
SWIM	Surface Water Improvement & Management Program (Charlotte-Mecklenburg)	
TKN	Total Kjeldahl Nitrogen	
TLW	Targeted Local Watersheds	
TMDL	Total Maximum Daily Load	
TN	Total Nitrogen	
ТОТ	Time-Of-Travel	
ТР	Total Phosphorus	
Tr	Trout Waters	
TRC	Total Residual Chlorine	
TSS	Total Suspended Solids	
UNCC	University of North Carolina at Charlotte	
URW	Use Restoration Watershed	
USEPA	United States Environmental Protection Agency	
USFS	United States Forestry Service	
USGS	United States Geological Survey	
UT	Unnamed Tributary	
WET	Whole effluent toxicity	
WLA	Wasteload Allocation	
WPCOG	Western Piedmont Council of Government	
WQC	Water Quality Committee	
WRC	Water Resource Commission	
WRP	Watershed Restoration Plan	
WRP	Wetland Reserve Program	
WS	Water Supply	
WTP	Water Treatment Plant	
WWTP	Wastewater Treatment Plants	

HYPERLINK INDEX

Symbols

319 Grant Program	
http://portal.ncdenr.org/web/wq/ps/nps/319program	
2005 New River Basinwide Water Quality Plan	
2009 Basinwide Assessment Report: New River Basin http://www.esb.enr.state.nc.us/documents/NewBasinwideFinal_09.pdf	
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Alleghany County Soil & Water Conservation District http://www.alleganyctyswcd.org/	
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В	
Basinwide Planning Unit http://portal.ncdenr.org/web/wq/ps/bpu/basin/new	
Benthic Standard Operating Procedures	
С	
CCAP	6.6
http://portal.ncdenr.org/web/swc/ccaplandingpage	
CG&L http://portal.ncdenr.org/web/wq/cgls	
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D	
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Division of Land Resources	5.1

Division of Soil and Water Conservation
Division of Water Resources
DWR's Environmental Flows
DWRs Water Supply Planning
Ε
EEP LWP Fact Sheet
EEP New River website
EEP Project Implementation webpage
EEP's New River Basin website
EEP's Web Map site
EEP website
Environmental Science Section
Executive Summary
F
Final Report
Fish Community SOP
four page document
L
Little River - Bledsoe Creek Watershed Management Plan
Little River & Chestnut Creek Watershed Chapter
Little River & Chestnut Creek Watersheds Chapter

NC DWQ NEW RIVER BASIN PLAN: GLOSSARY & HYPERLINKS 2011

10.12

M

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Monitoring Coalition Program	ES.12
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Ν	
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S	
\mathbf{D}	

Section 319 Grant Program	.4
selected stations 5	1
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http://h2o.enr.state.nc.us/basinwide/documents/Chapter2-0505000102-3PRwithApp.pdf	
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SWAP website	.4
http://swap.deh.enr.state.nc.us/swap/	
SWP	.6
http://swap.deh.enr.state.nc.us/swap/	
Τ	
This report7.	.5
http://dfr.nc.gov/water_quality/year_in_review.htm	
U	
Use Support Methodology Chapter 1.3, 1.14, 2.3, 2.13, 3.3, 3.1	2
http://h2o.enr.state.nc.us/basinwide/documents/Chapter8-UseSupportandMethodPR.pdf	2
\mathbf{V}	
Voluntary Farmland Preservation Program Ordinance	.6
http://www.alleghanycounty-nc.gov/ordinances/1-206.pdf	
Voluntary Incentive Programs & Local Initiatives7.	.1
http://h2o.enr.state.nc.us/basinwide/documents/Chapter6-LocalInitiativesandVolIncentivesPR.pdf	
W	
Water Quality ChapterES.	.8
http://h2o.enr.state.nc.us/basinwide/documents/Chapter5-WaterQuantityPR.pdf	
water quality webpage	.4
http://dfr.nc.gov/water_quality/water_quality.htm	
Watershed Management Plan	.3
http://h2o.enr.state.nc.us/basinwide/319_Documents/documents/OreKnob_Watershed_Plan.pdf	
web page	.6
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WOWD Drogram	_
W S W P Ploglalli	.5
http://h2o.enr.state.nc.us/wswp/index.html	.5

APPENDIX 1-A

Use Support Ratings for All Monitored Waters In the North Fork New River Watershed

Draft 2010 IR Category	INTEGRATED REPORTING CATEGORIES FOR INDIVIDUAL ASSESSMENT UNIT/USE SUPPORT CATEGORY/ PARAMETER ASSESSMENTS. A SINGLE AU CAN HAVE MULTIPLE ASSESSMENTS DEPENDING ON DATA AVAILABLE AND CLASSIFIED USES.
1	All designated uses are monitored and supporting
1b	Designated use was impaired, other management strategy in place and no standards violations for the parameter of interest (POI)
1nc	DWQ have made field determination that parameter in exceedance is due to natural conditions
1r	Assessed as supporting watershed is in restoration effort status
1t	No criteria exceeded but approved TMDL for parameter of interest
2	Some designated uses are monitored and supporting none are impaired Overall only
2b	Designated use was impaired other management strategy in place and no standards violations Overall only
2r	Assessed as supporting watershed is in restoration effort status overall only
2t	No criteria exceeded but approved TMDL for POI Overall only
3а	Instream/monitoring data are inconclusive (DI)
3b	No Data available for assessment
3c	No data or information to make assessment
3n1	Chlorophyll a exceeds TL value and SAC is met-draft
3n2	Chlorophyll a exceeds EL value and SAC is not met first priority for further monitoring-draft
3n3	Chlorophyll a exceeds threshold value and SAC is not met first second priority for further monitoring-draft
3n4	Chlorophyll a not available determine need to collect-draft
3t	No Data available for assessment –AU is in a watershed with an approved TMDL
4b	Designated use impaired other management strategy expected to address impairment
4c	Designated use impaired by something other than pollutant
4cr	Recreation use impaired no instream monitoring data or screening criteria exceeded
4cs	Shellfish harvesting impaired no instream monitoring data- no longer used
4ct	Designated use impaired but water is subject to approved TMDL or under TMDL development
4s	Impaired Aquatic Life with approved TMDL for Aquatic Life POI or category 5 listing
4t	Designated use impaired approved TMDL
5	Designated use impaired because of biological or ambient water quality standards violations and needing a TMDL
5r	Assessed as impaired watershed is in restoration effort status

		NC	2010 Integrated Re	eport		
	All 13,123 Waters in NC a	re in Category 5-303(d) L	ist for Mercury due to statewide	fish consumption advi	ce for several fish s	species
Cat	tegory Parameter	Ne AO_	Reason for Rating	Use Category	Collection Ye	ar 303(d)year
Ne	ew River Basin		N	orth Fork New River	Watershed 05	05000101
Ne	w River Basin		Upper Nev	v River Subbas	sin ()5050001
Ne	ew River Basin		N	orth Fork New River	Watershed 05	05000101
0	10-2-21-(4.5) B	ig Horse Creek	From SR#1362 to SR#1353 (⁻	Tuckerdale)	5.5 FW Mile	es C;Tr:+
	1 Ecological/biologi	cal Integrity Benthos	Excellent Bioclassification	Aquatic Life	2008	
0	10-2-21-(7) B (ł	ig Horse Creek Horse Creek)	From SR#1353 (Tuckerdale) New R	to North Fork	6.5 FW Mile	es C:+
	1 Ecological/biologi	cal Integrity Benthos	Excellent Bioclassification	Aquatic Life	2008	
	1 Ecological/biologi	cal Integrity FishCom	Good Bioclassification	Aquatic Life	2008	
0	10-2-14 B	ig Laurel Creek	From source to North Fork N	New River	17.5 FW Mile	es C;Tr:+
	1 Ecological/biologi	cal Integrity Benthos	Excellent Bioclassification	Aquatic Life	2008	
	1 Ecological/biologi	cal Integrity FishCom	Good Bioclassification	Aquatic Life	2008	
0	10-2-8 B	rush Fork	From source to North Fork N	New River	5.1 FW Mile	es C;Tr:+
	1 Ecological/biologi	cal Integrity Benthos	Excellent Bioclassification	Aquatic Life	2008	
Ο	10-2-20 B	uffalo Creek	From source to North Fork N	New River	9.7 FW Mile	es C;Tr:+
	1 Ecological/biologic	cal Integrity Benthos	Excellent Bioclassification	Aquatic Life	2008	
	3a Ecological/biologi	cal Integrity FishCom	Not Rated Bioclassification	Aquatic Life	2008	
•	10-2-27 H	elton Creek	From NC-VA State Line to No River	orth Fork New	19.0 FW Mile	es C;Tr:+
	1 Ecological/biologi	cal Integrity Benthos	Good Bioclassification	Aquatic Life	2008	
	3a Ecological/biologi	cal Integrity FishCom	Not Rated Bioclassification	Aquatic Life	2008	
•	10-2-7 H	oskin Fork	From source to North Fork N	New River	5.2 FW Mile	es C;Tr:+
	1 Ecological/biologi	cal Integrity Benthos	Excellent Bioclassification	Aquatic Life	2008	
•	10-2-20-1 L	ittle Buffalo Creek	From source to Buffalo Cree	k	4.4 FW Mile	es C;Tr:+
	5 Ecological/biologi	cal Integrity Benthos	Fair Bioclassification	Aquatic Life	2008	2000
•	10-2-21-8 Li	ittle Horse Creek	From source to Big Horse Cr	eek	10.9 FW Mile	es C;Tr:+
	1 Ecological/biologi	cal Integrity Benthos	Excellent Bioclassification	Aquatic Life	2008	
•	10-2-23 L	ittle Phoenix Creek	From source to North Fork N	New River	4.6 FW Mile	es C;Tr:+
	1 Ecological/biologi	cal Integrity Benthos	Excellent Bioclassification	Aquatic Life	2008	
0	10-2-25 L	ong Shoals Creek	From source to North Fork N	New River	2.7 FW Mile	es C;Tr:+
	1 Ecological/biologi	cal Integrity Benthos	Not Impaired Bioclassification	Aquatic Life	2008	

APPENDICES

1-A.2

			NC	2010 Integrated R	eport		
	All 13	3,123 Waters in N	NC are in Category 5-303(d) Lis	st for Mercury due to statewide	fish consumption advice	for several fish spe	ecies
AU_ Ca	tegory	Parameter	Name AO_L	Reason for Rating	Use Category	Collection Year	303(d)year
Ne	w Riv	er Basin		N	lorth Fork New River W	Vatershed 050	5000101
•	10-2	-21-8-1	Middle Fork Little Horse Creek	From source to Little Horse	Creek	4.5 FW Miles	C;Tr:+
	1	Ecological/biol	ogical Integrity Benthos	Excellent Bioclassification	Aquatic Life	2008	
•	10-2	-28	Millpond Branch	From source to North Fork	New River	2.0 FW Miles	C:+
	1	Ecological/biol	ogical Integrity Benthos	Excellent Bioclassification	Aquatic Life	2003	
•	10-2	-(1)	North Fork New River	From source to Three Top C	Creek	14.1 FW Miles	C;Tr:+
	1	Ecological/biol	ogical Integrity Benthos	Excellent Bioclassification	Aquatic Life	2008	
	1	Ecological/biol	ogical Integrity FishCom	Good Bioclassification	Aquatic Life	2008	
•	10-2	-(12)	North Fork New River	From Three Top Creek to No	ew River	36.5 FW Miles	C:+
	1	Ecological/biol	ogical Integrity Benthos	Excellent Bioclassification	Aquatic Life	2008	
	1	Fecal Coliform	n (recreation)	No Criteria Exceeded	Recreation	2008	
	1	Water Quality	Standards Aquatic Life	No Criteria Exceeded	Aquatic Life	2008	
0	10-2	-15	Rich Hill Creek	From source to North Fork	New River	4.9 FW Miles	C;Tr:+
	1	Ecological/biol	ogical Integrity Benthos	Excellent Bioclassification	Aquatic Life	2008	
0	10-2	-10	Roundabout Creek	From source to North Fork	New River	4.0 FW Miles	C;Tr:+
	1	Ecological/biol	ogical Integrity Benthos	Excellent Bioclassification	Aquatic Life	2008	
•	10-2	-13	Three Top Creek	From source to North Fork	New River	13.2 FW Miles	C;Tr:+
	1	Ecological/biol	ogical Integrity Benthos	Good Bioclassification	Aquatic Life	2008	
	3a	Ecological/biol	ogical Integrity FishCom	Not Rated Bioclassification	Aquatic Life	2008	
Ne	w Riv	er Basin		S	outh Fork New River W	atershed 0505/	000102
•	10-1	-37	Cranberry Creek (Mulberry Creek)	From source to South Fork	New River	18.9 FW Miles	B;Tr:+
	1	Ecological/biol	ogical Integrity Benthos	Excellent Bioclassification	Aquatic Life	2008	
	1	Ecological/biol	ogical Integrity FishCom	Good Bioclassification	Aquatic Life	2008	
0	10-1	-3-(1)	East Fork South Fork New River	From source to Watauga Co	ounty SR 1524	2.3 FW Miles	WS-IV;Tr:+
	5	Ecological/biol	ogical Integrity Benthos	Fair Bioclassification	Aquatic Life	2003	2008
0	10-1	-3-(8)	East Fork South Fork New River	From .8 mile downstream of SR 1524 to S Fk New River	of Watauga Co	0.5 FW Miles	WS-IV;CA:+
	1	Ecological/biol	ogical Integrity Benthos	Good Bioclassification	Aquatic Life	2008	

APPENDIX 1-B

BIOLOGICAL (BENTHIC & FISH) SAMPLE SITE DATA SHEETS

Station ID*	Waterbody	Assessment Unit #	DESCRIPTION	COUNTY	Site Location	SAMPLE RESULTS
			Benthic Sample Sites			
KB117	Ut. L. Phoenix Cr.	10-2-23ut5	Source to L Phoenix Cr.	Ashe	Old NC 16	08 - Not Rated 07 - Not Rated
KB118*	Ut. L. Phoenix Cr.	10-2-23ut6	Source to L Phoenix Cr.	Ashe	SR 1649	07 - Not Impaired
KB119*	Brush Fk.	10-2-8	From source to North Fork New River	Ashe	NC 88	08 - Excellent
KB120*	Roundabout Cr.	10-2-10	From source to North Fork New River	Ashe	SR 1308	08 - Excellent
KB121*	M. Fk. Little Horse Cr.	10-2-21-8-1	From source to Little Horse Cr.	Ashe	SR 1334	08 - Excellent
KB122*	Big Horse Cr.	10-2-21-(4.5)	From SR 1362 to SR 1353 (Tuckerdale)	Ashe	SR 1362	08 - Excellent
KB123*	Long Shoals Cr.	10-2-25	From source to North Fork New River	Ashe	SR 1574	08 - Not Impaired
KB125*	L. Phoenix Cr.	10-2-23	From source to North Fork New River	Ashe	SR 1513	08 - Excellent
KB127*	N. Fk. New R.	10-2-(12)	From Three Top Creek to New River	Ashe	SR 1549	08 - Excellent
KB129*	Ut. Mill Cr.	10-1-18ut4	Source to Mill Cr.	Ashe	SR 1111	07 - Not Impaired
KB134*	Buffalo Cr.	10-2-20	From source to North Fork New River	Ashe	NC 194-88	08 - Excellent
KB135*	N. Fk. New R.	10-2-(12)	From Three Top Creek to New River	Ashe	Old NC 16	08 - Excellent
KB136*	Helton Cr.	10-2-27	From NC-VA State Line to North Fork New River	Ashe	SR 1526	08 - Excellent
KB137*	Helton Cr.	10-2-27	From NC-VA State Line to North Fork New River	Ashe SR 1370		08 - Excellent
KB138*	Three Top Cr.	10-2-13	From source to North Fork New River	Ashe	SR 1100	09 - Excellent 08 - Good
KB141*	N. Fk. New R.	10-2-(1)	From source to Three Top Creek Ashe SR		SR 1118	08 - Excellent
KB23	N. Fk. New R.	10-2-(12)	From Three Top Creek to New River	Ashe	SR 1100	08 - Excellent 03 - Excellent
KB25	Helton Cr.	10-2-27	From NC-VA State Line to North Fork New River	Ashe	SR 1536	08 - Excellent 03 - Excellent
KB26	Hoskin Fk.	10-2-7	From source to North Fork New River	Ashe	NC 88	08 - Excellent 03 - Excellent
KB27	N. Fk. New R.	10-2-(12)	From Three Top Creek to New River	Ashe	SR 1644	08 - Excellent 03 - Excellent
KB30	Big Laurel Cr.	10-2-14	From source to North Fork New River	Ashe	NC 88	08 - Excellent 03 - Excellent
KB31	Buffalo Cr.	10-2-20	From source to North Fork New River	Ashe	NC 194-88	08 - Excellent 03 - Excellent
KB32	L. Buffalo Cr.	10-2-20-1	From source to Buffalo Creek	Ashe	SR 1153	08 - Fair 03 - Poor
KB33	Big Horse Cr. (Horse Cr.)	10-2-21-(7)	From SR#1353 (Tuckerdale) to North Fork New R	Ashe	NC 194	08 - Excellent 03 - Excellent
KB63	L. Horse Cr.	10-2-21-8	From source to Big Horse Creek	Ashe	SR 1334	08 - Excellent 03 - Good
KB86*	Rich Hill Cr.	10-2-15	From source to North Fork New River	Ashe	NC 88	08 - Excellent
			Fish Community Sample Sites			
KF21*	Buffalo Cr.	10-2-20	From source to North Fork New River	Ashe	NC 88/194	08 - Not Rated
KF2	Cranberry Cr.	10-1-37	From source to South Fork New River	Ashe	SR 1600	08 - Good 98 - Excellent
KF16*	Grassy Cr.	10-3	From North Carolina-Virginia State	Ashe	SR 1549	08 - Good-Fair
KF1	Big Horse Cr.	10-2-21-(7)	From SR#1353 (Tuckerdale) to North Fork New R	Ashe	SR 1350	08 - Good 98 - Good

* New station location; therefore, no data from the previous cycle.

Station ID*	Waterbody	Assessment Unit #	DESCRIPTION	COUNTY	Site Location	SAMPLE RESULTS
KF22*	Big Laurel Cr.	10-2-14	From source to North Fork New River	Ashe	NC 88	08 - Good
KF5	Helton Cr.	10-2-27	From NC-VA State Line to North Fork New River	Ashe	SR 1536	08 - Not Rated 98 - Good
KF10	N. Fk. New R.	10-2-(1)	From source to Three Top Creek	Ashe	SR 1119	08 - Good 98 - Good
KF23*	Three Top Cr.	10-2-13	From source to North Fork New River	Ashe	SR 1123	08 - Not Rated

* New station location; therefore, no data from the previous cycle.

APPENDICES

FISH COMMUNITY SAMPLE

Waterbody		Location			Date	Date Station ID		Bioclassification			
N FK NE	N FK NEW R		S	SR 1119 05/21/08 KF10		KF10		Good			
County	Subb	asin	8 digit HUC	Latitude	Longi	tude A	U Number		Level	IV Eco	region
ASHE	2	2	05050001	36.407098	-81.68	1014	10-2-(1)	S	outhern Crystal	lline Rid	lges & Mountains
Stream Classifica	ation	Drain	nage Area (mi2)	Elevatio	on (ft)	Stream V	/idth (m)	Δ	verage Depth	(m)	Reference Site
C;Tr,+			23.9	311	8	ç			0.5		No
	-	Fore	ested/Wetland	Rural Re	sidential	A	griculture		c	Other (d	escribe)
Visible Landuse	(%)		60		5		35			()
Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile) NPDES Number Volume (MGD)											
			None								
Water Quality Param	neters						5	Site Ph	otograph		
Temperature (°C)			11.2		10.3/	AN/			-	Z.	A V-AR TO L
Dissolved Oxygen (m	g/L)		10.2		A A				S AVA	-/-	
Specific Conductance	e (µS/cm)	59		1-21	AN LES			-	13	
pH (s.u.)			6.5			的地震	allow in		- And	1	
Water Clarity	[Clear			MA					
Habitat Assessment	Scores	(max)						5.	Self 2		de transition of
Channel Modification	(5)		5	Carl Carl	VA &	the second				A B	STALL STALL

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/21/08	2008-46	15	48	Good
06/29/98	98-56	14	50	Good
Most Abundant Species	Western Blacknose Dace.	Exotic	Species Brown Trout.	

cobble, gravel, sand, boulder.

Substrate

18

8

4

16 4

4

4

5 3

71

Species Change Since Last Cycle

Gains -- Bluehead Chub, Bigmouth Chub. Losses -- Rosyface Shiner.

Data Analysis

Instream Habitat (20)

Bottom Substrate (15)

Left Bank Stability (7) Right Bank Stability (7)

Light Penetration (10)

Left Riparian Score (5)

Right Riparian Score (5)

Total Habitat Score (100)

Pool Variety (10) Riffle Habitat (16)

Watershed -- located along the rural west-central edge of the New River basin where Watauga and Ashe Counties meet; this catchment drains the North Fork New River's headwaters plus the main tributaries of Pine Mountain Branch, Brush Fork, and Hoskin Fork. Habitats -- primarily riffles and runs with some chutes that were holding trout, and a few silt bottom pools; the reach is mostly sunlit because of the vegetation type along the banks and in the riparian corridor (majority of shrubs and grasses vs. trees); substrates exhibited moderate to high embededdness. **2008** -- a diverse and abundant population of cool and cold water fish species were present, including three intolerant taxa (New River Shiner, Tonguetied Minnow, and Kanawha Darter); more than twice the total abundance was collected than in 1998 (1368 vs. 552); Western Blacknose Dace (n=553) represented 40% of the sample. **1998**-**2008** -- very similar species compositions were observed and nearly identical NCIBI metrics were calculated for both monitoring years, indicating that water quality in this headwater catchment has remained good over a ten year period. APPENDICES

BENTHIC MACROINVERTEBRATE SAMPLE



Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/31/08	10517	119	57	3.67	2.73	Excellent
08/19/03	9222	81	44	3.96	3.51	Excellent
08/17/98	7710	96	52	4.05	3.23	Excellent
07/29/93	6296	102	50	3.95	3.01	Excellent

Taxonomic Analysis

The greatest number of EPT taxa collected at the site occurred in 2008. A few EPT taxa were collected for the first time, including: *Acroneuria carolinensis, Hydroptila,* and *Nectopsyche exquisita*.

Data Analysis

The site is 8.2 miles west of Jefferson. This is the site furthest upstream of the three basinwide sites on North Fork New River.

The site has consistently received classifications of Excellent following each summer sampling event (a Good was received after a non-summer sampling event in March 1989). No indications of impact are exhibited by the benthic community.

APPENDICES


Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/20/08	10541	99	49	3.93	3.31	Excellent
08/21/03	9234	72	45	3.66	3.31	Excellent
08/19/98	7719	87	50	3.77	2.91	Excellent
07/28/93	6294	93	46	4.00	2.94	Excellent

Taxonomic Analysis

EPT Richness at the site has shown very little change for the four summer sampling events between 1993 and 2008. *Helicopsyche paralimnella* has been recorded for the first time from the site; this is only one of five sites in the state so far at which the species has been found by BAU, though undoubtedly more sites will be found.

Data Analysis

The site is 4.6 miles NNW of Jefferson and is directly upstream of the mouth of Big Horse Creek. The town of West Jefferson is almost entirely included in the catchment above the site.

Consistently high EPT Richness and low NCBI values have resulted in classifications of Excellent for each sampling event between 1993 and 2008. The healthy benthic community indicates an absence of stressors at the site.



APPENDICES

Taxonomic Analysis

There is little difference between this new basinwide site and the former upstream basinwide site in terms of richness within the major groups; the number of taxa collected within each group at the new site is within the range of taxa collected at the upstream site with the exception of Lepidoptera (one taxon collected at this site; never collected at the former site) and Oligochaeta (only lumbriculids collected at this site in 2008; at least two taxa collected upstream). However, there were a few EPT taxa collected at Old NC 16 that have not been collected at NC 16 over eight sampling events, including (all rare within the sample except as noted): Acerpenna pygmaea, Heterocloeon anoka (common), Anthopotamus distinctus, Agnetina, Hydroptila, and Pycnopsyche lepida group.

Data Analysis

The site is 7.4 miles northeast of Jefferson and six stream-miles above the confluence with South Fork New River. This is the furthest downstream site of the three basinwide sites on North Fork New River. The town of West Jefferson is almost entirely included in the catchment above the site. This site replaces the basinwide site at NC 16, which is about two stream-miles upstream of this site, due to difficult access to the river at NC 16.

The four summer sampling events in 1989, 1993, 1998, and 2003 resulted in classifications of Excellent at the former basinwide site. There appears to be little difference in water quality either temporally or longitudinally between sampling events on this lower segment of North Fork New River.



Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/31/08	10514		38		3.18	Excellent
08/19/03	9221		37		2.92	Excellent
08/17/98	7709		35		3.59	Good
07/23/93	6299		30		3.56	Good

Taxonomic Analysis

The number of EPT taxa identified from the site has increased with each successive sampling event since 1993. A few taxa were collected for the first time at the site, including: *Ephemerella subvaria, Serratella deficiens, Hexagenia, Acroneuria carolinensis,* and *Leucotrichia pictipes*.

Data Analysis

The site is about 1.5 miles east of the closest point on the Tennessee Valley Divide and 0.8 stream-miles from the confluence with North Fork New River.

Increasing EPT richness with each successive sampling event since 1993 is suggestive of improving water quality at the site.



A fairly diverse EPT community exists at the site. There are no historical data for the site, so trends in community composition can not be analyzed. A few taxa were collected here that have not been collected at the former basinwide site downstream, including: *Procloeon, Maccaffertium pudicum, Diplectrona modestum, Ceraclea,* and *Chimarra*.

Data Analysis

The site is 8.1 miles west of Jefferson. This new basinwide site is 1.3 stream-miles upstream of the former site at SR 1100. The site was moved to remove the influence of development directly upstream of the old basinwide site, and to locate it in the Amphibolite Mountains ecoregion so that a potential reference site for the ecoregion could be established.

The same number of EPT taxa were recorded for this site in 2008 as were for the former site in 2003. In both cases the additional of a single EPT taxon would have resulted in a classification of Excellent.

FISH COMMUNITY SAMPLE

Waterboo	dy		L	ocation		Date	Station ID	Bio	classification
THREE TO	P CR		SF	R 1123		05/20/08	KF23	N	ot Rated
County	Subba	sin 8 di	git HUC	Latitude	Long	itude	AU Number	Lev	el IV Ecoregion
ASHE	2	050	50001	36.420699	-81.62	21819	10-2-13	Amp	hibolite Mountains
Stream Classifica	tion	Drainage /	Area (mi2)	mi2) Elevation (ft) Stream Width (m) Average Depth (m) Re					
C;Tr		23	5.1	290	0	10		0.4	Yes
								0.1	
Vicible Landuce	(0/)	Forested	/wetland	Rurai	Residenti	ai	Agriculture	15	ier (describe)
visible Landuse	(%)	0	5		15		5	10	
Upstream NPDES Di	scharger	s (>1MGD	or <1MGD a	and within 1 r	nile)		NPDES Nu	mber	Volume (MGD)
		<u> </u>	lone						
Water Quality Param	eters						Site I	Photograph	
Temperature (°C)			14.4	Ser LA	1	C-S-it		2 0 0 00 10	State State States
Dissolved Oxygen (mg	g/L)		9.5	- Art	1 Der	and the second			ALL AND AND A
Specific Conductance	(µS/cm)		38				四条 计言		
pH (s.u.)			6.4	A State	- inform		1000	A Diss	
	_			1 and	10 Page	a Gind H			
Water Clarity		Cle	ear					Sector (
Habitat Assessment	Scores (max)							A sources
Channel Modification	(5)		5	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1					
Instream Habitat (20)			20		2 and				
Bottom Substrate (15))		12						
Pool Variety (10)			6		- Carl				
Riffle Habitat (16)			16		All and				
Left Bank Stability (7)			7						Contraction of the second
Right Bank Stability (7	')		7		3				
Light Penetration (10)			7		The .		3	A States	
Left Riparian Score (5)		3						
Right Riparian Score ((5)		2						
Total Habitat Score (100)		85	Sub	strate	flat cobble, bo	ulder, bedrock, g	ravel, sand.	
Sample Date	•		Sample II	b	Spe	cies Total	NC	СІВІ	Bioclassification
05/20/08			2008-45			15			Not Rated
Most Abundant	t Species	Fanta	il Darter.			Exotic	Species Roc	k Bass, Brown Tro	ut.
Species Change	Since La	st Cycle	N/A						
Data Analysis									
New basinwide site.	Natershe	d a tribu	tary to the N	orth Fork New	River that	flows north, dr	aining part of we	st-central Ashe Co	unty. Habitats high

quality instream habitats consisting of riffles and runs with deep chutes that were holding trout, and some small side pools; roads on both sides of the stream prevent broad riparian widths, but the stream's banks were very stable, with some Mountain Laurel on the right bank; the tree canopy provides about 50% shading to the stream. **2008** -- a diverse assemblage of cool and cold water fish fauna were collected from the stream, including four species that are considered to be intolerant to pollution (Rock Bass, Tonguetied Minnow, Kanawha Darter, and Appalachia Darter); Fantail Darters represented 36% of the sample and Mottled Sculpin comprised 29%; overall, the fish community of Three Top Creek appears to be healthy, and suggests no obvious water quality issues.



Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
06/19/08	10468		53		2.62	Excellent
08/19/03	9225		38		2.92	Excellent
07/17/98	7712		40		3.49	Excellent
07/29/93	6298		48		3.29	Excellent

Taxonomic Analysis

The greatest number of EPT taxa collected from the site occurred in 2008. Taxa collected for the first time included: *Eurylophella verisimilis, Ephemera, Anthopotamus distinctus, Brachycentrus appalachia, Ceratopsyche slossonae, Oecetis persimilis, and Triaenodes ignitus*.

Data Analysis

The site is near the confluence with North Fork New River and about eight miles west of Jefferson.

The highest EPT richness and the lowest EPT BI values were recorded for the site in 2008. Each time the site has been sampled it has received a classification of Excellent. The benthic community does not exhibit signs of impact.

FISH COMMUNITY SAMPLE



Species Change Since Last Cycle

N/A

Data Analysis

New basinwide site. **Watershed** -- a tributary to the North Fork New River that drains the northwestern-most edge of Ashe County. **Habitats** -- good instream habitat qualities in this large mountain stream, consiting primarily of runs and some riffles; moderate to high embeddedness of substrates; good bank stabilities and vegetated riparian widths, but shading is limited to the stream's edges. **2008** -- a highly diverse and trophically balanced population of mostly cool and cold water fish species was collected, including seven taxa that are considered intolerant to pollution (Rock Bass, Tonguetied Minnow, New River Shiner, Rosyface Shiner, Kanawha Minnow, Kanawha Darter, and Appalachia Darter); Mountain Redbelly Dace represented 47% of the sample (n=350); two Hellbenders (one adult and one young-of-year) were also collected, suggesting high quality water.



Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/20/08	10542		39		2.51	Excellent

Taxonomic Analysis

The EPT portion of the benthic community at the site is diverse. *Baetisca berneri*, a mayfly often collected in the New River basin but uncollected at the prior basinwide site on Buffalo Creek, was abundant at this site. The low EPT BI indicates a community intolerant to the presence of pollutants.

Data Analysis

The site is about 2 miles west of Jefferson. The basinwide site for Buffalo Creek was relocated to above the mouth of Little Buffalo Creek to assess conditions in the catchment without the influence of West Jefferson WWTP; the original basinwide site is about 0.4 stream-miles downstream of the present site. At the new location the catchment is mostly forest and pasture with no urban influence.

The high EPT Richness and low EPT BI value indicates a healthy benthic community and the absence of stressors.

FISH COMMUNITY SAMPLE

Waterbo	dy			Location		Date	,	Station ID	ID Bioclassification		fication
BUFFALC	O CR		N	C 88/194		05/19/	/08	KF 21		Not R	ated
County	Subba	asin	8 digit HUC	Latitude	Long	itude		AU Number	1	evel IV F	coregion
ASHE	1		05050001	36.433146	-81.51	11071		10-2-20	Ar	nphibolite	e Mountains
Stream Classifica	tion	Drain	nage Area (mi2)) Elevatio	on (ft)	Stream	m Wid	ith (m)	Average Depth	n (m)	Reference Site
C;Tr			12.6	283	3		7		0.4		Yes
			4 1/14/- 411	Desident				A		041	
Vicible Landuce	(%)	For	50	Resident	ai/Comm	ercial		Agriculture	15 (r	Other (de	88 and 104)
	(70)		50		50			5	13 (1		00 anu 194)
Upstream NPDES Di	ischarge	rs (>1	MGD or <1MGE) and within 1 m	nile)			NPDES Nur	nber	Ve	olume (MGD)
			None								
Water Quality Param	neters							Site P	hotograph		
Temperature (°C)			17.0		1.5		Start/	14 × 1	the in the	A State	
Dissolved Oxygen (m	a/L)		9.3	1.1.1.1				L-Children		August -	the A Care
Specific Conductance	e (µS/cm)		62					AND DE	t ibe	Field 1	JAC ALL
pH (s.u.)			6.9		1						
	_								6 × 0		
Water Clarity			Clear		Sec. 1				C. Let ?		
				-				- 70	Sand Barry Barry		
Habitat Assessment	Scores	(max)					No.			46	
Channel Modification	(5)		5	and the second		5					
Instream Habitat (20)			20			-	-				
Bottom Substrate (15))		12				-				
Pool Variety (10)			4						na anna an taonn an t		
Riffle Habitat (16)			16		-			-1			100 - 10 M
Left Bank Stability (7)			6	the film							and the second sec
Right Bank Stability (7	7)		6	and a second							
Light Penetration (10))		7								and the second s
Left Riparian Score (5)		4		the same of the	and the second					and the second
Right Riparian Score	(5)		3	Cub	- 4	flat askbla		al baulden			
Total Habitat Score ((100)		83	Sub	strate	nat coople	e, grav	el, douider.			
Sample Date	e		Sample	ID	Spe	cies Total		NC	IBI	Bio	classification
05/19/08			2008-4	2		15			-		Not Rated
Most Abundan	t Specie	s	Fantail Darter.			Exc	otic Sj	pecies Rock Trou	k Bass, Bluegill, t, Brown Trout.	Saffron S	Shiner, Rainbow

Species Change Since Last Cycle

N/A

Data Analysis

New basinwide site. **Watershed** -- a tributary to the North Fork New River that drains part of central Ashe County, just to the west of Jefferson. **Habitats** -- high quality instream habitats including swift riffles and runs with a few chutes and a few shallow side pools that were holding trout; good bank stabilities and vegetated riparian widths; the canopy was providing equal amounts of shade and sunlight to the stream; low to moderate embeddedness of substrates; the Buffalo Meadows WWTP (<1MGD, 100% domestic) located 2.8 miles upstream may be contributing to the slightly elevated conductivity. **2008** -- a diverse and fairly trophically balanced mix of mostly cool and cold water fish taxa was collected, including three species that are considered intolerant to pollution (Rock Bass, Kanawha Darter, and Rainbow Trout); Fantail Darters (intermediately tolerant insectivores) represented 59% of the collected sample; overall, this stream is supporting a reasonably healthy fish population and appears to have no obvious water quality issues.



Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/21/08	10543	63	13	6.00	5.00	Fair
08/20/03	9228	22	6	6.40	4.11	Poor
08/18/98	7713	39	14	7.07	5.28	Fair
07/13/93	6265	24	0	8.31		Poor

Taxonomic Analysis

The EPT portion of the benthic community has differed significantly with each sampling event. Even for the two sampling events with similar EPT richness (1998 and 2008) only four taxa were in common. In 2008 four EPT taxa were collected that had not been collected during prior sampling events, and three of those (*Maccaffertium pudicum, Hydropsyche betteni,* and *Leucotrichia pictipes*) were abundant in the sample.

Data Analysis

The site is one mile west of downtown Jefferson and within 0.9 stream-miles downstream of the West Jefferson WWTP. The stream is on the state's 303(d) list for nutrients and impaired biological integrity.

For the four sampling events since 1993 the lowest NCBI value is shown for 2008, and EPT Richness is close to the high value from 1998. Of the four years that benthic sampling was performed 2008 exhibited the lowest flows for area streams. Dry conditions should increase instream effluent concentrations from the WWTP upstream; the benthic community does not reflect this.

FISH COMMUNITY SAMPLE

Waterboo	dy		Location				Date)	Station ID		Bioclassification	
BIG HORS	SE CR			SR 1	350		05/20	/08	KF1		od	
County	Subba	asin	8 digit HUC Latitude Longitu		itude	le AU Number		er	Level IV Ecoregion			
ASHE	2		05050001	36.	487395	-81.50	0386		10-2-21-(7))	New Riv	er Plateau
Stream Classifica	tion	Drair	nage Area (mi	2)	Elevatio	on (ft)	Strea	m Wio	dth (m)	Av	erage Depth (m)	Reference Site
C;Tr,+			56.2		268	1		13			0.7	No
Visible Landuse	Forested/Wetland				Rural Residential		Ag	Agriculture		Other (d	Other (describe) 0	
Upstream NPDES Di	scharge	ers (>1	MGD or <1MG	D and	within 1 r	nile)	ł		NPDES	Numb	er V	olume (MGD)
Town	of Lansi	ng WV	VTP (<1MGD -	1.1 mi	iles upstrea	am)			NC00	66028		0.05
Water Quality Param	neters								Si	te Pho	tograph	
Temperature (°C)			12.5	5			k	Mary Land				

Temperature (°C) Dissolved Oxygen (mg/L) Specific Conductance (µS/cm) pH (s.u.)

Water Clarity

Slightly turbid

9.7

46

6.0

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	8
Pool Variety (10)	4
Riffle Habitat (16)	5
Left Bank Stability (7)	5
Right Bank Stability (7)	4
Light Penetration (10)	2
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	59



Substrate sa

e sand, cobble, boulder, gravel.

Sample Date		Sample ID	Spe	cies Total		NCIBI	Bioclassification
05/20/08		2008-43	15		48		Good
06/29/98		98-57	13			48	Good
Most Abundant Species	Fanta	il Darter.		Exotic S	pecies	Rock Bass, Smallmo	outh Bass, Brown Trout.
Species Change Since Las	t Cycle	Gains White Sucker, M Dace, Brown Trout. Los Shiner.	Mottled Sci ses Ros	ulpin, Kanawha syside Dace, Big	Darter, Sm gmouth Ch	nallmouth Bass, Kanav ub, Saffron Shiner, Ne	wha Minnow, Longnose w River Shiner, Rosyface
Data Analysis							
Watershed a tributary to the N	lorth Fork	New River that drains a go	ood portior	of the northwe	stern tip of	Ashe County; the site	is located just southeast of

Watershed -- a tributary to the North Fork New River that drains a good portion of the northwestern tip of Ashe County; the site is located just southeast of Lansing. Habitats -- low quality instream habitats composed of wide and swift sandy runs with some boulder and cobble, few pools, and very few riffles for a mountain stream; the banks were generally healthy except for a 25 foot area on the right bank that was sloughng into the stream; riparian zones vegetated with mostly grasses, shrubs and very few trees; full sun over most of the stream due to its' width and the lack of canopy trees. 2008 -- a diverse and trophically balanced community of cool and cold water fish species was collected, including six intolerant taxa (Rock Bass, Smallmouth Bass, Tonguetied Minnow, Silver Shiner, Kanawha Minnow, and Kanawha Darter); almost three times the total abundance than in 1998 (652 vs. 242). 1998-2008 -- a total of 20 fish species have been collected from this site; in spite of some habitat issues, this stream is supporting a healthy assemblage of fish, and continues to exhibit good water quality.



Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
06/10/08	10470	123	60	4.33	2.84	Excellent
08/19/03	9226	89	50	3.95	3.42	Excellent
08/18/98	7715	103	56	4.18	3.14	Excellent
07/28/93	6293	129	56	4.10	2.78	Excellent

Taxonomic Analysis

A large number of EPT taxa have always been collected from the site; the highest number was in 2008. Many taxa were recorded for the first time, including: *Brachycercus, Dannella simplex, Ephemerella dorothea, Eurylophella aestiva, Rhithrogena uhari, Ceraclea enodis, and Neophylax fuscus*. There were several highly tolerant taxa (i.e. with a tolerance value of 8.0 or greater) either common or abundant that helped to drive the NCBI value up: Corixidae; the midges *Chironomus, Polypedilum illinoense* group, *Procladius, Thienemannimyia* group; and *Nais*, an oligochaete.

Data Analysis

The site is about 4.7 miles NNW of Jefferson and about 0.25 stream-miles above the confluence with North Fork New River.

The site has received a classification of Excellent during each summer sampling event since 1993, in most cases driven by high EPT abundance and richness.

Right Bank Stability (7)

Light Penetration (10)

Left Riparian Score (5)

Right Riparian Score (5)

Total Habitat Score (100)

Sample Date

08/21/08

08/19/03

08/18/98

Taxonomic Analysis

Data Analysis



4

2

0

0

61

Sample ID

10544

9227

7716

The site is about 9.7 miles northwest of Jefferson and 3.6 miles south of the Virginia border.

provided by trees would diversify benthic habitat, and streamside vegetation would filter pollutants from runoff.

collected from the site, reflecting the paucity of root mat habitat.

Substrate

ST

EPT

38

33

35

EPT Richness was higher in 2008 than for previous years, improving the classification for the site from Good to Excellent. *Isogenoides hansoni* was identified from the site for the first time in 2008; this is one of 44 sites from which the BAU has collected the stonefly. Leptocerids have not been

The site attained a classification of Excellent for the first time in 2008. Though the benthic community does not reflect stress, the lack of a riparian zone at the reach sampled is likely limiting the fauna. A canopy over the stream would increase the presence of coldwater stenotherms, root mats

mix of cobble, boulder, gravel, sand; some silt

BI

EPT BI

2.92

3.03

3.62

Bioclassification

Excellent

Good

Good

APPENDICES

1-B.19



Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/20/08	10538		37		2.93	Excellent
08/18/03	9220		40		3.12	Excellent
08/18/98	7718		37		3.14	Excellent

Taxonomic Analysis

Though abundant and common in the sample in 1998 and 2003 respectively, *Tallaperla* was uncollected in August 2008 in spite of ample leafpacks for habitat. The only leptocerid collected during summer sampling was *Setodes* (rare in the sample) in 1998, reflecting the paucity of root mats at the site. *Glossosoma*, which was abundant in 2003, was uncollected in both 1998 and 2008. Otherwise the EPT portion of the benthic community was similar among the three summer sampling events at the site, primarily with taxa rare at the site dropping in and out.

Data Analysis

The site is 8.4 miles NNE of Jefferson, and 1.7 stream-miles from the confluence with North Fork New River.

There has been little change in the benthic community among the three summer sampling events, suggesting stable conditions at the site since 1998.

FISH COMMUNITY SAMPLE

Waterboo	dy		Location		Date	e	Station ID	E	Bioclassifi	cation	
HELTON	CR	S	R 1536		05/08/08 KF5			Not Rated			
County	Subbasin	8 digit HUC	Latitude	Longi	itude		AU Number	L	Level IV Ecoregion		
ASHE	2	05050001	36.53472222	-81.421	38889		10-2-27		New River	Plateau	
Stream Classifica	tion Drai	nage Area (mi2)	Elevatio	n (ft)	Strea	am Wio	dth (m)	verage Depth	ı (m)	Reference Site	
C;Tr,+		43.7	2580)		10		0.4		Yes	
	Fo	rested/Wetland	Rural Re	sidential		Aa	riculture	(Other (des	cribe)	
Visible Landuse	(%)	95	5	5			0		0		
Unstream NPDES Di	schargers (>	IMGD or <1MGD	and within 1 n	nila)	•			ber	Vol	ume (MGD)	
	Schargers (*	None		ine)					101		
Water Quality Param	otors						Site Pl	notograph			
Torrespondence (%C)		11.0		1000	Sec. 10		THE OWNER ADDRESS	ioto grupii	Televista	主要	
Dissolved Oversen (m)	∼/l)	14.9			A		A TON		المجتمع والم		
Specific Conductance	y/L)	9.7		A and	X			ALC DE		and the	
	; (µ3/cm)	74	As a second				Same X				
pri (3.u.)		1.4	a start		Street P	同時		Contraction of the	and the second		
Water Clarity		Clear					all and a second			and the second second	
Habitat Assessment	Scores (max)				State of the second	- 66			sed -		
Channel Medification	(5)	5		and the second			The state of the	and the state	Constant of the	ALC: N	
Instream Habitat (20)	(3)	18	Carlos and			6	and the second		Charles and		
Bottom Substrate (15))	13								100 45	
Pool Variety (10))	4			2 Martin	- Carton	ANTIN THE REAL PROPERTY	- the second	- The	TAX.	
Riffle Habitat (16)		15			-	Sam.			-		
Left Bank Stability (7)		6	10000				Fine		the state	THE LOW THE WAY	
Right Bank Stability (7	7)	4					Provent To Page			and the second second	
Light Penetration (10)	,	7	Section in				And and a second second	and the second		and the second second	
Left Riparian Score (5	5)	5		Contraction of the			and I	Part of the	HE T	AL PROPERTY	
Right Riparian Score	(5)	3									
Total Habitat Score ((100)	80	Subs	strate	Cobble, b	ooulde	r, gravel, and det	itus			
Sample Date)	Sample	ID	Spe	cies Tota	I	NCI	BI	Bioc	lassification	
05/08/08		2008-34	1		15				Ν	lot Rated	

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification				
05/08/08	2008-34	15		Not Rated				
06/30/98	98-58	15	52	Good				
Most Abundant Species	Mountain Redbelly Dace	Exotic Spec	cies Saffron Shiner					
	Gains Kanawha Minnow, Mottled Sculpin, and Kanawha Darter. Losses Bluntnose Minnow, Bainhow							

Species Change Since Last Cycle

Gains -- Kanawha Minnow, Mottled Sculpin, and Kanawha Darter. **Losses** -- Bluntnose Minnow, Rainbow Trout, and Rock Bass.

Data Analysis

Watershed -- drains southern Grayson County, VA and northern Ashe County; no municipalities within the watershed; tributary to the N Fk New River, site is ~ 2 miles from the creek's confluence with the river. Habitat -- runs, riffles, shallow uniform pools, narrow riparian zone on the right; total score in 1998 was 88; bank stability and quality of pools appeared to have declined. 2008 -- Rock Bass+Smallmouth Bass+Trout absent; ~ 60% of the fish were Mountain Redbelly Dace, Bluehead Chub, and Central Stoneroller; Mountain Redbelly Dace were extremely abundant along the stream margins; community is Not Rated pending an evaluation in 2009. 1998 & 2008 -- 18 species known from the site, including the endemic Kanawha Minnow and Kanawha Darter and the nonindigenous Saffron Shiner, Rainbow Trout, and Rock Bass; 2.4 times more fish collected in 2008 than in 1998 (1,388 vs. 581); 10 times more Mountain Redbelly Dace were collected in 2008 than in 1998; species absent in 2008 were represented by 2-4 fish/species in 1998; and fishery is managed by NCWRC as Delayed Harvest Waters, within the reach, eight 230-389 mm TL stocked Brook Trout and Rainbow Trout were collected.

NEW

APPENDIX 1-C

Ambient Monitoring Systems Station Data Sheets

Station ID	WATERBODY	AU#	Location	Impaired (By Parameter)	Impacted (By Parameter)
K7500000	North Fork New R.	10-2-(12)	SR 1573 at Crumpler	Fecal Coliform (20%)	Turbidity (7%)

Ambient Monitoring System Station Summaries

NCDENR, Division of Water Quality

Basinwide Assessment Report

Location:	N FORK NEW	NFORK NEW RIV AT SR 1573 AT CRUMPLER								
Station #:	K7500000			Hydrologic Unit Code:	05050001					
Latitude:	36.50403	Longitude:	-81.39004	Stream class:	C +					
Agency:	NCAMBNT			NC stream index:	10-2-(12)					

Time period: 02/01/2005 to 12/17/2009

	#	#		Resul	ts no	t meeting	EL	Percentiles					
	results	ND	EL	#	%	%Conf	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	57	0	<4	0	0		7	8	8.6	9.9	11.4	13.4	14.3
	57	0	<5	0	0		7	8	8.6	9.9	11.4	13.4	14.3
pH (SU)	57	0	<6	0	0		6.8	7.1	7.4	7.6	8	8.2	8.6
	57	0	>9	0	0		6.8	7.1	7.4	7.6	8	8.2	8.6
Spec. conductance (umhos/cm at 25°C)	56	0	N/A				54	58	61	66	72	79	100
Water Temperature (°C)	57	0	>29	0	0		0.8	3.6	7.2	14.3	20.8	24.2	25.6
Other													
TSS (mg/L)	18	4	N/A				6	6.2	6.2	11.5	22.2	262.6	268
Turbidity (NTU)	57	2	>50	4	7		1	1.5	3.1	6.3	13.5	28.2	330
Metals (ug/L)													
Aluminum, total (Al)	8	0	N/A				82	82	262	330	518	610	610
Arsenic, total (As)	8	8	>10	0	0		5	5	5	5	5	5	5
Cadmium, total (Cd)	8	8	>2	0	0		1	1	1.2	2	2	2	2
Chromium, total (Cr)	8	8	>50	0	0		10	10	14	25	25	25	25
Copper, total (Cu)	8	8	>7	0	0		2	2	2	2	2	2	2
Iron, total (Fe)	8	0	>1000	0	0		260	260	478	575	922	1000	1000
Lead, total (Pb)	8	8	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	6	6	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	8	8	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	8	7	>50	0	0		10	10	10	10	10	33	33
Fecal Coliform Screen	ing(#/10()mL)											
# results: Geomean	:	#>40	0: %	> 400: %	Conf:								

# results:	Geomean:	<i>#</i> > 400:	% > 40
55	73.7	11	20

<u>Key:</u>

result: number of observations

ND: number of observations reported to be below detection level (non-detect)

EL: Evaluation Level; applicable numeric or narrative water quality standard or action level

Results not meeting EL: number and percentages of observations not meeting evaluation level

%Conf : States the percent statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)

Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

APPENDIX 1-D

12-DIGIT SUBWATERSHED MAPS









NEW RIVER BASIN: NORTH FORK NEW RIVER WATERSHED (HUC 0505000101)



NEW RIVER BASIN: NORTH FORK NEW RIVER WATERSHED (HUC 0505000101)



NEW RIVER BASIN: NORTH FORK NEW RIVER WATERSHED (HUC 0505000101)







APPENDIX 2-A

USE SUPPORT RATINGS FOR ALL MONITORED WATERS IN THE SOUTH FORK NEW RIVER & FOX CREEK WATERSHEDS

Draft 2010 IR Category	INTEGRATED REPORTING CATEGORIES FOR INDIVIDUAL ASSESSMENT UNIT/USE SUPPORT CATEGORY/ PARAMETER ASSESSMENTS. A SINGLE AU CAN HAVE MULTIPLE ASSESSMENTS DEPENDING ON DATA AVAILABLE AND CLASSIFIED USES.
1	All designated uses are monitored and supporting
1b	Designated use was impaired, other management strategy in place and no standards violations for the parameter of interest (POI)
1nc	DWQ have made field determination that parameter in exceedance is due to natural conditions
1r	Assessed as supporting watershed is in restoration effort status
1t	No criteria exceeded but approved TMDL for parameter of interest
2	Some designated uses are monitored and supporting none are impaired Overall only
2b	Designated use was impaired other management strategy in place and no standards violations Overall only
2r	Assessed as supporting watershed is in restoration effort status overall only
2t	No criteria exceeded but approved TMDL for POI Overall only
3а	Instream/monitoring data are inconclusive (DI)
3b	No Data available for assessment
3с	No data or information to make assessment
3n1	Chlorophyll a exceeds TL value and SAC is met-draft
3n2	Chlorophyll a exceeds EL value and SAC is not met first priority for further monitoring-draft
3n3	Chlorophyll a exceeds threshold value and SAC is not met first second priority for further monitoring-draft
3n4	Chlorophyll a not available determine need to collect-draft
3t	No Data available for assessment –AU is in a watershed with an approved TMDL
4b	Designated use impaired other management strategy expected to address impairment
4c	Designated use impaired by something other than pollutant
4cr	Recreation use impaired no instream monitoring data or screening criteria exceeded
4cs	Shellfish harvesting impaired no instream monitoring data-no longer used
4ct	Designated use impaired but water is subject to approved TMDL or under TMDL development
4s	Impaired Aquatic Life with approved TMDL for Aquatic Life POI or category 5 listing
4t	Designated use impaired approved TMDL
5	Designated use impaired because of biological or ambient water quality standards violations and needing a TMDL
5r	Assessed as impaired watershed is in restoration effort status

NC 2010 Integrated Report

	All 13	3.123 Waters in NC are in Category 5-3	03(d) Li	st for Mercury due to statewide f	ish consumption advice	for sev	veral f	ish spe	cies		
AU_	U_Number AU_Name AU_Description LengthArea AU_Units Classification										
Cat	egory	7 Parameter		Reason for Rating	Use Category	Coll	ectior	Year	303(d)year		
Ne	w Riv	ver Basin		No	orth Fork New River W	aters	hed	0505	000101		
•	10-2	2-21-8-1 Middle Fork Litt Horse Creek	le	From source to Little Horse C	Creek	4.5	FW	Miles	C;Tr:+		
	1	Ecological/biological Integrity Bent	hos	Excellent Bioclassification	Aquatic Life	, -	2008				
0	10-2	2-28 Millpond Brancl	า	From source to North Fork N	ew River	2.0	FW	Miles	C:+		
	1	Ecological/biological Integrity Bent	hos	Excellent Bioclassification	Aquatic Life	:	2003				
0	10-2	2-(1) North Fork New	River	From source to Three Top Cr	eek	14.1	FW	Miles	C;Tr:+		
	1	Ecological/biological Integrity Bent	hos	Excellent Bioclassification	Aquatic Life	:	2008				
	1	Ecological/biological Integrity Fish	Com	Good Bioclassification	Aquatic Life	:	2008				
•	10-2	2-(12) North Fork New	River	From Three Top Creek to Nev	w River	36.5	FW	Miles	C:+		
	1	Ecological/biological Integrity Bent	hos	Excellent Bioclassification	Aquatic Life	:	2008				
	1	Fecal Coliform (recreation)		No Criteria Exceeded	Recreation		2008				
	1	Water Quality Standards Aquatic I	life	No Criteria Exceeded	Aquatic Life		2008				
0	10-2	2-15 Rich Hill Creek		From source to North Fork N	ew River	4.9	FW	Miles	C;Tr:+		
	1	Ecological/biological Integrity Bent	hos	Excellent Bioclassification	Aquatic Life		2008				
•	10-2	2-10 Roundabout Cre	ek	From source to North Fork New River		4.0	FW	Miles	C;Tr:+		
	1	Ecological/biological Integrity Bent	hos	Excellent Bioclassification	Aquatic Life		2008				
•	10-2	2-13 Three Top Creel	(From source to North Fork N	ew River	13.2	FW	Miles	C;Tr:+		
	1	Ecological/biological Integrity Bent	hos	Good Bioclassification	Aquatic Life		2008				
	За	Ecological/biological Integrity Fish	Com	Not Rated Bioclassification	Aquatic Life	:	2008				
Ne	w Riv	ver Basin		So	uth Fork New River W	aters	hed	0505	000102		
•	10-1	1-37 Cranberry Creel (Mulberry Creel	(()	From source to South Fork N	ew River	18.9	FW	Miles	B;Tr:+		
	1	Ecological/biological Integrity Bent	hos	Excellent Bioclassification	Aquatic Life		2008				
	1	Ecological/biological Integrity Fish	Com	Good Bioclassification	Aquatic Life	:	2008				
•	10-1	1-3-(1) East Fork South New River	Fork	From source to Watauga Cou	inty SR 1524	2.3	FW	Miles	WS-IV;Tr:+		
	5	Ecological/biological Integrity Bent	hos	Fair Bioclassification	Aquatic Life		2003		2008		
•	10-1	1-3-(8) East Fork South New River	Fork	From .8 mile downstream of SR 1524 to S Fk New River	Watauga Co	0.5	FW	Miles	WS-IV;CA:+		
	1	Ecological/biological Integrity Bent	hos	Good Bioclassification	Aquatic Life		2008				

