Waterbody		Location		Date	Station	ID	Bioclassification		
DEAR SWP		NC 301		00/20/12		-	60	ou	
County Subba	asin 8 digit HUC	Latitude	Longi	tude	AU Numbe	r	Level IV F	Ecoregion	
HALIFAX 4	03020102	36.2779312	-77.884	1524	28-79-25-7	/	Northern Ou	ter Piedmont	
Stream Classification	Drainage Area (mi	<sup>2</sup> ) Elevatio	on (ft)	Stream Wi	idth (m)	Average [	Depth (m)	Reference Site	
C;NSW	42.8	200	)	7		0.	.4	No	
	Forested/Wetlan	A Pural Pa	sidential	٨	ariculture		Other (de	scribe)	
Visible Landuse (%)	100		n					scribe)	
	100		0		0		0		
Upstream NPDES Discharge	rs (> 1MGD or <1 M	GD and within 1 r	nile)		NPDES	Number	Vol	ume (Q <sub>w,</sub> MGD)	
	None								
Water Quality Parameters	_				S	ite Photograp	h		
Temperature (°C)	25.	7		and the second second		10000			
Dissolved Oxygen (mg/L)	4.0			a start	A Me	Lines	S. COL		
Specific Conductance (µS/cm)	110								
pH (s.u.)	6.1						1 Al and		
,				223					
Water Clarity Slig	htly turbid; greenish		ALC: N			A STAN		A BUNK	
				SA-	1.00			Stroke No	
Habitat Assessment Scores (	(max)				100 C		and and a second		
Channel Modification (5)	5			Land Martin			a france	A A A A A A A A A A A A A A A A A A A	
Instream Habitat (20)	18			1000	25		A SHARE SHA		
Bottom Substrate (15)	4		Law Parts	-13					
Riffle Habitat (16)	7					The second	A DE LAND	and Sala	
Pool Variety (10)	8		and the second	and the second	18.4		Starting of Starting	Standing M	
Erosion (7)	7						A TANK	aller a star	
Bank Vegetation (7)	6				A Start			ser and the	
Light Penetration (10)	8		and the second	ACTION OF THE PARTY OF				Carlos and	
Left Riparian Score (5)	5		and the set					and the second se	
Right Riparian Score (5)	5								
Total Habitat Score (100)	73	Sub	strate	Gravel, sand					
Sample Date	Samn		Snec	vies Total			,		
06/20/12	2012	-66	Spec	20		46		Good	
05/07/07	2012	-40		25		52		Good	
04/11/02	2002	-10		20		52		Good	
Maat Abundant Creation 201		-	1	Evetia Crea	[				
Most Abundant Species, 201	Z Redbreast Su	nfish (n=93, 44%)		Exotic Spec	cies	None, only 3 fis collected out of	h (Green Sunf 722 fish at thi	ish) have been s site.	
Species Change Since Last (	Gainer Cycle Shiner Sunfish	l Bowfin and La (n=13), V-lip Redł n (n=3), and Chain	rgemouth B horse (n=2), back Darte	ass (n=1 each , Northern Hog r (n=2).	, first collectio Sucker (n=3)	ons ever) and B I, Redfin Picker	lluegill (n=1). <b>I</b> rel (n=4), Flier	Lost Pinewoods (n=1), Green	
Data Analysis									
Watershed drains the west-s	southwest corner of H	lalifax County; the	Town of Lit	ttleton is locate	ed within the e	extreme headwa	aters; borders f	the Rolling Coastal	
Plain; Town of Littleton's WWT	P (NC0025691, Qw :	= 0.28) is located -	~ 11 miles u	pstream on Bu	Itterwood Cre	ek a tributary to	b Bear Swamp	; Bear Swamp is a	
http://water.usgs.gov/osw/strea	, site is located ~ 1.8 amstats/north_carolin	a.html, only landus	se categorie	is $\geq 5\%$ are rep	oorted) 64%	o forest, 16% cu	ultivation, and	7%	
grassiand/herbaceous; since 1	992 forested land has	decreased from a	9 to 64% a	na developed l	and has incre	eased from 1 to	4%. Habitat	Coastal Plain-like;	
low flow in 2012, dissolved oxy - not as abundant (fewest fish of	gen at 49% of satura of any site in the Tar	tion; specific cond River basin in 201	uctance woody uctance wa 2) and diver	s greatest ever s eas expected	r recorded at d (total divers	this site, previo ity and diversit	us range was f y of major grou	64-83 μS/cm. <b>2012</b> - ips) and with a	
moderately high percentage of	tolerant fish (47%); to	vo intolerant speci	es (Pinewo	ods Shiner and	d Chainback [	Darter) present	in 2007 were r	not collected in 2012;	

only one intolerant fish and species collected (Roanoke Darter). **2002-2012** -- high species diversity; 31 species known from the site including 4 darters, 6 suckers, 7 cyprinids, 6 sunfish, and 3 intolerant species (Pinewoods Shiner, Roanoke Darter, and Chainback Darter); dominant species is the tolerant Redbreast Sunfish which has increased in percent abundance form 13 to 15 to 44% since 2002, while the intermediate Highfin Shiner has declined from 41 to 11 to 2% during the same time period; NCIBI rating has declined from a high Good (52) to a low Good (46). **Recommendation** -- although still rated Good, continued basinwide assessment of this site in 2017 is warranted because the community maybe undergoing a species and tolerance shift due to changing natural flow regimes, changing water quality, or landuse practices. Overall, water quality rating for the Bear Creek watershed is stable.

Waterbody		L	ocation		Date	Stati	on ID	Bioclass	sification
CEDAR CR		SF	R 1109		04/17/	12 0	F7	Good	l-Fair
County Subb	asin 8d	ligit HUC	Latitude	Long	itude	AU Num	nber	Level IV	Ecoregion
FRANKLIN 1	03	3020101	36.06	-78.353	88889	28-29-(	2)b	Northern O	uter Piedmont
Stream Classification	Drainage	e Area (mi²)	Elevatio	on (ft)	Strear	n Width (m)	Avera	age Depth (m)	Reference Site
C;NSW	4	10.2	220	)		7		0.4	No
	Foreste	d/Wetland	Rural Re	sidential		Agriculture		Other (d	escribe)
Visible Landuse (%)		95	Į	5		0		(	)
Upstream NPDES Discharge	rs (> 1MGI	D or <1 MGD	and within 1 i	mile)		NPD	ES Number	Vo	lume (Q <sub>w.</sub> MGD)
Town of F	ranklin's W	WTP, ~ 4.1 m	iles upstream			N	C0069311		3.0
Water Quality Parameters							Site Photo	graph	
Temperature (°C)		19.4				-	18 2 2 10	A The set	
Dissolved Oxvgen (mg/L)		7.4			10 march		And the second second	<b>下下下了</b> 第一次	A Service Texas
Specific Conductance (uS/cm)	1	323			et a	and the second second			
pH (s.u.)		6.4		Stil a		- AND	58.32		Contraction of the
					2	18	State P	No. IN	
Water Clarity	Slight	tly turbid		7 8	4		The second second	A NUME PRINT	A PARTICIPATION OF
_			-		A Same	ALC: No.	" interest	100 - 100 - 10	Carles A
Habitat Assessment Scores	(max)		_	Car		- North	a second	and the second s	AL PHOLES
Channel Modification (5)		5		Y-6-	No. No House and	Carl Control	A series of	and the second	and a second second
Instream Habitat (20)		14		14 AS		1 and Mary	juin (	and the second second	the second second
Bottom Substrate (15)		3					ALL T	N.S.	A state of the state
Riffle Habitat (16)		7		Contraction of the	HAT	Entral and	Contraction of the local division of the loc	and a second	
Pool Variety (10)		8		Const.		24 J. J. F.	2 14	and the second	
Erosion (7)		5			N K C		AL A		- Contractor
Bank Vegetation (7)		6		a the	Hick of			A RASA	
Light Penetration (10)		8		T AVA	The state		426	1 ACT	Il and the
Left Riparian Score (5)		5		ACT /	* TO P	the start			- AN
Right Riparian Score (5)		5							
Total Habitat Score (100)		66	Sub	strate	Sand				
Sample Date		Sample II	)	Spe	cies Total		NCIBI		NCIBI Rating
04/17/12		2012-05			18		42		Good-Fair
06/10/04	2	004-80 @ SR	1105		20		56		Excellent
04/10/02		97-26			17		54		Good
04/08/92		92-08			18		48		Good
Most Abundant Species, 201	2 (n=9 resp	nfin Shiner an 97 and 90, 229 pectively).	d Eastern Mos % and 21%,	squitofish	Exotic	Species	Green Su	nfish (n=6)	
Species Change Since Last	Cycle (200	<b>2)</b> Gained (n=1), Red	Yellow Bullhea fin Pickerel (n	ad (n=1) ar =18), Pirat	nd Green S e Perch (n=	unfish (n=6). <b>I</b> =1), and Redea	L <b>ost</b> Golde ar Sunfish (n:	en Shiner (n=1), Cro =2).	eek Chubsucker
Data Analysis									
Watershed drains southwes 2006 (from USGS, http://water 10% developed, and 7% grass Habitat moderate quality ha new bridge. Water Quality	st Franklin ( .usgs.gov/c sland/herba bitats inclue low flow in	County, includ osw/streamsta aceous; since ding sand bars 2012, but still	ing the towns its/north_carol 1992 forested s and sandy ru plenty of wate	of Franklin lina.html, o land has d uns, coarse r filling the	and Young nly landuse lecreased f woody de channel; b	sville and the categories ≥ s rom 68 to 52% bris riffles, sna ased upon the	US 1 corrido 5% are repor and develop igs, wide ripa USGS gage	r; tributary to the T ted) 52% forest, oed land has increa arian zones, and ar e (Tar River at US 4	ar River. <b>Landuse</b> 25% cultivation, ased from 3 to 10%. open canopy at the 101 at Louisburg)

new bridge. Water Quality habitats including sands bars and yruns, coarse woody debris finites, snags, wide ripartal 20nes, and an open canopy at the new bridge. Water Quality -- low flow in 2012, but still plenty of water filling the channel; based upon the USGS gage (Tar River at US 401 at Louisburg) flows from July-October 2011 were the lowest on record for the period January 01, 2008-April 21, 2012 and Cedar Creek may have become intermittent; specific conductance was the greatest ever recorded at the site, previous range was 74-180 μS/cm; instream waste concentration of the WWTP is 74%. **2012** -- an abundant (most fish ever collected at the site, n = 432) and diverse community but with a very high percentage of tolerant fish (52%, Satinfin Shiner, Eastern Mosquitofish, Redbreast Sunfish, Green Sunfish, and Yellow Bullhead, the greatest percentage ever recorded at the site) and a very skewed trophic structure due to an absence of piscivores and a very low percentage of omnivores (5%); decline in rating is substantial. **1992-2012** -- moderate species diversity; 24 species known from the site including 4 darters, 4 suckers, 6 cyprinids, 5 sunfish, and 3 intolerant species (Pinewoods Shiner, Roanoke Darter, and Chainback Darter); dominant species is the Satinfin Shiner; the percentage of tolerant fish has increased from 13% in 1992 to 30% in 1997-2004 to 52% in 2012 due to increased abundance and dominance by Satinfin Shiner and Eastern Mosquitofish. Although permitted flow of the WWTP is 3 MGD, the actual flow has been trending upward from 0.4 to 0.6 MGD and the specific conductance of the effluent has also been trending upward. The combination of prolonged low flow periods, the WWTP effluent, and changing landuse practices likely all factored into the decline in the NCIBI rating and water quality. **Recommendation** -- continued basinwide assessment of this site in 2017 to document impacts from WWTP discharge and future urban growth in the watershed and to determine if the decline in the rating is real. Overa



Species Change Since Last Cycle

**Gained** -- none. **Lost** -- Satinfin Shiner (n=11), White Sucker (n=8), Redfin Pickerel (n=3), Pumpkinseed (n=6), Bluegill (n=58), Redear Sunfish (n=2), Largemouth Bass (n=1), Glassy Darter (n=4), and Roanoke Darter (n=9).

