FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
BEAR SWP	**NC 561**	**06/20/12**	**OF2**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
HALIFAX	4	03020102	36.2779312	-77.8841524	28-79-25-7	Northern Outer Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;NSW	42.8	200	7	0.4	No

	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
Visible Landuse (%)	100	0	0	0

Upstream NPDES Dischargers (> 1MGD or <1 MGD and within 1 mile)	NPDES Number	Volume (Q_w, MGD)
None	---	---

Water Quality Parameters

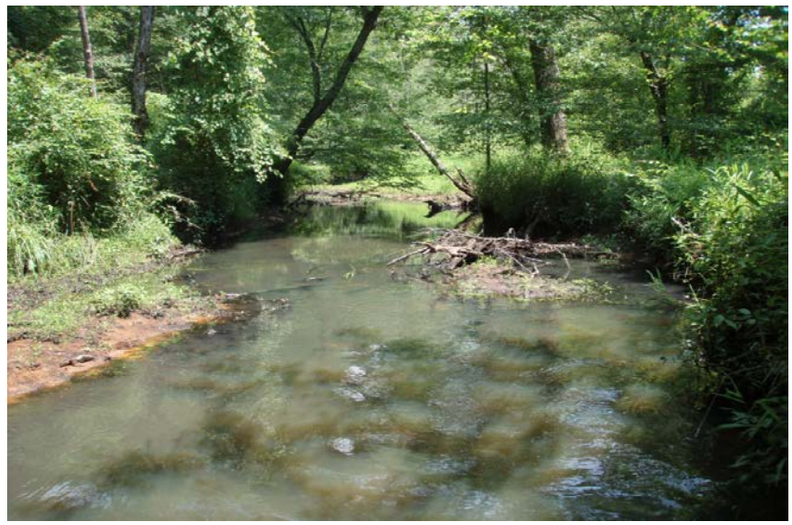
Temperature (°C)	25.7
Dissolved Oxygen (mg/L)	4.0
Specific Conductance (µS/cm)	110
pH (s.u.)	6.1

Water Clarity: Slightly turbid; greenish

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	4
Riffle Habitat (16)	7
Pool Variety (10)	8
Erosion (7)	7
Bank Vegetation (7)	6
Light Penetration (10)	8
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	73

Site Photograph



Substrate: Gravel, sand

Sample Date	Sample ID	Species Total	NCIBI	NCIBI Rating
06/20/12	2012-66	20	46	Good
05/07/07	2007-40	25	52	Good
04/11/02	2002-10	20	52	Good

Most Abundant Species, 2012: Redbreast Sunfish (n=93, 44%)

Exotic Species: None, only 3 fish (Green Sunfish) have been collected out of 722 fish at this site.

Species Change Since Last Cycle: **Gained** -- Bowfin and Largemouth Bass (n=1 each, first collections ever) and Bluegill (n=1). **Lost** -- Pinewoods Shiner (n=13), V-lip Redhorse (n=2), Northern Hog Sucker (n=3), Redfin Pickerel (n=4), Flier (n=1), Green Sunfish (n=3), and Chainback Darter (n=2).

Data Analysis

Watershed -- drains the west-southwest corner of Halifax County; the Town of Littleton is located within the extreme headwaters; borders the Rolling Coastal Plain; Town of Littleton's WWTP (NC0025691, Qw = 0.28) is located ~ 11 miles upstream on Butterwood Creek a tributary to Bear Swamp; Bear Swamp is a tributary to Little Fishing Creek, site is located ~ 1.8 miles upstream from the creek's confluence with Little Fishing Creek. **Landuse 2006** (from USGS, http://water.usgs.gov/osw/streamstats/north_carolina.html, only landuse categories ≥ 5% are reported) -- 64% forest, 16% cultivation, and 7% grassland/herbaceous; since 1992 forested land has decreased from 79 to 64% and developed land has increased from 1 to 4%. **Habitat** -- Coastal Plain-like; snags; several species of aquatic plants; submerged deadfalls and coarse woody debris; right riparian zone logged within last five years. **Water Quality** -- very low flow in 2012, dissolved oxygen at 49% of saturation; specific conductance was greatest ever recorded at this site, previous range was 64-83 µS/cm. **2012** -- not as abundant (fewest fish of any site in the Tar River basin in 2012) and diverse as expected (total diversity and diversity of major groups) and with a moderately high percentage of tolerant fish (47%); two intolerant species (Pinewoods Shiner and Chainback Darter) present in 2007 were 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.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
CEDAR CR	SR 1109	04/17/12	OF7	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
FRANKLIN	1	03020101	36.06	-78.35388889	28-29-(2)b	Northern Outer Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;NSW	40.2	220	7	0.4	No