				NC 2010 Integrated	a Report						
	All 13,	,123 Waters in	NC are in Category 5-303	B(d) List for Mercury due to state	wide fish consumption adv	vice for several fish spe	cies				
AU_	Number AU_Name tegory Parameter			AU_Description	LengthA	rea AU_Units Class	sification				
Cat	egory	Parameter		Reason for Rating	Use Category	Collection Year	303(d)year				
Ne	w Rive	er Basin			South Fork New River Watershed 05						
•	10-1-9-(6) Howard Creek		From the Appalachian Water Supply Intake D New River	State University Raw am to South Fork	3.6 FW Miles	C;Tr,HQW					
	1	Ecological/bio	logical Integrity Bentho	Good Bioclassification	Aquatic Life	2008					
	3a	Ecological/bio	logical Integrity FishCo	Mot Rated Bioclassificat	ion Aquatic Life	2008					
0	10-1-	-35-4	Little Peak Creek	From source to Peak C	reek	2.8 FW Miles	B;Tr:+				
	4s	Ecological/bio	logical Integrity Bentho	Poor Bioclassification	Aquatic Life	2008	2000				
0	10-1	-10	Meat Camp Creek	From source to South	Fork New River	10.4 FW Miles	C;Tr:+				
	1	Ecological/bio	logical Integrity Bentho	s Excellent Bioclassificati	on Aquatic Life	2008					
	3a	Ecological/bio	logical Integrity FishCo	Mot Rated Bioclassificat	ion Aquatic Life	2008					
0	10-1	-2-(15)	Middle Fork Soutl Fork New River	h From 0.4 mile downstr 321 to South Fk New R	of US Hwy 221 & iver	0.5 FW Miles	WS-IV;CA:·				
	1	Ecological/bio	logical Integrity Bentho	Good-Fair Bioclassificat	ion Aquatic Life	2008					
	3a	Ecological/bio	logical Integrity FishCo	Mot Rated Bioclassificat	ion Aquatic Life	2008					
•	10-1	-2-(6)	Middle Fork Soutl Fork New River	h From Brown Branch to	Boone Dam	3.5 FW Miles	WS-IV;Tr:+				
	1	Ecological/bio	logical Integrity Bentho	Good-Fair Bioclassificat	ion Aquatic Life	2003					
•	10-1	-32b	Naked Creek	From 0.4 miles above J South Fork New River	efferson WWTP to	2.5 FW Miles	C:+				
	1	Ecological/bio	logical Integrity Bentho	s Good-Fair Bioclassificat	ion Aquatic Life	2008					
	5	Ecological/bio	logical Integrity FishCo	m Fair Bioclassification	Aquatic Life	2008	2010				
0	10-1	-10-2	Norris Fork	From source to Meat C	Camp Creek	4.3 FW Miles	C;Tr:+				
	1	Ecological/bio	logical Integrity Bentho	Good Bioclassification	Aquatic Life	2008					
0	10-1	-27-(2)	Obids Creek	From a point 0.9 mile o Hwy 163 to South Fork	lownstream of NC KNew River	2.8 FW Miles	WS-IV;Tr:+				
	1	Ecological/bio	logical Integrity Bentho	Good Bioclassification	Aquatic Life	2008					
	1	Ecological/bio	logical Integrity FishCo	Good Bioclassification	Aquatic Life	2008					
0	10-1	-35-3	Ore Knob Branch	From source to Peak C	reek	0.9 FW Miles	B;Tr:+				
	4s	Ecological/bio	logical Integrity Bentho	Poor Bioclassification	Aquatic Life	2003	2000				
0	10-1	-35-(2)a	Peak Creek	From Water Supply Da Sulphides, Inc to Ore K	m at Appalachian nob Branch	2.1 FW Miles	B;Tr:+				
	1	Ecological/bio	logical Integrity Bentho	Good Bioclassification	Aquatic Life	2008					

NC 2010 Integrated Report

	All 13,123 Waters in NC are in Category 5-303(d) List for Mercury due to statewide fish consumption advice for several fish species										
	Numb	Der AU_	Name AU_I	Description	LengthA	rea AU_Units Class					
Ca	egory	Parameter		Reason for Rating	Use Category	Collection Year	303(d)year				
Ne	w Riv	ver Basin		S	outh Fork New Rive	r Watershed 0505	000102				
•	10-1	35-(2)b	Peak Creek	From Ore Knob Branch to S River	outh Fork New	2.9 FW Miles	B;Tr:+				
	4s	Ecological/bio	logical Integrity Benthos	Poor Bioclassification	Aquatic Life	2008	2006				
0	10-1	-15-1	Pine Orchard Creek	From source to Elk Creek		3.5 FW Miles	C;Tr:+				
	1	Ecological/bio	ogical Integrity Benthos	Excellent Bioclassification	Aquatic Life	2008					
•	10-1	0-1-24 Pine Swamp Creek (Pine Swamp)		From source to South Fork	New River	5.5 FW Miles	C:+				
	1	Ecological/bio	logical Integrity Benthos	Good Bioclassification	Aquatic Life	2008					
Ο	10-1	-38	Prathers Creek	From source to South Fork	New River	11.1 FW Miles	B;Tr:+				
	1	Ecological/bio	logical Integrity FishCom	Good-Fair Bioclassification	Aquatic Life	2008					
•	10-1	-31-(2)	Roan Creek	From 0.5 mile upstream of Fork New River	mouth to South	0.4 FW Miles	WS- IV;Tr,CA:+				
	1	Ecological/bio	logical Integrity Benthos	Good Bioclassification	Aquatic Life	2008					
	1	Ecological/biol	logical Integrity FishCom	Good Bioclassification	Aquatic Life	2008					
•	10-1	-25-2a	South Beaver Creek(Lake Ashe)	From source to Lake Ashe		5.1 FW Miles	C;Tr:+				
	1	Ecological/bio	logical Integrity Benthos	Good Bioclassification	Aquatic Life	2008					
•	10-1	(20.5)	South Fork New River	From a point 0.4 mile upstru Creek to a point 2.8 mile up Creek	eam of Couches ostream of Obids	21.8 FW Miles	WS-V;HQW				
	1	Ecological/bio	logical Integrity Benthos	Good Bioclassification	Aquatic Life	2008					
•	10-1	-(26)b	South Fork New River	From Obids Creek to a poin upstream of Roan Creek	t 0.6 miles	6.6 FW Miles	WS-IV;HQV				
	1	Ecological/bio	logical Integrity Benthos	Excellent Bioclassification	Aquatic Life	2008					
	1	Fecal Coliform	1 (recreation)	No Criteria Exceeded	Recreation	2008					
	1	Water Quality	Standards Aquatic Life	No Criteria Exceeded	Aquatic Life	2008					
	1	Water Quality	Standards Water Supply	No Criteria Exceeded	Water Supply	2008					
•	10-1	(3.5)a	South Fork New River	From Winkler Creek to 0.1 r downstream of Hunting Lar	niles 1e	0.3 FW Miles	C:+				
	5	Ecological/bio	logical Integrity Benthos	Fair Bioclassification	Aquatic Life	2003	2008				
	1	Ecological/biol	ogical Integrity FishCom	Good Bioclassification	Aquatic Life	2008					
	1	Fecal Coliform	1 (recreation)	No Criteria Exceeded	Recreation	2008					
	1	Water Ouality	Standards Aquatic Life	No Criteria Exceeded	Aquatic Life	2008					

NC 2010 Integrated Report

	All 13	3,123 Waters in NC are in Category 5-30	<mark>(d) Li</mark> s	st for Mercury due to statewide	fish consumption advice	for several fish	species
AU_	Numb	er AU_Name	AU_C	Description	LengthArea	AU_Units C	lassification
Ca	tegory	Parameter		Reason for Rating	Use Category	Collection Ye	ear 303(d)year
Ne	ew Riv	ver Basin		Sc	outh Fork New River W	atershed 0	505000102
0	10-1	-(3.5)b South Fork New	River	From 0.1 mile downstream H US Hwy.221/421	lunting Lane to	5.1 FW Mi	es C:+
	5	Ecological/biological Integrity Benth	05	Fair Bioclassification	Aquatic Life	2008	2008
	1	Ecological/biological Integrity FishC	om	Good Bioclassification	Aquatic Life	2008	
	1	Fecal Coliform (recreation)		No Criteria Exceeded	Recreation	2008	
	1	Water Quality Standards Aquatic Li	fe	No Criteria Exceeded	Aquatic Life	2008	
•	• 10-1-(33.5) South Fork New River			From Dog Creek to New Rive	er	22.5 FW Mi	es B;ORW
	1	Ecological/biological Integrity Benth	08	Excellent Bioclassification	Aquatic Life	2008	
	1	Fecal Coliform (recreation)		No Criteria Exceeded	Recreation	2008	
	1	Water Quality Standards Aquatic Li	fe	No Criteria Exceeded	Aquatic Life	2008	
•	10-1	-18ut4 UT MILL CR		Source to MILL CR		1.3 FW Mi	es
	1	Ecological/biological Integrity Benth	08	Not Impaired Bioclassification	Aquatic Life	2007	
•	10-1	-(14.5)ut4 UT S FK NEW R		Source to S FK NEW R		1.0 FW Mi	es
	3a	Ecological/biological Integrity Benth	05	Data Inconclusive	Aquatic Life	2007	
•	10-1	-4-(3.5)b Winkler Creek		From Winkler Creek Road (SR #1549) to South Fork New River		1.7 FW Mi	es C;Tr:+
	1	Ecological/biological Integrity Benth	05	Excellent Bioclassification	Aquatic Life	2008	
Ne	w Riv	er Basin		F	ox Creek-New River W	atershed 0	505000103
•	10-3	Grassy Creek		From North Carolina-Virginia	a State	4.1 FW Mi	es C;Tr:+
	1	Ecological/biological Integrity Benth	05	Good Bioclassification	Aquatic Life	2008	
	1	Ecological/biological Integrity FishC	om	Good-Fair Bioclassification	Aquatic Life	2008	
•	10b	New River (Nort Carolina Portion)	ר ו	From first point of crossing s point of crossing state line	tate line to last	6.4 FW Mi	es C;ORW
	За	Copper		Standard Violation	Aquatic Life	2006	
	1	Ecological/biological Integrity Benth	05	Excellent Bioclassification	Aquatic Life	2008	
	3a	Zinc		Standard Violation	Aquatic Life	2006	
APPENDIX 2-B

BIOLOGICAL (BENTHIC & FISH) SAMPLE SITE DATA SHEETS

Station ID*	WATERBODY	Assessment Unit #	DESCRIPTION	COUNTY	Site Location	SAMPLE RESULTS
			Benthic Sample Sites			
KB130*	Ut. S. Fk. New R.	10-1-(14.5)ut4	Source to South Fork New River	Watauga	SR 1353	07 - Not Rated
KB140*	Ut. S. Fk. New R.	10-1-(14.5)ut4	Source to South Fork New River	Watauga	SR 1353	07 - Not Rated
KB2	S. Fk. New R.	10-1-(20.5)	From a point 0.4 mile upstream of Couches Creek to a point 2.8 mile upstream of Obids Creek	Ashe	SR 1169	08 - Good 03 - Excellent
KB3	S. Fk. New R.	10-1-(26)b	From Obids Creek to a point 0.6 miles upstream of Roan Creek	Ashe	NC 16-18	08 - Excellent 03 - Excellent
KB16	S. Fk. New R.	10-1-(3.5)b	From 0.1 mile downstream Hunting Lane to US Hwy.221/421	Watauga	US 421	08 - Fair 03 - Fair
KB10	S. Fk. New R.	10-1-(33.5)	From Dog Creek to New River	Ashe	US 221	08 - Excellent 03 - Excellent
KB20	Meat Camp Cr.	10-1-10	From source to South Fork New River	Watauga	SR 1333	08 - Excellent 03 - Good
KB21	Norris Fk.	10-1-10-2	From source to Meat Camp Creek	Watauga	SR 1337	08 - Good 03 - Excellent
KB22	Pine Orchard Cr.	10-1-15-1	From source to Elk Creek	Watauga	SR 1369	08 - Not Impaired 03 - Excellent
KB1	M. Fk. S. Fk. New R.	10-1-2-(15)	From 0.4 mile downstr of US Hwy 221 & 321 to South Fk New River	Watauga	SR 1522	08 - Good-Fair 03 - Good-Fair
KB108	Pine Swamp Cr.	10-9-5	From source to S. Fork New River	Alleghany	SR 1128	08 - Good 03 - Good
KB5	S. Beaver Cr.	10-1-25-2a	From source to Lake Ashe	Ashe	SR 1147	08 - Good 03 - Good
KB6	Obids Cr.	10-1-27-(2)	From a point 0.9 mile downstream of NC Hwy 163 to South Fork New River	Ashe	SR 1192	08 - Good 03 - Good
KB12	E. Fk. S. Fk. New R.	10-1-3-(8)	From .8 mile downstream of Watauga Co SR 1524 to S Fk New River	Watauga	SR 1522	08 - Good '03 - Good
KB7	Roan Cr.	10-1-31-(2)	From 0.5 mile upstream of mouth to South Fork New River	Ashe	SR 1588	08 - Good 03 - Excellent
KB8	Naked Cr.	10-1-32b	From 0.4 miles above Jefferson WWTP to South Fork New River	Ashe	NC 16-88	08 - Good 03 - Good-Fair
KB139*	Naked Cr.	10-1-32b	From 0.4 miles above Jefferson WWTP to South Fork New River	Ashe	SR 1589	08 - Good-Fair
KB11	Peak Cr.	10-1-35-(2)a	From Water Supply Dam at Appalachian Sulphides, Inc to Ore Knob Branch	Ashe	SR 1599	08 - Excellent 03 - Good
KB13	Peak Cr.	10-1-35-(2)b	From Ore Knob Branch to South Fork New River	Ashe	SR 1599	08 - Poor '03 - Poor
KB14	L. Peak Cr.	10-1-35-4	From source to Peak Creek	Ashe	SR 1595	08 - Poor 03 - Poor
KB15	Cranberry Cr.	10-1-37	From source to South Fork New River	Ashe	SR 1603	08 - Excellent 03 - Excellent
KB17	Winkler Cr.	10-1-4-(3.5)b	From Winkler Creek Road (SR #1549) to South Fork New River	Watauga	SR 1549	08 - Excellent 03 - Excellent
KB18	Howard Cr.	10-1-9-(6)	From the Appalachian State University Raw Water Supply Intake Dam to South Fork New River	Watauga	SR 1328	08 - Excellent 03 - Good
KB126*	Grassy Cr.	10-3	From North Carolina-Virginia State	Ashe	SR 1548	08 - Good
KB34	New R.	10b	From first point of crossing state line to last point of crossing state line	Alleghany	SR 1345	08 - Excellent 03 - Excellent

* New station location; therefore, no data from the previous cycle.

APPENDICES

NEW RIVER BASIN: SOUTH FORK NEW RIVER & FOX CREEK WATERSHEDS (HUC 0505000102 & 0505000103)

Station ID*	WATERBODY	Assessment Unit #	DESCRIPTION	COUNTY	Site Location	SAMPLE RESULTS
			Fish Community Sample Sites			
KF6	Howard Cr.	10-1-9-(6)	From the Appalachian State University Raw Water Supply Intake Dam to South Fork New River	Watauga	SR 1306	08 - Not Rated 98 - Not Rated
KF8	M. Fk. S. Fk. New R.	10-1-2-(15)	From 0.4 mile downstr of US Hwy 221 & 321 to South Fk New River	Watauga	SR 1522	08 - Not Rated 98 - Excellent
KF24	Meat Camp Cr.	10-1-10	From source to South Fork New River	Watauga	SR 1333	08 - Not Rated 98 - Not Rated
KF14	Naked Cr.	10-1-32b	From 0.4 miles above Jefferson WWTP to South Fork New River	Ashe	NC 16/88	08 - Fair 98 - Fair
KF13*	Obids Cr.	10-1-27-(2)	From a point 0.9 mile downstream of NC Hwy 163 to South Fork New River	Ashe	SR 1192	08 - Good
KF15*	Prathers Cr.	10-1-38	From source to South Fork New River	Alleghany	SR 1302	08 - Good-Fair
KF20*	Roan Cr.	10-1-31-(2)	From 0.5 mile upstream of mouth to South Fork New River	Ashe	SR 1588	08 - Good
KF12	S. Fk. New R.	10-1-(3.5)b	From 0.1 mile downstream Hunting Lane to US Hwy.221/421	Watauga	US 421	08 - Good 98 - Good

* New station location; therefore, no data from the previous cycle.





Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/19/08	10551	75	19	5.80	4.88	Fair
11/04/03	9302		11		4.25	Fair
08/20/03	9257	67	24	5.46	4.81	Good-Fair
08/17/98	7734	71	22	5.68	4.14	Good-Fair
07/12/93	6261	69	18	6.17	3.80	Fair

Taxonomic Analysis

The 2008 sample is dominated by taxa that are pollution-tolerant. Abundant mayflies found here in 2008 included: *Pseudocloeon propinquum, Plauditus dubius* group, *Heterocloeon anoka, Isonychia,* and *Baetis flavistriga*. Other abundant taxa here that are considered generalists and are tolerant were the caddisfly *Cheumatopsyche* and the dragonfly *Calopteryx*.

Data Analysis

The South Fork New River at US 421/221 rated Fair in 2008, the same rating as in 2003. There have been eight samples collected here from 1984 through 2008. Of the seven summer samples (all Full Scale samples) this site rated Fair four times and Good-Fair thrice. This site is just downstream of the Boone WWTP. The 2004 Basinwide Assessment Report noted a gradual decrease in the Biotic Index here (indicating a slightly more pollution-sensitive benthic community) in relation to reductions in NH3 and TKN from effluent from the Boone WWTP beginning in 1998. Unfortunately this trend did not continue in 2008 and the Biotic Index is now back to the level it was in the mid 1990's which indicates a more pollution-tolerant benthic community. This watershed is also heavily agricultural. A large silt load covers 40% of the benthos of this reach limiting habitat for aquatic macroinvertebrates. There is very little substrate over 10 inches in length in this reach. Overall habitat quality here is low and has been since at least 2003 (scores of 58, 59 and 60).

Waterboo	dy		L	ocation		Date		Station	ID	В	ioclassif	ication
S FK NE	WR		U	S 421		05/22/0	8	KF1	2		Goo	d
County	Subb	asin	8 digit HUC	Latitude	Long	itude	AU N	lumber		Level	IV Ecore	gion
WATAUGA	1		05050001	36.220736	-81.63	39974	10-1-	-(3.5)b	Southern Crystall		line Ridge	es & Mountains
Stream Classifica	tion	Drai	nage Area (mi2)	Elevation (ft) Str			Widt	'h (m)	Δv	Average Depth (m) Bo		Reference Site
		Drui	34.2	3100		Otream	13			0.4	(,	No
0, 1			01.2	010			10			0.1		
	_	For	ested/Wetland	Urk	ban		Agri	culture		0	ther (des	scribe)
Visible Landuse	(%)		70	1	5			10			0	
Unotroom NDDES Di	cohara	oro (51		and within 1 n	aila)			NDDEG	Numb	~r	Vo	luma (MGD)
	Town of		WWTP (0.9 mile	s unstream)	ine)			NCO	020621		•0	4.8
		Doome						1100	020021			1.0
Water Quality Param	eters							S	ite Pho	tograph		
Temperature (°C)			11.7	and a second					-	A	Kill	
Dissolved Oxygen (mg	g/L)		8.5	and the second	Sec.	and the second	17			Sec.	CARK &	STAT 10
Specific Conductance	(µS/cm)	126			Transfel						
pH (s.u.)			6.0				and a set	-			CAN T	NOR DE
	ſ			the second								
Water Clarity			Clear		4.4. 4						100	
Habitat Assossment Scores (max)												1 12 -3
Channel Medification	(5)	(max)	5					and the second				
Instream Habitat (20)	(3)		16									Ser 1
Bottom Substrate (15))		5									A SAMPAN
Pool Variety (10)	/		4									
Riffle Habitat (16)			10									- Andrew
Left Bank Stability (7)			5						F	15		Star 1
Right Bank Stability (7	7)		5							-		See Long See
Light Penetration (10)			5					-	-	ites		
Left Riparian Score (5	5)		5		-							
Right Riparian Score ((5)		3									
Total Habitat Score ((100)		63	Subs	strate	gravel, sand	d, bou	ulder, silt.				
Sample Date	•		Sample I	D	Spe	cies Total			NCIBI		Bio	classification
05/22/08	,		2008-49	-		22			56			Good
06/08/98			98-51			20			52			Good
Most Abundant Species Western Blacknose Dace.					Exoti	ic Sp	ecies	Rock Ba	ass, Rainbow	Trout, Br	own Trout.	
Species Change	Since L	ast Cy	cle Gains k	(anawha Minno	ow, Green	side Darter, I	Kana	wha Darte	er, Appal	achia Darter.	Losses	Bluegill.
Data Analysis	ata Analysis											

Watershed -- this large site is located in the northeast corner of Boone and drains the entire southern-most tip of the New River basin in Watauga County, including the catchments of Winkler Creek, Middle Fork South Fork New River, and East Fork South Fork New River. Habitats -- shallow runs, with a few large riffles, and a few shallow side pools; the canopy was open due to the river's width, but the banks were generally healthy; substrates were highly embedded in this reach of the river; conductivity was elevated because of Boone's WWTP. 2008 -- an extremely diverse and abundant (n=2058) community of fish was collected, including eight intolerant taxa, three of which were not previously collected; Western Blacknose Dace (n=524) comprised 25% of the sample, and Central Stoneroller represented 24% (n=484). 1998-2008 -- although many more fish were collected in 2008, little difference exists between the trophic structures and NCIBI values between samples, suggesting that little has changed in this watershed over a 10 year period (in spite of upstream fish kill in 2003); overall, the fish community continues to thrive here, and suggests good water quality.

Waterbo	Waterbody			ion		Statio	Station ID			Date	Bioclassification
S FK NE	WR		SR 1169			KB	2		80	8/18/08	Good
County Subbasin		asin	8 digit HUC	Latitude		Longitude)	AU Num	nber	L	evel IV Ecoregion
ASHE 1			05050001	36.29	99167	-81.468056	6	10-1-(20	0.5)	Southern Cr	stalline Ridges and Mountains
Stream Classifica WS-V; HQW	ation	D	Drainage Area (mi2) E 143		Elev	/ation (ft) 2830		Stream V	ream Width (m) 25		Stream Depth (m) 0.3
	-	For	Forested/Wetland		Urban	Urban A		Agriculture			Other (describe)
Visible Landuse	(%)		25		0			75		0	
Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)								NPDE	S Nun	nber	Volume (MGD)
Town of Boone, Jimm	wn of Boone, Jimmy Smith WWTP							NC0020621		21	4.82



Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/18/08	10547	99	38	4.84	3.78	Good
08/21/03	9263	98	45	4.19	3.33	Excellent
08/18/98	7737	101	48	4.61	3.64	Excellent

Taxonomic Analysis

Small changes in rare and in some cases common taxa were the main differences between the 2008 collection and past collections. Only one taxonomic group showed any drastic changes: the dragonfly family Gomphidae. In both 1998 and 2003 four taxa were found in the samples but in 2008, this group was absent. One unusual chironomid taxa was found in 2008: *Polypedilum* sp. P. The infrequently collected caddisfly *Oecetis avara* was first collected here in 2008. There are only 37 BAU records of this species. Overall EPT and total diversity remains high here.

Data Analysis

This South Fork New River site rated Good in 2008, a decrease from Excellent in both 1998 and 2003. An increase in the Biotic Index indicates that a more pollution-tolerant community resides in this reach than did in previous years. The number of EPT taxa was also lower in 2008 compared with 1998 and 2003. This reach earned a low habitat scorce due to limited in-stream habitat including substrate sizes that consisted mostly of sand, silt and gravel. The water quality at SR 1169 is an improvement from the next site upstream of here (at US 421, approximately 20 miles upstream). That site rated Fair in 2008.





Substrate

69

mix of bedrock, boulder, cobble, gravel, sand and silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
06/19/08	10474	106	54	4.26	3.48	Excellent
08/22/03	9271	104	58	3.67	3.12	Excellent
08/18/98	7742	95	48	4.01	3.44	Excellent
07/14/93	6270	104	51	3.41	2.75	Excellent
07/11/90	5375	97	50	3.79	3.11	Excellent

Taxonomic Analysis

Total Habitat Score (100)

A large number of taxa were collected here in 2008. The number of EPT taxa collected was 54, only 4 fewer than in 2003, but the total number of taxa collected was slightly higher in 2008 than 2003 (106 versus 104). A diverse aquatic macroinvertebrate community resides in this reach of the South Fork New River. Abundant taxa in past years were generally both collected again in 2008 and were also abundant. Some noteable taxa were first collected at the site in 2008, including: the mayflies *Drunella lata, Eurylophella aestiva* and *Anthopotamus* (all common in the sample); the stoneflies *Acroneuria mela* and *Agnetina annulipes* (both rare in the sample); and the caddisfly *Apatania* (common in the sample).

Data Analysis

This South Fork New River site rated Excellent again in 2008 as it has following each prior sampling event since 1987. The 2008 sample was collected one to two months earlier in the year than past samples, but still within the summer basinwide sampling window. This earlier sampling may have accounted for a few taxa not seen in previous samples (e.g. *Drunella lata, Eurylophella aestiva*). Though the total number of aquatic invertebrate taxa collected in 2008 was greater than in all previous years, the Biotic Index was also higher suggesting a slightly more pollution-sensitive community than in past years.

Waterbody		Locati	ion	n Station ID			D	Date			Bioclassificatio	on	
S FK NE	WR		US 221 BELOW CREE	CRAN EK	BERRY	ĸ	(B10)	08	8/22/08	В	Excellent	:
County	Subb	asin	8 digit HUC	Lat	titude	Longi	tude	AU I	Number		Lev	vel IV Ecoregion	
ASHE	1		05050001	36.4	73889	-81.336	6944	10-1	1-(33.5)		Ne	w River Plateau	
Stream Classific	ation		Drainage Area (mi2	2)	Elev	vation (ft)		Strea	am Width	(m)		Stream Depth (m)	
B;ORW			300			2545			25			0.4	
			rested/Wetland		Urban			Agricul	ture		O	ther (describe)	
Visible Landuse	Visible Landuse (%)		50		25			25				0	
Upstream NP	IGD ar	nd withii	n 1 mile)		NF	DES Nur	nber		Volume (MGD)				
Town of Boone, Jimm						NC00206	21		4.82				
Water Quality Param	neters								Site Ph	otograph	ı		
Temperature (°C)			22.6									in dealer and	MAR
Dissolved Oxygen (m	g/L)		7.2										
Specific Conductance	e (µS/cm)		82								4		
pH (s.u.)			8.1							Ste	ALC: N		The g
Water Clarity			clear						A				
Habitat Assessment	Scores	(max)			Change Co	A REAL PROPERTY.	-	1				N. P	and the second
Channel Modification	(5)		5				Provide Sta		CALLE				
Instream Habitat (20)			13		- State						Later a		
Bottom Substrate (15)		11					tel an					
Pool Variety (10)			10	5		-	- 12.				No.		
Riffle Habitat (16)			10			and the second s			AND DESCRIPTION OF				Ten
Left Bank Stability (7) 3				and the			Contraction of the			- 3.			
Right Bank Stability (7) 6									-			-	
Light Penetration (10) 0						100	-	and the second	and free and		-		
Left Riparian Score (5) 1										-		and the second	
Right Riparian Score (5) 4					a contraction		-	and a			and the second second		a second

Substrate mix of bedrock, boulder, cobble, gravel and sand

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/22/08	10563	102	49	4.41	3.26	Excellent
08/23/03	9272	112	47	4.62	3.43	Excellent
08/20/98	7749	112	55	4.24	3.57	Excellent
07/15/93	6273	103	46	4.06	3.09	Excellent

63

Taxonomic Analysis

Total Habitat Score (100)

A large number of taxa continue to inhabit this downstream section of the South Fork New River. Many pollution-sensitive taxa are abundant here, including the mayflies: *Heterocloeon curiosum, Acerpenna macdunnoughi, Serratella serratoides, Stenacron pallidum,* and *Leucrocuta*. The pollution-sensitive stonefly *Acroneuria arenosa* and the caddisflies *Brachycentrus numerosus* and *Helicopsyche* were also abundant here in in 2008. Most taxa collected in 2008 were also collected in previous years.