# Data Analysis

Watershed -- drains east-central Granville County, including portions of the Town of Oxford; no NPDES dischargers in the watershed; tributary to Fishing Creek; site is ~ 1.7 miles upstream from the the creek's confluence with Fishing Creek. Landuse 2006 (from USGS, http://water.usgs.gov/osw/streamstats/north\_carolina.html, only landuse categories ≥ 5% are reported) -- 51% forest, 20% cultivation, 15% developed, and 9% grassland/herbaceous; since 1992 forested land has decreased from 65 to 51% and developed land has increased from 10 to 15%. Habitat -- low quality and minimal instream habitats including infrequent, short and shallow gravel riffles, gravel bars, sandy runs, and side snags; wide forested riparian zones. Water Quality -- very low flow in 2012, dissolved oxygen at 80% of saturation; specific conductance lower than previously recorded, range 115-125 µS/cm. 2012 -lower than expected total species diversity (fewest species of any site in the Tar River basin in 2012) and diversity of major groups with a moderately high percentage of tolerant fish (46%, Eastern Mosquitofish, Redbreast Sunfish, Green Sunfish, and Creek Chub); piscivores absent; Bluegill which was abundant in 2006 (14% of all fish collected) was unexpectedly absent; lowest total species diversity ever recorded at the site; only one intolerant species (Pinewoods Shiner) collected; only site in the basin in 2012 where only one species of darter was collected; all of these declines may be attributed to the persistent low flow conditions and loss of habitats. 2002-2012 -- moderate species diversity; 22 species known from the site including 4 darters, 2 suckers, 5 cyprinids, 7 sunfish, and 3 intolerant species (Pinewoods Shiner, Roanoke Darter, and Chainback Darter); dominant species are the intermediate Swallowtail Shiner and intermediate Johnny Darter; percentage of tolerant fish has increased from 5 to 30 to 46% due to increase in dominance by the Eastern Mosquitofish (0 to 3 to 29%); community has declined over the past 10 years, perhaps due to chronic low flows; the mean annual discharge (ft<sup>3</sup>/sec) for the USGS gage site on the Tar River near Tar River were 126.4 in 2002, 72.4 in 2007, and 39.8 in 2012; since 2009 the means have decreased from 188.2 to 95.2 to 41.7 to 39.8 ft<sup>3</sup>/sec. Recommendation -- continued basinwide assessment of this site in 2017 to document impacts from potential future town growth. Overall, the water quality in the Coon Creek watershed has declined from Excellent in 2002 to Good-Fair in 2012.

Waterbody		L	ocation		Date	Statio	n ID	В	ioclassif	ication
FISHING CR		S	R 1643		04/18/12	OF1	17		Excel	lent
County Subt	asin 8 di	igit HUC	Latitude	Longi	tude	AU Numb	er	L	evel IV E	coregion
GRANVILLE	03	020101	36.22311	-78.5	756	28-11e		Nort	hern Out	er Piedmont
Stream Classification	Drainage	Area (mi <sup>2</sup> )	Elevatio	on (ft)	Stream W	/idth (m)	A١	verage Depth	(m)	Reference Site
C;NSW	44	4.1	305	5	16	6		0.5	. /	No
	Forester	d/Wetland	Rural Re	sidential	٥	ariculture		C	ther (de	scribe)
Visible Landuse (%)	1 0105100	00		0		0				scribej
			· · · · · ·							
Upstream NPDES Discharge	ers (> 1MGD	or <1 MGD	and within 1 r	nile)		NPDE	S Numb	ber	Volu	ime (Q <sub>w,</sub> MGD)
Oxford waste	water Treat	iment Plant (*	-6 miles upstre	eam)		NC	JUZ5054			3.5
Water Quality Parameters			•				Site Pho	otograph		
Temperature (°C)		18.1				and the R		Part and a second		and a series
Dissolved Oxygen (mg/L)		7.4	-		- State		2 - K	12 June		
Specific Conductance (µS/cm	)	330					10-1		國體	Contraction Property
pH (s.u.)		6.7			1 200		The second	THE?		A start
Water Clarity	CI	ear	1		A Pro-		1	States.	· W	Y
Water Clarity				The second	化合于了	CRAST PERM		-Al-A		The second second
Habitat Assessment Scores	(max)			No.			The state	2 10		as to
Channel Modification (5)	(max)	5	ר			A REAL PROPERTY OF		-	a start	Contra 1
Instroam Habitat (20)		19		and strategic little	and the second		Carlos and	and the second s		the second
Rottom Substrato (15)		10	-	Contraction of the	Annual -			-		
Dollom Substrate (15) Diffle Habitat (16)		14	-	3.	and the second			2		
Pool Variety (10)		14								T the
Frosion (7)		7	-							
Bank Vegetation (7)		7	-							
Light Penetration (10)		8	-	8						
Left Riparian Score (5)		5	-	A A	Barroster -			N. C.		
Pight Piparian Score (5)		5	-		and the state of the		the second second			
Total Habitat Score (100)		 	Sub	strate	Boulder cobb	le gravel sa	nd			
		- 01		I	200.001,0000	.0, g.a.o., co				
Sample Date		Sample I	D	Spec	cies Total		NCIB	1	N	CIBI Rating
04/18/12		2012-08			23		56			Excellent
05/18/06		2006-52			22		56			Excellent
04/08/02		2002-02			20		50			Good
04/14/97		97-22			17		52			Good
04/07/92		92-06			18		42			Good-Fair
Most Abundant Species, 20	12 White	e Shiner (n=1	94, 27%)		Exotic Spe	cies	Green	Sunfish (n=10)		
Species Change Since Last	Cycle	Gained (n=3) and	Mimic Shiner Bluegill (n=5).	(n=4) and №	Notchlip Redho	orse (n=1) (fi	st collec	ctions ever). L	ost No	rthern Hog Sucker
Data Analysis										
Watershed drains central G	ranville Cou	nty, including	the Town of C	Dxford; tribu	tary to the Tar	River; site is	s located	d ~ 5.8 miles do	ownstrear	m from the WWTP
discharge and ~ 3.5 miles abo	ve the creek	's confluence	with the river.	The WW1	۲P upgrade an	d expansion	(from 2.	17 to 3.5 MGD	) was coi	mpleted in 2007
with mechanical bar screen ar	nd grit remov	al, new influe	nt pumps and	pump statio	on, zone oxida	tion ditches v	vith biolo	ogical nutrient	removal c	apability, an
activated sludge return pump	station, three	e secondary c	larifiers, a trav	eling bridge	e tertiary filter,	UV disinfect	on, and	post aeration.	Landus	e 2006 (from
and 9% grassland/berbaceous	s since 1002	the forested	land has decre	y lanuuse o	allegoties $\ge 5\%$ 62 to 49% and	d the develor	u) 495 bed land	has increased	from 12	to 18% Habitat
typical high quality Carolina S	ate Belt-type	stream; shall	low and deep	rocky pools	; shallow long	riffles and ro	cky runs	s; no habitat ch	anges si	nce last cycle.
Water Quality low flow in 2	012; specific	conductance	was the great	est ever me	easured at the	site, previou	s range	was 132-186	uS/cm. 2	012 a diverse
and very abundant community	(n=23 speci	ies and n=72	3 fish, most ev	er collected	l at this site); c	only metric no	ot scoring	g a "5" (the ma	ximum va	alue) was the
Percentage of Piscivores: one	specimen of	f the Roanok	e Bass (Amblo	plites cavifi	rons) and four	specimens of	of Mimic	Shiner (Notrop	ois voluce	llus) (both state

Significantly Rare species) were collected. **1992-2012** -- despite the WWTP discharge (which provides persistent flows during low flow periods), the instream and riparian habitats are consistently of very high quality, and the community has rated Good or Excellent since 1997, even in 2012 during a low flow period; moderate-high species diversity; 29 species known from the site including 4 darters, 5 suckers, 11 cyprinids, 6 sunfish, and 4 intolerant species (Pinewoods Shiner, Mimic Shiner, Roanoke Darter, and Chainback Darter); dominant species is the omnivorous Bluehead Chub. **Recommendation** -- continued basinwide assessment of this site in 2017 to document impacts WWTP and from potential future town growth. Overall, no change in water quality since 2006 in the Fishing Creek watershed.



stream). **1992-2012** -- very high species diversity; 31 species known from the site including 4 darters, 5 suckers, 8 cyprinids, 7 sunfish, and 3 intolerant species (Pinewoods Shiner, Roanoke Darter, and Chainback Darter); dominant species is the Satinfin Shiner; community has consistently rated Good since April 1997, even in 2012 during a low flow period. **Recommendation** -- continued basinwide assessment of this site in 2017. Overall, no change in water quality in the Lynch Creek watershed.

Waterbod	ly		L	ocation		Dat	е	Station	ID	Bioclass	ification
MIDDLE	CR		S	R 1203		04/17	//12	OF2	8	Exce	llent
County	Subb	asin 8	digit HUC	Latitude	Long	itude		AU Numbe	er	Level IV	Ecoregion
FRANKLIN	1	0	3020101	36.17194444	-78.4	4875		28-15		Northern Or	uter Piedmont
Stream Classificat	ion	Drainag	e Area (mi <sup>2</sup> )	Elevatio	on (ft)	Strea	am Wid	th (m)	Ave	erage Depth (m)	Reference Site
C;NSW			8.8	215			4			0.2	No
	·	Forest	ed/Wetland	Rural Re	sidential		Aar	iculture		Other (d	escribe)
Visible Landuse (	(%)	1 01000	100	(	)		, .g.	0		(	)
Unstroom NDDES Dis	chargo	re (> 1MG		and within 1 n	nilo)			NDDES	Numbe	v Vo	
Opsilean NPDES Dis	scharge	5 (> 11410	None		ille)			NFDES		vo	
			NONC								
Water Quality Parame	eters		17.0					S	ite Phot	ograph	
Temperature (°C)			17.2	-		1. 1	A				A STATE
Dissolved Oxygen (mg	/L)		7.7	-	and the	Rel	TA	A. T. C.			
Specific Conductance	(µS/cm)		98		1		77	-2/3	( mh		ALL MARKED
pH (s.u.)			6.1	1		X	1,0	1	S Free	1618 100	I La
Water Clarity	Г	Clear, o	easily silted	1			A	and Mail	( the area	I mar the	A start of the
	L			J	4	100	1-			Carrow F. F.	21 - 11
Habitat Assessment S	Scores (	max)				the second		Sec. Sec.			
Channel Modification (	5)		5	ן		the second	and the	A REAL			
Instream Habitat (20)	,		10		4 1 - 1	den de	in.	Sam			
Bottom Substrate (15)			3			ALL T	ching 2	- Carl	al inte		The Part of
Riffle Habitat (16)			5		17 A B		14 miles	and a state of the	ELS.	A set a state of	Contraction of the
Pool Variety (10)			6		the second second	e Mich				State of the second	
Erosion (7)			5			A. Nil	The state			e and	and the second second
Bank Vegetation (7)			6		S No ada	11	la		1	Share and share and	
Light Penetration (10)			10		and the second		52.55	New JE AL	Contraction of the second	2 - 18/	
Left Riparian Score (5)			5		Ar and the			¥ # 7	a shall	Contraction in a	and the gran
Right Riparian Score (	5)		5								
Total Habitat Score (1	100)		60	Subs	strate	Sand, silt	t, gravel				
Sample Date			Sample II	D	Spe	cies Tota	I		NCIBI		NCIBI Rating
04/17/12			2012-04			22			54		Excellent
04/09/07			2007-09			25			56		Excellent
04/08/02			2002-01			19			50		Good
Most Abundant Spec	ies, 201	<b>2</b> Wh	nite Shiner (n=3	331, 29%)		Exotic	: Specie	es	Green S	unfish (n=14)	
						-		-			
			Gained	Mountain Red	celly Dace	(n=1), No	tchlip R	edhorse (n	=2), and	V-Lip Redhorse (n=3	3) (first collections
Species Change Sinc	e Last (	Cycle	ever), Ros Minnow (n	yside Dace (n=	=14), Yello 2007 (n=1)	w Bullhea	d (n=1), uckor (n	and Easte	rn Mosqi	uitofish (n=12). Lost Suckor (n=2). Blackti	Eastern Silvery
			Redfin Pic	=2), Goiden Si kerel (n=1), Pu	mpkinsee	d (n=2). W	larmout	h (n=2), an	d I arger	nouth Bass (n=1) (1-	3 fish/species).
					praneee	a (),	annoa	( <u>_</u> ), a	a <u>_</u> a.go.		
Data Analysis											
Watershed drains no	orthwest	Franklin (	County; no mui	nicipalities or N	PDES dis	chargers i	n the wa	atershed; si	mall tribu	itary to the Tar River	; site is ~ 0.3 miles
upstream from the cree	ek's conf	luence wit	the river. La	nduse 2006 (f	rom USGS	S, http://wa	ater.usg	s.gov/osw/	streamst	ats/north_carolina.ht	ml, only landuse
categories ≥ 5% are re	ported)	-72% for from $-0.1$	to 4% Habit	ation, and 8% (	grassland/	nerbaceou	IS; SINCE	e 1992 fore	sted land	a nas decreased from	1 90 to 72% and
gravel riffles and chute	s: wide f	orested ri	parian zones: r	eriphyton abur	ndant aton	the sand	a verv	sinuous ch	annel. V	ater Quality verv	low flow in 2012
specific conductance w	vas the c	reatest ev	ver recorded at	the site, previo	ous range	80-83 µS/	cm. 20	12 a very	diverse	and extremely abund	dant community
(n=1,161, most fish of	any site	in the bas	in in 2012) con	prised primaril	v of Age 1	fish of W	hite Shi	ner, Bluehe	ad Chub	, Swallowtail Shiner.	and Satinfin Shiner