	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
Visible Landuse (%)	95	5	0	0

Upstream NPDES Dischargers (> 1MGD or <1 MGD and within 1 mile)	NPDES Number	Volume (Q_w, MGD)
Town of Franklin's WWTP, ~ 4.1 miles upstream	NC0069311	3.0

Water Quality Parameters

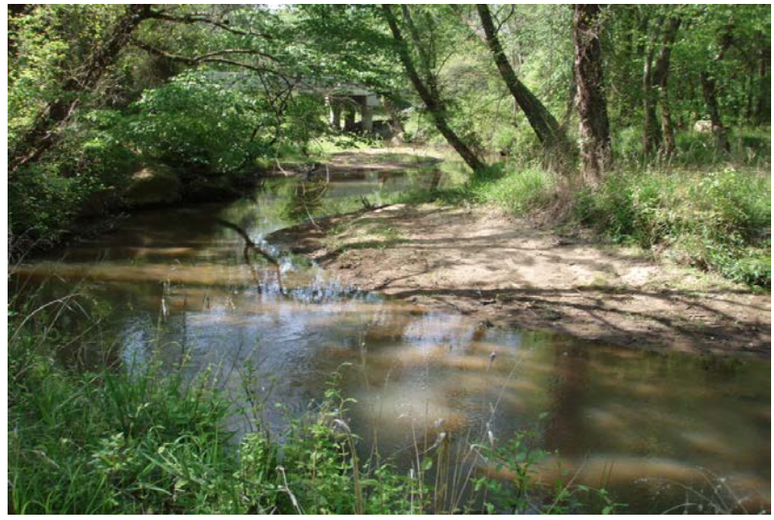
Temperature (°C)	19.4
Dissolved Oxygen (mg/L)	7.4
Specific Conductance (µS/cm)	323
pH (s.u.)	6.4

Water Clarity	Slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	14
Bottom Substrate (15)	3
Riffle Habitat (16)	7
Pool Variety (10)	8
Erosion (7)	5
Bank Vegetation (7)	6
Light Penetration (10)	8
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	66

Site Photograph



Substrate Sand

Sample Date	Sample ID	Species Total	NCIBI	NCIBI Rating
04/17/12	2012-05	18	42	Good-Fair
06/10/04	2004-80 @ SR 1105	20	56	Excellent
04/10/02	2002-09	21	54	Excellent
04/16/97	97-26	17	50	Good
04/08/92	92-08	18	48	Good

Most Abundant Species, 2012 Satinfin Shiner and Eastern Mosquitofish (n=97 and 90, 22% and 21%, respectively).

Exotic Species Green Sunfish (n=6)

Species Change Since Last Cycle (2002) **Gained** -- Yellow Bullhead (n=1) and Green Sunfish (n=6). **Lost** -- Golden Shiner (n=1), Creek Chubsucker (n=1), Redfin Pickerel (n=18), Pirate Perch (n=1), and Redear Sunfish (n=2).