Data Analysis

This site has consistently rated Excellent since 1990. A total of thirteen samples have been collected from this location since 1983. The number of Total Taxa and EPT Taxa have remained high and the Biotic Index has been consistent in showing a pollution-sensitive aquatic community residing here. The site upstream of here (NC 16-88, approximately 18 miles upstream) was also Excellent. The US 221 site is the farthest downstream basinwide site on the South Fork New River. The South Fork and North Fork New River converge approximately 15 miles downstream of this site and then flow northward to Virginia a further five miles downstream. There are no permitted discharges between the US 221 site and the North Carolina-Virginia border, suggesting that an Excellent water quality rating could continue downstream to Virginia.

New



Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/19/08	10550		27		4.19	Good-Fair
11/04/03	9307		29*		2.99	Good
08/20/03	9259		24		3.26	Good-Fair
08/17/98	7732		31		2.99	Good
07/12/93	6260		37		2.97	Excellent

*value corrected for seasonality

Taxonomic Analysis

In general, the EPT taxa found in the Middle Fork of the South Fork New River in 2008 were typical of previous collections. However, the most recent collection contained fewer EPT taxa than most of the past sampling efforts. This site supports an increasingly pollution-tolerant benthic community. Abundant taxa found in 2008 were cosmopolitan species (e.g. *Isonychia, Cheumatopsyche, Plauditus dubius* group) with few pollution-sensitve species.

Data Analysis

This site rated Good-Fair in 2008, the same rating it received in summer 2003. The four summer basinwide collections have seen this site go from Excellent and Good in 1993 and 1998 respectively, to Good-Fair in 2003 and 2008. The Biotic Index indicates that the benthic community is becoming more tolerant of aquatic pollution with sensitve species no longer residing in this reach. This site is located just downstream of Boone Golf Club, a large expanse of open area with only a narrow grass riparian zone and few trees. Silt and sand comprised 30% of the benthic area, limiting interstitial benthic habitats and increasing embeddedness. Additionally, there is a small reservior 1.6 miles upsteam of this site and three minor dischargers (>1.5 miles upstream) that may be affecting the benthic community here. In October 2003, one of these dischargers, Blowing Rock Water Treatment Plant (WTP), spilled approximately 3,000 gallons of sodium hydroxide into the Middle Fork South Fork New River (BAU memorandum B-20031113). There does not appear to be any long term effect of this event on the macroinvertebrate community at SR 1522.

Waterboo	dy			Location		Date		Station	ID	Bioclas	sification
M FK S FK	NEW F	R	S	R 1522		05/22/0)8	KF	3	Not	Rated
County	Subba	sin	8 digit HUC	Latitudo	Long	itudo	Δ11 N	umber			region
WATAUGA	1	5111	05050001	36 20128	-81 64	19851	10-1-	-2-(15)	So	Southern Crystalline Ridges & Mour	
	•		0000001	00.20120	0110		10 1	2 (10)	00		
Stream Classifica	tion	Drair	nage Area (mi2)	Elevatio	on (ft)	Stream	Widt	h (m)	A	verage Depth (m)	Reference Site
WS-IV, CA, +			12	310	0		5			0.5	No
		For	ested/Wetland	Urt	Urban			culture		Other (describe)
Visible Landuse	(%)		50	2	20 10				20 (gol	f course)	
Upstream NPDES Di	scharger	rs (>1	MGD or <1MGD	and within 1 n	nile)			NPDES	S Numb	ber	Volume (MGD)
			None		,						
Water Quality Param	eters							S	ite Pho	otograph	
Temperature (°C)			12.3	A Read Contraction			Service Services		Alen A	A STATE AND	
Dissolved Oxvaen (mo	a/L)		9.3	2.2 **						ALL ALL	
Specific Conductance	(µS/cm)		92			1100	2.1				125
pH (s.u.)	u ,		6.4	Alleria a					e.		P A A
	_				and the second	1995 - 1995 -				and the	
Water Clarity			Clear	and the second		6 e	1 m. A. 1				E THE AND
Habitat Assessment	Scores ((max)									1 ANAR
Channel Modification	(5)	(5	A A A A	Also -						V AND AND A
Instream Habitat (20)	(0)		20								A PARA
Bottom Substrate (15))		8	and the second							
Pool Variety (10)	·		6								
Riffle Habitat (16)			16	- 10000			had	Martin Contraction			
Left Bank Stability (7)			3						Sec. 2		
Right Bank Stability (7	7)		5	and the second		and the	Paris				
Light Penetration (10)			8	Er and	1-	and the	white	- Main			A Property in
Left Riparian Score (5	5)		2			and and the	1- 1 h	- K12-M			
Right Riparian Score ((5)		2								
Total Habitat Score ((100)		75	Sub	strate	cobble, grav	vel, bo	oulder, sill	t, sand.		
Sample Date)		Sample	ID	Spe	cies Total			NCIB	I B	ioclassification
05/22/08			2008-5	0		14			38 Not Ra		Not Rated
06/09/98			98-53			16			58		Excellent
Most Abundant Species Mottlee			Mottled Sculpin.			Exot	ic Spe	ecies	Green Trout.	Sunfish, Bluegill, Ra	nbow Trout, Brown

Species Change Since Last Cycle

Gains -- Green Sunfish, Rosyside Dace, Bluehead Chub, Creek Chub. **Losses** -- Rock Bass, New River Shiner, Kanawha Minnow, Longnose Dace, Greenside Darter, Kanawha Darter.

Data Analysis

Watershed - a large trib to the South Fork New River; drains the southern-most tip of the basin. Habitats - riffles, runs, swift chutes, and a few snag pools; high substrate embeddedness; bordered by a golf course (left) and a fenced cattle operation (right) with narrow riparian widths; the four NPDES facilities (combined discharge of 1.0 MGD, 1.9 to 7.0 miles above) may have elevated the instream waste concentration during droughts. 2008 - a diverse and abundant community of fish (n=803) was collected, including two intolerant taxa (Tounguetied Minnow, and Rainbow Trout); however six of ten NCIBI metrics fell during this assessment. 1998-2003 -- the decline in bioclassification, and particularly the loss of four sparsely populated intolerant species (Rock Bass, New River Shiner, Kanawha Minnow, and Kanawha Darter - 18 individuals combined) may be related to a 2003 spill of sodium hydroxide (3,000 gal.), that occurred in Blowing Rock. These losses may be explained by the combined effects of this spill, and the urban nature of this stream. In light of these extremes, this site was Not Rated; it has likely seen impressive recovery toward its previous bioclass and may continue to improve.



Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/19/08	10549		31		3.54	Good
11/04/03	9306		3		5.21	Poor
08/20/03	9258		31		3.06	Good
08/17/98	7731		32		3.29	Good
07/12/93	6259		37		3.34	Excellent

Taxonomic Analysis

The EPT taxa found in the East Fork of the South Fork New River in 2008 were similar to past basinwide collections. Some taxa were collected in lower abundances (e.g. *Isonychia*) and some have yet to reestablish (e.g. *Maccaffertium pudicum* and *Ceratopsyche sparna*) following an acute, unknown event that occurred in 2003 after the basinwide sampling event for that year. In terms of EPT richness the benthic community has recovered to summer 2003 levels. This site still supports a pollution-intolerant benthic community.

Data Analysis

This site rated Good in 2008, the same classification it received in summer 1998 and 2003. The loss of benthic fauna in late 2003 following an acute, unknown event does not appear to have been permanent. This site was sampled in November 2003 as a reference site after a spill in the Middle Fork South Fork New River (BAU memorandum B-20031113). This East Fork site has no dischargers upstream nor any larger reserviors which may have been the source of the problems seen in late 2003. Despite the ample evidence of being located just downstream of Boone Golf Club (e.g. grass clippings and golf balls in stream) the benthic fauna at this site appears less affected by the golf course in 2008 than the Middle Fork South Fork New River.



Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/19/08	10548		36		2.93	Excellent
08/21/03	9262		39		2.36	Excellent
08/17/98	7733		34		2.89	Good
07/12/93	6258		37		2.02	Excellent

Taxonomic Analysis

EPT taxa collected in 2008 were very similar to past samples here. Abundant taxa included the mayflies *Baetis pluto, Epeorus vitreus, Maccaffertium* modestum, M. pudicum and Paraleptophlebia. Six stonefly taxa were found at Winkler Creek with Leuctra and Tallaperla being dominant. Caddisflies were well represented with 12 taxa present, but only Ceratopsyche sparna, Cheumatopsyche and Dolophilodes were abundant. The less commonly collected caddisfly, Mystacides nr. alafimbriata, was found to be common here in 2008.

Data Analysis

The benthic site on Winkler Creek is near the headwaters of South Fork New River, and is located within and near the town limits of Boone. Much of the catchment upstream of the site is forested; only a very minor portion is urban.

Winkler Creek rated Excellent in 2008, the same as in 2003 and 1993. The number of EPT taxa collected here has remained stable since the first sampling effort in 1993. The low Biotic Index indicates a pollution-intolerant benthic community residing in this section of Winkler Creek.

Waterbo	dy		L	ocation		Date		Station	ID	В	Bioclassi	fication
HOWAR) CR		S	R 1306		05/21/	08	KF6	5		Not R	ated
							••					
County	Subb	asin	8 digit HUC	Latitude	Long	itude		AU Numbe	er	L	evel IV E	coregion
WATAUGA	1		05050001	36 241748	-81.6	6127		10-1-9-(6)	/ ·	_ An	nnhiholite	Mountains
			0000001	00.211110	01.0	0121				7.01		mountaino
Stream Classifica	tion	Drai	nage Area (mi2)	Elevatio	on (ft)	Strear	n Widt	th (m)	Ave	rage Depth	(m)	Reference Site
C;Tr,HQW			7.9	319	8		7			0.4		No
								P				
		For	ested/Wetland	Residenti	ial/School		Agri	iculture		C	Other (de	scribe)
Visible Landuse	(%)		85	1	5			0			0	
											.,	
Upstream NPDES Di	scharg	ers (>1	MGD or <1MGD	and within 1 n	nile)			NPDES	Numbe	r I	Vo	olume (MGD)
			None					-				
Water Quality Param	eters							Si	ite Phot	ograph		
Temperature (°C)			15.1	See 1	1. M.	1 1 × 1	100					
Dissolved Oxygen (m	a/L)		0.3		a mess		1	14		P SK		
Specific Conductance	yr∟) √uS/cm		9.5					142	Nix	1 200		and the second
nH (s II)		''	65		-		The second	Telle .			Setter 1	A state of the
P. 1 (0.0.)			0.0		125	1.18	1.3	1 and		and the second	dail	
Water Clarity			Clear	1.	- A 🖉							Constant B
Water Clarity			Olcal		1				-			
Habitat Assessment Scores (max)												
Channel Medification	(5)	, (max)	E		2-15					-		
Instroom Habitat (20)	(5)		20	a second	Alexandre a							and the second second
Bottom Substrate (15)	、 、		20			-	-	and the second			Parties Service	
Boll Variaty (10))		6		a car				and the			
Riffle Habitat (16)			16					- 6 C	T. Mar	TAT		
Left Bank Stability (7)			7		Carl Carl							
Pight Bank Stability (7)	7)		7				E.	-65	12-3	and the set	norman.	
Light Penetration (10))		10		- and				1	5. 32	and the	
Left Riparian Score (5	5)		4		100	and the	- 24			1. 1.	Part Part	
Right Riparian Score	(5)		4	ge tel							10 Mail 19	
Total Habitat Score	(0)			Sub	strate	abundant -	flat roc	ks. cobble.	aravel.	boulder.		
	,		0.					,	J ,			
Sample Date)		Sample I	D	Spe	cies Total			NCIBI		Bio	classification
05/21/08			2008-48	1		17						Not Rated
06/08/98			98-52			12						Not Rated
Most Abundan	t Speci	es	Central Stoneroll	er.	Exc	otic Specie	s	Rock Bass,	Redbrea	ast Sunfish,	Green Si	unfish, Bluegill,
	-					-	F	Rainbow II	oul, Bro	wn Troul.		
Spacios Chango	Sinco I	act Cu	Gains C	Green Sunfish,	Bluegill, T	onguetied I	Minnov	w, Bluehea	d Chub,	Longnose D	ace, App	oalachia Darter.
opecies onalige	Onice L		Losses	Creek Chub.								
Data Analysis												
Watershed a tributa	ary to th	e North	Fork New River	located one wa	atershed so	outh of the	Meat C	Camp Cree	k catchr	nent in north	east Wat	tauga County;
drains the primarily fo	rested a	area jus	at north of Boone.	Habitats hig	gh quality i	instream ha	abitats	consisting	of excel	lent riffles, b	edrock cl	hutes, and pools;
a highly diverse mix o	f cold c	ig abui ool an	d warm water sne	cies was colleged	cted from t	his mounta	in stre	am includi	ina four i	ntolerant tax	n ine npa va (Rock	Rass Tonquetied
a highly diverse mix of cold, cool, and warm water species was collected from this mountain stream, including four intolerant taxa (Rock Bass, Tonguetied Minnow, Appalachia Darter, and Rainbow Trout); Central Stonerollers represented 25% of the catch, and the six new species collected were represented by												
low abundances (maximum of 8 individuals). 1998-2008 a total of 18 fish species have been collected from this location, including two species of sucker,												
four species of sunfisl	four species of sunfish (three of which are warm water exotics, suggesting alteration of the original population), six species of minnow, two darter species,											
and two trout species	overall	, this si	ream appears he	aitny, and is su	ipporting a	rich comm	iunity c	of fish throu	igh good	quality wat	er and ha	iditats.



Substrate

89

mix of boulder, cobble, gravel, sand and silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/19/08	10552		44		2.19	Excellent
08/20/03	9254		35		2.35	Good
08/17/98	7735		40		2.64	Excellent
07/13/93	6262	102	52	3.85	2.87	Excellent
07/26/88	4633		38		3.22	Excellent

Taxonomic Analysis

Total Habitat Score (100)

Howard Creek conatains a pollution-intolerant macroinvertebrate community dominated by taxa that one would expect to find in a minimally disturbed small mountain watershed (e.g. *Litobrancha recurvata, Neoephemera purpurea*). Shredders, such as the stoneflies *Tallaperla* and *Pteronarcys proteus*, were abundant in 2008.

Data Analysis

Howard Creek rated Excellent in 2008, an increase from Good in 2003. As noted in the 2003 report, the Good rating was one EPT taxon away from an Excellent rating. Data from 1988 to 2008 show consistently high water quality with a diverse and pollution intolerant macroinvertebrate community. Residential and commercial development appears to be increasing in this watershed but the sampled reach did not appear to be affected by this as of August 2008.

Waterbo	dy		1	Location		Date		Station ID	1	Bioclassi	fication
	MP CF	२	S	R 1335		05/21/	08	KF24	Not Rated		ated
County	Subb	asin	8 digit HUC	Latitude	Long	itude		AU Number	L	.evel IV E	coregion
WATAUGA	1		05050001	36.271611	-81.65	58809		10-1-10	Ar	nphibolite	Mountains
<u>-</u>											
Stream Classifica	ation	Drai	nage Area (mi2)	Elevatio	on (ft)	Stream	n Wic	ith (m)	Average Depth	n (m)	Reference Site
C;Tr			10.7	330	0		7		0.2		Yes
		For	ested/Wetland	Urt	ban		Ag	riculture		Other (de	scribe)
Visible Landuse	(%)		80	()			15		5 (roa	ad)
Upstream NPDES Di	ischarge	ers (>1	MGD or <1MGD	and within 1 n	nile)			NPDES Nu	nber	Vo	olume (MGD)
			None								
Water Quality Param	neters							Site F	hotograph		
Temperature (°C)			13.2			and the			é dé		A REAL PROPERTY.
Dissolved Oxygen (m	ig/L)		9.8						1 5 4 A	- All	
Specific Conductance	e (µS/cm)	42	and the second			1			1 216	
pH (s.u.)			6.5	a com					AL A DA		and the second
	F					an it was		AD A STA	Star Con Star	all and a set	And a state of the
Water Clarity			Clear							\$ - s	
Habitat Assassment	L Seeree	(max)			ante Alla		All and a second		and a		XIV
Habitat Assessment	Scores	(max)			Coller.					Set at	
Channel Modification	(5)		5			the Maria	a series		and and a set		
Dettern Substrate (20)	``		18		P St.	the share			- APRIL	and the	
Boll Variaty (10))		12	a set				The states		the state	AND C
Riffle Habitat (16)			16							in the	
Left Bank Stability (7)			6						- Ward	10	
Right Bank Stability (, 7)		5							- Carlin	
Light Penetration (10))		5						-	-L-	11
Left Riparian Score (5	, 5)		5				al se		Che Mail	-	
Right Riparian Score	(5)		3			1999 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 -	No. The Co		A REAL		
Total Habitat Score	(100)		75	Sub	strate	cobble, gra	vel,	boulder.			
Sample Date	9		Sample		Sno	cies Total		NC	IBI	Bio	classification
05/21/08	5		2008-4	7	Spe	10		NC		Вю	Not Rated
06/09/98			98-54			11		-	-		Not Rated

05/21/08	2008-47	10			Not Rated
06/09/98	98-54	11	11		Not Rated
Most Abundant Species	Mottled Sculpin.	Exotic S	Species	Rock Bass, Rainbov	v Trout, Brown Trout.

Species Change Since Last Cycle

Gains -- Bluehead Chub, Rainbow Trout. Losses -- White Sucker, Northern Hogsucker, Rosyside Dace.

Data Analysis

This site was moved about 2.7 miles upstream from the SR 1333 crossing (above Rittle Fork and Cobb Creek) to serve as a regional reference site. **Watershed** - a tributary to the South Fork New River that drains part of rural northeast Watauga County. **Habitats** - the 100% riffle habitats are high quality, but there are no functional pools in this 600 foot reach, and the lower 2/3 is completely without a canopy; however, bank stabilities are still good, and the substrates show relatively low levels of embeddedness, which suggests minor amounts of upstream sedimention. **2008** - a fairly diverse mix of cold and cool water species was collected, including three intolerant taxa (Rock Bass, Kanawha Darter, and Rainbow Trout) and almost four times the abundance was observed at this new location (n=1060 vs. 271); Mottled Sculpin (cold water benthic insectivore) represented 84% of the sample. **1998-2008** - although separated by a few miles and Not Rated, the fish taxa collected at these two locations reflect similar trophic structures (in spite of the high number of Mottled Sculpin at SR 1335); overall, the fish community suggests good water quality characteristics in this catchment.





Temperature (°C) Dissolved Oxygen (mg/L) Specific Conductance (µS/cm) pH (s.u.)

Water Clarity

slightly	turbid

15.2

8.7

57

7.0

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	15
Pool Variety (10)	10
Riffle Habitat (16)	16
Left Bank Stability (7)	6
Right Bank Stability (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	97

Site Photograph



mix of bedrock, boulder, cobble, gravel, sand and silt

 Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/20/08	10554		39		2.80	Excellent
08/20/03	9255		35		2.81	Good
08/17/98	7736		39		2.69	Excellent
07/13/93	6263		31		2.52	Good
03/05/90	5205		37		2.60	Good

Taxonomic Analysis

In 2008 Meat Camp Creek contained 39 EPT taxa, equaling the largest number of taxa collected from this stream. Many of the species collected in 2003 and previous samples were found in 2008. Most of these taxa are sensitive to aquatic pollution. Several taxa appeared for the first time here in 2008. These included the caddisflies Neophylax consimilis (abundant in the sample), Goera fuscula (common), Ceratopsyche morosa, and Neureclipsis (both rare in the sample). The pollution-sensitive mayfly Stenacron pallidum (common) and Tricorythodes (rare) also appeared at this site for the first time in 2008.

Data Analysis

Meat Camp Creek rated Excellent in 2008. The Good rating received in 2003 was only one EPT short of an Excellent bioclassification. The number of EPT collected here during the five collections since 1990 suggest a stable, pollution-sensitive macroinvertebrate community at the site. Riparian habitat along this reach shows little disturbance and a variety of in-stream microhabitats exist for macroinvertebrate colonization despite a large percentage of bedrock. Water temperatures in Meat Camp Creek were the lowest recorded for all sites in this part of the HUC in 2008.



Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/19/08	10553		35		2.11	Good
08/20/03	9256		36		1.56	Excellent

Taxonomic Analysis

Taxa collected in 2003 that were not found in 2008 included the caddisflies *Fattigia pele, Parapsyche cardis, Brachycentrus spinae* and *Apatania*. New caddisflies for this site in 2008 included *Ceratopsyche bronta, Pycnopsyche gentilis* and a second (unidentified) species of *Pycnopcyshe, Polycentropus* and *Lype diversa*. The stoneflies *Suwallia* and *Isoperla* nr *holochlora* were present in 2003 though absent in 2008, while *Paragnetina immarginata* was absent in 2003 and present in 2008. These taxa differences resulted in a slightly higher EPT Biotic Index in 2008 compared with 2003. However, overall this site contains a pollution-intolerant macroinvertebrate community.

Data Analysis

Norris Fork at SR 1337 received a classification of Good in 2008, though the addition of a single EPT taxon would have pushed the classification up to Excellent. The difference in the number of EPT taxa between 2003 and 2008 is very small, but the difference in EPT Biotic Index values is relatively large. Many of the rare but highly intolerant taxa collected in 2003 were absent in 2008. Some recent development has occurred upstream of the site. Higher silt levels were seen in 2008 corresponding to ongoing land clearing activities here. A large number of lots were for sale at the time of sampling suggesting that development would continue in the watershed. Despite this, the EPT Biotic Index in Norris Fork was the second lowest in this part the HUC (formerly subbasin 1).



Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/20/08	10555		36		2.09	Not Impaired
08/21/03	9260		33		1.64	Excellent

Taxonomic Analysis

Small differences exist with the taxa collected at the site between 2003 and 2008, but overall the benthic community here remains diverse and pollution-sensitive. *Neophylax consimils*, a pollution-intolerant case-making caddisfly, was abundant in 2003 and absent in 2008. However, two other taxa, *N. mitchelli* and *N. oligius*, were common in 2008. Abundant taxa collected in 2008 included these pollution-sensitive taxa: the mayfly, *Drunella conestee*; the stonefly *Malirekus hastatus*; and the caddisfly *Dolophilodes*.

Data Analysis

Pine Orchard Creek had the lowest EPT Biotic Index of any stream in this part of the HUC (formerly subbasin 1) indicating a very pollution-intolerant benthic community here. The classification for the site in 2003 was derived using High Quality Small Mountain Stream (HQSMS) criteria, which are used for stream sites with undisturbed drainage areas under 3.5 square miles. Recent aerial photos and streamside observations show the presence of disturbance from residences, agriculture, and state roads and highways in the watershed, therefore HQSMS criteria can not be applied to the site for 2008. Additionally, since no criteria have been completed for stream sites with drainage areas under 3.0 square miles with disturbance present, this site is given a classification of Not Impaired for 2008 (it would have been classified as Good with large-stream criteria). One notable difference in habitat at the site was an increase in silt from 2003 to 2008 (40% in 2008 versus 0% in 2003 by visual estimation).



Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/18/08	10546		34		3.82	Good
08/19/03	9253		30		3.14	Good

Taxonomic Analysis

Macroinvertebrates collected in Pine Swamp Creek differed slightly between 2003 and 2008, with four more EPT taxa collected in the latter year. Taxa abundant in the sample were similar between 2003 and 2008, but rare and common taxa varied. New taxa that appeared in 2008 included the caddisflies *Ceratopsyche bronta, C. morosa* and the mayfly *Ephoron leukon*. The stonefly *Isoperla*, common in 2003, was not collected in 2008. The macroinvertebrate community residing in Pine Swamp Creek in 2008 appears to be slightly more pollution-tolerant than in 2003.

Data Analysis

Pine Swamp Creek at SR 1179 rated Good in 2008 despite the lack of a healthy riparian zone upstream. Active cow pastures and tree farms constitute a sizeable portion of the visible watershed upstream of the sampling reach. A large amount of silt was visible in this stream (30% of the substrate by visual estimation). Though more EPT taxa were found in 2008 than 2003, the Biotic Index for these macroinvertebrates was higher, suggesting a response to either chemical or physical stressors at the site.



Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/18/08	10411		35		2.83	Good
08/21/03	9264		31		2.68	Good

Taxonomic Analysis

The taxa collected in 2008 from South Beaver Creek were very similar to those collected in 2003. The list of abundant taxa in both years were nearly identical. Addional taxa seen in 2008 were mostly rare in abundance with a few exceptions, such as the mayflies *Stenacron pallidum*, *Maccertium modestum* and *Leucrocuta* (all common in the sample). Generally, the macroinvertebrate community residing in this reach is pollution-sensitive and diverse.

Data Analysis

South Beaver Creek rated Good in 2008, the same rating as in 2003. One additional EPT taxon would have resulted in an Excellent bioclassification. Based on only two samples, the macroinvertebrate community at this site appears stable, diverse and pollution-sensitive. Drought conditions in 2008 resulted in most of the root mats being exposed. Typically, this type of habitat is heavily colonized by aquatic macroinvertebrates.



Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/08/08	10410		31		3.28	Good
08/19/03	9252		32		3.16	Good

Taxonomic Analysis

The EPT taxa collected from Obids Creek in 2008 are very similar to those from the 2003 collection. An exception to this was the baetid mayfly *Baetis tricaudatus*, which was abundant in 2003 and absent in 2008. Despite this, all six other taxa from the mayfly family Baetidae were found here in 2008. Other "missing" taxa in 2008 were the heptageniid mayflies *Maccaffertium pudicum* and *M. ithaca*, which were common and abundant respectively. One rare taxon, *Mystacides* nr *alafimbriata*, was found in 2008. Only 17 records of this species exist in the BAU database going back to 1985. Four of these records, however, are in the New River drainage. Overall, 31 EPT taxa were found in 2008, one fewer than the number in the 2003 collection.

Data Analysis

Obids Creek rated Good in 2008, the same rating as in 2003. The taxa collected in both years are generally intolerant to aquatic pollution. A slight increase in the EPT Biotic Index reflects the few taxonomic differences and abundances between 2003 and 2008. The open canopy here has resulted in a higher water temperature than other nearby sampled streams of similar size. Additionally, cattle appear to have direct access to the stream which could be limiting in-stream habitat quality.