(n = 959, 83%) which indicates that Middle Creek is an important nursery stream for the Tar River; piscivores absent due to the lack of deeper pools and downstream dams (barrier to the piscivorous American Eel). **2002-2012** -- very high species diversity for a stream of its size; 31 species known from the site including 4 darters, 6 suckers, 10 cyprinids, 6 sunfish, and 3 intolerant species (Pinewoods Shiner, Roanoke Darter, and Chainback Darter); dominant species is the intermediate White Shiner; proximity to river may influence transient nature of some species; community has rated Excellent during the past two cycles, even in 2012 during a low flow period. **Recommendation** -- continued basinwide assessment of this important tributary nursery site in 2017. Overall, no change in water quality in the Middle Creek watershed.

Waterboo	dy		L	ocation		Date	e	Station	ID	В	ioclassifi	cation
RED BUD	) CR		S	R 1407		04/19	/12	OF3	3		Excell	ent
County	Subb	asin	8 digit HUC	Latitude	Longi	tude		AU Numbe	r	L	evel IV Ed	coregion
NASH	2		03020101	36.11611111	-78.021	11111		28-78-1-17		Nort	hern Oute	er Piedmont
Stream Classificat	tion	Drai	nage Area (mi <sup>2</sup> )	Elevatio	on (ft)	Strea	ım Wic	dth (m)	Aver	age Depth	(m)	Reference Site
C;NSW:+			18.9	170	)		7			0.3		Yes
	_	For	ested/Wetland	Rural Re	sidential		Ag	riculture		c	ther (des	scribe)
Visible Landuse	(%)		100	(	0			0			0	
Upstream NPDES Dis	scharge	rs (> 1	MGD or <1 MGD	and within 1 r	nile)			NPDES	Number		Volu	me (Q <sub>w,</sub> MGD)
			None					-				
Water Quality Parame	eters							Si	te Photo	graph		
Temperature (°C)			16.1				- Corr	1		1		
Dissolved Oxygen (mg	μ/L)		6.2		3					E SAL		
Specific Conductance	(µS/cm)		102			States	1	- start	- ISA	and the		13 -
pH (s.u.)			6.4			303		and 1	1.5615	A P	Alter	X
Water Clarity		Clear	/tannic, very dark	]		Y.	N.	1	Nie	Rich	A A	Les Ca
Habitat Assessment	Scores (	(max)			S - 217	G. Bert	P	N N I		1		
Channel Modification (	5)	. ,	5	1	Lan Ce	184. A	G T	A A C		11/1	1	
Instream Habitat (20)			18		A CONTRACT			Contraction of the		636	115	1. 1
Bottom Substrate (15)			12		132			See	The state of	man 1		
Riffle Habitat (16)			7		1			1 4 1 4				1
Pool Variety (10)			8		21:							the see
Erosion (7)			7		1			×	alle -		and the second	
Bank Vegetation (7)			6		. 7	and the second second	1	Se de la	10			
Light Penetration (10)			7		MAR P.	and y	5	Time			A.	1 Alexandre
Left Riparian Score (5)	)		5			See h	53	a second de la companya		- These		
Right Riparian Score (	5)		3									
Total Habitat Score (	100)		78	Sub	strate	Bedrock,	cobble	e, dark red-bi	own silt			
Sample Date	•		Sample I	D	Spec	cies Total	I		NCIBI		N	CIBI Rating
04/19/12			2012-09			22			58			Excellent
04/11/07			2007-13			22			50			Good
04/09/02			2002-06			16			50			Good
Most Abundant Spec	ies, 201:	2	Bluehead Chub (r	1=74, 26%)		Exotic	Speci	ies	Green Su	nfish (n=4)		

Species Change Since Last Cycle

Gained -- Creek Chub (n=1) (first collection ever). Lost -- Flat Bullhead (n=1).

Data Analysis

Watershed -- a tributary to Sandy Creek and ultimately Swift Creek; drains northeastern Franklin and northwestern Nash counties; no municipalities or NPDES dischargers in the watershed; adjacent to the Rolling Coastal Plain Level IV ecoregion. Landuse 2006 (from USGS, http://water.usgs.gov/osw/streamstats/north\_carolina.html, only landuse categories ≥ 5% are reported) -- 61% forest and 23% cultivation; since 1992 forested land has decreased from 71 to 61% and developed land has increased from 0.4 to 4.2%. Habitat -- straight, but not channelized; numerous bedrock vein shelves and riffles; undercuts; right riparian zone logged with past five years. Water Quality -- low flow in 2012, dissolved oxygen at 63% of saturation; specific conductance was the greatest ever recorded at the site, previous range was 66-80 µS/cm. 2012 -- diverse, abundant, and trophically balanced community; only metric not scoring a "5" (the maximum score) was the Number of Species of Suckers; improvement in rating was due to a more balanced trophic structure in 2012 than in 2007. 2002-2012 -- moderate species diversity; 24 species known from the site including 3 darters, 3 suckers, 7 cyprinids, 6 sunfish, and 3 intolerant species (Pinewoods Shiner, Roanoke Darter, and Chainback Darter); dominant species are the intolerant Pinewoods Shiner and intermediate White Shiner; similar to other streams in the transitional zone between the Piedmont and the Coastal Plain, the trophic structure in 2002 and 2007 was skewed with a very low percentage of Omnivores+Herbivores and a high percentage of insectivores and piscivores which resulted in a medium-high Good rating. Recommendation -- continued basinwide assessment of this regional reference site in 2017. Overall, an improvement in water quality in the Red Bud Creek watershed.

Waterbo	dy		Location		Date	Station ID	E	Bioclassif	ication
ROCKY	SWP	S	R 1002		06/20/12	OF35		Goo	bd
County	Subbas	sin 8 digit HUC	Latitude	l ongi	tude	AU Number	·	evel IV F	coregion
HALIFAX	4	03020102	36.22638889	-77.809	16667	28-79-28-(0.7)	No	rthern Out	er Piedmont
Ctroom Clossifies			Flourstin		Ctracers M/L			()	Defenence Cite
	ition	Drainage Area (mi )	Elevatio	n (ft)	Stream Wi		verage Depth	(m) [	Keterence Site
VV 3-IV, IV 3VV		19.5	140		5		0.3		Tes
	_	Forested/Wetland	Rural Re	sidential	Ag	riculture	(	Other (des	scribe)
Visible Landuse	(%)	80	(	)		20		0	
Upstream NPDES Di	schargers	s (> 1MGD or <1 MGE	) and within 1 i	nile)		NPDES Num	ber	Volu	ıme (Q <sub>w.</sub> MGD)
- -		None		-					
Water Quality Param	neters					Site Ph	otograph		
Temperature (°C)		23.8							
Dissolved Oxvaen (m	a/L)	5.6		1 4	4- 12-1				
Specific Conductance	e (µS/cm)	108		Serth		Ser Carlo	Ale and		
pH (s.u.)	,	6.7			Se CA		4 7 2	61	
				- Asta		A State of	2 Pro	1	
Water Clarity		Slightly turbid			State Server	The second se			V-9 - 1
					Storek.		att i pe	1 3	A PARTY AND
Habitat Assessment	Scores (n	max)	_	A STATE	3	A HAVE A		R. B.	
Channel Modification	(5)	5		Se a			A PARANCE		Contraction State
Instream Habitat (20)		16		And the second	C. C. C.	~ 11 /	1.4	Starting 1	· ····································
Bottom Substrate (15)	)	4			STORES .	1- st			
Riffle Habitat (16)		3		2.6.		A MALIN	No los		
Pool Variety (10)		10		- AND			A CALL STORE		
Erosion (7)		5				and -	Barren As	the second	
Bank Vegetation (7)		6		the second		man an			18 19 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Light Penetration (10)		7		and the second	The states				
Left Riparian Score (5	5)	5		and the set	A State .	AND TOWN			
Right Riparian Score	(5)	5	_	r					
Total Habitat Score (	(100)	66	Sub	strate	Sand				
Sample Date	9	Sample	ID	Spec	cies Total	NCIE	31	N	CIBI Rating
06/20/12		2012-6	7		19	50			Good
05/07/07		2007-4	1		19	48			Good
04/12/02		2002-1	3		19	50			Good
04/03/97		97-11			14	42			Not Rated
02/03/93		93-01			14	42			Not Rated

Most Abundant Species, 2012

Species Change Since Last Cycle

 Gained -- Golden Shiner (n=2), Flier (n=4), and Sawcheek Darter (n=1) (first collections ever), Redfin Pickerel (n=5), and sunfish hybrid (n=1).

 Lost -- Bluehead Chub (n=1), Satinfin Shiner, Pinewoods Shiner (n=13), Mud Sunfish (n=2), and Green Sunfish (n=1).

None, only 2 fish (Green Sunfish) have been

**Exotic Species** 

#### Data Analysis

Watershed -- drains rural north-central Warren County; no municipalities or NPDES dischargers in the watershed; within a transitional area between the Northern Outer Piedmont and the Rolling Coastal Plain; tributary to Fishing Creek. Landuse 2006 (from USGS, http://water.usgs.gov/osw/streamstats/north\_carolina.html, only landuse categories ≥ 5% are reported) -- 60% forest, 18% cultivation, and 6% grassland/herbaceous; since 1992 forested land has decreased from 70 to 60% and developed land has increased from 0.3 to 4.2%. Habitat -- sun-lit areas with abundant aquatic plants and *Spirogyra;* undercut banks; shallow stick and gravel riffles only at the beginning and end of the reach; variety of pool sizes for a shallow stream. Water Quality -- very low flow in 2012, dissolved oxygen at 66% of saturation; specific conductance was slightly greater than the normal range previously measured at the site, range 58-97 µS/cm. 2012 -- diverse and abundant community, but similar to other streams in the transitional zone between the Northern Outer Piedmont and the Rolling Coastal Plain, the trophic structure was skewed with a very low percentage of Omnivores+Herbivores and a high percentage of piscivores; diversity of darters, suckers, and intolerant species lower than expected; most species diversity; 30 species known from the site including 4 darters, 1 sucker, 7 cyprinids, 9 sunfish, and 3 intolerant species (Pinewoods Shiner; Sawcheek Darter, and Chainback Darter); dominant species is the Swallowtail Shiner; Least Brook Lamprey (*Lampetra aepyptera*, a state Threatened species), Bowfin, and Chainback Darter have not been collected since 1993; when there is sufficient flow, the community has rated Good since 2002, even in 2012 during a low flow period. Recommendation -- continued basinwide assessment of this transitional regional reference site in 2017. Overall, no change in the water quality in the Rocky Swamp watershed.

Swallowtail Shiner (n=53, 20%)



regional reference site in 2017. Overall, no long-term change in water quality in the Shelton Creek watershed.