Data Analysis

Watershed -- drains southwest Franklin County, including the towns of Franklin and Youngsville and the US 1 corridor; tributary to the Tar River. **Landuse 2006** (from USGS, http://water.usgs.gov/osw/streamstats/north_carolina.html, only landuse categories ≥ 5% are reported) -- 52% forest, 25% cultivation, 10% developed, and 7% grassland/herbaceous; since 1992 forested land has decreased from 68 to 52% and developed land has increased from 3 to 10%. **Habitat** -- moderate quality habitats including sand bars and sandy runs, coarse woody debris riffles, snags, wide riparian zones, 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. Overall, a decline in the water quality in the Cedar Creek watershed was noted.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
COON CR	SR 1609	04/16/12	OF11	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
GRANVILLE	1	03020101	36.26805556	-78.56777778	28-11-5	Northern Outer Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;NSW	25.2	350	6	0.3	No

	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
Visible Landuse (%)	95	0	0	5

Upstream NPDES Dischargers (> 1MGD or <1 MGD and within 1 mile)	NPDES Number	Volume (Q_w, MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	19.0
Dissolved Oxygen (mg/L)	7.4
Specific Conductance (µS/cm)	106
pH (s.u.)	6.5

Water Clarity: Clear, greenish black in pools

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	10
Bottom Substrate (15)	3
Riffle Habitat (16)	3
Pool Variety (10)	8
Erosion (7)	5
Bank Vegetation (7)	6
Light Penetration (10)	8
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	58

Site Photograph

Substrate: Sand

Sample Date	Sample ID	Species Total	NCIBI	NCIBI Rating
04/16/12	2012-03	11	42	Good-Fair
05/18/06	2006-51	20	46	Good
04/08/02	2002-03	18	54	Excellent

Most Abundant Species, 2012: Eastern Mosquitofish (n=87, 29%)

Exotic Species: Green Sunfish (n=7)

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^3/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^3/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.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
FISHING CR	**SR 1643**	**04/18/12**	**OF17**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
GRANVILLE	1	03020101	36.22311	-78.5756	28-11e	Northern Outer Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;NSW	44.1	305	16	0.5	No

	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
Visible Landuse (%)	100	0	0	0

Upstream NPDES Dischargers (> 1MGD or <1 MGD and within 1 mile)	NPDES Number	Volume (Q_w, MGD)
Oxford Waste Water Treatment Plant (~6 miles upstream)	NC0025054	3.5

Water Quality Parameters

Temperature (°C)	18.1
Dissolved Oxygen (mg/L)	7.4
Specific Conductance (µS/cm)	330
pH (s.u.)	6.7
Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	12
Riffle Habitat (16)	14
Pool Variety (10)	10
Erosion (7)	7
Bank Vegetation (7)	7
Light Penetration (10)	8
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	91

Site Photograph

Substrate Boulder, cobble, gravel, sand

Sample Date	Sample ID	Species Total	NCIBI	NCIBI 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, 2012 White Shiner (n=194, 27%)

Exotic Species Green Sunfish (n=10)

Species Change Since Last Cycle

Gained -- Mimic Shiner (n=4) and Notchlip Redhorse (n=1) (first collections ever). **Lost** -- Northern Hog Sucker (n=3) and Bluegill (n=5).

Data Analysis

Watershed -- drains central Granville County, including the Town of Oxford; tributary to the Tar River; site is located ~ 5.8 miles downstream from the WWTP discharge and ~ 3.5 miles above the creek's confluence with the river. The WWTP upgrade and expansion (from 2.17 to 3.5 MGD) was completed in 2007 with mechanical bar screen and grit removal, new influent pumps and pump station, zone oxidation ditches with biological nutrient removal capability, an activated sludge return pump station, three secondary clarifiers, a traveling bridge tertiary filter, UV disinfection, and post aeration. **Landuse 2006** (from USGS, http://water.usgs.gov/osw/streamstats/north_carolina.html, only landuse categories ≥ 5% are reported) -- 49% forest, 21% cultivation, 18% developed, and 9% grassland/herbaceous; since 1992 the forested land has decreased from 62 to 49% and the developed land has increased from 12 to 18%. **Habitat** -- typical high quality Carolina Slate Belt-type stream; shallow and deep rocky pools; shallow long riffles and rocky runs; no habitat changes since last cycle. **Water Quality** -- low flow in 2012; specific conductance was the greatest ever measured at the site, previous range was 132-186 µS/cm. **2012** -- a diverse and very abundant community (n=23 species and n=723 fish, most ever collected at this site); only metric not scoring a "5" (the maximum value) was the Percentage of Piscivores; one specimen of the Roanoke Bass (*Ambloplites cavifrons*) and four specimens of Mimic Shiner (*Notropis volucellus*) (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.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
LYNCH CR	SR 1235	04/17/12	OF27	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
FRANKLIN	1	03020101	36.14861111	-78.34166667	28-21-(0.7)	Northern Outer Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV;NSW	23.9	210	5	0.4	No