Waterboo	dy		Location		Date		Station ID	В	lioclassif	fication
OBIDS	CR		SR 1192		05/09/	08	KF13		Goo	bd
County	Subba	sin 8 diait HUC	Latitude	Long	litude		AU Number	L	evel IV E	coregion
ASHE	1	05050001	36.345566	-81.40	42353	353 10-1-27-(2)			New Rive	r Plateau
Stream Classifica	tion	Drainage Area (mi	2) Elevatio	on (ft)	Stream	n Wid	th (m) 🛛 🖌	verage Depth	(m)	Reference Site
WS-IV; Tr:+		8.3	271	2710 6 0.4				No		
				_						
Visible Londuse	(0/)	Forested/Wetland	Ur	ban	_	Agr	iculture		Other (de	scribe)
VISIDIE Landuse ((%)	75		0			25		0	
Upstream NPDES Di	scharger	s (>1MGD or <1MG	D and within 1	mile)			NPDES Num	ber	Vc	olume (MGD)
	Jerre ger	None								
Water Quality Param	eters						Site Pr	notograph		
Temperature (°C)		15.5		TRUE				Starting -	A NOT	and a galing
Dissolved Oxygen (mg	g/L)	9.3				1		Carlot an	MAR	在 国际的 国际的
Specific Conductance	(µS/cm)	37						a destation	and a state	
pH (s.u.)		6.4		No.	A Rose	-				The second second
	_			Service .	Con State		appendies of	and the second	State 1	
Water Clarity		Clear			the start		- Herman	- Water La	and the second	e (pp
			Call March					States	- Unite	La talàn La s
Habitat Assessment	Scores (I	nax)			4 22 -		2			AT A PARTY OF
Channel Modification	(5)	5		1000				al la	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	
Instream Habitat (20)		19	and the second						14/14	Salar and the
Bottom Substrate (15))	13		-	All and the second second	-	and the second s	The second	Alto St	
Pool Variety (10)		9	100				SHART NO	e la jost	1	S S S S D
Riffle Habitat (16)		16			-	, P	22-5% AL			S Antes
Left Bank Stability (7)		2		-				Section 1	to a	
Right Bank Stability (7	')	7	-	-	M. al	No.	Sieles and		2 and	
Light Penetration (10)		7			the well			A seal of the seal	1.84	
Left Riparian Score (5)	1	-			2	Hand Market		And and a	
Right Riparian Score ((5)	5								
Total Habitat Score (100)	84	Sub	strate	Cobble, bo	oulder	, gravel, and silt			
Sample Date	1	Sampl	e ID	Spe	cies Total		NCII	31	Bio	classification
05/09/08		2008-	37		17		50			Good
Most Abundant Spe	ecies	Mottled Sculpi	n and Central Sto	oneroller	Exotic S	Speci	es Warp Redb	aint Shiner, Bro reast Sunfish, a	own Trout and Smal	t, Rock Bass, Imouth Bass
Species Change Sind	ce Last C	ycle N/A								
Data Analysis		-								
This is the first fish co	mmunity	sample collected at	this site. Waters	shed dra	ains southea	stern	Ashe County; no	municipalities	within the	e watershed;

tributary to South Fork New River, site is ~ 600 ft. upstream from the creek's confluence with the river. **Habitat** -- high gradient riffles and plunge pools; *Rhododendron* - and Eastern Hemlock-lined banks; grasses and pastures in the riparian zones; unstable left bank; livestock with access to the stream. **2008** -- diversity of cyprinids and intolerant species were slightly lower than expected; proximity to the river enables the site to serve as a nursery area for Age 1 Rock Bass (n=124 collected) and Smallmouth Bass (n=26 collected); and two endemic species (Kanawha Darter and Appalachia Darter) were collected.



Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/20/08	10558		32		3.18	Good
08/18/03	9245		44		3.03	Excellent
08/18/98	7741		39		2.61	Excellent
07/14/93	6271		39		3.02	Excellent

Taxonomic Analysis

Most taxonomic differences between 2003 and 2008 pertained to rare taxa. Exceptions to this were: the stone-cased caddisfly *Glossosoma*, which was abundant in 2003 but absent in 2008; the stoneflies *Isoperla* and *Malirekus hastatus* and the caddisfly *Rhyacophila fuscula*, which were all common in 2003 though absent in 2008. The caddisfly *Triaenodes ignitus* appeared here in 2008 (and was common in the sample) but had not been found in previous collections.

Data Analysis

Roan Creek declined from Excellent in the first three samples collected here from 1993 through 2003, to Good in 2008. Four additional EPT taxa would be required for the site to attain a classification of Excellent in 2008. The EPT Biotic Index suggests a slightly more pollution-tolerant macroinvertebrate community than in past years. Overall however, the species residing in this reach contribute to a pollution-sensitive macroinvertebrate community. Noticeable amounts of silt in 2008, (30% by visual estimation compared to 0% in 2003) may have reduced the number of EPT taxa residing here by filling benthic interstitial habitat.

NEW

Waterbo	dy	L	ocation		Date	Statio	n ID	Bio	oclassifica	ation
ROAN	CR	S	R 1588		05/19/0	08 KF2	20		Good	
County	Subbasin		Latituda	Long	itudo					rogion
	Jubbasin		26 407040		111100	40 Nullii		Lev		leteeu
ASILE	I	05050001	30.407949	-01.40	JITZ	10-1-31-	(2)	INC		lateau
Stream Classifica	tion Dra	inage Area (mi2)	Elevatio	on (ft)	Stream	Width (m)	Aver	rage Depth (m) F	Reference Site
WS-IV, Tr, CA-	+	6.7	269	4		5		0.3		No
	Fo	rested/Wetland	Rural Re	sidential		Agriculture		Ot	her (desci	ribe)
Visible Landuse	(%)	30	1	5		55			0	
Upstream NPDES Di	schargers (>	1MGD or <1MGD	and within 1 n	nile)		NPDE	S Number	r	Volu	me (MGD)
		None								
Water Quality Param	neters						Site Photo	ograph		
Temperature (°C)		12.5					AAA	ALC: N		
Dissolved Oxygen (m	g/L)	10.4	a start				AND-	A starting of the		
Specific Conductance	(µS/cm)	38					という理論	Menter:	1 19	INSE
pH (s.u.)		6.1					Sales S	AL X		
Water Clarity		Clear		A 14 4		2 Aller	C. Jack	AND THE		
					-	C. Carlos Part	- see		- 710	
Habitat Assessment	Scores (max	()					Tartes		A	12 1 2
Channel Modification	(5)	5			Contraction of the					15
Instream Habitat (20)		19	PINE	a state of	- Participation				a Valla Ir	
Bottom Substrate (15)	8	and the		and a second		-			
Pool Variety (10)		8				-	-		- Adhe	
Riffle Habitat (16)		16		al ant	and the second		-			A AN A
Left Bank Stability (7)		5	2-00 11-0							AL AN
Right Bank Stability (7	7)	5	-				and the second s		and the	·
Light Penetration (10)	->	7						The la	ala Tar	
Left Riparian Score (5) (=)	2	No. Ale					and and	ALL ST	
Right Riparian Score	(5)	2	Sub	-	groval appl	ala aand haul	dor			
lotal Habitat Score	(100)	11	Sub	strate	gravel, cobi	bie, sand, boui	der.			
Sample Date)	Sample I	D	Spe	cies Total		NCIBI		Biocla	ssification
05/19/08		2008-41			14		48			Good
Most Abundan	t Species	Mottled Sculpin			Exot	ic Species	Rock Bas	ss, Smallmou	th Bass, B	rown Trout.
Species Change	Since Last C	ycle N/A								

New basinwide site. Watershed -- a tributary to the South Fork New River that drains the southeastern central edge of Ashe County, located southeast of Jefferson. Habitats -- good riffles and runs, with one good pool that was holding trout; moderately embedded substrates, but cattle are fenced out of the stream, allowing generally healthy banks; narrow vegetated riparian widths on both sides of the stream and a canopy that provides equal amounts of sun and shade. 2008 -- a very abundant (n=1273), fairly diverse, and trophically balanced community of mostly cool and cold water fish species was collected, including four intolerant taxa (Rock Bass, Smallmouth Bass, Kanawha Darter, and Appalachia Darter); Mottled Sculpin represented 53% of the sample; in light of the agricultural land use in the watershed and lasting drought conditions, this stream appears fairly healthy as indicated by its instream habitats, water parameters, and its abundance of fish.



Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/20/08	10557		34		4.37	Good
08/19/03	9250	70	30	4.92	4.11	Good-Fair
08/18/98	7739	71	32	5.16	4.18	Good-Fair
07/14/93	6269	84	36	4.65	3.77	Good

Taxonomic Analysis

Naked Creek at NC 16-88 contains a typical benthic fauna for this part of the New River Basin. Abundant taxa collected in 2008 (and in most previous years) included the mayflies Acentrella, Baetis flavistriga, Maccaffertium ithaca, and M. modestum. Abundant caddisflies were Ceratopsyche sparna, Cheumatopsyche, Hydropsyche betten i and Leucotrichia pictipes. A few more EPT taxa were collected in 2008 than in recent samples. New taxa to this location in 2008 were the caddisflies Neureclipsis, Oligostomis, Hydatophylax argus and the stonefly Pteronarcys proteus.

Data Analysis

The few additional EPT taxa found in 2008 elevated this sample from Good-Fair to Good. Though this stream reach is entirely within an agricultural area (corn production), the headwaters of some small tributaries to this stream originate in Mount Jefferson State Park. A forested riparian buffer along this section of stream could aid in maintaining the Good bioclassification or possibly improving it.



Taxonomic Analysis

A greater number of taxa were collected here in 2008 compared with the former basinwide site in 2003. Coleoptera (beetles) and Gastropoda (snails) were the most notable groups that reflected greater diversity in 2008, with increases of five and four taxa respectively. Overall, most taxa collected in 2003 at the former basinwide site were also found in 2008 at the new site.

Compared with the upstream basinwide site on Naked Creek (at NC 16-88, which received a classification of Good), there were nine fewer EPT taxa. All abundant taxa collected upstream were found here. However, five taxa that were common in the upstream sample were absent at this site off SR 1589: the caddisflies *Neophylax consimilis*, *N. oligus*, and *Glossosoma*; and the mayflies *Epeorus vitreus* and *Maccaffertium pudicum*. The beetle *Cymbiodyta* (Hydrophilidae) was collected here in 2008; this is the first BAU record of the taxon in the New River drainage. This uncommon beetle has only been collected in 25 BAU samples since 1985.

Data Analysis

This site replaces the former basinwide site at SR 1585, which is about one stream-mile upstream. The former site is within a recently established gated community.

Naked Creek off SR 1589 rated Good-Fair in 2008, the same rating received at the former basinwide site at SR 1585 in 2003. The upstream basinwide site on Naked Creek at NC 16-88 rated Good in 2008. A golf course and the outfalls from two minor dischargers (Town of Jefferson WTP, permit NC0083470; Town of Jefferson WWTP, permit NC0021709) are situated between the upstream and downstream basinwide sites, and appear to have an effect on water quality at the downstream site.

According to the 2004 Basinwide Assessment Report, upgrades to the WWTP were ongoing at the time of sampling. The specific conductance measured 140 µmhos/cm in 2008, higher than in 2004 at SR 1585 (102 µmhos/cm). Also, habitat issues remain a problem here with large amounts of silt covering benthic surface and ongoing water withdrawals for lawn and golf course irrigation. At the time of the 2008 sampling event new homes were being constructed on the left side of the stream.

Waterboo	dy		L	_ocation		Date	е	Station	ID	Bi	oclassifi	cation
NAKED	CR		off	SR 1589		05/09	/08	KF1	4		Fai	r
County	Subba	asin	8 digit HUC	Latitude	Long	itude		AU Numbe	er	Le	vel IV E	coregion
ASHE	1		05050001	36.413027	-81.40	70488		10-1-32b		N	ew River	Plateau
Stream Classifica	tion	Drair	nage Area (mi2)	Elevatio	n (ft)	Strea	am Wio	dth (m)	Ave	rage Depth (m)	Reference Site
C;+			12.4	2670)		8			0.4		No
		For	ostod/Wetland	Subu	urhan		۸a	riculture		0	hor (dos	cribe)
Visible Landuse	(%)	101	40	3	0		лy	30				cribe)
	• · · <u>-</u>				- !! - `	U		NDDEO	Nerraha	_	N-	
Town of Jefferson W	scharge	ers (>1	MGD or <1MGD	and within 1 n	nile)			NCO	Numbe	r0	6 VO	lume (MGD)
											.0	
Water Quality Param	ieters			A PROVIDE		Same and a state	1.1.1	5	ite Phot	ograpn	Page 1	2
Temperature (°C)			15.6		NT	- AR	1		St. Sal			14
Dissolved Oxygen (m	g/L)		8.1		Carl Carl		TTON		a sec		and the second	- V - State
Specific Conductance	e (µS/cm))	104	1	- 4	The second		2 Marking	and line	and the second	the case	- Nether
pH (s.u.)	_		6.2		1 A	AN AL		THERE	3/	Serie	2ª	
Water Clarity			Turbid	and a star		-		and the second		and a second		A These
Habitat Assessment	Scores	(max)			STATES -	1 Take	17/0		1	A FEE		
Channel Modification	(5)		5	the state of the s		- Marca		ALC: N	-	AC		
Instream Habitat (20)	()		15		A - Surt		S. Contraction				1.50	
Bottom Substrate (15))		6		1217	and the					1	
Pool Variety (10)	,		4	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	alt S.							
Riffle Habitat (16)			7		1 10	a det					SYNC T	
Left Bank Stability (7)			3	2	1514 - P. S.						- War A	
Right Bank Stability (7	7)		3	100	A DEPERTURN IN THE	endor P						MARKA STATIST
Light Penetration (10)			5							13:469	And W	ABENESS ARE
Left Riparian Score (5	5)		1							TRANSPORT	和父母们	
Right Riparian Score	, (5)		1							$h \sim 10$		
Total Habitat Score ((100)		50	Subs	strate	Cobble, I	ooulde	r, gravel, an	d silt			
Sample Date)		Sample I	D	Spe	cies Tota	l		NCIBI		Biod	classification
05/09/08			2008-36	5		20			36			Fair
06/09/98			98-55			12			34			Fair
Most Abundant Spe	ecies		Central Stoneroll	er		Exotic	: Spec	ies	Warpaint Rock Ba Sunfish, Bass	: Shiner, Brov ss, Redbreas Smallmouth I	vn Bullhe t Sunfish Bass, an	ead, Brown Trout, n, Pumpkinseed d Largemouth
Species Change Sin	ce Last	Cycle	Gains Trout, Rec Losses	Spotfin Shiner, dbreast Sunfish Blacknose Dao	Warpaint n, Pumpkir ce, Creek	Shiner, S nseed Sur Chub, an	pottal S nfish, S d Blueg	Shiner, Kana Smallmouth I gill.	awha Ro Bass, La	syface Shine rgemouth Ba	r, Brown ss, and (Bullhead, Brown Greenside Darter.
Data Analysis												
1998 site was ~2.2 mi community is within th	iles upsti ne immed	ream a diate w	it NC 16/88. Wat atershed; WWTP	ershed drain discharge is ~	s south-ce 2 miles u	entral Ash pstream:	ie Coui tributai	nty, including	g the Tov uth Fork	wn of Jefferso New River; si	on; golf c ite is ~ 7	ourse residential 00 ft. upstream

from the creek's confluencewith the river. Habitat -- lowest total habitat scores of any fish site in the basin in 2008; runs, riffles, slick periphyton; eroded vertical banks; open canopy within the golf course. 2008 -- diversities of darters, cyprinids, and intolerant species were lower than expected; the

percentage of tolerant fish (primarily White Sucker and Redbreast Sunfish) was elevated for a mountain stream; high percentage of Omnivores+Herbivores; proximity to the river enables the site to serve as a nursery area for Age 1 Rock Bass (n=250) and a source of temporary migrants (Spotfin Shiner, Warpaint Shiner, Spottail Shiner, Kanawha Rosyface Shiner, and Greenside Darter); and the most nonindigenous species and the second greatest conductivity at any fish site in the basin in 2008. 1998 & 2008 -- 23 species known from the stream, including 2 endemic and 9 nonindigenous species.

Waterbod	ly	Locat	ion	Station II	D	Date		Bioclassification
PEAK C	R	OFF SR 1599 3 UPSTREAM OF C	50 METERS DRE KNOB BR	KB11		06/19/08		Excellent
County	Subbasin	8 digit HUC	Latitude	Longitude	AU Numb	ber	Lev	el IV Ecoregion
ASHE	1	05050001	36.420833	-81.319444	10-1-35-(2	2)a	Nev	w River Plateau
Stream Classificat	tion [Drainage Area (mi2	2) Elev	ation (ft)	Stream W	/idth (m)		Stream Depth (m)
B;Tr:+		9.0		2700	6			0.2
	For	rested/Wetland	Urban	l	Agriculture		Ot	her (describe)
Visible Landuse ((%)	75	25		0			0
Upstream NPD	ES Discharge	ers (>1MGD or <1M	IGD and within	1 mile)	NPDES	Number		Volume (MGD)
none		•			-			
Water Quality Parame	eters				Site	e Photograph		
Temperature (°C)		18.0				tion that is not	Jel 1	
Dissolved Oxygen (mg	/L)	8.3						
Specific Conductance ((µS/cm)	38	100	and the second				
pH (s.u.)		6.3	and the second				A state	
			and the second					mar and
Water Clarity		clear	-192	the sale of		- Trans		
				and the			123	A second and
Habitat Assessment S	Scores (max)		1	and the second	1983.	- Contraction of the second		
Channel Modification (5)	5		Vier Contraction	and the second	3		
Instream Habitat (20)		20	and the second	1. 1.4				
Bottom Substrate (15)		12	100	1	Sector Sector	-	En	
Pool Variety (10)		10	and the		Contraction of the	-Sel	and the second	11-22 - 12-
Riffle Habitat (16)		16		aller a se	100		alla a	
Left Bank Stability (7)		6		and the second		Cale Parts		
Right Bank Stability (7)	1	7		Care and		Sec. The	Eist 1	
Light Penetration (10)		10		A STATE OF THE STA	1.1			A TABLE
Left Riparian Score (5)		2			and the	A COLORINA	-1-3	and the the
Right Riparian Score (5	5)	5						
Total Habitat Score (1	00)	93	Substra	nte mix of	bedrock, bou	ulder, cobble, g	ravel ar	nd sand
Sample Date		Sample ID	ST	EPT	BI	EPT	BI	Bioclassification

Sample Date	Sample ID	51	EPI	ы	EPIBI	Bioclassification
06/19/08	10473		44		2.32	Excellent
08/18/03	9248		31		2.53	Good
08/19/98	7746		35		2.77	Good
04/08/96	7032	74	37*	4.01*	2.47	Excellent
07/15/93	6275		35		2.61	Good

* values corrected for seasonality

Taxonomic Analysis

A diverse and pollution-sensitive aquatic community resides in this section of Peak Creek (above the confluence of Peak Creek and Ore Knob Branch). In 2008, the number of EPT taxa was higher than in recent collections here (an April 1991 Full Scale sample yielded 50 EPT). Generally, the aquatic macroinvertebrate community was similar to past samples with abundant, pollution-sensitive taxa such as: the mayflies *Drunella cornutella*, *Paraleptophlebia, Stenacron pallidum,* and *Heptagenia*; and the caddisflies *Glossosoma, Ceratopsyche slossonae, Dolophilodes,* and *Neophylax oligius*. In 2008 an extremely rare caddisfly, *Hydropsyche carolina*, was found in Peak Creek. Only one other record exists for this taxon in the North Carolina BAU database going back to 1983.

Data Analysis

This section of Peak Creek rated Excellent in 2008. The second highest EPT totals and the lowest EPT Biotic Index summarize the 2008 sample here and highlight the high water quality conditions in this stream. An undisturbed riparian zone, diverse in-stream benthic surfaces and a mostly forested watershed have resulted in favorable conditions for macroinvertebrate colonization in this stream (as indicated by the high habitat score received).

The location name for this site was formerly "SR 1599."



Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/21/08	10561		3		2.62	Poor
08/18/03	9247		6		1.91	Poor
01/13/99	7798		5*		1.60	Poor
08/19/98	7747		23		3.10	Good-Fair
04/08/96	7026	30	14*	4.18*	2.10	Fair

* values corrected for seasonality

Taxonomic Analysis

In 2008 only three EPT taxa were collected: *Pycnopsyche gentilis* (one specimen), a second unidentified species of *Pycnopsyche* (three specimens), and *Hydropsyche venularis* (one specimen). Precipitate from acid mine drainage covered the caddisflies and/or their cases. It is quite apparent that the benthic community is very highly stressed at the site.

Data Analysis

This reach of Peak Creek, below the confluence of Ore Knob Branch, received the same classification of Poor in 2008 as in 2003. It appears that in both wet and dry years the highly stressed macroinvertebrate community here borders on extirpation. As seen in the photo, an orange precipitate covered all instream surfaces. The 2004 Basinwide Assessment Report stated that proposed mitigation efforts were planned (in 2004). Unfortunately that work was not initiated, though site stabilization efforts continue at the mine site itself. Approximately one mile upstream of this site is station KB 11, which earned a classification of Excellent in 2008. Despite the diverse aquatic community residing just upstream, this reach continues to suffer from the acid mine drainage received from Ore Knob Branch.

The location name for this site was formerly "BIG PEAK CR RD."

Waterbody		Locati	ion Station ID Date		Date	Bioclassification		
L PEAK CF	R	SR 15	595	KB14 08/21/08		3/21/08	Poor	
County S	ubbasin	8 digit HUC	Latitude	Longitude	AU I	Number	Le	vel IV Ecoregion
ASHE	1	05050001	36.427778	-81.344444	10-	10-1-35-4 Ne		ew River Plateau
Stream Classification B;Tr:+	1 D	rainage Area (mi2 2.3	2) Ele ^s	vation (ft) 2615	Stre	am Width 3	(m)	Stream Depth (m) 0.1
Visible Landuse (%)	For	ested/Wetland 100	Urbar 0	1	Agricul 0	ture	c	ther (describe) 0
Upstream NPDES	Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)							Volume (MGD)
none								

Water Quality Parameters

Temperature (°C)	17.8
Dissolved Oxygen (mg/L)	7.7
Specific Conductance (µS/cm)	76
pH (s.u.)	5.9
Water Clarity clear	

Habitat Assessment Scores (max)

Channel Modification (5)	3
Instream Habitat (20)	18
Bottom Substrate (15)	12
Pool Variety (10)	5
Riffle Habitat (16)	16
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	86

Site Photograph



Substrate

mix of boulder, cobble, gravel, sand and silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/21/08	10560		7		2.12	Poor
08/19/03	9249		6		1.95	Poor
08/19/98	7744		7		2.02	Poor
04/08/96	7030	16	6*	3.58*	1.77	Poor
04/16/91	5551		5		2.01	Poor

*values corrected for seasonality

Taxonomic Analysis

Only seven EPT taxa were found in Little Peak Creek in 2008. Abundant taxa collected here were similar to previous samples (*Leuctra, Tallaperla*, and *Diplectrona modesta*). Three larger-bodied case caddisflies were present (all common in the sample): *Hydatophylax, Pycnopsyche gentilis,* and a second unidentifed species of *Pycnopsyche*. Acid mine drainage from Ore Knob continues to suppress macroinvertebrate diversity and densities here.

Data Analysis

Little Peak Creek rated Poor in 2008, the same rating that it has always received. Acid mine drainage creates a toxic situation for aquatic macroinvertebrates here.

By current BAU protocols this site would not be assigned a classification due to the small drainage area. However, due to the depauperate benthic community, in the judgment of BAU biologists the site is among the worst in the state and the classification is justified.



Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/21/08	10562	93	45	3.96	3.07	Excellent
08/18/03	9246	106	52	4.08	3.07	Excellent
08/19/98	7748	79	42	3.78	3.11	Excellent

Taxonomic Analysis

Cranberry Creek contained a large number of aquatic macroinvertebrate taxa in 2008. The species composition was similar to the 1998 and 2003 collections. Abundant taxa at this site in 2008 included: *Dolophilodes, Neophylax oligius, Paraleptophlebia,* and *Neoephemera purpurea*.

Data Analysis

Cranberry Creek rated Excellent in 2008. Total taxa and EPT taxa numbers were similar among all three samples collected here. The Biotic Index indicates a pollution-sensitive community residing in this lower section of Cranberry Creek. This watershed contains a large number of tree farms with some mixed agriculture and residences.

Waterbody		Location			Date Station ID			Bioclassification			
CRANBER	RY CF	२	S	R 1600		05/08/	08	KF2		Good	
County	Subba	asin	8 digit HUC	Latitude	Longi	tude		AU Number	L	Level IV Ecoregion	
ASHE	1		05050001	36.46944444	-81.326	94444		10-1-37		New River Plateau	
Stream Classifica	ation	Drair	nage Area (mi2)	Flevatio	n (ft)	Stream	n Wic	ith (m) A	verage Dept	n (m)	Reference Site
C:+		2.4.1	36.8	2560)		14		0.4	. ()	No
,	8				u						
	F	For	ested/Wetland	Rural Res	sidential		Ag	riculture		Other (de	scribe)
Visible Landuse	(%)		20	55	5			25		0	
Upstream NPDES Di	ischarge	rs (>1	MGD or <1MGD	and within 1 m	nile)			NPDES Num	ber	Vo	olume (MGD)
•	Ŭ		None								
Water Quality Param	neters							Site Ph	otograph		
Temperature (°C)			15.4	· 11						-	and the second second
Dissolved Oxygen (m	a/L)		9.1		the second					-	
Specific Conductance	e (µS/cm))	39		NEC.				150		
pH (s.u.)	u ,		5.7	-					1000		
Water Clarity			Clear			-		AL.			
Habitat Assessment	Scores	(max)		and the second s		1		and then			
Channel Modification	(5)		4							1 1 2 M	
Instream Habitat (20)			16			100		-			
Bottom Substrate (15)		8	المراجع المحمد							
Pool Variety (10)			4	Part of							
Riffle Habitat (16)			14			200					
Left Bank Stability (7)			2	a ces							
Right Bank Stability (7	7)		3								
Light Penetration (10))		0								The state
Left Riparian Score (5	5)		1		-				-	12400	
Right Riparian Score	(5)		1		_						
Total Habitat Score ((100)		53	Subs	trate	Cobble, gr	avel,	sand, and boulde	rs		
Sample Date	e la compañía de la c		Sample I	D	Spec	ies Total		NCI	31	Bio	classification
05/08/08			2008-33			22		56			Good
06/30/98			98-59			20		60			Excellent

Most Abundant Species	Mottled Sculpin and Bluehead Chub	Exotic Species	Warpaint Shiner, Redlip Shiner, Tennessee Shiner, Saffron Shiner, Rock Bass, and Smallmouth Bass		
Species Change Since Last Cycle	Gains Tonguetied Minnow, Warp	oaint Shiner, Tennessee S	hiner, Saffron Shiner, Kanawha Rosyface Shiner,		
	and Creek Chub. Losses Wester	ern Blacknose Dace, White	Sucker, Brown Trout, and Greenside Darter.		

Data Analysis

Watershed -- drains eastern Ashe County; no municipalities within the watershed; tributary to South Fork New River, site is ~ 1 mile upstream of the creek's confluence with the river. Habitat -- straight channel, stream widening is occurring; 100% open canopy; very narrow riparian zones; unstable banks with high erosion potential; and shallow pools; a popular fishing site. 2008 -- more total species, species of cyprinids (15), and intolerant species (9) were collected at this site than at any other site, except for at the South Fork New River (also 22 species). 1998 & 2008 -- twice as many fish collected in 2008 than in 1998; a very diverse fish community is present, 26 species known from the site, including 16 species of cyprinids, 4 species of darters, 6 endemic species (Tonguetied Minnow, New River Shiner, Kanawha Rosyface Shiner, Kanawha Minnow, Kanawha Darter, and Appalachia Darter), and 7 nonindigenous species; and species present in 1998, but absent in 2008 were represented by 1-5 fish/species.