Waterbo				ocation		Date	40	Station	ID	В	ioclassifi	ication
IABB2	CR		51	K 1100		04/19/	12	OF4	1		Goo	a
County	Subb	asin	8 digit HUC	Latitude	Longi	tude	Α	U Numbe	er	Le	evel IV E	coregion
VANCE	1		03020101 3	6.18222222	-78.455	83333	28	8-17-(0.5)	)b	Nort	hern Oute	er Piedmont
Stream Classifica	tion	Drai	nage Area (mi <sup>2</sup> )	Elevatio	on (ft)	Stream	n Width	i (m)	Ave	erage Depth	(m)	Reference Site
C;NSW			70.8	225	5		11			0.4		No
		For	ested/Wetland	Rural Re	sidential		Agric	ulture		o	ther (des	scribe)
Visible Landuse	(%)		75	2	25		(	0			0	
Unstream NPDES Di	- echarge	re (~ 1		and within 1 r	nilo)			NDDES	Numbe	r	Volu	ime (Q_MGD)
	sonarge	10 (21	None									
Water Quality Param	atara								ite Phot	ograph		
Temperature (°C)	elers		16.9	ן	1.1.1	131 × 101	140	Sec. 1		ograph	Marine and	
Dissolved Oxygen (mg	¬/I )		7.4			A State			1			
Specific Conductance	y/⊏) (uS/cm)		1.4					17X	the state			
	(µ3/cm)		6.4				12.2	and the second	10. 14	The C	A IL	1
pri (s.u.)			0.4	l	C. Carrier			- Tigeran		NV d	A	
Water Clarity	Г	S	lightly turbid	1		2 July	4	1	- 63 -		*U	1 35 1 20 3
	L	-	3 .,	1	A Particular	- ALLAN			Non			JTR.
Habitat Assessment	Scores	(max)					hie	and the second	-FC	La car		Se die Altaine
Channel Modification	(5)	()	5	)						and the second	C.LE	Carlos Total
Instream Habitat (20)	(-)		12			5	A.					and the second se
Bottom Substrate (15)			4					C.	1	1 / ferre		1 1100 000
Riffle Habitat (16)			3			N Sale		and the second	500	- the	S. Ale	
Pool Variety (10)			10					and the	H.	H.		
Erosion (7)			5			VIE STA			Liber -		A 10	12.22
Bank Vegetation (7)			7							1 1 1 1 2		Call & Bare
Light Penetration (10)			10							White States		10 10 M 12
Left Riparian Score (5	)		5									1 martin
Right Riparian Score (	, (5)		5		N. PARA SPICE		and the second		Dist.			
Total Habitat Score (	100)		66	Sub	strate	Gravel, sar	nd					
Sample Date			Sample IF	, ,	Snor	cies Total			NCIBI		N	CIBI Rating
04/19/12			2012-10	,		22			46			Good
04/10/07			2007-10			20			48			Good
10/14/99			99-65			21			46			Good
06/24/99			99-55			21			48			Good
04/09/99			99-05			21			50			Good
04/15/97			97-23			25			56			Excellent
Most Abundant Spec	cies, 201	2	Swallowtail Shiner	(n=100, 34%)	)	Exotic S	Species	;	Green S	unfish (n=12)		
Species Change Sind	ce Last	Cycle	<b>Gained</b> I (n=7), and (n=14).	Bluehead Chul sunfish hybrid	b (n=1), Mi (n=1). <b>Lo</b> s	mic Shiner <b>st</b> Yellow	(n=1), F Bullhea	Pirate Per ad (n=1),	rch (n=4) Largemo	, Eastern Mos outh Bass (n=	squitofish 5), and G	(n=33), Warmouth alassy Darter
Data Analysis												
Watershed drains s	outhwes	t Vanc	e, southern Hende	rson (including	the south	west portion	of the	Town of I	Henders	on), and west	ern Granv	ville counties, and
the I-85 and US 1 corr	idors; tw	o smal	I NPDES discharge	ers (NC002913	31 and NC	0048631, C	λ <sub>w</sub> total :	= 0.032 N	/IGD) loc	ated ~ 3.9 mi	les upstre	eam on Long Creek-
river <b>I and use 2006</b>	from US	SGS ht	ttp://water usgs go	v/osw/streams	tats/north	carolina htm	nl only	landuse o	categorie	s > 5% are re	eks conii ported)	- 59% forest 16%
cultivation, 12% devel	oped, an	d 9% c	rassland/herbacec	ous; since 1992	2 forested I	and has de	creased	d from fro	m 77% t	59% and de	eveloped I	land has increased
from 6% to 12%. Hab	itat sr	ags al	ong the sides acros	ss the channel	; gravelly ru	uns; riffles r	are; Sp	arganium	bed at	he beginning	along the	e left bank. Water
Quality low flow in 2	2012, sp	ecific c	onductance was th	e greatest eve	er recorded	at the site,	range is	s 82-138	µS/cm.	<b>2012</b> abund	dant and o	diverse community
with five species of su	ckers co	llected	; skewed trophic st	ructure due to	a very low	percentage	e of Om	nivores+l	Herbivor	es (Bluehead	Chub, W	hite Sucker, and
Creek Chub); one spe	cimen of	Mimic	Shiner (Notropis v	olucellus, a st	ate Signific	antly Rare	species	) was col	lected.	1997-2012 V	Very high	species diversity;
Madtom Roanoke Da	n the site	Chain	back Darters, 6 Su	nant species is	inius, o sur s the tolera	nish, and 5 nt Redbrees	st Sunfi	sh: Caroli	ina Madt	om (Noturus	furiosus	a state Threatened
species) and Roanoke	Bass (A	Amblop	lites cavifrons, a st	tate Significant	tly Rare sp	ecies) have	not bee	en collect	ed from	this site since	June 19	99; typically with a
skewed trophic structu	ire which	n may b	e natural and in re	sponse to the	low gradier	nt nature of	this eas	stern Pied	dmont st	ream; has cor	nsistently	rated Good since
1999, even in 2012 du	iring a lo	w flow	period. Recomme	endation co	ntinued bas	sinwide ass	essmen	nt of this s	site in 20	17 to docume	nt impact	ts from future
growth within the wate	ershed. (	Jverall	, no change in wate	er quality in the	e Tabbs Cr	eek watersl	hed.					