	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
Visible Landuse (%)	65	0	35	0

Upstream NPDES Dischargers (> 1MGD or <1 MGD and within 1 mile)	NPDES Number	Volume (Q_w, MGD)
None	---	---

Water Quality Parameters

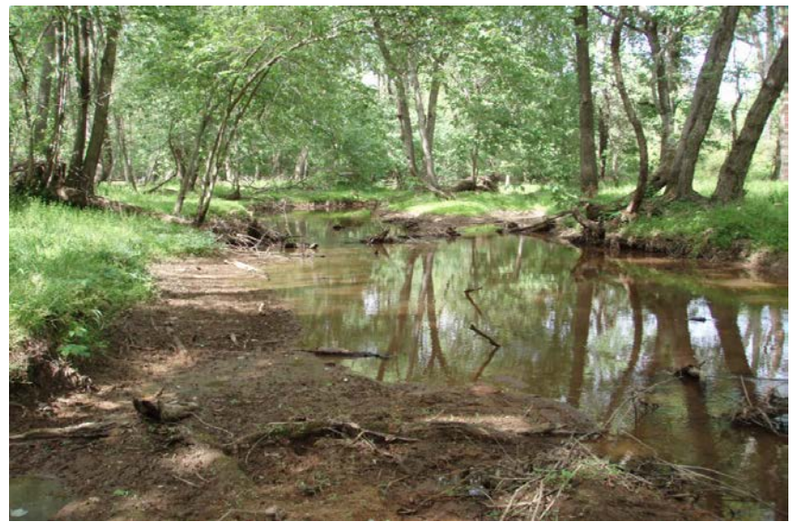
Temperature (°C)	21.0
Dissolved Oxygen (mg/L)	6.2
Specific Conductance (µS/cm)	88
pH (s.u.)	6.0

Water Clarity: Clear/tannic; easily silted

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	2
Riffle Habitat (16)	3
Pool Variety (10)	8
Erosion (7)	7
Bank Vegetation (7)	7
Light Penetration (10)	9
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	69

Site Photograph



Substrate: Sand, silt, clay

Sample Date	Sample ID	Species Total	NCIBI	NCIBI Rating
04/17/12	2012-06	20	50	Good
04/10/07	2007-11	25	50	Good
05/24/99	99-35	19	46	Good
04/15/97	97-25	24	48	Good
06/18/92	92-20	15	38	Fair

Most Abundant Species, 2012: Satinfin Shiner (n=131, 28%)

Exotic Species: None, only 3 fish (Green Sunfish) have been collected out of 1,406 fish at this site.

Species Change Since Last Cycle: **Gained** -- Pirate Perch (n=3). **Lost** -- Bull Chub (n=3), Notchlip Redhorse (n=1), V-lip Redhorse (n=1), Chain Pickerel (n=1), Bluespotted Sunfish (n=11), Green Sunfish (n=1), Bluegill (n=4), and Largemouth Bass (n=4).