Waterbody		Location			Date Station ID			n ID	Bioclassification			
PRATHER	S CF	र	off	SR 1302		05/07	/08	KF1	5	Good-Fair		Fair
0 aunta	0			1 - 414 1 -								
County	Subr	basin	8 digit HUC	Latitude	Long	jitude		AU Numb	er	Le	vei iv Ecoregion	
ALLEGHANY		I	05050001	36.4967511	-81.32	205856		10-1-38		ING	ew River	Plateau
Stream Classifica	tion	Drai	nage Area (mi2)	Elevatio	on (ft)	Strea	m Wio	dth (m)	Avera	iae Depth (m)	Reference Site
B;Tr			13.7	252	0		7			0.4	<i>,</i>	No
		Foi	rested/Wetland	Rural Re	sidential		Ag	riculture		Ot	her (des	scribe)
Visible Landuse	(%)		50	1	0			40			0	
Unotroom NDDES Di	aabara			and within 4 r	nilo)			NDDE	Number		Va	
Opstream NPDES DI	scharg	ers (>	None		nne)			NPDE	5 Number		VO	iume (MGD)
			None									
Water Quality Param	eters							5	Site Photog	graph		
Temperature (°C)			17.2	Sec. 1						1200	1 5	
Dissolved Oxygen (m	g/L)		8.7	2.2010		12 200			S. A.Y.			
Specific Conductance	e (µS/cn	n)	42			有人自然	7		3/2		a la car	
pH (s.u.)			7.2			C.A.	Ser.	The state	1000		1	BACK STATE
								117.12	AND -			
Water Clarity			Clear	2 october		30 1	No.	Sec.		E Brook		
						True -		SCAPE CO.	- Aller	2 martin	S. M	
Habitat Assessment	Scores	s (max))			14	N=		1			
Channel Modification	(5)		5	they -	AR	Act of the local division of the local divis	1	-	-	-		A CALL
Instream Habitat (20)			18	-			1				1	
Bottom Substrate (15))		14	-64	and the same	- And	-	n.			-	- 31.0
Pool Variety (10)			6	Sale of the	- AD-		in the second		and the second	Mar Anon	- the	
Riffle Habitat (16)			16	- Part	10	1	-	Constant of the local distance of the local	Teach	and the second second	-	
Left Bank Stability (7)			4	and the second se	-	Alberto Part	-	L. Carlin	100		and life	A She is the
Right Bank Stability (7	7)		4	2000	- RE	-			- Contractor		and and	~~ ~ ~
Light Penetration (10)			4			and some states				-	-	A starter
Left Riparian Score (5	5)		2						and the second	M	Station	THE ALL AND
Right Riparian Score	(5)		2									
Total Habitat Score ((100)		75	Sub	strate	Cobble an	nd bou	ılder				
Sample Date)		Sample	ID	Spe	ecies Total	I		NCIBI		Biod	classification
05/07/08			2008-3	2		19			46		(Good-Fair
						7						
							-		Warpaint S	Shiner, Red	lip Shine	r, Tennessee
Most Abundant Spe	ecies		Central Stonero	ler		Exotic	Spec	ies	Shiner, Sa	ffron Shinei	r, Brown	Trout, Rock Bass,
									anu Smalli	nouth Bass	1	
Species Change Sin	ce Last	Cvcle	N/A									
Data Analysis		-,										
This is the first fish community sample collected at this site. Watershed drains western Alleghany County; no municipalities within the watershed; much												

of watershed is with livestock pasture, no riparian zones, and an open canopy; tributary to South Fork New River, site is ~ 750 ft. upstream from the creek's confluence with the river. **Habitat** -- high gradient stream, primarily riffles, runs, and some plunge pools; fairly open canopy; narrow riparian zones. **2008** -- Central Stoneroller accounted for 57% of all the fish collected; high percentage of Omnivores+Herbivores, indicative of nonpoint source nutrients and an open canopy; and two endemic species (Kanawha Rosyface Shiner and Kanawha Darter) were present.

Waterbody			Location			e Station ID		E	Bioclassification		
GRASSY CR			SR 1549			08	KF16		Good-Fair		
County	Subbas	in 8 digit HUC	Latitude	Long	itude		AU Number	L	Level IV Ecoregion		
ASHE	1	05050001	36.5522927	-81.35	55517	10-3			New Rive	er Plateau	
Stream Classifica	tion I	Drainage Area (mi	2) Elevatic	on (ft)	Stream	n Wid	lth (m)	Average Depth	ı (m)	Reference Site	
C;Tr:+		10.6	248	0		8	8 0.3			No	
	Forested/Wetland		i Url	Urban		Agriculture		Other (describe)		escribe)	
Visible Landuse	(%)	90		0			0	10 (South Fork New Rive		(New River)	
Upstream NPDES Di	schargers	; (>1MGD or <1MG	D and within 1 r	nile)			NPDES Nu	mber	Va	olume (MGD)	
None											
Water Quality Param	eters					15 and 10	Site F	Photograph			
			and the second se		and the second se	State of the local division of the local div	COMPANY OF THE OWNER OF THE OWNER OF		- La - Maria	Statement and soldiers of the second statement of the	

Temperature (°C) 18.0 8.5 Dissolved Oxygen (mg/L) Specific Conductance (µS/cm) 84 7.7 pH (s.u.) Very slightly turbid Water Clarity (easily silted) Habitat Assessment Scores (max) Channel Modification (5) 5 Instream Habitat (20) 19 14 Bottom Substrate (15) Pool Variety (10) 8 Riffle Habitat (16) 16 7 Left Bank Stability (7) Right Bank Stability (7) 7 9 Light Penetration (10) 5 Left Riparian Score (5) Right Riparian Score (5) 5 Total Habitat Score (100) 95 Substrate Cobble, boulder, and silts on the rocks Sample Date Sample ID **Species Total** NCIBI Bioclassification 05/08/08 2008-35 18 40 Good-Fair Redlip Shiner, Saffron Shiner, Brown Trout, Rock **Most Abundant Species** Bluehead Chub and Central Stoneroller **Exotic Species** Bass, Green Sunfish, and Smallmouth Bass

Species Change Since Last Cycle

N/A

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- drains southern Grayson County, VA and northeast corner of Ashe County; no municipalities within the watershed; tributary to the New River, site is ~ 50 ft. from the creek's confluence with the river. **Habitat** -- greatest habitat score of any fish community site in the basin in 2008, although much of the watershed is without canopy cover in pasture with cattle; high gradient boulder plunge pools; site is atypical. **2008** -- 82% of all the fish collected were Bluehead Chub, Central Stoneroller, and Mountain Redbelly Dace; very high percentage of Omnivores+Herbivores were collected, indicative of nonpoint sources of nutrients and open canopy upstream of the reach; proximity to the river enables the site to serve as a nursery area for Age 1 Rock Bass and Smallmouth Bass; one endemic species (Appalachia Darter) was collected; and the greatest pH of any fish community site in the basin in 2008 due to photosynthetic activity by the upstream periphyton.

New
APPENDIX 2-C

Ambient Monitoring Systems Station Data Sheets

Station ID	WATERBODY	AU#	Location	Impaired (By Parameter)	Impacted (By Parameter)
K2100000	South Fork New R.	10-1-(3.5)	US 221/421 at Perkinsville	Fecal Coliform (10.9%)	
K3250000	South Fork New R.	10-1-(26)	NC 16/88 near Jefferson		Fecal Coliform (7.1%)
K4500000	South Fork New R.	10-1-(33.5)	US 221 near Scottville	Copper (11.1%) Iron (22.2%) Zinc (11.1%)	

Ambient Monitoring System Station Summaries

NCDENR, Division of Water Quality

Basinwide Assessment Report

Location: S FORK NEW RIV AT US 221 AND 421 AT PERKINSVILLE

Station #:	K2100000		Hydrologic Unit Code:	05050001
Latitude:	36.22088	Longitude: -81.63978	Stream class:	C +
Agency:	NCAMBNT		NC stream index:	10-1-(3.5)

Time period: 01/27/2005 to 12/16/2009

	#	#		Resul	ts no	t meeting	EL	Percentiles					
	results	ND	EL	#	%	%Conf	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	57	0	<4	0	0		7.6	8.2	8.5	9.8	11.8	13	13.7
	57	0	<5	0	0		7.6	8.2	8.5	9.8	11.8	13	13.7
pH (SU)	57	0	<6	0	0		6.7	6.9	7.2	7.5	7.8	7.9	8.4
	57	0	>9	0	0		6.7	6.9	7.2	7.5	7.8	7.9	8.4
Spec. conductance (umhos/cm at 25°C)	57	0	N/A				86	101	118	156	179	219	310
Water Temperature (°C)	57	0	>29	0	0		1.8	3.5	6.9	14	19.1	20.8	25.7
Other													
TSS (mg/L)	18	10	N/A				2.5	2.5	3	5.5	6.2	24.8	68
Turbidity (NTU)	57	4	>50	2	3.5		1	1	1.5	2.3	4.5	9.9	150
Nutrients (mg/L)													
NH3 as N	57	38	N/A				0.02	0.02	0.02	0.02	0.02	0.04	0.08
NO2 + NO3 as N	57	0	N/A				0.24	0.98	1.3	1.7	2.15	3	3.9
TKN as N	57	15	N/A				0.2	0.2	0.2	0.24	0.28	0.38	0.89
Total Phosphorus	57	0	N/A				0.03	0.04	0.06	0.1	0.2	0.26	0.48
Metals (ug/L)													
Aluminum, total (Al)	10	2	N/A				50	50	60	83	114	206	210
Arsenic, total (As)	10	10	>10	0	0		5	5	5	5	5	5	5
Cadmium, total (Cd)	10	10	>2	0	0		1	1	1.8	2	2	2	2
Chromium, total (Cr)	10	10	>50	0	0		10	10	21	25	25	25	25
Copper, total (Cu)	10	7	>7	0	0		2	2	2	2	2	3	3
Iron, total (Fe)	10	0	>1000	0	0		190	191	230	265	325	487	500
Lead, total (Pb)	10	10	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	8	8	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	10	10	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	10	4	>50	0	0		10	10	10	11	16	21	21

Fecal Coliform Screening(#/100mL)

 # results:
 Geomean:
 # > 400:
 % > 400:
 % Conf:

 55
 89.1
 6
 10.9

Key:

result: number of observations

ND: number of observations reported to be below detection level (non-detect)

EL: Evaluation Level; applicable numeric or narrative water quality standard or action level

Results not meeting EL: number and percentages of observations not meeting evaluation level

%Conf : States the percent statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)

Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries

NCDENR, Division of Water Quality

Basinwide Assessment Report

S FORK NEW R	IV AT NC 16	AND 88 NR JEFI	FERSON	
K3250000			Hydrologic Unit Code:	05050001
36.39473	Longitude:	-81.40750	Stream class:	WS-IV HQW
NCAMBNT			NC stream index:	10-1-(26)
	S FORK NEW R K3250000 36.39473 NCAMBNT	S FORK NEW RIV AT NC 16 K3250000 36.39473 Longitude: NCAMBNT	S FORK NEW RIV AT NC 16 AND 88 NR JEFF K3250000 36.39473 Longitude: -81.40750 NCAMBNT	S FORK NEW RIV AT NC 16 AND 88 NR JEFFERSON Hydrologic Unit Code: 36.39473 Longitude: -81.40750 Stream class: NCAMBNT NC stream index:

02/01/2005 to 12/17/2009 Time period:

	#	#		Resul	ts no	t meeting	EL	Percentiles					
	results	ND	EL	#	%	%Conf	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	58	0	<4	0	0		7.6	8.3	8.5	9.8	11.5	13.1	14.6
	58	0	<5	0	0		7.6	8.3	8.5	9.8	11.5	13.1	14.6
pH (SU)	58	0	<6	0	0		6.7	7.1	7.4	7.7	8.1	8.6	9.4
	58	0	>9	2	3.4		6.7	7.1	7.4	7.7	8.1	8.6	9.4
Spec. conductance (umhos/cm at 25°C)	58	0	N/A				45	61	68	73	80	100	656
Water Temperature (°C)	58	0	>29	0	0		2.3	4.7	8.2	15.4	21.9	24.4	27.1
Other													
TSS (mg/L)	18	9	N/A				2.5	2.5	3.9	6.2	6.6	68.4	576
Turbidity (NTU)	58	2	>50	3	5.2		1	1.2	1.7	2.8	5.2	22	380
Nutrients (mg/L)													
NH3 as N	58	40	N/A				0.02	0.02	0.02	0.02	0.02	0.04	0.12
NO2 + NO3 as N	58	0	>10	0	0		0.15	0.38	0.51	0.6	0.77	0.85	1
TKN as N	56	25	N/A				0.2	0.2	0.2	0.2	0.26	0.37	2.5
Total Phosphorus	58	11	N/A				0.02	0.02	0.02	0.02	0.03	0.05	3.8
Metals (ug/L)													
Aluminum, total (Al)	9	0	N/A				110	110	120	150	200	310	310
Arsenic, total (As)	9	9	>10	0	0		5	5	5	5	5	5	5
Cadmium, total (Cd)	9	9	>2	0	0		1	1	2	2	2	2	2
Chromium, total (Cr)	9	9	>50	0	0		10	10	25	25	25	25	25
Copper, total (Cu)	9	8	>7	0	0		2	2	2	2	2	2	2
Iron, total (Fe)	9	0	>1000	0	0		200	200	220	280	380	480	480
Lead, total (Pb)	9	9	>25	0	0		10	10	10	10	10	10	10
Manganese, total (Mn)	8	0	>200	0	0		14	14	16	18	22	29	29
Mercury, total (Hg)	8	8	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	9	9	>25	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	9	8	>50	0	0		10	10	10	10	10	10	10
Food Coliform Saroon	ing(#/100	mI)											

results: # > **400**: % > 400: %Conf: Geomean:

56

7.1 4

21.8

Key:

result: number of observations

ND: number of observations reported to be below detection level (non-detect)

EL: Evaluation Level; applicable numeric or narrative water quality standard or action level

Results not meeting EL: number and percentages of observations not meeting evaluation level

%Conf : States the percent statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)

Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries

NCDENR, Division of Water Quality

Basinwide Assessment Report

Location:	S FORK NEW R	IV AT US 221 NR SC	OTTVILLE		
Station #:	K4500000		Hydr	ologic Unit Code:	05050001
Latitude:	36.47378	Longitude: -81.336	19	Stream class:	B ORW
Agency:	NCAMBNT]	NC stream index:	10-1-(33.5)

02/01/2005 to 12/17/2009 Time period:

	#	#		Resul	ts no	t meeting	EL	Percentiles						
	results	ND	EL	#	%	%Conf	Min	10th	25th	50th	75th	90th	Max	
Field														
D.O. (mg/L)	58	0	<4	0	0		5.6	7.9	8.5	9.5	11.4	13.4	14.6	
	58	0	<5	0	0		5.6	7.9	8.5	9.5	11.4	13.4	14.6	
pH (SU)	58	0	<6	0	0		6.6	7	7.4	7.7	8	8.4	9	
	58	0	>9	0	0		6.6	7	7.4	7.7	8	8.4	9	
Spec. conductance (umhos/cm at 25°C)	57	0	N/A				35	56	68	72	78	83	148	
Water Temperature (°C)	58	0	>29	0	0		1.1	4	8	15.4	22.6	25.6	27	
Other														
TSS (mg/L)	19	10	N/A				2.5	2.5	6.2	6.2	14	48	354	
Turbidity (NTU)	58	3	>50	4	6.9		1	1.2	1.7	3.1	6.6	27.4	260	
Nutrients (mg/L)														
NH3 as N	57	42	N/A				0.02	0.02	0.02	0.02	0.02	0.03	0.1	
NO2 + NO3 as N	57	0	N/A				0.08	0.33	0.45	0.62	0.74	0.86	0.95	
TKN as N	56	26	N/A				0.2	0.2	0.2	0.2	0.26	0.4	3	
Total Phosphorus	57	10	N/A				0.02	0.02	0.02	0.02	0.04	0.08	0.8	
Metals (ug/L)														
Aluminum, total (Al)	9	0	N/A				64	64	92	200	1765	17000	17000	
Arsenic, total (As)	9	9	>10	0	0		5	5	5	5	5	5	5	
Cadmium, total (Cd)	9	9	>2	0	0		1	1	2	2	2	2	2	
Chromium, total (Cr)	9	9	>50	0	0		10	10	25	25	25	25	25	
Copper, total (Cu)	9	6	>7	1	11.1		2	2	2	2	3	24	24	
Iron, total (Fe)	9	0	>1000	2	22.2		280	280	335	470	1925	20000	20000	
Lead, total (Pb)	9	8	>25	0	0		10	10	10	10	10	15	15	
Mercury, total (Hg)	8	8	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2	
Nickel, total (Ni)	9	8	>88	0	0		10	10	10	10	10	12	12	
Zinc, total (Zn)	9	5	>50	1	11.1		10	10	10	10	13	71	71	

Fecal Coliform Screening(#/100mL)

> **400**: % > 400: %Conf: # results: Geomean: 56 16.5 3 5.4

Key:

result: number of observations

ND: number of observations reported to be below detection level (non-detect)

EL: Evaluation Level; applicable numeric or narrative water quality standard or action level

Results not meeting EL: number and percentages of observations not meeting evaluation level

%Conf : States the percent statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform) 2-C.4

Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

APPENDIX 2-D

12-DIGIT SUBWATERSHED MAPS



APPENDICES New River Basin: South Fork New River & Fox Creek Watersheds (HUC 0505000102 & 0505000103)





APPENDICES New River Basin: South Fork New River & Fox Creek Watersheds (HUC 0505000102 & 0505000103)





New River Basin: South Fork New River & Fox Creek Watersheds (HUC 0505000102 & 0505000103)









New River Basin: South Fork New River & Fox Creek Watersheds (HUC 0505000102 & 0505000103)







Use Support Ratings for all Monitored Waters In the Little River & Chestnut Creek Watersheds

1 All designated uses are monitored and supporting 1b Designated use was impaired, other management strategy in place and no standards violations for the parameter of interest (POI) 1nc DWQ have made field determination that parameter in exceedance is due to natural conditions 1r Assessed as supporting watershed is in restoration effort status 1t No criteria exceeded but approved TMDL for parameter of interest 2 Some designated uses are monitored and supporting none are impaired Overall only 2b Designated use was impaired other management strategy in place and no standards violations Overall only 2r Assessed as supporting watershed is in restoration effort status overall only 2dt No criteria exceeded but approved TMDL for POI Overall only 3a Instream/monitoring data are inconclusive (DI) 3b No Data available for assessment 3c No data or information to make assessment 3r1 Chlorophyll a exceeds TL value and SAC is not met first priority for further monitoring-draft 3n3 Chlorophyll a exceeds threshold value and SAC is not met first second priority for further monitoring-draft 3n4 No Data available for assessment -AU is in a watershed with an approved TMDL 4b Designated use impaired other management strategy expected to address impairment <	Draft 2010 IR Category	INTEGRATED REPORTING CATEGORIES FOR INDIVIDUAL ASSESSMENT UNIT/USE SUPPORT CATEGORY/ PARAMETER ASSESSMENTS. A SINGLE AU CAN HAVE MULTIPLE ASSESSMENTS DEPENDING ON DATA AVAILABLE AND CLASSIFIED USES.
1b Designated use was impaired, other management strategy in place and no standards violations for the parameter of interest (POI) 1nc DWQ have made field determination that parameter in exceedance is due to natural conditions 1r Assessed as supporting watershed is in restoration effort status 1t No criteria exceeded but approved TMDL for parameter of interest 2 Some designated uses are monitored and supporting none are impaired Overall only 2b Designated use was impaired other management strategy in place and no standards violations Overall only 2r Assessed as supporting watershed is in restoration effort status overall only 3a Instream/monitoring data are inconclusive (DI) 3b No Data available for assessment 3c No data or information to make assessment 3n1 Chlorophyll a exceeds TL value and SAC is not met first priority for further monitoring-draft 3n3 Chlorophyll a exceeds threshold value and SAC is not met first second priority for further monitoring-draft 3n4 Chlorophyll a exceeds threshold value and SAC is not met first second priority for further monitoring-draft 3n4 Chlorophyll a exceeds threshold value and SAC is not met first second priority for further monitoring-draft 3n4 Chlorophyll a exceeds threshold value and SAC is not met firs	1	All designated uses are monitored and supporting
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1r Assessed as supporting watershed is in restoration effort status 1t No criteria exceeded but approved TMDL for parameter of interest 2 Some designated uses are monitored and supporting none are impaired Overall only 2b Designated use was impaired other management strategy in place and no standards violations Overall only 2r Assessed as supporting watershed is in restoration effort status overall only 2t No criteria exceeded but approved TMDL for POI Overall only 3a Instream/monitoring data are inconclusive (DI) 3b No Data available for assessment 3c No data or information to make assessment 3n1 Chlorophyll a exceeds TL value and SAC is not met first priority for further monitoring-draft 3n3 Chlorophyll a exceeds threshold value and SAC is not met first second priority for further monitoring-draft 3n4 Chlorophyll a not available determine need to collect-draft 3n4 Chlorophyll a ont available determine need to collect-draft 4c Designated use impaired other management strategy expected to address impairment 4c Designated use impaired on instream monitoring data or screening criteria exceeded 4cs Shellfish harvesting impaired no instream monitoring data - no longer used 4ct Designated use impaired	1nc	DWQ have made field determination that parameter in exceedance is due to natural conditions
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5 Designated use impaired because of biological or ambient water quality standards violations and needing a TMDL 5r Assessed as impaired watershed is in restoration effort status	4t	Designated use impaired approved TMDL
5r Assessed as impaired watershed is in restoration effort status	5	Designated use impaired because of biological or ambient water quality standards violations and needing a TMDL
	5r	Assessed as impaired watershed is in restoration effort status

NC 2010 Integrated Report

	All 13	,123 Waters in N	C are in Category 5-303	B(d) Lis	t for Mercury due to statewide f	ish consumption ad	vice for sev	eral fish sp	oecies
AU_	Numb	er AU_N	lame	AU_D	escription	LengthA	Area AU_U	nits Cla	ssification
Ca	tegory	Parameter			Reason for Rating	Use Category	Colle	ection Year	303(d)year
Ne	w Rive	er Basin			Liti	tle River-New Rive	er Watersh	ed 050	5000104
$oldsymbol{O}$	10-9	-7	Bledsoe Creek		From source to Little River		5.9	FW Miles	s C;Tr
	1	Ecological/biolo	ogical Integrity Bentho)S	Good-Fair Bioclassification	Aquatic Life	2	008	
0	10-9	-10	Brush Creek		From source to Little River		27.8	FW Miles	s C;Tr
	1	Ecological/biolo	ogical Integrity Bentho)S	Good Bioclassification	2	007		
	1	Ecological/biolo	ogical Integrity FishCo	om	Good Bioclassification Aquatic Life		2	008	
•	10-9	-12	Crab Creek		From source to Little River		7.8	FW Miles	s C;Tr
	1	Ecological/biolo	ogical Integrity Bentho	DS .	Good-Fair Bioclassification	Aquatic Life	2	007	
	5	Ecological/biolo	ogical Integrity FishCo	om	Fair Bioclassification	Aquatic Life	2	008	2010
0	10-6	-(2)	Elk Creek (North Carolina Portion)		From U.S. Hwy. 221 to New F	River	7.4	FW Miles	s C:+
	1	Ecological/biolo	ogical Integrity Bentho)S	Good Bioclassification	Aquatic Life	2	008	
	1	Ecological/biolo	ogical Integrity FishCo	om	Good Bioclassification	Aquatic Life	2	008	
0	10-9	-9	Glade Creek		From source to Little River		8.3	FW Miles	s C;Tr
	1	Ecological/biolo	ogical Integrity Bentho	os	Excellent Bioclassification	Aquatic Life	2	008	
	1	Ecological/biolo	ogical Integrity FishCo	om	Good Bioclassification	Aquatic Life	2	008	
•	10-9	-10-2	Laurel Branch (Lau Creek)	urel	From source to Brush Creek		5.2	FW Miles	s C;Tr
	1	Ecological/biolo	ogical Integrity Bentho)S	Not Impaired Bioclassification	Aquatic Life	2	008	
•	10-9-	-(6)	Little River		From dam at Sparta Lake to I Crossroads)	NC 18 (Blevins	17.5	FW Mile	s C
	1	Ecological/biolo	ogical Integrity Bentho	os	Excellent Bioclassification	Aquatic Life	2	008	
	1	Fecal Coliform	(recreation)		No Criteria Exceeded	Recreation	2	008	
	1	Water Quality	Standards Aquatic Life	e	No Criteria Exceeded	Aquatic Life	2	008	
0	10-9-(11.5) Little Ri Carolina		Little River (North Carolina Portion)	ı	From NC 18 (Blevins Crossroa River (state line)	ads) to New	3.6	FW Miles	s C;HQW
	1	Ecological/biolo	ogical Integrity Bentho	os	Excellent Bioclassification	Aquatic Life	2	003	
•	10-9	-(1)a	Little River (Sparta Lake)	а	From source to Sparta Lake a Creek	t Pine Swamp	11.6	FW Miles	s C;Tr
	1	Ecological/biolo	ogical Integrity Bentho	os	Excellent Bioclassification	Aquatic Life	2	008	
	1 Ecological/biological Integ		ogical Integrity FishCo	om	Good Bioclassification	Aquatic Life	2	008	

NC 2010 Integrated Report

	All 13	3,123 Waters in	NC are in Category 5-303	(d) List for Mercury due to statewide f	ish consumption advice	for several fish spe	ecies
AU_	_Numb	er AU	Name	AU_Description	LengthArea	AU_Units Class	sification
Ca	tegory	Parameter		Reason for Rating	Use Category	Collection Year	303(d)year
Ne	ew Riv	er Basin		Lit	tle River-New River W	atershed 0505	6000104
•	10-9	-11	Moccasin Creek	From source to Little River		4.4 FW Miles	С
	1	Ecological/bio	logical Integrity Benthos	Good Bioclassification	Aquatic Life	2006	
0	10-9	-5	Pine Swamp Creek	From source to Little River		5.2 FW Miles	C;Tr
	1	Ecological/bio	logical Integrity Benthos	Good Bioclassification	Aquatic Life	2008	
	1	Ecological/bio	logical Integrity FishCo	m Good Bioclassification	Aquatic Life	2008	
0	10-9	-12ut8ut4	UT CRAB CR	Source to CRAB CR		0.7 FW Miles	
	1	Ecological/bio	logical Integrity Benthos	Not Impaired Bioclassification	Aquatic Life	2008	
0	10-9	-12ut8	UT UT CRAB CR	Source to UT CRAB CR		4.5 FW Miles	
	1	Ecological/bio	logical Integrity Benthos	Not Impaired Bioclassification	Aquatic Life	2007	
0	10-9	-4	Waterfalls Creek	From source to Little River		4.3 FW Miles	C;Tr
	1	Ecological/bio	logical Integrity Benthos	Excellent Bioclassification	Aquatic Life	2006	
0	10-9	-9-1	Wolf Branch	From source to Glade Creek		2.8 FW Miles	C;Tr
	1	Ecological/bio	logical Integrity Bentho	Not Impaired Bioclassification	Aquatic Life	2006	

APPENDIX 3-B

BIOLOGICAL (BENTHIC & FISH) SAMPLE SITE DATA SHEETS

Station ID**	Waterbody	Assessment Unit #	DESCRIPTION	COUNTY	SITE LOCATION	SAMPLE RESULTS
KB35	Elk Cr.	10-6-(2)	From U.S. Hwy. 221 to New River	Alleghany	SR 1344	08 - Good 03 - Good
KB37	Little R.	10-9-(1)a	From source to Sparta Lake at Pine Swamp Creek	Alleghany	SR 1128	08 - Excellent 03 - Good
KB38	Little R.	10-9-(6)	From dam at Sparta Lake to NC 18 (Blevins Crossroads)	Alleghany	SR 1424	08 - Excellent 03 - Excellent
KB100	Little R.	10-9-(6)	From dam at Sparta Lake to NC 18 (Blevins Crossroads)	Alleghany	NC 18	08 - Excellent 03 - Excellent
KB41	Brush Cr.	10-9-10	From source to Little River	Alleghany	SR 1422	07 - Good 03 - Excellent
KB47*	Brush Cr.	10-9-10	From source to Little River	Alleghany	SR 1444	06 - Excellent
KB42	Laurel Br.	10-9-10-2	From source to Brush Creek	Alleghany	SR 1105	08 - Not Impaired 03 - Good
KB73*	Moccasin Cr.	10-9-11	From source to Little River	Alleghany	NC 18	06 - Good
KB49	Crab Cr.	10-9-12	From source to Little River	Alleghany	SR 1450	07 - Good-Fair 03 - Good
KB132*	Ut. Ut. Crab Cr.	10-9-12ut8	Source to Ut. Crab Creek	Alleghany	NC 18	07 - Not Impaired
KB133*	Ut. Ut. Crab Cr.	10-9-12ut8	Source to Ut. Crab Creek	Alleghany	Ab. Ut. Crab Cr.	07 - Not Impaired
KB128*	Ut. Crab Cr.	10-9-12ut8ut4	Source to Crab Cr.	Alleghany	400 meters S. of state line	07 - Not Impaired
KB97*	Waterfalls Cr.	10-9-4	From source to Little River	Alleghany	SR 1132	06 - Excellent
KB36	Pine Swamp Cr.	10-9-5	From source to Little River	Alleghany	SR 1128	08 - Good 03 - Good-Fair
KB82*	Pine Swamp Cr.	10-9-5	From source to Little River	Alleghany	SR 1126	06 - Excellent
KB101	Bledsoe Cr.	10-9-7	From source to Little River	Alleghany	SR 1172	08 - Excellent 03 - Good
KB40*	Bledsoe Cr.	10-9-7	From source to Little River	Alleghany	SR 1171	06 - Good-Fair
KB46*	Bledsoe Cr.	10-9-7	From source to Little River	Alleghany	US 21	06 - Not Impaired
KB104	Glade Cr.	10-9-9	From source to Little River	Alleghany	SR 1422	08 - Excellent 03 - Good
KB98*	Wolf Br.	10-9-9-1	From source to Glade Cr.	Alleghany	SR 1117	06 - Not Impaired
Fish Com	munity Sample Site	S				-
KF17*	Brush Cr.	10-9-10	From source to Little River	Alleghany	SR 1433	08 - Good
KF18*	Crab Cr.	10-9-12	From source to Little River	Alleghany	NC 18	08 - Fair
KF3	Elk Cr.	10-6-(2)	From U.S. Hwy. 221 to New River	Alleghany	SR 1341	08 - Good 98 - Good
KF4	Glade Cr.	10-9-9	From source to Little River	Alleghany	SR 1422	08 - Good 98 - Good
KF7	Little R.	10-9-(1)a	From source to Sparta Lake at Pine Swamp Creek	Alleghany	SR 1128	08 - Good 98 - Good-Fair
KF19*	Pine Swamp Cr.	10-9-5	From source to Little River	Alleghany	SR 1128	08 - Good

* New station location; therefore, no data from the previous cycle.