TAR RUS 158CountySubbasin8 digit HUCLatitudeGRANVILLE103020101 $36.33333333$ -Stream ClassificationDrainage Area (mi <sup>2</sup> )Elevation (fWS-IV;NSW26435Forested/WetlandRural ResideVisible Landuse (%)7525Upstream NPDES Dischargers (> 1MGD or <1 MGD and within 1 mile)	US 158     04/18/12     OF44     Excellent       Latitude     Longitude     AU Number     Level IV Ecoregion       36.3333333     -78.76833333     28-(1)     Carolina Slate Belt       12 <sup>3</sup> Elevation (ft)     Stream Width (m)     Average Depth (m)     Reference Site       435     11     0.4     Yes       d     Rural Residential     Agriculture     Other (describe)       25     0     0       GD and within 1 mile)     NPDES Number     Volume (Qw, MGD)	
CountySubbasin8 digit HUCLatitudeGRANVILLE103020101 $36.33333333$ -Stream ClassificationDrainage Area (mi²)Elevation (fWS-IV;NSW26435Forested/WetlandRural ResideVisible Landuse (%)7525Upstream NPDES Dischargers (> 1MGD or <1 MGD and within 1 mile)Water Quality ParametersInterperature (°C)17.6Dissolved Oxygen (mg/L)7.383Specific Conductance ( $\mu$ S/cm)83pH (s.u.)ClearWater ClarityClearHabitat Assessment Scores (max)5Channel Modification (5)5Instream Habitat (20)18Difference18	Latitude       Longitude       AU Number       Level IV Ecoregion         36.3333333       -78.76833333       28-(1)       Carolina Slate Belt         i <sup>2</sup> )       Elevation (ft)       Stream Width (m)       Average Depth (m)       Reference Situ         435       11       0.4       Yes         d       Rural Residential       Agriculture       Other (describe)         25       0       0         GD and within 1 mile)       NPDES Number       Volume (Q <sub>w</sub> , MGD)            Site Photograph         6       3       3         3       3       3       3	
GRANVILLE103020101 $36.33333333$ -Stream ClassificationDrainage Area (mi²)Elevation (fWS-IV;NSW26435Forested/WetlandRural ResideVisible Landuse (%)7525Upstream NPDES Dischargers (> 1MGD or <1 MGD and within 1 mile)NoneNoneWater Quality Parameters17.6Temperature (°C)17.6Dissolved Oxygen (mg/L)7.3Specific Conductance ( $\mu$ S/cm)83pH (s.u.)6.3Water ClarityClearHabitat Assessment Scores (max)5Channel Modification (5)5Instream Habitat (20)18	36.33333333       -78.76833333       28-(1)       Carolina Slate Belt         i <sup>2</sup> )       Elevation (ft)       Stream Width (m)       Average Depth (m)       Reference Situ         435       11       0.4       Yes         d       Rural Residential       Agriculture       Other (describe)         25       0       0         GD and within 1 mile)       NPDES Number       Volume (Q <sub>w</sub> , MGD)            Site Photograph	
Stream ClassificationDrainage Area (mi²)Elevation (fWS-IV;NSW26435Forested/WetlandRural ResideVisible Landuse (%)7525Upstream NPDES Dischargers (> 1MGD or <1 MGD and within 1 mile)	i <sup>2</sup> )       Elevation (ft)       Stream Width (m)       Average Depth (m)       Reference Site         435       11       0.4       Yes         d       Rural Residential       Agriculture       Other (describe)         25       0       0         GD and within 1 mile)       NPDES Number       Volume (Q <sub>w</sub> , MGD)         Image: Site Photograph         6       3         3       3	
WS-IV;NSW         26         435           Forested/Wetland         Rural Reside           Visible Landuse (%)         75         25           Upstream NPDES Dischargers (> 1MGD or <1 MGD and within 1 mile)         None           Water Quality Parameters         17.6           Temperature (°C)         17.6           Dissolved Oxygen (mg/L)         7.3           Specific Conductance (μS/cm)         83           pH (s.u.)         6.3           Water Clarity         Clear           Habitat Assessment Scores (max)         5           Channel Modification (5)         5           Instream Habitat (20)         18	435     11     0.4     Yes       d     Rural Residential     Agriculture     Other (describe)       25     0     0       GD and within 1 mile)     NPDES Number     Volume (Q <sub>w</sub> , MGD)       Image: Colspan="2">Image: Colspan="2" Image: Colspan="	
Forested/WetlandRural ResideVisible Landuse (%)7525Upstream NPDES Dischargers (> 1MGD or <1 MGD and within 1 mile)	d     Rural Residential     Agriculture     Other (describe)       25     0     0       GD and within 1 mile)     NPDES Number     Volume (Qw, MGD)       Image: Site Photograph	
Visible Landuse (%)7525Upstream NPDES Dischargers (> 1MGD or <1 MGD and within 1 mile)NoneWater Quality ParametersTemperature (°C)17.6Dissolved Oxygen (mg/L)7.3Specific Conductance ( $\mu$ S/cm)83pH (s.u.)6.3Water ClarityClearHabitat Assessment Scores (max)Channel Modification (5)5Instream Habitat (20)18	25     0     0       GD and within 1 mile)     NPDES Number     Volume (Qw, MGD)          Site Photograph	
Upstream NPDES Dischargers (> 1MGD or <1 MGD and within 1 mile)	GD and within 1 mile)       NPDES Number       Volume (Qw, MGD)             Site Photograph	
None         Water Quality Parameters         Temperature (°C)       17.6         Dissolved Oxygen (mg/L)       7.3         Specific Conductance (μS/cm)       83         pH (s.u.)       6.3         Water Clarity       Clear         Habitat Assessment Scores (max)       5         Channel Modification (5)       5         Instream Habitat (20)       18	Image: the provide of the provide o	
Water Quality Parameters         Temperature (°C)       17.6         Dissolved Oxygen (mg/L)       7.3         Specific Conductance (µS/cm)       83         pH (s.u.)       6.3         Water Clarity       Clear         Habitat Assessment Scores (max)       5         Channel Modification (5)       5         Instream Habitat (20)       18	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	
Temperature (°C)       17.6         Dissolved Oxygen (mg/L)       7.3         Specific Conductance (µS/cm)       83         pH (s.u.)       6.3         Water Clarity       Clear         Habitat Assessment Scores (max)       5         Channel Modification (5)       5         Instream Habitat (20)       18	6 3 3 3	
Dissolved Oxygen (mg/L)     7.3       Specific Conductance (µS/cm)     83       pH (s.u.)     6.3       Water Clarity     Clear       Habitat Assessment Scores (max)     5       Channel Modification (5)     5       Instream Habitat (20)     18		
Specific Conductance (µS/cm)     83       pH (s.u.)     6.3       Water Clarity     Clear       Habitat Assessment Scores (max)     5       Channel Modification (5)     5       Instream Habitat (20)     18		
bpconte conductance (po/entr)     00       pH (s.u.)     6.3       Water Clarity     Clear       Habitat Assessment Scores (max)     5       Channel Modification (5)     5       Instream Habitat (20)     18		
Water Clarity     Clear       Habitat Assessment Scores (max)       Channel Modification (5)       Instream Habitat (20)       18		
Water Clarity     Clear       Habitat Assessment Scores (max)       Channel Modification (5)       Instream Habitat (20)       18		
Habitat Assessment Scores (max)       Channel Modification (5)       Instream Habitat (20)		
Habitat Assessment Scores (max)       Channel Modification (5)     5       Instream Habitat (20)     18		
Channel Modification (5)   5     Instream Habitat (20)   18		
Instream Habitat (20) 18		
Bottom Substrate (15) 12		
Riffle Habitat (16) 9		
Pool Variety (10) 10		
Erosion (7) 7		
Bank Vegetation (7) 6		
Light Departmention (10)		
Light Penetration (10)		
Left Riparian Score (5)		
Light Penetration (10)     o       Left Riparian Score (5)     5       Right Riparian Score (5)     4       Total Habitat Score (100)     84	Substrate Boulder, cobble, gravel	
Light Penetration (10)     0       Left Riparian Score (5)     5       Right Riparian Score (5)     4       Total Habitat Score (100)     84	Substrate Boulder, cobble, gravel	
Light Penetration (10)     o       Left Riparian Score (5)     5       Right Riparian Score (5)     4       Total Habitat Score (100)     84       Sample Date     Sample ID       04/18/12     2012-07	Substrate Boulder, cobble, gravel	
Light Penetration (10)         o           Left Riparian Score (5)         5           Right Riparian Score (5)         4           Total Habitat Score (100)         84           Sample Date         Sample ID           04/18/12         2012-07           04/09/07         2007-07	Substrate     Boulder, cobble, gravel       Substrate     Boulder, cobble, gravel       NCIBI     NCIBI Rating       2-07     22     56     Excellent       '-07     16     46     Good	
Light Penetration (10)     o       Left Riparian Score (5)     5       Right Riparian Score (5)     4       Total Habitat Score (100)     84       Sample Date     Sample ID       04/18/12     2012-07       04/09/07     2007-07       10/14/99     99-63	Substrate     Boulder, cobble, gravel       I     Species Total     NCIBI       NCIBI Rating       2-07     22       56     Excellent       '-07     16       63     18	
Light Penetration (10)     o       Left Riparian Score (5)     5       Right Riparian Score (5)     4       Total Habitat Score (100)     84       Sample Date     Sample ID       04/18/12     2012-07       04/09/07     2007-07       10/14/99     99-63       06/24/99     99-53	Substrate       Boulder, cobble, gravel         NCIBI       NCIBI Rating         2-07       22       56       Excellent         7-07       16       46       Good         63       18       54       Excellent         53       18       54       Excellent	
Clight Penetration (10)         0           Left Riparian Score (5)         5           Right Riparian Score (5)         4           Total Habitat Score (100)         84           Sample Date         Sample ID           04/18/12         2012-07           04/09/07         2007-07           10/14/99         99-63           06/24/99         99-53           04/27/99         99-25	Substrate Boulder, cobble, gravel Boulder, cobble, gravel Boulder, cobble, gravel NCIBI NCIBI Rating 2-07 22 56 Excellent 7-07 16 46 Good 63 18 54 Excellent 53 18 54 Excellent 25 17 52 Good	
Clight Penetration (10)       o         Left Riparian Score (5)       5         Right Riparian Score (5)       4         Total Habitat Score (100)       84         Sample Date       Sample ID         04/18/12       2012-07         04/09/07       2007-07         10/14/99       99-63         06/24/99       99-53         04/27/99       99-25	SubstrateBoulder, cobble, gravelNe IDSpecies TotalNCIBI2-0722562-0722562-071646631854531854251752Good	
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Light Penetration (10)       o         Left Riparian Score (5)       5         Right Riparian Score (5)       4         Total Habitat Score (100)       84         Sample Date       Sample ID         04/18/12       2012-07         04/09/07       2007-07         10/14/99       99-63         06/24/99       99-53         04/27/99       99-25         Most Abundant Species, 2012       Johnny Darter, Redbreast Sunfish, a         Highfin Shiner, (n=139, 130, and 124         18%, 17%, and 16%, respectively).	Substrate       Boulder, cobble, gravel         Substrate       Boulder, cobble, gravel         NCIBI       NCIBI Rating         2-07       22       56       Excellent         7-07       16       46       Good         63       18       54       Excellent         25       17       52       Good         r, Redbreast Sunfish, and r, (n=139, 130, and 124, id 16%, respectively).       Exotic Species       Green Sunfish (n=41)	
Clight Penetration (10)         o           Left Riparian Score (5)         5           Right Riparian Score (5)         4           Total Habitat Score (100)         84           Sample Date         Sample ID           04/18/12         2012-07           04/09/07         2007-07           10/14/99         99-63           06/24/99         99-53           04/27/99         99-25   Most Abundant Species, 2012           Johnny Darter, Redbreast Sunfish, a           Highfin Shiner, (n=139, 130, and 124           18%, 17%, and 16%, respectively).	Substrate       Boulder, cobble, gravel         Substrate       Boulder, cobble, gravel         NCIBI       NCIBI Rating         2-07       22         56       Excellent         7-07       16         46       Good         63       18         54       Excellent         25       17         52       Good         r, Redbreast Sunfish, and r, (n=139, 130, and 124, id 16%, respectively).       Exotic Species       Green Sunfish (n=41)         d Redfin Pickerel (n=2) and Warmouth (n=2) (first collections ever), White Sucker (n=1), Eastern	
Light Penetration (10)         o           Left Riparian Score (5)         5           Right Riparian Score (5)         4           Total Habitat Score (100)         84           Sample Date         Sample ID           04/18/12         2012-07           04/09/07         2007-07           10/14/99         99-63           06/24/99         99-53           04/27/99         99-25           Most Abundant Species, 2012         Johnny Darter, Redbreast Sunfish, a           Highfin Shiner, (n=139, 130, and 124           18%, 17%, and 16%, respectively).           Species Change Since Last Cycle         Gained Redfin Pickerel (n=	Substrate       Boulder, cobble, gravel         NCIBI       NCIBI Rating         2-07       22       56       Excellent         7-07       16       46       Good         63       18       54       Excellent         25       17       52       Good         r, Redbreast Sunfish, and r, (n=139, 130, and 124, id 16%, respectively).       Exotic Species       Green Sunfish (n=41)         d Redfin Pickerel (n=2) and Warmouth (n=2) (first collections ever), White Sucker (n=1), Eastern itofish (n=22), Pumpkinseed (n=1), and Chainback Darter (n=1). Lost none.       Lost none.	
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Light Penetration (10)       o         Left Riparian Score (5)       5         Right Riparian Score (100)       84         Sample Date       Sample ID         04/18/12       2012-07         04/09/07       2007-07         10/14/99       99-63         06/24/99       99-53         04/27/99       99-25         Most Abundant Species, 2012       Johnny Darter, Redbreast Sunfish, a         Highfin Shiner, (n=139, 130, and 124-18%, 17%, and 16%, respectively).         Species Change Since Last Cycle       Gained Redfin Pickerel (n=         Mosquitofish (n=22), Pumpkii         Data Analysis         Watershed the extreme headwaters of the Tar River basin; drains the e         dischargers in the watershed. Landuse 2006 (from USGS, http://water.us	Substrate       Boulder, cobble, gravel         be ID       Species Total       NCIBI       NCIBI Rating         2-07       22       56       Excellent         7-07       16       46       Good         63       18       54       Excellent         53       18       54       Excellent         25       17       52       Good         r, Redbreast Sunfish, and r, (n=139, 130, and 124, id 16%, respectively).       Exotic Species       Green Sunfish (n=41)         d Redfin Pickerel (n=2) and Warmouth (n=2) (first collections ever), White Sucker (n=1), Eastern itofish (n=22), Pumpkinseed (n=1), and Chainback Darter (n=1). Lost none.       Image: Collection of the section	
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Light Penetration (10)       0         Left Riparian Score (5)       5         Right Riparian Score (100)       84         Sample Date       Sample ID         04/18/12       2012-07         04/09/07       2007-07         10/14/99       99-63         06/24/99       99-53         06/24/99       99-53         04/27/99       99-25         Most Abundant Species, 2012       Johnny Darter, Redbreast Sunfish, a         Highfin Shiner, (n=139, 130, and 124         18%, 17%, and 16%, respectively).         Species Change Since Last Cycle       Gained Redfin Pickerel (n=         Mosquitofish (n=22), Pumpkin         Data Analysis         Watershed the extreme headwaters of the Tar River basin; drains the e         dischargers in the watershed. Landuse 2006 (from USGS, http://water.us         reported) 55% forest, 24% cultivation, and 12% grassland/herbaceous; s         increased from 7 to 12%, and developed land has increased from <0.3 to 5	Substrate       Boulder, cobble, gravel         Del ID       Species Total       NCIBI       NCIBI Rating         2-07       22       56       Excellent         7-07       16       46       Good         63       18       54       Excellent         53       18       54       Excellent         25       17       52       Good         r, Redbreast Sunfish, and r, (n=139, 130, and 124, id 16%, respectively).       Exotic Species       Green Sunfish (n=41)         d Redfin Pickerel (n=2) and Warmouth (n=2) (first collections ever), White Sucker (n=1), Eastern itofish (n=22), Pumpkinseed (n=1), and Chainback Darter (n=1). Lost none.       Iver basin; drains the eastern edge of Person and part of Granville counties; no municipalities or NPDES I USGS, http://water.usgs.gov/osw/streamstats/north_carolina.html, only landuse categories ≥ 5% are rassland/herbaceous; since 1992 forested land has decreased from 77 to 55%, grassland herbaceous has preased from <0.3 to 3.1%. Habitat high quality Carolina Slate Belt-type stream; shallow and deep	
Light Penetration (10)       0         Left Riparian Score (5)       5         Right Riparian Score (100)       84         Sample Date       Sample ID         04/18/12       2012-07         04/09/07       2007-07         10/14/99       99-63         06/24/99       99-53         06/24/99       99-53         04/27/99       99-25         Most Abundant Species, 2012       Johnny Darter, Redbreast Sunfish, a         Highfin Shiner, (n=139, 130, and 124         18%, 17%, and 16%, respectively).         Species Change Since Last Cycle       Gained Redfin Pickerel (n=         Mosquitofish (n=22), Pumpkin         Data Analysis       Watershed the extreme headwaters of the Tar River basin; drains the e         dischargers in the watershed. Landuse 2006 (from USGS, http://water.us         reported) 55% forest, 24% cultivation, and 12% grassland/herbaceous; s         increased from 7 to 12%, and developed land has increased from <0.3 to 3	Substrate       Boulder, cobble, gravel         Del ID       Species Total       NCIBI       NCIBI Rating         2-07       22       56       Excellent         7-07       16       46       Good         63       18       54       Excellent         53       18       54       Excellent         25       17       52       Good         r, Redbreast Sunfish, and r, (n=139, 130, and 124, id 16%, respectively).       Exotic Species       Green Sunfish (n=41)         d Redfin Pickerel (n=2) and Warmouth (n=2) (first collections ever), White Sucker (n=1), Eastern itofish (n=22), Pumpkinseed (n=1), and Chainback Darter (n=1). Lost none.       Iver basin; drains the eastern edge of Person and part of Granville counties; no municipalities or NPDES i USGS, http://water.usgs.gov/osw/streamstats/north_carolina.html, only landuse categories ≥ 5% are rassland/herbaceous; since 1992 forested land has decreased from 77 to 55%, grassland herbaceous has preased from <0.3 to 3.1%. Habitat high quality Carolina Slate Belt-type stream; shallow and deep nges since last cycle. Water Quality very low flow in 2012, specific conductance was near the normal	