Data Analysis

Watershed -- drains northwest Franklin and southeast Vance counties; no municipalities or NPDES dischargers in the watershed; tributary to the Tar River; site is located ~ 1.1 miles upstream from the creek's confluence with the river. **Landuse 2006** (from USGS, http://water.usgs.gov/osw/streamstats/north_carolina.html, only landuse categories ≥ 5% are reported) -- 54% forest, 24% cultivation, 6% developed, and 8% grassland/herbaceous; since 1992 forested land has decreased from 69 to 54% and developed land has increased from 1 to 6%. **Habitat** -- Coastal Plain-like; several species of aquatic plants; coarse woody debris; stick riffles; primarily runs; snags; wide riparian flood plain forest and wetlands. **Water Quality** -- low flow in 2012, dissolved oxygen at 70% of saturation; specific conductance was near the range previously measured, 73-82 µS/cm. **2012** -- abundant (most fish ever collected at this site, n = 472) and diverse community, but with a low diversity of sunfish (only Redbreast Sunfish and Warmouth present) and a moderately high percentage of tolerant fish (41% which has not changed since 1999, so a moderately high percentage for this metric might be natural for this 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.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
MIDDLE CR	SR 1203	04/17/12	OF28	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
FRANKLIN	1	03020101	36.17194444	-78.4875	28-15	Northern Outer Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;NSW	8.8	215	4	0.2	No

	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
Visible Landuse (%)	100	0	0	0

Upstream NPDES Dischargers (> 1MGD or <1 MGD and within 1 mile)	NPDES Number	Volume (Q_w, MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	17.2
Dissolved Oxygen (mg/L)	7.7
Specific Conductance (µS/cm)	98
pH (s.u.)	6.1

Water Clarity: Clear, easily silted

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	10
Bottom Substrate (15)	3
Riffle Habitat (16)	5
Pool Variety (10)	6
Erosion (7)	5
Bank Vegetation (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	60

Site Photograph

Substrate: Sand, silt, gravel

Sample Date	Sample ID	Species Total	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 Species, 2012: White Shiner (n=331, 29%)

Exotic Species: Green Sunfish (n=14)

Species Change Since Last Cycle

Gained -- Mountain Redbelly Dace (n=1), Notchlip Redhorse (n=2), and V-Lip Redhorse (n=3) (first collections ever), Rosyside Dace (n=14), Yellow Bullhead (n=1), and Eastern Mosquitofish (n=12). **Lost** -- Eastern Silvery Minnow (n=2), Golden Shiner (n=1), White Sucker (n=3), Northern Hog Sucker (n=2), Blacktip Jumprock (n=1), Redfin Pickerel (n=1), Pumpkinseed (n=2), Warmouth (n=2), and Largemouth Bass (n=1) (1-3 fish/species).

Data Analysis

Watershed -- drains northwest Franklin County; no municipalities or NPDES dischargers in the watershed; small tributary to the Tar River; site is ~ 0.3 miles upstream from the creek's confluence with the river. **Landuse 2006** (from USGS, http://water.usgs.gov/osw/streamstats/north_carolina.html, only landuse categories ≥ 5% are reported) -- 72% forest, 13% cultivation, and 8% grassland/herbaceous; since 1992 forested land has decreased from 90 to 72% and developed land has increased from < 0.1 to 4%. **Habitat** -- lower quality and minimal instream habitats including shallow sandy runs, undercuts and snags, gravel riffles and chutes; wide forested riparian zones; periphyton abundant atop the sand; a very sinuous channel. **Water Quality** -- very low flow in 2012, specific conductance was the greatest ever recorded at the site, previous range 80-83 µS/cm. **2012** -- a very diverse and extremely abundant community (n=1,161, most fish of any site in the basin in 2012) comprised primarily of Age 1 fish of White Shiner, Bluehead 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.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
RED BUD CR	**SR 1407**	**04/19/12**	**OF33**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
NASH	2	03020101	36.11611111	-78.02111111	28-78-1-17	Northern Outer Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;NSW:+	18.9	170	7	0.3	Yes

	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
Visible Landuse (%)	100	0	0	0