Waterbo	dy	Locatio	on	Statio	on ID		Date	Bioclassification
NEW	R	SR 13	45	KB	34	30	8/19/08	Excellent
County	Subbasin	8 digit HUC	Latitudo	Longitur		Numbor	Lov	
	3 Subbasiii	05050001	36 552222	_81 1833	22	10b	Ne	w River Plateau
ALLEGHANT	5	03030001	30.332222	-01.1000	55	100	INC.	W NIVEL Flateau
Stream Classifica	ation E	Drainage Area (mi2)	Elev	vation (ft)	Stre	am Width	(m)	Stream Depth (m)
C; ORW		823		2335		125		0.4
	Foi	rested/Wetland	Urban	I	Agricu	lture	O	ther (describe)
Visible Landuse	(%)	40	10		50			0
Upstream NPDES Dischargers		ers (>1MGD or <1M	GD and withir	n 1 mile)	N	PDES Nur	nber	Volume (MGD)
Town of Boone, Jimm	y Smith WWTP					NC00206	21	4.82
United Chemi-Con, Inc	с.					NC00000	19	1.018
Water Quality Param Temperature (°C) Dissolved Oxygen (mg Specific Conductance pH (s.u.) Water Clarity	eters g/L) (μS/cm)	26.1 75 8.0 clear				Site Pho	tograph	
Habitat Assessment	Scores (max)		Street and					
Channel Modification	(5)	4			- Andrew			
Instream Habitat (20)		18		Construction of the	and the			
Bottom Substrate (15))	13		- the	Trans		The second second second	and the second
Pool Variety (10)		6					- Carlos and Carlos	
Riffle Habitat (16)		3	and the second	and the second	1000			and the second
Left Bank Stability (7)		7	and	and the second		and the second s	the second	
Right Bank Stability (7	')	7	and the second second					
Light Penetration (10)		0	2	the state				and the state of t
Left Riparian Score (5)	3		e de la compañía de la	and the g		and the second	
Right Riparian Score ((5)	0		·				
Total Habitat Score (100)	61	Substra	ate miz	x of gravel	, sand; son	ne boulder, cobbl	e, bedrock

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/19/08	10535	105	50	4.58	3.42	Excellent
08/21/03	9236	86	51	3.61	3.13	Excellent
08/19/98	7721	73	37	4.40	3.53	Good
07/26/93	6278	102	47	4.70	3.61	Excellent
07/11/90	5376	99	49	4.88	3.52	Good

Taxonomic Analysis

Despite having 11 prior sampling events, there were still several EPT taxa reported for the first time at the site in 2008, including: Acroneuria evoluta, Apatania, Protoptila, Mystacides, Oecetis avara, and Triaenodes perna/helo. Also collected for the first time at the site was the midge Cricotopus nostocicola; there are only nine other records for the species in the BAU database.

Data Analysis

The site is 4.6 northwest of Sparta. The site receives water from the North Fork and South Fork New River catchments along with smaller catchments in Virginia.

The site has undergone yearly summer benthic sampling from 1983 through 1990, then once each five years beginning in 1993. The site has received ratings of either Good or Excellent following each sampling event. EPT Richness range from 37 to 51; NCBI values from 3.61 to 5.53. EPT richness in 2008 is near the highest value for the site; NCBI value is near the middle of the range. Overall the benthic community at the site has generally been stable since 1983.

FISH COMMUNITY SAMPLE





Substrate



Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/19/08	10536		30		3.14	Good
08/18/03	9219		34		3.52	Good
08/20/98	7723		34		3.36	Good
07/26/93	6286		36		3.48	Excellent

Taxonomic Analysis

Total Habitat Score (100)

The site has been sampled on four occassions. The 30 EPT taxa collected in 2008 is the lowest number for the site.

84

Several taxa were recorded for the first time in 2008, including: *Caenis* (rare in the sample); *Stenacron interpunctatum* (common); and *Apatania* (rare). Neither *Glossosoma* nor *Ceratopsyche morosa* were collected in 2008; both taxa were reported from the first three sampling events at the site.

Data Analysis

The site is 0.4 stream-miles above the confluence with New River and within 0.2 miles of the Virginia border.

The drop in the number of EPT taxa collected between 2003 and 2008 may be indicative of impacts to the benthic community, though that is offset by the decrease in the EPT BI value. As in 2003, periphyton was noted on the boulders and cobbles, which indicates some nutrient enrichment at the site.



Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/19/08	10534	102	42	3.74	3.27	Excellent
04/05/06	9828	103	42*	4.05*	2.32	Excellent
08/18/03	9218	75	36	4.03	3.53	Good
08/20/98	7724	72	37	3.94	3.18	Good
07/26/93	6303	84	45	3.32	2.53	Excellent

* values corrected for seasonality

Taxonomic Analysis

The number of EPT taxa collected in 2008 is significantly higher than in 1998 and 2003, though still lower than in 1993. There are a few notable differences in the EPT taxa present between 1993 and the following years. Two ephemerellids, *Drunella conestee* and *Serratella serratoides*, were both abundant in the 1993 sample but have not been recorded from any sampling event since. Also, *Drunella cornutella* was abundant in 1993, rare in 1998, and absent in each following sampling event. *Serratella deficiens* was also abundant in 1993 and absent from each summer sampling event since, though it was common in the spring sample collected in 2006.

Data Analysis

The site is 2.7 miles SSW of Sparta, and is the site most upstream of the three basinwide sites on Little River.

The increase in EPT Richness and lower NCBI values in 2008 compared to the prior summer sampling events in 1998 and 2003 suggests better recent water quality. Those changes have improved the classification of the site from Good 1998 and 2003 to Excellent in 2008. However, both EPT Richness and NCBI values have not returned to the standards set in 1993.

FISH COMMUNITY SAMPLE

Waterboo	dy			Location		Date	9	Station ID			ioclassi	fication
LITTLE	R		0,	SR 1128		05/06	/08	KF7		Good		bd
County	Subba	asin	8 digit HUC	Latitude	Long	itude		AU Numbe	er	L	evel IV E	coregion
ALLEGHANY	3		05050001	36.46777778	-81.132	277778		10-9-(1)a		1	New Rive	r Plateau
Stream Classifica	tion	Drair	nage Area (mi2) Elevatio	n (ft)	Strea	m Wic	ith (m)	Av	erage Depth	(m)	Reference Site
C;Tr			14.1	2870	C		10			0.3		Yes
	-	For	ested/Wetland	Urt	ban		Agi	riculture		С	Other (de	scribe)
Visible Landuse	(%)		90	()			0			10	
Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)					nile)			NPDES	Numb	er	Vo	olume (MGD)
			None									

Water Quality Parameters

Total Habitat Score (100)

Temperature (°C) Dissolved Oxygen (mg/L) Specific Conductance (µS/cn pH (s.u.)	n)	9.9 10.3 35 5.5	
Water Clarity	Clea	ar	
Habitat Assessment Scores	s (max)		A STATE
Channel Modification (5)		5	-
Instream Habitat (20)		19	
Bottom Substrate (15)		10	
Pool Variety (10)		6	-
Riffle Habitat (16)		16	
Left Bank Stability (7)		7	
Right Bank Stability (7)		6	
Light Penetration (10)		8	-30
Left Riparian Score (5)		5	
Right Riparian Score (5)		3	

85



Site Photograph

Substrate

Cobble and silt

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification			
05/06/08	2008-28	16	50	Good			
07/01/98	98-61	15	44	Good-Fair			
Most Abundant Species	Redlip Shiner and Rosyside Dad	ce Exotic Spec	ties Highback Chub, Re Redbreast Sunfish,	dlip Shiner, Brown Trout, and Tessellated Darter			
Species Change Since Last Cycle Data Analysis	Cycle Gains Highback Chub, Mountain Redbelly Dace, and Longnose Dace. Losses Tonguetied Mi Rainbow Trout.						

Watershed -- drains southern Alleghany County; no municipalities within the watershed. Habitat -- snags and undercuts; silts along the margins and atop the rocks; cobble riffles and runs; wide riparian zone on the left, but narrow along the right bank; site is a popular fishing spot. 2008 -- diversity of Rock Bass+Smallmouth Bass+Trout and Intolerant species were slightly lower than expected; percentage of tolerant fish (White Sucker, Creek Chub, and Redbreast Sunfish) was slightly greater than expected for a mountain stream; lowest pH of any fish community site in the basin in 2008. 1998 & 2008 -- 18 species known from the site, including 3 endemic species (Tonguetied Minnow, Kanawha Darter, and Appalachia Darter) and 6 nonindigenous species; ~ 6 times more fish collected in 2008 than in 1998 (1,444 vs. 224); Mountain Redbelly Dace constituted 9% of the fauna in 2008, but absent in 1998; and species present in 1998, but absent in 2008 were represented by 1 or 3 fish each.



Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/18/08	10530	111	47	3.90	3.00	Excellent
08/21/03	9232	104	49	4.11	3.23	Excellent
08/20/98	7726	80	41	3.94	2.95	Excellent
07/26/93	6277	98	48	3.98	2.92	Excellent

Taxonomic Analysis

Several taxa were recorded for the first time from the site in 2008, including: Rhithrogena, Anthopotamus distinctus, Paragnetina ichusa/media, Apatania, Ceratopsyche walkeri, and Hydropsyche scalaris.

Data Analysis

The site is 2.2 miles ENE of Sparta, which is entirely included in the catchment above the site.

NCBI values have been very similar between the four most recent sampling events at the site, as have EPT Richness values with the exception of 1998. The site has rated as Excellent following each sampling event since 1993 at the site, though a spring sampling event in 1989 resulted in classification of Fair. Improvements to the Sparta WWTP (permit NC0026913; discharge 0.6 million gallons per day) occurred in 1990 and apparently improved water quality at the site.

Waterbo	Locatio	Location			Station ID			Date Bioclassification			
LITTLE	R	NC 1	8		KB1	00	08	3/18/08	8/08 Excellen		
County	Subbasin	8 digit HUC	Lat	itude	Longitude	e AU	Number		Leve	el IV Ecoregion	
ALLEGHANY	3	05050001	36.5	43056	-81.02138	9 10)-9-(6)		Nev	w River Plateau	
Stream Classifica	ation	Drainage Area (mi2)	Elev	vation (ft)	Stre	am Width	(m)		Stream Depth (m)	
С		99			2410		30			0.4	
	F	orested/Wetland		Urban	l	Agricul	ture		Ot	her (describe)	
Visible Landuse	(%)	50		0		50				0	
Upstream NPI	DES Dischar	gers (>1MGD or <1M	GD ar	nd withir	n 1 mile)	NI	PDES Nur	nber		Volume (MGD)	
none											
Water Quality Param	eters						Site Pho	otograph			
Temperature (°C)		23.4		100	and the second					1. 1. A. A. A. A.	
Dissolved Oxygen (mg	g/L)	8.9							XX	and the first	A
Specific Conductance	(µS/cm)	46			10 A						10.1
pH (s.u.)		7.2						Company of		Constant Constant	
Water Clarity		clear		1.4			1.				
Habitat Assessment	Scores (max	()					-				-
Channel Modification	(5)	5		-	- Change	the last				And have a second	
Instream Habitat (20)		12					aller !!			and the	
Bottom Substrate (15))	13		and the second s	The second second	-		and and	-		
Pool Variety (10)		6		the second	and the state of t			Service and the service of the servi		and the manufacture of	

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/18/08	10531	129	59	3.96	2.80	Excellent
08/20/03	9233	89	47	3.96	3.40	Excellent
08/20/98	7727	84	46	3.53	2.72	Excellent
07/27/93	6288	89	49	3.73	2.84	Excellent
07/11/90	5377	93	44	4.36	3.15	Excellent

mostly bedrock and boulder; some sand, cobble, gravel, silt

Substrate

12

7

7 0

5

0

67

Taxonomic Analysis

Riffle Habitat (16)

Left Bank Stability (7) Right Bank Stability (7)

Light Penetration (10)

Left Riparian Score (5) Right Riparian Score (5)

Total Habitat Score (100)

The 59 EPT taxa from 2008 was the most ever recorded for the site, which has been sampled a total of nine times; the previous high for a summer sample was 49, last attained in 1993. The site has received a classification of Excellent following each sampling event except for August 1986, when it received a rating of Good. Several EPT taxa are reported for the first time in 2008: *Heterocloeon anoka, Heterocloeon curiosum, Maccaffertium exiguum, Anthopotamus distinctus, Micrasema bennetti, Hydropsyche venularis, Hydroptila,* an unamed species of *Nectopsyche*, and *Neophylax fuscus*.

Data Analysis

The site is 2.6 stream-miles upstream of the Virginia border and six miles ENE of the town of Sparta, which is entirely included in the catchment above the site. This is the furthest downstream of the three basinwide sites on Little River. Cattle were present in a pasture on the west side and had unhindered access to the river at the reach sampled.

EPT Richness for the seven summer sampling events at the site prior to 2008 has been rather stable, with a range of 44 to 49 taxa collected, making the 59 EPT taxa recorded for 2008 anomalous. NCBI values have ranged from 3.53 (in 1998) to 4.50 (in 1986 and 1988), putting the 2008 value of 3.96 near the middle of the range.

FISH COMMUNITY SAMPLE

Waterbo	dy			Location		Date Station ID Bioclassification				
PINE SWAI	мр с	R	SR 1128			05/06/08	KF19)	Good	
County	Subr	basin	8 digit HUC	Latitude	Long	itude	AU Number	·	.evel IV EC	oregion
ALLEGHANY	,	5	05050001	30.4759215	-81.11	00911	10-9-5		New River	Plateau
Stream Classifica	tion	Drai	nage Area (mi2	Elevatio	on (ft)	Stream W	idth (m)	Average Depth	ı (m)	Reference Site
C;Tr			5.3	2760	0	7		0.4		No
		For	ested/Wetland	Rural Re	sidential	A	griculture	(Other (des	cribe)
Visible Landuse	(%)		50	3	0		20		0	
Upstream NPDES Di	scharg	ers (>1	MGD or <1MG) and within 1 n	nile)		NPDES	Number	Vol	ume (MGD)
	Senarg	010 (* 1	None		inic)			-	101	
Water Quality Param	eters						Sit	e Photograph		
Temperature (°C)			12.4			H-V-	Contraction of the	and the second by		SALA DEPA
Dissolved Oxygen (m	g/L)		10.0				- Andr		100	
Specific Conductance	e (µS/cn	n)	29	100			a state of the		1.34	
pH (s.u.)			6.1				free and fill			
Water Clarity			Clear	-				- 4A		
Habitat Assessment	Scores	s (max)								18- 250 V
Channel Modification	(5)		5		A. West			- Aller and a second se	7. 19. 19. 19	A REAL
Instream Habitat (20)	(-)		20	Trans.			A DALET		-	and the second second
Bottom Substrate (15)		13	See the see			Contraction of the second	An and a second		
Pool Variety (10)			8	Service of the servic				1 Distantion		
Riffle Habitat (16)			16					the plant of	-	
Left Bank Stability (7)			6	Sec. All	Sec. 1	and the second	al and		-	and the second
Right Bank Stability (7	7)		6		1					
Light Penetration (10)			8	- 100	215	and the second	THE FER	The second	- Carlo	
Left Riparian Score (5	5)		4	- 57	100	and the second second	Contraction of	1000	in the	1000
Right Riparian Score	(5)		5							
Total Habitat Score ((100)		91	Subs	strate	Cobble, bould	er, and angula	r bedrock		
Sample Date)		Sample	ID	Spe	cies Total		NCIBI	Bioc	lassification
05/06/08			2008-2	29		16		52		Good
Most Abundant Spe	ecies		Mountain Redb Dace	elly Dace and Ro	osyside	Exotic Spe	cies R D	lighback Chub, Red Rock Bass, Redbrea Parter	dlip Shiner, ast Sunfish	Brown Trout, , and Tessellated
Species Change Sin	ce Last	Cycle	N/A							
Data Analysis		-								
This is the first fish on	mmunit	veamr	lo colloctod at t	nic cito Matore	had dra	inc couthorn Al	loghany Coun	ty: no municipalitio	a within the	waterehod:

This is the first fish community sample collected at this site. **Watershed** -- drains southern Alleghany County; no municipalities within the watershed; tributary to the Little River, site is ~ 60 ft. upstream from the creek's confluence with the river. **Habitat** -- runs, riffles, plunge pools, undercuts, and overhangs; riparian zone of multifloral rose then pasture along the left banks. **2008** -- percentage of tolerant fish (Creek Chub, White Sucker and Redbreast Sunfish) was slightly greater than expected for a mountain stream; one endemic species (Kanawha Darter) was present; and the lowest conductivity of any fish site, along with Brush Creek, in the basin in 2008.



Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/19/08	10533		34		2.72	Good
04/04/06	9827		41*		2.69	Excellent
08/18/03	9217		26		3.63	Good-Fair
08/20/98	7725		34		3.52	Good
07/27/93	6290		33		3.45	Good

mix of cobble, boulder, bedrock; some gravel, sand

Substrate

* value corrected for seasonality

Taxonomic Analysis

Bottom Substrate (15)

Left Bank Stability (7)

Right Bank Stability (7)

Light Penetration (10)

Left Riparian Score (5) Right Riparian Score (5)

Total Habitat Score (100)

Pool Variety (10) Riffle Habitat (16)

A few taxa were collected for the first time in 2008: *Baetisca*, which was rare in the sample; *Chimarra* and *Dolophilodes*, two philopotamid genera, which were common and abundant respectively.

Data Analysis

The site is about two miles south of Sparta and just upstream of the confluence with Little River.

12

6

16 6

6

9

3

2

83

The number of EPT taxa collected in 2008 returned to the previous high of 34 (in 1998) for a summer sampling event at the site. The EPT BI in 2008 was significantly lower than for any prior summer sampling event. There is currently very little evidence for water-quality impacts to the stream at the site.



Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/18/08	10532		42		3.75	Excellent
04/05/06	9831		25*		3.32	Good-Fair
08/20/03	9231		30		3.39	Good
08/19/98	7722		21		4.67	Good-Fair
07/26/93	6287		33		3.31	Good

* value corrected for seasonality

Taxonomic Analysis

The 42 EPT taxa collected in 2008 greatly surpasses the previous high of 33 collected in 1993. Several taxa were reported for the first time from the site in 2008 (all rare in the sample), including: *Plauditus cestus, Baetisca berneri, Leucrocuta, Tricorythodes, Ceratopsyche morosa,* and *Rhyacophila carolina*. There were also a few taxa present in 2008 that had not been recorded from the site since the sampling event in 1993: *Sevratella serratoides*, which was abundant in 1993 and common in 2008; *Heptagenia marginalis*, abundant in 1993 and rare in 2008; *Tallaperla,* rare in 1993 and common in 2008.

Data Analysis

The site is in the town of Sparta and 0.8 stream-miles above the confluence with Little River.

Despite the location within the town of Sparta, the suboptimum habitat, and a silty cover of *aufwuchs* over the cobbles and boulders, the site attained a classification of Excellent in 2008. Less surprising is the relatively high EPT BI score for a mountain sample not associated with a discharger.
FISH COMMUNITY SAMPLE

Waterbody				Location			ate Station ID		Bioclassification			
GLADE CR			:	SR 1422 0			6/08 KF4		Good			
County	Subba	sin	8 digit HUC	Latitude	Longitude		AU Number		Level IV Ecoregion			
ALLEGHANY	3		05050001	36.49972222	-81.036	638889	10-9-9		١	New Rive	r Plateau	
Stream Classification Draina		nage Area (mi2	?) Elevation (ft)		Stream Width (m)		Ave	Average Depth (m) Refere		Reference Site		
C;Tr			13.6	2520	2520		7			0.5		Yes
For		ested/Wetland	Urt	Urban		Agriculture			Other (describe)			
Visible Landuse	(%)		50	()			50			0	
Upstream NPDES Di	Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile) NPDES Number Volume (MGD)									olume (MGD)		
	None											

Water Quality Parameters

Temperature (°C)	16.2						
Dissolved Oxygen (mg/L)	9.2						
Specific Conductance (µS/cm)	32						
pH (s.u.)	5.9						
Water Clarity Slightly	turbid						
Habitat Assessment Scores (max)							
Channel Modification (5)	5						
Instream Habitat (20)	15						
Bottom Substrate (15)	5						
Pool Variety (10)	6						
Riffle Habitat (16)	15						
Left Bank Stability (7)	4						
Right Bank Stability (7)	4						



Site Photograph

Substrate

5 5

4

68

Sand, silt, and bedrock

Sample Date	Sample ID	Spe	cies Total		NCIBI	Bioclassification
05/06/08	2008-30	20		52		Good
07/01/98	98-62		19		50	Good
Most Abundant Species	Redlip Shiner and Mountain Red Dace	dbelly	Exotic Spec	ies	Highback Chub, Redlip Shiner, Tennessee Shiner, Brown Trout, Black Crappie, and Tessellated Darter	
Species Change Since Last Cycle	Gains Tonguetied Min Chub and Kanawha Ros	now, High yface Shin	back Chub, Blac er.	ck Crappie,	and Appalachia Darte	er. Losses Bigmouth

Data Analysis

Light Penetration (10)

Left Riparian Score (5) Right Riparian Score (5)

Total Habitat Score (100)

Watershed -- drains east central Alleghany County; no municipalities within the watershed; tributary to the Little River, site is ~ 0.3 miles above the creek's confluence with the river. Habitat -- runs, bedrock riffles, fairly open canopy; sands and silts in the pools; bottom substrate showed evidence of excessive sedimentation from upstream landuse practices. 2008 -- Redlip Shiner and Mountain Redbelly Dace, both common along the silty banks, accounted for almost 60% of the fish collected; percentage of Omnivores+Herbivores was slightly elevated and indicative of nonpoint source nutrient inputs; Rock Bass and Smallmouth Bass were absent. 1998 & 2008 -- ~6 times more fish collected in 2008 than in 1998 (1,862 vs. 297), Redlip Shiner increased almost 16 fold and Mountain Redbelly Dace increased 20 fold; 23 species known from the site, including 14 species of cyprinids, 6 endemic species (Tonguetied Minnow, Bigmouth Chub, Kanawha Rosyface Shiner, Kanawha Minnow, Kanawha Darter, and Appalachia Darter), and 7 nonindigenous species; and species present in 1998, but absent in 2008 were represented by 2 or 4 fish each.

FISH COMMUNITY SAMPLE

Waterbo	dy			Location		Date	Station ID	Bioc	lassification	
BRUSH	CR		S	R 1433		05/05/08	KF17		Good	
County	Subb	acin		Latituda	Long	itudo	All Number	Lova	LIV Ecorogian	
	Juuro		05050001	36 / 85 88 1 1	81.00	10272		Leve		
ALLEGHANT		,	03030001	30.4030011	-01.00	49212	10-9-10	1164	Triver Flateau	
Stream Classifica	tion	Drai	nage Area (mi2)	Elevatio	on (ft)	Stream Wi	idth (m)	Average Depth (m) Reference Site	
C;Tr			18.1	257	0	10		0.4	No	
		For	ested/Wetland	Ur	ban	Ag	griculture	Othe	er (describe)	
Visible Landuse	(%)		30		0		70	0		
Upstream NPDES Di	ischarg	ers (>1	MGD or <1MGD	and within 1	mile)		NPDES Nur	nber	Volume (MGD)	
[.			None		,					
							Cite D	h a ta aven h		
Water Quality Param	neters			43864 3	E 18 5		Site P	notograph		
Temperature (°C)			17.7		1.18	Mr.	La Alleria	11 19.6	- FREM	
Dissolved Oxygen (m	g/L)		9.0	30 2				AW	77465	
Specific Conductance	e (µS/cm	ו)	29		目的。	A A	and stiller			
pH (s.u.)			6.2		1 LU	Jan Stranger	and the second s	1 + + 13		
	1				AT THE	All Parts	1	F. C. S.	W ARTENALS A	
Water Clarity			Clear		1 F		Contraction of the second s	and stand the sub-	And the second sec	
Habitat Assessment	Scores	(max)				and the second second	and the second	With the local division of the	Martin and a state	
Channel Modification	(5)		5			and the second second	Coloradore of the		Kal of	
Instream Habitat (20)	()		19					-	the second second	
Bottom Substrate (15)		13	3		1		A STATE	The state of the s	
Pool Variety (10)	-		6							
Riffle Habitat (16)			16		111 A	and in some				
Left Bank Stability (7)			5						The second	
Right Bank Stability (7)		5							
Light Penetration (10)			2						210	
Left Riparian Score (5	5)		2						Sector States	
Right Riparian Score	(5)		2							
Total Habitat Score	(100)		75	Sub	strate	Cobble, gravel	, and soft silts alo	ng the banks		
Sample Date	•		Sample	<u> </u>	Sne	cies Total	NC	BI	Bioclassification	
05/05/08	,		2008-2	7		19	52		Good	
00,00,00			2000 2						0004	
Most Abundant Sp	ecies		Mountain Redbe	elly Dace		Exotic Spec	cies High Brow	back Chub, Redlip n Trout, and Tesse	Shiner, Rainbow Trout, llated Darter	
Species Change Sin	ce Last	Cycle	N/A							
Data Analysis	55 2451	5,010								
This is the first fish co	ommunit	v samr	ble collected at th	nis site. Waters	shed dra	ins the southea	stern corner of Al	leghany County: no	municipalities within its	

watershed; tributary to the Little River. **Habitat** -- runs, riffles, and swiftly flowing chutes; side snag pools; minimal canopy and riparian zones along both banks. **2008** -- Mountain Redbelly Dace and Bluehead Chub accounted for 39% of all the fish collected; moderate percentage of Omnivores+Herbivores, indicative of nonpoint source nutrients and an open canopy; percentage of tolerant fish (White Sucker and Creek Chub) was slightly greater than expected for a mountain stream; three endemic species (Kanawha Minnow, Kanawha Darter, and Appalachia Darter) were present; and the lowest conductivity of any fish site, along with Pine Swamp Creek, in the basin in 2008.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody		Locati	on	Station	ID	Date	Bioclassification
BRUSH C	R	SR 14	22	KB4	1 10	0/02/07	Good
County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Le	evel IV Ecoregion
ALLEGHANY	3	05050001	36.516111	-81.012500	10-9-10	N	lew River Plateau
Stream Classificatio	n I	Drainage Area (mi2) Elev	ation (ft)	Stream Width	(m)	Stream Depth (m)
C;Tr		32		2500	8		0.1
	Fo	rested/Wetland	Urban		Agriculture		Other (describe)
Visible Landuse (%)	30	10		60		0
Upstream NPDES	S Discharge	ers (>1MGD or <1M	GD and withir	n 1 mile)	NPDES Nur	nber	Volume (MGD)
none							
Water Quality Parameter Temperature (°C) Dissolved Oxygen (mg/L) Specific Conductance (µS pH (s.u.) Water Clarity Habitat Assessment Sc Channel Modification (5) Instream Habitat (20)	ores (max)	11.9 9.4 38 6.2 clear			Site Pho	otograph	
Bottom Substrate (15) Pool Variety (10) Riffle Habitat (16) Left Bank Stability (7) Right Bank Stability (7) Light Penetration (10) Left Riparian Score (5) Right Riparian Score (5) Total Habitat Score (100 Sample Date))	8 6 14 3 3 7 1 2 69 Sample ID	Substra	ate mix o	f cobble, sand; sor	me boulder, gra	vel, silt, bedrock Bioclassification

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
10/02/07	10345	88	36*	4.87*	3.46	Good
08/20/03	9230	83	42	3.94	3.34	Excellent
08/20/98	7728	62	36	4.04	3.56	Good
07/27/93	6289	96	40	4.73	3.38	Good

* values corrected for seasonality

Taxonomic Analysis

Sampling for this site was last done in October of 2007; all other sampling events occurred in July or August. There were four EPT taxa present (rare in the sample) in October that were not present in the summer samples; of those only one taxon (*Isoperla lata*) shows a seasonal distribution in North Carolina mountain stream sites (it has not been recorded from summer mountain samples). EPT Richness was decremented by one to compensate for the seasonality of the species.