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Light Penetration (10)       0         Left Riparian Score (5)       5         Right Riparian Score (100)       84         Sample Date         Sample Date         Sample Date         Od/18/12         Od/2007-07         Od/09/07         Od/2007-07         Od/24/99         Od/27/99         Od/2007         Sample Colspan= 2         Johnny Darter, Redbreast Sunfish, a         Highfin Shiner, (n=139, 130, and 124 <td colspa<="" td=""><td>Substrate       Boulder, cobble, gravel         be ID       Species Total       NCIBI       NCIBI Rating         2-07       22       56       Excellent         7-07       16       46       Good         63       18       54       Excellent         53       18       54       Excellent         25       17       52       Good         r, Redbreast Sunfish, and r, (n=139, 130, and 124, id 16%, respectively).       Exotic Species       Green Sunfish (n=41)         d Redfin Pickerel (n=2) and Warmouth (n=2) (first collections ever), White Sucker (n=1), Eastern itofish (n=22), Pumpkinseed (n=1), and Chainback Darter (n=1). Lost none.         iver basin; drains the eastern edge of Person and part of Granville counties; no municipalities or NPDES n USGS, http://water.usgs.gov/osw/streamstats/nonth_carolina.html, only landuse categories ≥ 5% are raasland/herbaceous; since 1992 forested land has decreased from 77 to 55%, grassland herbaceous has bereased from &lt;0.3 to 3.1%. Habitat high quality Carolina Slate Belt-type stream; shallow and deep nges since last cycle. Water Quality very low flow in 2012, specific conductance was near the normal 12 diverse (most species ever collected at this site) and very abundant (n=779) community; one specim pecial Concern species) and five specimens of Mimic Shiner (<i>Notropis volucellus</i>, a state Significantly Ra due to a more balanced trophic structure in 2012 than in 2007. 2002-2012 moderate-high specimes</td></td>	<td>Substrate       Boulder, cobble, gravel         be ID       Species Total       NCIBI       NCIBI Rating         2-07       22       56       Excellent         7-07       16       46       Good         63       18       54       Excellent         53       18       54       Excellent         25       17       52       Good         r, Redbreast Sunfish, and r, (n=139, 130, and 124, id 16%, respectively).       Exotic Species       Green Sunfish (n=41)         d Redfin Pickerel (n=2) and Warmouth (n=2) (first collections ever), White Sucker (n=1), Eastern itofish (n=22), Pumpkinseed (n=1), and Chainback Darter (n=1). Lost none.         iver basin; drains the eastern edge of Person and part of Granville counties; no municipalities or NPDES n USGS, http://water.usgs.gov/osw/streamstats/nonth_carolina.html, only landuse categories ≥ 5% are raasland/herbaceous; since 1992 forested land has decreased from 77 to 55%, grassland herbaceous has bereased from &lt;0.3 to 3.1%. Habitat high quality Carolina Slate Belt-type stream; shallow and deep nges since last cycle. Water Quality very low flow in 2012, specific conductance was near the normal 12 diverse (most species ever collected at this site) and very abundant (n=779) community; one specim pecial Concern species) and five specimens of Mimic Shiner (<i>Notropis volucellus</i>, a state Significantly Ra due to a more balanced trophic structure in 2012 than in 2007. 2002-2012 moderate-high specimes</td>	Substrate       Boulder, cobble, gravel         be ID       Species Total       NCIBI       NCIBI Rating         2-07       22       56       Excellent         7-07       16       46       Good         63       18       54       Excellent         53       18       54       Excellent         25       17       52       Good         r, Redbreast Sunfish, and r, (n=139, 130, and 124, id 16%, respectively).       Exotic Species       Green Sunfish (n=41)         d Redfin Pickerel (n=2) and Warmouth (n=2) (first collections ever), White Sucker (n=1), Eastern itofish (n=22), Pumpkinseed (n=1), and Chainback Darter (n=1). Lost none.         iver basin; drains the eastern edge of Person and part of Granville counties; no municipalities or NPDES n USGS, http://water.usgs.gov/osw/streamstats/nonth_carolina.html, only landuse categories ≥ 5% are raasland/herbaceous; since 1992 forested land has decreased from 77 to 55%, grassland herbaceous has bereased from <0.3 to 3.1%. Habitat high quality Carolina Slate Belt-type stream; shallow and deep nges since last cycle. Water Quality very low flow in 2012, specific conductance was near the normal 12 diverse (most species ever collected at this site) and very abundant (n=779) community; one specim pecial Concern species) and five specimens of Mimic Shiner ( <i>Notropis volucellus</i> , a state Significantly Ra due to a more balanced trophic structure in 2012 than in 2007. 2002-2012 moderate-high specimes
Light Peneration (10)       0         Left Riparian Score (5)       5         Right Riparian Score (5)       4         Total Habitat Score (100)       84         Sample Date       Sample ID         04/18/12       2012-07         04/09/07       2007-07         10/14/99       99-63         06/24/99       99-53         04/27/99       99-25    Most Abundant Species, 2012  Johnny Darter, Redbreast Sunfish, a Highfin Shiner, (n=139, 130, and 124-18%, 17%, and 16%, respectively).  Species Change Since Last Cycle  Gained Redfin Pickerel (n=Mosquitofish (n=22), Pumpkin Data Analysis Watershed the extreme headwaters of the Tar River basin; drains the extreme headwaters of the Tar River basin; drains the extreme dischargers in the watershed. Landuse 2006 (from USGS, http://water.us reported) 55% forest, 24% cultivation, and 12% grassland/herbaceous; sincreased from 7 to 12%, and developed land has increased from <0.3 to 3 pools; shallow riffles and rocky runs; no habitat changes since last cycle. range for the site, previous range 69-81 µS/cm. 2012 diverse (most specied) of the Carolina Darter ( <i>Etheostoma collis</i> , a state Special Concern species species) were collected; improvement in rating was due to a more balance diversity; 28 species known from the site including 4 darters, 4 suckers, 6	Substrate       Boulder, cobble, gravel         bit ID       Species Total       NCIBI       NCIBI Rating         2-07       22       56       Excellent         7-07       16       46       Good         63       18       54       Excellent         53       18       54       Excellent         25       17       52       Good         7, Redbreast Sunfish, and r, (n=139, 130, and 124, id 16%, respectively).       Exotic Species       Green Sunfish (n=41)         d Redfin Pickerel (n=2) and Warmouth (n=2) (first collections ever), White Sucker (n=1), Eastern itofish (n=22), Pumpkinseed (n=1), and Chainback Darter (n=1). Lost none.         iver basin; drains the eastern edge of Person and part of Granville counties; no municipalities or NPDES to USGS, http://water.usgs.gov/osw/streamstats/north_carolina.html, only landuse categories ≥ 5% are rassland/herbaceous; since 1992 forested land has decreased from 77 to 55%, grassland herbaceous has neceased from <0.3 to 3.1%. Habitat high quality Carolina Slate Belt-type stream; shallow and deep nges since last cycle. Water Quality very low flow in 2012, specific conductance was near the normal 12 diverse (most species ever collected at this site) and very abundant (n=779) community; one specim pecial Concern species) and five specimens of Mimic Shiner (Notropis volucellus, a state Significantly Ra due to a more balanced trophic structure in 2012 than in 2007. 2002-2012 moderate-high species         1 darters, 4 suckers, 6 cyprinids, 7 sunfish, and 4 intolerant specices (Pinewoods Shi	
Light Peneration (10)       0         Left Riparian Score (5)       5         Right Riparian Score (5)       4         Total Habitat Score (100)       84         Sample Date       Sample ID         04/18/12       2012-07         04/09/07       2007-07         10/14/99       99-63         06/24/99       99-53         04/27/99       99-25         Most Abundant Species, 2012       Johnny Darter, Redbreast Sunfish, a         Highfin Shiner, (n=139, 130, and 124-18%, 17%, and 16%, respectively).         Species Change Since Last Cycle       Gained Redfin Pickerel (n=Mosquitofish (n=22), Pumpkit)         Data Analysis       Watershed the extreme headwaters of the Tar River basin; drains the e         dischargers in the watershed. Landuse 2006 (from USGS, http://water.us       reported) 55% forest, 24% cultivation, and 12% grassland/herbaceous; s         increased from 7 to 12%, and developed land has increased from <0.3 to 3	Substrate       Boulder, cobble, gravel         ble ID       Species Total       NCIBI       NCIBI Rating         2-07       22       56       Excellent         7-07       16       46       Good         63       18       54       Excellent         53       18       54       Excellent         25       17       52       Good         r, Redbreast Sunfish, and r, (n=139, 130, and 124, id 16%, respectively).       Exotic Species       Green Sunfish (n=41)         d Redfin Pickerel (n=2) and Warmouth (n=2) (first collections ever), White Sucker (n=1), Eastern itofish (n=22), Pumpkinseed (n=1), and Chainback Darter (n=1). Lost none.         ver basin; drains the eastern edge of Person and part of Granville counties; no municipalities or NPDES n USGS, http://water.usgs.gov/osw/streamstats/north_carolina.html, only landse, categories ≥ 5% are rassland/herbaceous; since 1992 forested land has decreased from 77 to 55%, grassland herbaceous has rcreased from <0.3 to 3.1%. Habitat high quality Carolina Slate Belt-type stream; shallow and deep nges since last cycle. Water Quality very low flow in 2012, specific conductance was near the normal 12 diverse (most species ever collected at this site) and very abundant (n=779) community; one specim pecial Concern species) and five specimens of Mimic Shiner ( <i>Notropis volucellus</i> , a state Significantly Ra due to a more balanced trophic structure in 2012 than in 2007. 2002-2012 moderate-high species 4 datrers, 4 suckers, 6 cyprinids, 7 sunfish, and 4 intolerant species ( <i>Innevoods</i> Shiner, Mimic Shiner, 4 datrers, 4 su	
Light Perietration (10)       0         Left Riparian Score (5)       5         Right Riparian Score (5)       4         Total Habitat Score (100)       84         Sample Date       Sample ID         04/18/12       2012-07         04/09/07       2007-07         10/14/99       99-63         06/24/99       99-53         04/27/99       99-25         Most Abundant Species, 2012       Johnny Darter, Redbreast Sunfish, a         Highfin Shiner, (n=139, 130, and 124         18%, 17%, and 16%, respectively).         Species Change Since Last Cycle         Gained Redfin Pickerel (n=         Mosquitofish (n=22), Pumpkit         Data Analysis         Watershed the extreme headwaters of the Tar River basin; drains the e         dischargers in the watershed. Landuse 2006 (from USGS, http://water.us         reported) 55% forest, 24% cultivation, and 12% grassland/herbaceous; s         increased from 7 to 12%, and developed land has increased from <0.3 to 3	Substrate       Boulder, cobble, gravel         De ID       Species Total       NCIBI       NCIBI Rating         2-07       22       56       Excellent         7-07       16       46       Good         63       18       54       Excellent         53       18       54       Excellent         25       17       52       Good         r, Redbreast Sunfish, and r, (n=139, 130, and 124, id 16%, respectively).       Exotic Species       Green Sunfish (n=41)         d Redfin Pickerel (n=2) and Warmouth (n=2) (first collections ever), White Sucker (n=1), Eastern itiofish (n=22), Pumpkinseed (n=1), and Chainback Darter (n=1). Lost none.         iver basin; drains the eastern edge of Person and part of Granville counties; no municipalities or NPDES 0 USGS, http://water.usgs.gov/osw/streamstats/north_carolina.html, only landuse categories ≥ 5% are rassland/herbaceous; since 1992 forested land has decreased from 77 to 55%, grassland herbaceous has creased from <0.3 to 3.1%. Habitat high quality Carolina Slate Belt-type stream; shallow and deep nges since last cycle. Water Quality very low flow in 2012, specific conductance was near the normal 12 - diverse (most species ever collected at this site) and very abundant (n=779) community; one specim pecial Concern species) and five specimens of Mimic Shiner ( <i>Natropis volucellus</i> , a state Significantly Ra due to a more balanced trophic structure in 2012 than in 2007. 2002-2012 moderate-high species 4 darters, 4 suckers, 6 cyprinids, 7 sunfish, and 4 intolerant specise (Pinewoods Shiner, Mimic Shiner, species is the int	
Light Perietration (10)       0         Left Riparian Score (5)       5         Right Riparian Score (5)       4         Total Habitat Score (100)       84         Sample Date       Sample ID         04/18/12       2012-07         04/09/07       2007-07         10/14/99       99-63         06/24/99       99-53         04/27/99       99-25         Most Abundant Species, 2012       Johnny Darter, Redbreast Sunfish, a         Highfin Shiner, (n=139, 130, and 124/18%, 17%, and 16%, respectively).         Species Change Since Last Cycle       Gained Redfin Pickerel (n=Mosquitofish (n=22), Pumpkin)         Data Analysis       Watershed the extreme headwaters of the Tar River basin; drains the edischargers in the watershed. Landuse 2006 (from USGS, http://water.us         reported) 55% forest, 24% cultivation, and 12% grassland/herbaceous; sincreased from 7 to 12%, and developed land has increased from <0.3 to 2	Substrate       Boulder, cobble, gravel         Del D       Species Total       NCIBI       NCIBI Rating         2-07       22       56       Excellent         7-07       16       46       Good         63       18       54       Excellent         53       18       54       Excellent         25       17       52       Good         r, Redbreast Sunfish, and r, (n=139, 130, and 124, nd 16%, respectively).       Exotic Species       Green Sunfish (n=41)         d Redfin Pickerel (n=2) and Warmouth (n=2) (first collections ever), White Sucker (n=1), Eastern itofish (n=22), Pumpkinseed (n=1), and Chainback Darter (n=1). Lost none.         iver basin; drains the eastern edge of Person and part of Granville counties; no municipalities or NPDES 10 USGS, http://water.uggs.gov/osw/streamstats/north_carolina.html, only landuse categories > 5% are rassland/herbaceous; since 1992 biotested land has decreased from 71 to 55%, grassland herbaceous has creased from <0.3 to 3.1%. H2bittat - high quality Carolina Slate Belt-type stream, shallow and deep nges since last cycle. Water Quality very low flow in 2012, specific conductance was near the normal 12 - diverse (ms species) and five speciemens of Minic Shiner (Notropis volucellus, a state Significantly Ra due to a more balanced trophic structure in 2012 than in 2007. 2002-2012 moderate-high species 1 darters, 4 suckers, 6 cyprinids, 7 sunfish, and 4 intolerant species (Pinewoods Shiner, Minic Shiner, Jine Species 1 darters, 4 suckers, 6 cyprinids, 7 sunfish, and 4 intolerant species (Pinewoods Shiner, Minic Shiner, 1999	
Bank Vegetation (7) 6		
Bottom Substrate (15)		
Bottom Substrate (15) 12		
Bottom Substrate (15)		
Instream Habitat (20) 18	and the second sec	
Instream Habitat (20) 18		
Channel Modification (5)   5     Instream Habitat (20)   18		
Habitat Assessment Scores (max)       Channel Modification (5)     5       Instream Habitat (20)     18		
Habitat Assessment Scores (max)       Channel Modification (5)       Instream Habitat (20)       18		
Habitat Assessment Scores (max)       Channel Modification (5)       Instream Habitat (20)       18		
Water Clarity     Clear       Habitat Assessment Scores (max)       Channel Modification (5)       Instream Habitat (20)       18		
pH (s.u.)     6.3       Water Clarity     Clear       Habitat Assessment Scores (max)     Channel Modification (5)       Channel Modification (5)     5       Instream Habitat (20)     18		
specific Conductance (µS/cm)     83       pH (s.u.)     6.3       Water Clarity     Clear       Habitat Assessment Scores (max)     Channel Modification (5)       Channel Modification (5)     5       Instream Habitat (20)     18		
Specific Conductance (µS/cm) PH (s.u.) Water Clarity Habitat Assessment Scores (max) Channel Modification (5) Instream Habitat (20) 18		
Dissolved Oxygen (mg/L)     7.3       Specific Conductance (µS/cm)     83       pH (s.u.)     6.3       Water Clarity     Clear       Habitat Assessment Scores (max)     Channel Modification (5)       Channel Modification (5)     5       Instream Habitat (20)     18		
Temperature (°C)       17.6         Dissolved Oxygen (mg/L)       7.3         Specific Conductance (µS/cm)       83         pH (s.u.)       6.3         Water Clarity       Clear         Habitat Assessment Scores (max)       Channel Modification (5)         Channel Modification (5)       5         Instream Habitat (20)       18		
Water Quality Parameters         Temperature (°C)       17.6         Dissolved Oxygen (mg/L)       7.3         Specific Conductance (µS/cm)       83         pH (s.u.)       6.3         Water Clarity       Clear         Habitat Assessment Scores (max)       5         Channel Modification (5)       5         Instream Habitat (20)       18	6 3 3	
Water Quality Parameters         Temperature (°C)       17.6         Dissolved Oxygen (mg/L)       7.3         Specific Conductance (µS/cm)       83         pH (s.u.)       6.3         Water Clarity       Clear         Habitat Assessment Scores (max)       5         Channel Modification (5)       5         Instream Habitat (20)       18	6 3 3	
None         Water Quality Parameters         Temperature (°C)       17.6         Dissolved Oxygen (mg/L)       7.3         Specific Conductance (µS/cm)       83         pH (s.u.)       6.3         Water Clarity       Clear         Habitat Assessment Scores (max)       5         Channel Modification (5)       5         Instream Habitat (20)       18	GD and within Thine) IN DES with being with the second sec	
Visible Landuse ( $n_0$ ) $n_0$ Upstream NPDES Dischargers (> 1MGD or <1 MGD and within 1 mile)         None         Water Quality Parameters         Temperature (°C)       17.6         Dissolved Oxygen (mg/L)       7.3         Specific Conductance ( $\mu$ S/cm)       83         pH (s.u.)       6.3         Water Clarity       Clear         Habitat Assessment Scores (max)       5         Channel Modification (5)       5         Instream Habitat (20)       18         Dimensional Matrix (20)       18	GD and within 1 mile) NPDES Number Volume (Q <sub>w</sub> , MGD) 	
Forested/Wetland       Rural Reside         Visible Landuse (%)       75       25         Upstream NPDES Dischargers (> 1MGD or <1 MGD and within 1 mile)	d     Rural Residential     Agriculture     Other (describe)       25     0     0       GD and within 1 mile)     NPDES Number     Volume (Qw, MGD)          Site Photograph       6     3       3	
VIS-IV, NSW20433Forested/WetlandRural ResideVisible Landuse (%)7525Upstream NPDES Dischargers (> 1MGD or <1 MGD and within 1 mile)NoneWater Quality ParametersTemperature (°C)17.6Dissolved Oxygen (mg/L)7.3Specific Conductance ( $\mu$ S/cm)83PH (s.u.)Water ClarityClearHabitat Assessment Scores (max)Channel Modification (5)5Issue Output (20)18	433       II       0.4       Tes         d       Rural Residential       Agriculture       Other (describe)         25       0       0         GD and within 1 mile)       NPDES Number       Volume (Q <sub>w</sub> , MGD)         Image: Step Photograph         6       3       3         3       Image: Step Photograph       Image: Step Photograph	
Stream ClassificationDrainage Area (mi²)Elevation (fWS-IV;NSW26435Forested/WetlandRural ResideVisible Landuse (%)7525Upstream NPDES Dischargers (> 1MGD or <1 MGD and within 1 mile)	i') Elevation (ft) Stream Width (m) Average Depth (m) Reference Situ 435 11 0.4 Yes d Rural Residential Agriculture Other (describe) 25 0 0 0 GD and within 1 mile) NPDES Number Volume (Q <sub>w</sub> , MGD)  Site Photograph 6 3 4 5 6 5 6 5 6 5 6 6 6 7 7 7 7 7 7 7 7 7 7 7 7 7	
GRANVILLE103020101 $36.33333333$ -Stream ClassificationDrainage Area (mi²)Elevation (fWS-IV;NSW26435Forested/WetlandRural ResideVisible Landuse (%)7525Upstream NPDES Dischargers (> 1MGD or <1 MGD and within 1 mile)NoneNoneWater Quality Parameters7.3Temperature (°C)17.6Dissolved Oxygen (mg/L)7.3Specific Conductance ( $\mu$ S/cm)83pH (s.u.)6.3Water ClarityClearHabitat Assessment Scores (max)5Channel Modification (5)5Instream Habitat (20)18	36.33333333       -78.76833333       28-(1)       Carolina Slate Belt         i <sup>2</sup> )       Elevation (ft)       Stream Width (m)       Average Depth (m)       Reference Situ         435       11       0.4       Yes         d       Rural Residential       Agriculture       Other (describe)         25       0       0         GD and within 1 mile)       NPDES Number       Volume (Qw, MGD)            Site Photograph	
CountySubbasin8 digit HUCLatitudeGRANVILLE103020101 $36.33333333$ -Stream ClassificationDrainage Area (mi <sup>2</sup> )Elevation (fWS-IV;NSW26435Forested/WetlandRural ResideVisible Landuse (%)7525Upstream NPDES Dischargers (> 1MGD or <1 MGD and within 1 mile)NoneNoneWater Quality Parameters17.6Temperature (°C)17.6Dissolved Oxygen (mg/L)7.3Specific Conductance ( $\mu$ S/cm)83pH (s.u.)6.3Water ClarityClearHabitat Assessment Scores (max)5Channel Modification (5)5Instream Habitat (20)18Dime Out black (20)18	Latitude     Longitude     AU Number     Level IV Ecoregion       36.3333333     -78.76833333     28-(1)     Carolina Slate Belt       i <sup>2</sup> )     Elevation (ft)     Stream Width (m)     Average Depth (m)     Reference Situ       435     11     0.4     Yes       d     Rural Residential     Agriculture     Other (describe)       25     0     0       GD and within 1 mile)     NPDES Number     Volume (Q, MGD)	
IAR RUS 158CountySubbasin8 digit HUCLatitudeGRANVILLE103020101 $36.33333333$ -Stream ClassificationDrainage Area (mi²)Elevation (fWS-IV;NSW26435Forested/WetlandRural ResideVisible Landuse (%)7525Upstream NPDES Dischargers (> 1MGD or <1 MGD and within 1 mile)	US 158     04/18/12     OF44     Excellent       Latitude     Longitude     AU Number     Level IV Ecoregion       36.3333333     -78.76833333     28-(1)     Carolina Slate Belt       i <sup>2</sup> )     Elevation (ft)     Stream Width (m)     Average Depth (m)     Reference Site       435     11     0.4     Yes       d     Rural Residential     Agriculture     Other (describe)       25     0     0       GD and within 1 mile)     NPDES Number     Volume (Q <sub>w</sub> , MGD)	
TAR R       US 158         County       Subbasin       8 digit HUC       Latitude         GRANVILLE       1       03020101       36.33333333       -         Stream Classification       Drainage Area (mi²)       Elevation (f         WS-IV;NSW       26       435         Forested/Wetland       Rural Reside         Visible Landuse (%)       75       25         Upstream NPDES Dischargers (> 1MGD or <1 MGD and within 1 mile)       None         Water Quality Parameters       Temperature (°C)       17.6         Dissolved Oxygen (mg/L)       83       6.3         Specific Conductance (µS/cm)       83       6.3         PH (s.u.)       Clear       Habitat Assessment Scores (max)       5         Channel Modification (5)       5       18       18         Dime Output (20)       18       18       18	US 158 04/18/12 OF44 Excellent          Latitude       Longitude       AU Number       Level IV Ecoregion         36.3333333       -78.76833333       28-(1)       Carolina Slate Belt         i²)       Elevation (ft)       Stream Width (m)       Average Depth (m)       Reference Site         435       11       0.4       Yes         d       Rural Residential       Agriculture       Other (describe)         25       0       0         GD and within 1 mile)       NPDES Number       Volume (Qw, MGD)         Site Photograph	