Upstream NPDES Dischargers (> 1MGD or <1 MGD and within 1 mile)	NPDES Number	Volume (Q_w, MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	16.1
Dissolved Oxygen (mg/L)	6.2
Specific Conductance (µS/cm)	102
pH (s.u.)	6.4

Water Clarity: Clear/tannic, very dark

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	12
Riffle Habitat (16)	7
Pool Variety (10)	8
Erosion (7)	7
Bank Vegetation (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	5
Right Riparian Score (5)	3
Total Habitat Score (100)	78

Site Photograph

Substrate: Bedrock, cobble, dark red-brown silt

Sample Date	Sample ID	Species Total	NCIBI	NCIBI 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 Species, 2012: Bluehead Chub (n=74, 26%)

Exotic Species: Green Sunfish (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.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
ROCKY SWP	SR 1002	06/20/12	OF35	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
HALIFAX	4	03020102	36.22638889	-77.80916667	28-79-28-(0.7)	Northern Outer Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV;NSW	19.5	145	5	0.3	Yes

	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
Visible Landuse (%)	80	0	20	0

Upstream NPDES Dischargers (> 1MGD or <1 MGD and within 1 mile)	NPDES Number	Volume (Q_w, MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	23.8
Dissolved Oxygen (mg/L)	5.6
Specific Conductance (µS/cm)	108
pH (s.u.)	6.7

Water Clarity	Slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	4
Riffle Habitat (16)	3
Pool Variety (10)	10
Erosion (7)	5
Bank Vegetation (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	66

Site Photograph

Substrate Sand

Sample Date	Sample ID	Species Total	NCIBI	NCIBI Rating
06/20/12	2012-67	19	50	Good
05/07/07	2007-41	19	48	Good
04/12/02	2002-13	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 Swallowtail Shiner (n=53, 20%)

Exotic Species None, only 2 fish (Green Sunfish) have been collected out of 1,074 fish at this site.

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).

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 of sunfish (n=6) collected at any Tar River basin site in 2012, but only one intolerant fish and species (Sawcheek Darter). **1993-2012** -- high 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.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
SHELTON CR	**US 158**	**04/16/12**	**OF38**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
GRANVILLE	1	03020101	36.31297	-78.72116	28-4	Carolina Slate Belt

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV;NSW	23.8	405	9	0.4	Yes

	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
Visible Landuse (%)	60	5	35	0

Upstream NPDES Dischargers (> 1MGD or <1 MGD and within 1 mile)	NPDES Number	Volume (Q_w, MGD)
None	---	---

Water Quality Parameters

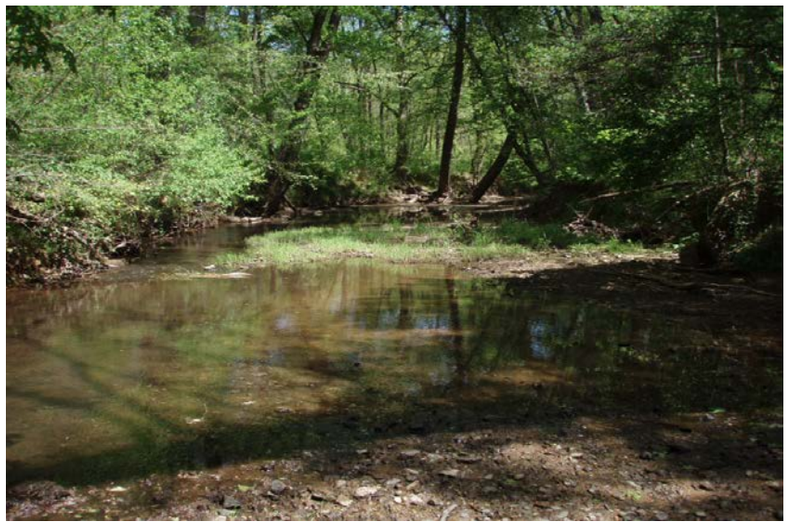
Temperature (°C)	17.2
Dissolved Oxygen (mg/L)	6.4
Specific Conductance (µS/cm)	96
pH (s.u.)	6.2

Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	15
Bottom Substrate (15)	11
Riffle Habitat (16)	3
Pool Variety (10)	10
Erosion (7)	6
Bank Vegetation (7)	7
Light Penetration (10)	7
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	74

Site Photograph



Substrate Cobble, gravel, sand

Sample Date	Sample ID	Species Total	NCIBI	NCIBI Rating
04/16/12	2012-02	18	54	Excellent
05/17/06	2006-49	18	50	Good
04/06/99	99-01	19	56	Excellent
04/14/97	97-20	24	58	Excellent
04/07/92	92-04	19	54	Excellent

Most Abundant Species, 2012 White Shiner (n=24, 22%)

Exotic Species Green Sunfish (n=8)

Species Change Since Last Cycle

Gained -- Golden Shiner and Brown Bullhead. **Lost** -- Creek Chub, Northern Hog Sucker, Pirate Perch, and Pumpkinseed. All species gained or lost were represented by 1 or 2 fish/species.

Data Analysis

Watershed -- drains west-central Granville County; no municipalities or NDPES dischargers in the watershed; tributary to the Tar River; site is ~ 2.9 miles upstream from the creek's confluence with the river. **Landuse 2006** (from USGS, http://water.usgs.gov/osw/streamstats/north_carolina.html, only landuse categories ≥ 5% are reported) -- 64% forest, 19% cultivation, and 9% grassland/herbaceous; since 1992 forested land has decreased from 80 to 64% and developed land has increased from 0.4 to 2.9%. **Habitat** -- infrequent, shallow and short riffles; primarily pools of various sizes and depths; beaver activity; NC Ecosystem Enhancement Program conservation area along the east bank. **Water Quality** -- low flow in 2012, dissolved oxygen at 67% of saturation; specific conductance was the greatest ever recorded at the site, previous range was 66-73 µS/cm. **2012** -- abundant and diverse community which was trophically balanced; improvements in trophic ratings (lower percentage of Omnivores+Herbivores, primarily Bluehead Chub, White Sucker, and Creek Chub) led to slight increases in NCIBI score and rating from Good to Excellent. **1992-2012** -- moderate-high species diversity; 29 species known from the site including 3 darters, 4 suckers, 8 cyprinids, 7 sunfish, and 4 intolerant species (Pinewoods Shiner, Mimic Shiner, Roanoke Darter, and Chainback Darter); dominant species is the Bluehead Chub; Mimic Shiner (*Notropis volucellus* , a Significantly Rare species) has not been collected from this site since April 1997; except for May 2006 when rated Good, community has rated Excellent, even in 2012, during a low flow period. **Recommendation** -- continued basinwide assessment of this regional reference site in 2017. Overall, no long-term change in water quality in the Shelton Creek watershed.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
TABBS CR	**SR 1100**	**04/19/12**	**OF41**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
VANCE	1	03020101	36.18222222	-78.45583333	28-17-(0.5)b	Northern Outer Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;NSW	70.8	225	11	0.4	No

	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
Visible Landuse (%)	75	25	0	0

Upstream NPDES Dischargers (> 1MGD or <1 MGD and within 1 mile)	NPDES Number	Volume (Q_w, MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	16.9
Dissolved Oxygen (mg/L)	7.4
Specific Conductance (µS/cm)	138
pH (s.u.)	6.4

Water Clarity: Slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	12
Bottom Substrate (15)	4
Riffle Habitat (16)	3
Pool Variety (10)	10
Erosion (7)	5
Bank Vegetation (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	66

Site Photograph

Substrate: Gravel, sand

Sample Date	Sample ID	Species Total	NCIBI	NCIBI 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 Species, 2012: Swallowtail Shiner (n=100, 34%)

Exotic Species: Green Sunfish (n=12)

Species Change Since Last Cycle

Gained -- Bluehead Chub (n=1), Mimic Shiner (n=1), Pirate Perch (n=4), Eastern Mosquitofish (n=33), Warmouth (n=7), and sunfish hybrid (n=1). **Lost** -- Yellow Bullhead (n=1), Largemouth Bass (n=5), and Glassy Darter (n=14).