There are five EPT taxa that have been identified from each of the three summer samples and not present in the October sample. Of those, four taxa show a moderate to strong seasonal distribution for mountain stream sites with peak occurrence in the summer and much reduced occurrence in the fall: Serratella serratiodes (common in 2003); Epeorus vitreus (abundant in 2003); Micrasema wataga (common in 2003); and Neophylax oligius (abundant in 2003). The four taxa have low tolerance values, ranging from 1.2 to 2.6.

Data Analysis

The site is about six miles east of Sparta, 2.9 miles NW of the closest point on the Blue Ridge Parkway, and 5.2 stream-miles above the confluence with Little River.

Seasonal effects are evident when comparing taxa from the October sample from 2007 with samples from summer in prior years. Reduced EPT richness and a higher NCBI value in 2007 compared to 2003 may be due to seasonal effects and not a decline in water quality between the two years.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbo	ody		Locat	ion		Sta	tion II)	Date	Bioclassification
LAUREL BR			SR 1105			K	B42	30	3/18/08	Not Impaired
County	Subba	sin 8	8 digit HUC	Lat	itude	Longitu	ude	AU Number	Le	evel IV Ecoregion
ALLEGHANY	3		05050001	36.4	20833	-81.008	333	10-9-10-2	Ν	lew River Plateau
Stream Classific	ation	Drair	nage Area (mi	2)	Elev	vation (ft)		Stream Width	(m)	Stream Depth (m)
C;Tr			2.7			2705		4		0.2
		Foreste	ed/Wetland		Urban	I	A	Agriculture	(Other (describe)
Visible Landuse	e (%)		40		0			40		20 (road)
Upstream NP	DES Discl	hargers (>1MGD or <1M	/IGD ar	nd withii	n 1 mile)		NPDES Nur	nber	Volume (MGD)
one										
later Quality Paran	neters			_				Site Pho	otograph	
emperature (°C)			16.0				and	Start 1		
issolved Oxygen (m	g/L)		8.6			S. A.	1			
pecific Conductance	e (µS/cm)		42		1 . S. L.	281.578			State /	

Specific Conductance (µS/cm)	42	
рн (s.u.)	0.0	
Water Clarity	clear	
Habitat Assessment Scores (max	:)	
Channel Modification (5)	4	
Instream Habitat (20)	19	A / A STATE AND A STATE AND A STATE / A
Bottom Substrate (15)	12	and the second
Pool Variety (10)	8	
Riffle Habitat (16)	16	
Left Bank Stability (7)	6	
Right Bank Stability (7)	6	
Light Penetration (10)	9	
Left Riparian Score (5)	3	
Right Riparian Score (5)	4	
Total Habitat Score (100)	87	Substrate mix of cobble, boulder, gravel, sand; some silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/18/08	10529		26		3.51	Not Impaired
04/04/06	9824	100	36*	4.58*	2.73	Good
08/18/03	9216	66	33	4.12	3.53	Good
08/21/98	7729	49	28	3.72	2.91	Good
09/03/92	6008		14		4.21	Fair

* values corrected for seasonality

Taxonomic Analysis

No unambiguously new taxa were collected in 2008 at the site. The EPT collection method was used in 2008 rather than the Full-Scale method used for the three prior sampling events, complicating comparison of 2008 taxonomic results with those prior events.

Data Analysis

The site is about 8.6 miles southeast of Sparta in southeast Alleghany County, and 0.3 stream-miles from the confluence with Brush Creek.

Current BAU criteria do not allow for classification of stream sites with drainage areas under 3.0 square miles except in unusual circumstances (such as for Little Peak Creek at SR 1595/Ashe County).

Due to the small size of the stream it was decided for the latest sampling effort to use EPT rather than Full-Scale collection methods (as was used for the prior three sampling events at the site); part of the reason for the decrease in EPT Richness between 2008 and the prior summer sampling event in 2003 is certainly due to the differenct collection methods used. The EPT BI is better for comparison of conditions when those two sampling methods are used; there is no evidence of change in water quality between 2003 and 2008 using that metric.

FISH COMMUNITY SAMPLE

Waterbo	dy			Location		Date	Station	ID	Bioclassi	fication
CRAB	CR			NC 18		05/05/08	KF18	3	Fai	ir
County	Subh	asin	8 digit HUC	Latitudo	Longi	itude		r	l ovol IV F	coregion
	0000		05050001	36 5495584	-81 00	023167 10.0.12 New Piver Plates			r Plateau	
/ LELOII/ INT		,	0000001	00.0400004	01.00	20101	10 0 12		THEW FRIVE	
Stream Classifica	ition	Drai	nage Area (mi2)	Elevatio	on (ft)	Stream Wi	dth (m)	Average Dept	h (m)	Reference Site
C;Tr			11.2	245	0	8		0.4		No
		For	ested/Wetland	Rural Re	sidential	Ag	riculture		Other (de	scribe)
Visible Landuse	(%)		60	1	0		30		0	
Upstream NPDES Di	ischarg	ers (>1	MGD or <1MGD	and within 1 r	nile)		NPDES	Number	Vo	olume (MGD)
			None				-			
Water Quality Param	neters						Si	te Photograph		
Temperature (°C)			16.1			Color.	-	1	feasible.	
Dissolved Oxygen (m	g/L)		9.7			1 Ste	STREET	R-	a de	4.0
Specific Conductance	e (µS/cm	ו)	50			- Balance		Re moto	Y	New attended
pH (s.u.)			6.7	12	1 and	41 202		2 Carlos		1 and the second
					and with			Constant and a	A REAL	Sales in Series and
Water Clarity			Clear		Prove to	C Stine	A Ver	- Forth - V	Car S	
				Ale and		70	The second second		and the	Conversion 17
Habitat Assessment	Scores	(max)		and the second sec	10	Contraction of the local division of the loc			1.92	T ### T
Channel Modification	(5)		5			and the second		and the second second		
Instream Habitat (20)			19							2 Carlos and
Bottom Substrate (15)		12			18435		a farmer and	-	A Participan
Pool Variety (10)			10	1		4		and the state of the	10000	
Riffle Habitat (16)			16	-		and the second second	TANK		10 Citrant	and the second
Left Bank Stability (7)			4	14.15		the state	Carde	在市场和市场	Nº Z	
Right Bank Stability (7	7)		4			and the second second	7-536-4J	AN SHORE	ALSO	
Light Penetration (10))		2	1000		- 6 2.4	E west			Alexand
Left Riparian Score (5	5)		1		1000	A A		Ser Maria	MONSTL.	
Right Riparian Score	(5)		4							
Total Habitat Score	(100)		77	Sub	strate	Slick bedrock,	boulders, silt	s on the substrate		
Sample Date	9		Sample	ID	Spe	cies Total		NCIBI	Bio	classification
05/05/08			2008-2	6		14		38		Fair
Most Abundant Spo	ecies	_	Mountain Redbe Stoneroller	elly Dace and C	entral	Exotic Spec	cies	Redlip Shiner, Saff and Tessellated Da	ron Shiner, ırter	, Rainbow Trout,
Species Change Sin	ce Last	Cycle	N/A							
Data Analysis		-	L							
This is the first fish or	mmunit	veem	la collected at th	io oito Motoro	had drai	ing the parthage	torn corner	f Alloghany Count		ainalitiaa within tha

This is the first fish community sample collected at this site. **Watershed** -- drains the northeastern corner of Alleghany County; no municipalities within the watershed; site is ~ 1.5 miles upstream of the creek's confluence with the Little River. **Habitat** -- runs and riffles; side undercuts, bedrock pools; minimal riparian zone along the right shoreline and minimal canopy. **2008** -- more fish were collected at this site (n = 2,368) than at any other site in the basin in 2008; Central Stoneroller, Mountain Redbelly Dace, and Bluehead Chub constituted 65% of all the fish collected; high percentage of Omnivores+Herbivores, indicative of nonpoint source nutrients and an open canopy; diversity metrics lower than expected -- total, cyprinid, Rock Bass+Smallmouth Bass+Trout, and Intolerant diversities; and two endemic species (Kanawha Darter and Appalachia Darter) were present.

APPENDIX 3-C

Ambient Monitoring Systems Station Data Sheets

Station ID	WATERBODY	AU#	Location	Impaired (By Parameter)	Impacted (By Parameter)
K7900000	New R.	10	SR 1345 at Amelia	Copper (22.2%) Iron (44.4%) Zinc (22.2%)	Fecal Coliform (7.1%)
K9600000	Little R.	10-9-(6)	SR 1426 near Edwards Crossroads	Copper (11.1%) Iron (11.1%) Zinc (11.1%) Fecal Coliform (10.7%)	

Ambient Monitoring System Station Summaries

NCDENR, Division of Water Quality

Basinwide Assessment Report

Location: NEW RIV AT SR 1345 AT AMELIA

Station #:	K7900000		Hydrologic Unit Code:	05050001
Latitude:	36.55190	Longitude: -81.18172	Stream class:	C ORW
Agency:	NCAMBNT		NC stream index:	10

Time period: 02/01/2005 to 12/08/2009

	#	#		Resul	ts no	t meeting	EL		Pe	ercenti	les		
	results	ND	EL	#	%	%Conf	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	57	0	<4	0	0		5.2	7.8	8.4	9.5	11.4	13.7	15.4
	57	0	<5	0	0		5.2	7.8	8.4	9.5	11.4	13.7	15.4
pH (SU)	58	0	<6	0	0		6.7	7.1	7.4	7.7	8.1	8.4	9.1
	58	0	>9	1	1.7		6.7	7.1	7.4	7.7	8.1	8.4	9.1
Spec. conductance (umhos/cm at 25°C)	57	0	N/A				42	55	61	66	73	77	94
Water Temperature (°C)	58	0	>29	0	0		0.7	3.8	7.8	15.7	22.9	26.4	27.7
Other													
TSS (mg/L)	19	9	N/A				2.5	2.5	6.2	6.2	18	171	280
Turbidity (NTU)	58	1	>50	4	6.9		1	1.4	1.9	4.1	11.8	31.1	450
Nutrients (mg/L)													
NH3 as N	57	45	N/A				0.02	0.02	0.02	0.02	0.02	0.04	0.1
NO2 + NO3 as N	57	1	N/A				0.05	0.24	0.36	0.55	0.73	0.8	0.87
TKN as N	57	24	N/A				0.2	0.2	0.2	0.2	0.28	0.53	2.8
Total Phosphorus	57	8	N/A				0.02	0.02	0.02	0.03	0.04	0.1	0.96
Metals (ug/L)													
Aluminum, total (Al)	9	0	N/A				60	60	83	320	7975	16000	16000
Arsenic, total (As)	9	9	>10	0	0		5	5	5	5	5	5	5
Cadmium, total (Cd)	9	9	>2	0	0		1	1	2	2	2	2	2
Chromium, total (Cr)	9	8	>50	0	0		17	17	25	25	25	25	25
Copper, total (Cu)	9	6	>7	2	22.2		2	2	2	2	9	15	15
Iron, total (Fe)	9	0	>1000	4	44.4		220	220	240	520	10550	20000	20000
Lead, total (Pb)	9	8	>25	0	0		10	10	10	10	10	13	13
Mercury, total (Hg)	8	8	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	9	7	>88	0	0		10	10	10	10	10	13	13
Zinc, total (Zn)	9	5	>50	2	22.2		10	10	10	10	41	73	73

Fecal Coliform Screening(#/100mL)

24.9

```
# results: Geomean: # > 400: % > 400: % Conf:
```

4

7.1

New River Basin: Little River & Chestnut Creek Watersheds (HUC 0505000104 & 0505000106)

result: number of observations

Key:

56

ND: number of observations reported to be below detection level (non-detect)

EL: Evaluation Level; applicable numeric or narrative water quality standard or action level

Results not meeting EL: number and percentages of observations not meeting evaluation level

%Conf : States the percent statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)

2 Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries

NCDENR, Division of Water Quality

Basinwide Assessment Report

Location:	LITTLE RIV AT SR 1426 NR EDWARDS CROSSROADS							
Station #:	K9600000		Hydrologic Unit Code:	05050001				
Latitude:	36.52465	Longitude: -81.069	Stream class:	С				
Agency:	NCAMBNT		NC stream index:	10-9-(6)				

Time period: 02/01/2005 to 12/08/2009

	#	#		Results not meeting EL		Percentiles							
	results	ND	EL	#	%	%Conf	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	58	0	<4	0	0		5.9	7.9	8.5	9.9	11.7	13.3	15.1
	58	0	<5	0	0		5.9	7.9	8.5	9.9	11.7	13.3	15.1
pH (SU)	58	0	<6	0	0		6.4	7.2	7.4	7.8	8	8.4	9.4
	58	0	>9	1	1.7		6.4	7.2	7.4	7.8	8	8.4	9.4
Spec. conductance (umhos/cm at 25°C)	57	0	N/A				35	42	47	50	54	61	86
Water Temperature (°C)	58	0	>29	0	0		0.6	4.4	8.4	14.5	20.2	23.7	26.4
Other													
TSS (mg/L)	18	8	N/A				2.5	2.5	3.1	6.2	6.2	72.7	178
Turbidity (NTU)	58	6	>50	2	3.4		1	1	1.5	2.3	4	15.2	110
Nutrients (mg/L)													
NH3 as N	1	1	N/A				0.02	0.02	0.02	0.02	0.02	0.02	0.02
NO2 + NO3 as N	1	0	N/A				0.65	0.65	0.65	0.65	0.65	0.65	0.65
TKN as N	1	1	N/A				0.2	0.2	0.2	0.2	0.2	0.2	0.2
Total Phosphorus	1	0	N/A				0.03	0.03	0.03	0.03	0.03	0.03	0.03
Metals (ug/L)													
Aluminum, total (Al)	9	0	N/A				51	51	66	120	240	18000	18000
Arsenic, total (As)	9	9	>10	0	0		5	5	5	5	5	5	5
Cadmium, total (Cd)	9	9	>2	0	0		1	1	2	2	2	2	2
Chromium, total (Cr)	9	9	>50	0	0		10	10	25	25	25	25	25
Copper, total (Cu)	9	8	>7	1	11.1		2	2	2	2	2	17	17
Iron, total (Fe)	9	0	>1000	1	11.1		89	89	190	200	340	19000	19000
Lead, total (Pb)	9	8	>25	0	0		10	10	10	10	10	15	15
Mercury, total (Hg)	8	8	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	9	8	>88	0	0		10	10	10	10	10	25	25
Zinc, total (Zn)	9	8	>50	1	11.1		10	10	10	10	10	80	80

Fecal Coliform Screening(#/100mL)

85.1

results: Geomean: # > 400: % > 400: % Conf:

6

10.7

Key:

result: number of observations

56

ND: number of observations reported to be below detection level (non-detect)

EL: Evaluation Level; applicable numeric or narrative water quality standard or action level

Results not meeting EL: number and percentages of observations not meeting evaluation level

%Conf : States the percent statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)

Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

APPENDIX 3-D

12-DIGIT SUBWATERSHED MAPS











APPENDICES New River Basin: Little River & Chestnut Creek Watersheds (HUC 0505000104 & 0505000106)



APPENDIX 4

PERMITS

IN THE NEW RIVER BASIN

PERMITS LISTED

- ♦ NPDES: Point Source Discharge
- **NPDES:** Non-Discharge
- & Stormwater
- **b** Animal Operations

NPDES PERMITS

TABLE 14-1: NPDES POINT SOURCE DISCHARGER PERMITS IN THE NEW RIVER BASIN

Permit #	FACILITY NAME	Permit Type	CLASS	Receiving Stream	Permitted Flow (gpd)
	Nort	h Fork New River Watershed (HUC 050	5000101)		
NC0000019	United Chemi-Con, Inc.	Industrial Process & Commercial	Minor	North Fork New River	38,000
NC0020451*	West Jefferson WWTP	Municipal, < 1MGD	Major	Little Buffalo Creek	500,000
NC0030325	Buffalo Meadows WWTP	100% Domestic < 1MGD	Minor	Buffalo Creek	10,000
NC0066028	Lansing WWTP	Municipal, < 1MGD	Minor	Big Horse Creek	50,000
NCG500267	Elk Creek Lumber	Non-contact Cooling, Boiler Blowdown Wastewater Discharge COC	Minor	Little Buffalo Creek	0
NCG550478	2634 Old Highway 16	Single Family Domestic Wastewater Discharge COC	Minor	Little Phoenix Creek	450
	South Fork New Ri	ver & Fox Creek Watersheds (HUC 050	5000102	& 0505000103)	
NC0020621*	Jimmy Smith WWTP (Town of Boone)	Municipal, Large	Major	South Fork New River	4,820,000
NC0021709*	Jefferson WWTP	Municipal, < 1MGD	Major	Naked Creek	300,000
NC0027286	Blowing Rock WWTP	Municipal, < 1MGD	Minor	Middle Fork SFNR	800,000
NC0030848	Jefferson Apparel Company WWTP	100% Domestic < 1MGD	Minor	Dog Creek	8,000
NC0032131	Tweetsie Railroad	100% Domestic < 1MGD	Minor	Middle Fork SFNR	175,000
NC0032158	Roaring River Chalets	100% Domestic < 1MGD	Minor	Middle Fork SFNR	5,000
NC0039608	Summit Woods Apartments WWTP	100% Domestic < 1MGD	Minor	Middle Fork SFNR	8,300
NC0044423	Appalachian State WTP	Water Treatment Plant	Minor	Norris Branch	not limited
NC0067016	Parkway Elementary School	100% Domestic < 1MGD	Minor	Laxon Creek	5,000
NC0083470	Jefferson WTP	Water Treatment Plant	Minor	Naked Creek	not limited
NCG500206	International Resistive Company	Non-contact Cooling, Boiler Blowdown Wastewater Discharge COC	Minor	Winkler Creek	0
NCG510152	Former Shell Dollar Mart #5	Groundwater Remediation Wastewater Discharge COC	Minor	Gap Creek	0
NCG550407	2684 Boggs Road	Single Family Domestic Wastewater Discharge COC	Minor	South Fork New River	300
NCG550430	Riverside Drive / Lot 667	Single Family Domestic Wastewater Discharge COC	Minor	New River	300
	Little River & Ch	estnut Creek Watersheds (HUC 050500	00104 & 0	505000106)	
NC00269131	Sparta WWTP	Municipal, < 1MGD	Minor ¹	Little River	600,000
NC0078158	Olde Beau Golf Club WWTP	100% Domestic < 1MGD	Minor	Laurel Branch (Laurel Creek)	20,000
NC0084832	Nikolas' Restaurant & High Meadow Inn LLC	100% Domestic < 1MGD	Minor	Laurel Branch (Laurel Creek)	25,000

¹ The Sparta WWTPs Pretreatment Program became inactive in January 2011 when it also became a Minor permit. Even though tables and maps have been changed to reflect the new status, the facility was considered Major during this planning cycle.

TABLE 14-2: NPDES NON-DISCHARGER PERMITS IN THE NEW RIVER BASIN

Permit #	FACILITY NAME	Permit Type	CLASS						
	North Fork New River Watershed	(HUC 0505000101)							
WQ0007149	United Chemi-Con Inc.	Wastewater Recycling	Minor						
	South Fork New River & Fox Creek Watersheds (HUC 0505000102 & 0505000103)								
WQ0004166	Town of Jefferson Residuals Land Application Program	Land Application of Residual Solids (503)	Minor						
WQ0013263	Town of Boone High Country 5-5-0 Drying Facility and Distribution Program	Distribution of Residual Solids (503)	Minor						
WQ0020293	Jimmy Smith WWTP (Town of Boone)	Gravity Sewer Extension, Pump Stations, & Pressure Sewer Extensions	Minor						
WQ0022120	Jefferson WWTP	Reuse	Minor						
WQ0022155	Jefferson WWTP	Distribution of Residual Solids (503)	Minor						
WQ0021731	Wastewater Reuse System	Reuse	Minor						
WQ0010878	West Campus	Surface Irrigation	Major						
WQ0012694	Maharishi Spiritual CT-East Campus	Surface Irrigation	Major						
WQ0015515	Heavenly Mountain Resort	Surface Irrigation	Major						
	Little River & Chestnut Creek Watersheds (H	UC 0505000104 & 0505000106)							
WQ0006242	Town of Sparta Residuals Land Application Site	Residuals	Minor						

* Permits from the two previous tables are mapped on the NPDES Permits map found in the Maps Chapter.

STORMWATER PERMITS

TABLE 14-3: COMMUNITIES IN THE NEW RIVER BASIN SUBJECT TO STORMWATER AND/OR WATER SUPPLY WATERSHED STORMWATER REQUIREMENTS.

	NPE	DES	STATE STORMWATER	WATER SUPPLY WATERSHED		
LOCAL GOVERNMENT	Phase I	PHASE II	Program	STORMWATER REQUIREMENTS		
Municipalities						
Boone						
Blowing Rock						
Jefferson						
West Jefferson						
Lansing						
Sparta						
Counties						
Ashe						
Alleghany						
Watauga						

TABLE 14-4: STORMWATER PERMITS IN THE NEW RIVER BASIN

Permit #	FACILITY NAME	Permit Type	CLASS
NCR002037	Blowing Rock Art and History Museum	Construction Stormwater	Minor
NCG140100	Chandler Concrete - Watauga	Ready Mix Concrete Stormwater/Wastewater Discharge COC	Minor
NCGNE0378	NC Nat Gd- Boone	Stormwater Discharge, No Exposure Certificate	Minor
NCG160141	Maymead Materials Inc - Boone	Asphalt Paving Mixture Stormwater Discharge COC	Minor
NCG140101	Chandler Concrete - Boone	Ready Mix Concrete Stormwater/Wastewater Discharge COC	Minor
NCG160039	Maymead Materials Inc	Asphalt Paving Mixture Stormwater Discharge COC	Minor
NCG020129	Radford Quarries Of Boone Inc	Mining Activities Stormwater Discharge COC	Minor
NCG080085	Appalachian Energy	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Minor
NCG140254	Boone Ready-Mix Incorporated	Ready Mix Concrete Stormwater/Wastewater Discharge COC	Minor
NCG140259	R H Loven Co Incorporated	Ready Mix Concrete Stormwater/Wastewater Discharge COC	Minor
NCR002049	Appalcart Waste Site	Construction Stormwater	Minor
NCG180130	Watauga Wood Products Incorporated	Furniture and Fixtures Stormwater Discharge COC	Minor
NCG140098	Chandler Concrete - Ashe County	Ready Mix Concrete Stormwater/Wastewater Discharge COC	Minor
NCG050182	Gates Corporation	Apparel/Printing/Paper/Leather/Rubber Stormwater Discharge COC	Minor
NCGNE0392	NC Nat Gd- Jefferson	Stormwater Discharge, No Exposure Certificate	Minor
NCG080062	Independence Oil & LP Gas Inc	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Minor
NCG150003	Ashe County Airport Authority	Air Transportation Stormwater Discharge COC	Minor
NCR000458	Ashe County Airport Authority	Construction Stormwater	Minor
NCG020227	Smithport Quarry	Mining Activities Stormwater Discharge COC	Minor
NCG140281	Chandler Concrete - Crumpler	Ready Mix Concrete Stormwater/Wastewater Discharge COC	Minor
NCG160015	Adams Construction Company Inc	Asphalt Paving Mixture Stormwater Discharge COC	Minor
NCG210273	L & E Lumber Co Incorporated	Timber Products Stormwater Discharge COC	Minor
NCGNE0579	United Chemi-Con, Inc.	Stormwater Discharge, No Exposure Certificate	Minor
NCGNE0149	Pioneer Eclipse Corporation	Stormwater Discharge, No Exposure Certificate	Minor
NCG140099	Chandler Concrete - Alleghany	Ready Mix Concrete Stormwater/Wastewater Discharge COC	Minor
NCG120057	Ashe County Environmental Ser	Landfill Stormwater Discharge COC	Minor

FIGURE 14-1: STORMWATER PROGRAM AREAS IN THE NEW RIVER BASIN



ANIMAL OPERATIONS

TADLE 14 5. DEDMITTED ANIMAN ODEDATI	IONE IN THE NEW DIVED BACIN AS OF 1417 2010
TABLE 14-J. FERMITTED ANIMAL OPERATI	IONS IN THE INEW INVER DASIN AS OF JULY ZUTU

Permit Number	Permit Type	COUNTY	Allowable Count	SSLW FACTOR	SSLW ¹						
	Little River & Chestnut Creek Watersheds (HUC 0505000104 & 0505000106)										
AWC030001	Cattle State COC	Alleghany	200	800	160,000						
AWC030002	Cattle State COC	Alleghany	400	1,400	560,000						
AWC030003	Cattle State COC	Alleghany	500	1,400	700,000						
AWC030005	Cattle State COC	Alleghany	200	1,400	280,000						
AWC030008	Cattle State COC	Alleghany	275	1,400	385,000						
AWC030013	Cattle State COC	Alleghany	150	1,400	210,000						
AWC030021	Cattle State COC	Alleghany	130	1,400	182,000						
AWC030026	Cattle State COC	Alleghany	262	1,400	366,800						
AWC030033	Cattle State COC	Alleghany	466	800	372,800						
				Total SSWL:	3,216,600						

1 - SSLW: The Steady State Live Weight is in pounds, after a conversion factor (SSLW Factor) has been applied to the number of animals on a farm. Conversion factors come from the US Department of Agriculture, Natural Resource Conservation Service guidelines.

A map of where these permits are located can be found in the Maps Chapter.