Waterbo	ody		L	ocation		Dat	e	Station ID		Bioclass	sification
N FK TA	AR R		SF	R 1151		04/16	6/12	OF60		Go	od
County	Subba	asin	8 diait HUC	Latitude	Lone	aitude		AU Number	<b>I</b>	Level IV	Ecoregion
GRANVILLE	1		03020101	36.299579	-78.7	007895		28-5		Carolina	Slate Belt
Stream Classifica	ation	Drai	nage Area (mi <sup>2</sup> )	Elevatio	on (ft)	Stre	am Wid	th (m)	Average I	Depth (m)	Reference Site
WS-IV;NSW		Bran	21.2	38	0		6		0	.3	No
_ , _		For	actod/Motiond	Burol B	ocidontial		Aar	ioulturo		Othor (a	locariba)
Visible Landuse	e (%)	FOr	85		5		Agr	10		Other (C	0
Upstream NPDES D	ischarge	rs (> 1	MGD or <1 MGD a	and within 1	mile)			NPDES Nu	umber	Va	lume (Q <sub>w.</sub> MGD)
		,	None		,						
Water Quality Paran	neters							Site	Photograp	h	
Temperature (°C)			17.0	1		695	S	No. and	1		-ALLA
Dissolved Oxygen (m	na/L)		6.0			Cash	11	and the second second	all and a	17 A MAR	
Specific Conductance	(uS/cm)		116							142	
	ς (μο/σπι)		63				1		a and a	The Parks	
рп (s.u.)			0.3			15 30	1		N Lightle		
Water Clarity	Γ		Clear	1	113			and the	1 the	- Int-	CHAR-
,	L			1		444	a de	See St.	- H		
Habitat Assessment	t Scores (	(max)	_	_					1. 115	The state	
Channel Modification	(5)		5				A STATE		the state	计学学学	The second
Instream Habitat (20)			11				IN LE	Wester Hand St.			4
Bottom Substrate (15	5)		4		-	-		and the second		No. Inter-	STREET, ST
Riffle Habitat (16)	)		3		and a	ALS.	and the second			a state	
Pool Variety (10)						(Lindler		State.		- 5.1	Alexandra .
Fool vallety (10)			4		And a			and the second s	der sie		A PARTY AND
			3		N. M. Da					for the second	The second second
Bank Vegetation (7)			6						5 Jan St		
Light Penetration (10)	)		10		T State	.9					- AND
Left Riparian Score (S	5)		5						1970	and a set	
Right Riparian Score	(5)		5								
Total Habitat Score	(100)		56	Sub	ostrate	Sand, gr	avel				
Sample Dat	e		Sample I	)	Spe	ecies Tota	al	N	CIBI		NCIBI Rating
04/16/12			2012-01			18			50		Good
04/09/07			2007-08	450		18			58		Excellent
10/14/99		-	99-64 @ US	158		15			46		Good
06/24/99			99-54 @ US	158		20			48		Good
04/00/99			99-02 @ 03	158		23			40 54		Excellent
04/07/92			92-05 @ US	158		16			46		Good
Most Abundant Spe	cies, 201	2	Bluehead Chub ar and 74, 23% and 2	nd White Shin 22%, respecti	er (n= 78 vely.	Exotic	c Specie	es Gre	een Sunfish	(n=16)	0000
Species Change Sin	nce Last (	Cycle	<b>Gained</b> Shiner (n= sunfish hyt	Golden Shine 1), Pinewoods orid (n=1), Roa	er (n=5), Pi s Shiner (n anoke Bas	irate Perch =9), White ss (n=3), a	n (n=1), \ e Sucker nd Large	Warmouth (n= (n=2), Northe mouth Bass (i	6), and Blac rn Hog Sucl n=1).	ck Crappie (n= ker (n=2), Cha	:1). <b>Lost</b> Highfin in Pickerel (n=3),
Data Analysis											
Watershed drains upstream from the cre (from USGS, http://wa developed, and 9% g Habitat shallow po oxygen at 62% of sat diversity of suckers a parasitic nematode w conditions resulting in	north-cen eek's conf ater.usgs. rassland/l ols, snags uration; sp nd intolera hich seen	tral Gra gov/os herbac s, and s pecific ant spe hs to p	anville County; no e with the river; wat w/streamstats/norf eous; since 1992 f small gravel riffles; conductance was eccies, low percenta referentially infect l d graved rich	municipalities ershed includ h_carolina.htu orested land h deeply entrer the greatest e ge of piscivor Bluegill) result	or NPDES les the Nor ml, only lan has decreat has decr	S discharger thern Outer nduse cate ased from 0 sloughing led at the s moderately rating decli	ers in the er Piedm egories ≥ 69 to 55 <sup>0</sup> I banks v site, prev y high pe ine from	e watershed; ti nont and the C 5% are repor % and develop vith moderate vious range wa ercentage of B Excellent to G	ributary to th arolina Slate ted) 59% bed land has erosion. Wa as 78-94 µS/ luegill with p iood; rating	e Tar River; s e Belt ecoregio forest, 27% co is increased fro ater Quality - cm. 2012 s oopeye diseass decline was re os site includio	site is ~ 1.2 miles ons. Landuse 2006 ultivation, 5% om 0.8 to 5.5%. - low flow, dissolved slight decrease in the e (caused by a elated to low flow on 3 datters, 5
suckers, 10 cyprinids	, 9 sunfish	n, and	3 intolerant species	s (Pinewoods	Shiner, Ro	banoke Da	arter, and	d Chainback D	arter); domi	nant species i	s the omnivorous

Bluehead Chub; ratings have varied from a low Good to a high Excellent depending upon the flow; the mean annual discharge (ft<sup>3</sup>/sec) for the USGS gage site

on the Tar River near Tar River was 72.4 in 2007 and 39.8 in 2012; since 2009 the means have decreased from 188.2 to 95.2 to 41.7 to 39.8 ft<sup>3</sup>/sec. **Recommendation** -- continued basinwide assessment of this site in 2017. Overall, a decline in fish community rating was likely due to persistent low flow conditions.

		Date	Station ID	Bioclas	sification
FISHING CR SR 1609		06/20/12	OF76	Exc	ellent
County Subbasin 8 digit HUC Latitude	Long	jitude	AU Number	Level IV	/ Ecoregion
WARREN 4 03020102 36.339067	-78.1	28844	28-79-(1)	Northern C	Outer Piedmont
Stream Classification Drainage Area (mi <sup>2</sup> ) Eleva	ation (ft)	Stream Wie	dth (m) A	verage Depth (m)	Reference Site
C,NSW 75.8	215	11		0.4	No
Forested/Wetland Rural	Residential	Aq	riculture	Other (	describe)
Visible Landuse (%) 100	0	J	0		0
Unstream NPDES Dischargers (> 1MGD or <1 MGD and within	1 mile)			ber V	olume (Q_MGD)
Town of Warrenton's WWTP	i iiiie)		NC002083	4	2.0
			Site Dk	etegraph	
Water Quality Parameters			Site Pr	lotograph	
Disselved Owerser (mg/l )					
Dissolved Oxygen (Ing/L) 5.8					
	- 9 A		X		and the second second
prr (s.u.)					State 1
Water Clarity Slightly turbid; greenish		States 4			
	1. 1.3			A PARA	the second
Habitat Assessment Scores (max)					Sime State
Channel Modification (5) 5	100				
Instream Habitat (20) 10	and the second			-18-8-7	and the second
Bottom Substrate (15) 2				is a start	- There
Riffle Habitat (16) 0	A LOUGH		The I do not		Contraction of the
Pool Variety (10) 10		and the second	and some and the		
Erosion (7) 6			1 to the second		1 20 C
Bank Vegetation (7) 7				ALS SE	All and a second se
Light Penetration (10) 10				The second	and the second s
Left Riparian Score (5) 5					
Right Riparian Score (5) 5					
Total Habitat Score (100) 60 S	Substrate	Sand, silt, clay			
Sample Date Sample ID	Spe	ecies Total	NCIE	31	NCIBI Rating
06/20/12 2012-65		24	54		Excellent
05/07/07 2007-39 @ SR 1600		21	58		Excellent
05/24/99 99-36 @ SR 1600		24	54		Excellent
04/16/97 97-28 @ SR 1600		24	60		Excellent
02/04/93 93-04 @ SR 1600		26	48		Good
	voods Shiner ,	Exotic Spec	ies None, been	only 1 fish (a single G collected out of 1,371	Green Sunfish) has fish at this site.
Most Abundant Species, 2012 (n=58 and 55, 18% and 17%, respectively).		-			
Most Abundant Species, 2012       Reddreast Suntish and Pinev (n=58 and 55, 18% and 17%, respectively).         Species Change Since Last Cycle       Gained Bull Chub (n=2), Bluegill (n=1), a Sunfish (n=1), and Glastic sunfish (n=1), and Gl	n=2), Mimic S and Mud Sunt assy Darter (r	<b>⊣</b> Shiner (n=19), Wl fish (n=1). <b>Lost</b> - n=11).	nite Sucker (n=1), Northern Hog Su	Notchlip Redhorse (n= ucker (n=7), Yellow Bu	=2), Redfin Pickerel Illhead (n=1), Green
Most Abundant Species, 2012       Reddreast Suntish and Pinev (n=58 and 55, 18% and 17%, respectively).         Species Change Since Last Cycle       Gained Bull Chub (n=2), Bluegill (n=1), a Sunfish (n=1), and Gla         Data Analysis       Data Analysis	n=2), Mimic S and Mud Sunf assy Darter (r	J Shiner (n=19), WI fish (n=1). Lost n=11).	hite Sucker (n=1), Northern Hog Su	Notchlip Redhorse (n= ucker (n=7), Yellow Bu	=2), Redfin Pickerel Illhead (n=1), Green
Most Abundant Species, 2012       Redbreast Suntish and Pinew (n=58 and 55, 18% and 17%, respectively).         Species Change Since Last Cycle       Gained Bull Chub (n=2), Bluegill (n=1), and Gla         Data Analysis       Site was moved one bridge (2.7 miles) downstream due to beavered	n=2), Mimic S and Mud Suni assy Darter (r dam at the SR	Chiner (n=19), Wi fish (n=1). Lost - n=11).	hite Sucker (n=1), Northern Hog Su ence in the drainag	Notchlip Redhorse (na ucker (n=7), Yellow Bu ge area was 17.4 mi <sup>2</sup> ;	=2), Redfin Pickerel Illhead (n=1), Green no significant

difference in landuse percentages. **Watershed** -- large tributary to the Tar River; drains north-central Vance and central Warren counties; small municipalities in the watershed include the towns of Norlina and Warrenton. **Landuse 2006** (from USGS, http://water.usgs.gov/osw/streamstats/north\_carolina.html, , only landuse categories  $\geq$  5% are reported) -- 59% forest, 16% cultivation, 8% developed, and 10% grassland/herbaceous; since 1992 forested land has decreased from 73 to 59% and developed land has increased from 3.5 to 8.4%. **Habitat** -- old mill site; coarse woody debris and large snags; no riffles at low flow conditions; wide forested riparian zones; slick substrate. **Water Quality** -- low flow in 2012, dissolved oxygen at 65% of saturation; specific conductance was the greatest ever recorded from this stream, previous range was 56-107 µS/cm. **2012** -- abundant and diverse community with more species collected than at any other site in the Tar River basin in 2012 including five species of suckers; slightly lower than expected percentage of Omnivores+Herbivores and species with multiple age classes; 19 specimens of Mimic Shiner (*Notropis volucellus*, a state Significantly Rare species) were collected. **1993-2012** -- very high species diversity; 36 species known from the site including 4 darters, 6 suckers, 10 cyprinids, 8 sunfish, and 4 intolerant species (Pinewoods Shiner, Mimic Shiner, Roanoke Darter, and Chainback Darter); dominant species are the intolerant Pinewoods Shiner and intermediate Tessellated Darter; Least Brook Lamprey (*Lampetra* aepyptera, a state Threatened species) has not been collected from this stream since May 1999; has consistently rated Excellent for past 15 years, even in 2012 during a low flow period. **Recommendation** -- continued basinwide assessment of this site in 2017. Overall no change in water quality in the Fishing Creek watershed.