Data Analysis

Watershed -- drains southwest Vance, southern Henderson (including the southwest portion of the Town of Henderson), and western Granville counties, and the I-85 and US 1 corridors; two small NPDES dischargers (NC0029131 and NC 0048631, Q_w total = 0.032 MGD) located ~ 3.9 miles upstream on Long Creek-a tributary to Tabbs Creek; Tabbs Creek is a large, low gradient tributary to the Tar River; site is ~ 1.7 miles upstream from the creek's confluence with the river. **Landuse 2006** (from USGS, http://water.usgs.gov/osw/streamstats/north_carolina.html, only landuse categories ≥ 5% are reported) -- 59% forest, 16% cultivation, 12% developed, and 9% grassland/herbaceous; since 1992 forested land has decreased from from 77% to 59% and developed land has increased from 6% to 12%. **Habitat** -- snags along the sides across the channel; gravelly runs; riffles rare; *Sparganium* bed at the beginning along the left bank. **Water Quality** -- low flow in 2012, specific conductance was the greatest ever recorded at the site, range is 82-138 µS/cm. **2012** -- abundant and diverse community with five species of suckers collected; skewed trophic structure due to a very low percentage of Omnivores+Herbivores (Bluehead Chub, White Sucker, and Creek Chub); one specimen of Mimic Shiner (*Notropis volucellus* , a state Significantly Rare species) was collected. **1997-2012** -- very high species diversity; 36 species known from the site including 4 darters, 6 suckers, 10 cyprinids, 8 sunfish, and 5 intolerant species (Pinewoods Shiner, Mimic Shiner, Carolina Madtom, Roanoke Darter, and Chainback Darter); dominant species is the tolerant Redbreast Sunfish; Carolina Madtom *(Noturus furiosus,* a state Threatened species) and Roanoke Bass (*Ambloplites cavifrons* , a state Significantly Rare species) have not been collected from this site since June 1999; typically with a skewed trophic structure which may be natural and in response to the low gradient nature of this eastern Piedmont stream; has consistently rated Good since 1999, even in 2012 during a low flow period. **Recommendation** -- continued basinwide assessment of this site in 2017 to document impacts from future growth within the watershed. Overall, no change in water quality in the Tabbs Creek watershed.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
TAR R	US 158	04/18/12	OF44	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
GRANVILLE	1	03020101	36.33333333	-78.76833333	28-(1)	Carolina Slate Belt

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV;NSW	26	435	11	0.4	Yes

	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
Visible Landuse (%)	75	25	0	0

Upstream NPDES Dischargers (> 1MGD or <1 MGD and within 1 mile)	NPDES Number	Volume (Q_w, MGD)
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)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	12
Riffle Habitat (16)	9
Pool Variety (10)	10
Erosion (7)	7
Bank Vegetation (7)	6
Light Penetration (10)	8
Left Riparian Score (5)	5
Right Riparian Score (5)	4
Total Habitat Score (100)	84

Site Photograph

Substrate: Boulder, cobble, gravel

Sample Date	Sample ID	Species Total	NCIBI	NCIBI Rating
04/18/12	2012-07	22	56	Excellent
04/09/07	2007-07	16	46	Good
10/14/99	99-63	18	54	Excellent
06/24/99	99-53	18	54	Excellent
04/27/99	99-25	17	52	Good

Most Abundant Species, 2012: Johnny Darter, Redbreast Sunfish, and Highfin Shiner, (n=139, 130, and 124, 18%, 17%, and 16%, respectively).

Exotic Species: Green Sunfish (n=41)

Species Change Since Last Cycle: **Gained** -- Redfin Pickerel (n=2) and Warmouth (n=2) (first collections ever), White Sucker (n=1), Eastern Mosquitofish (n=22), Pumpkinseed (n=1), and Chainback Darter (n=1). **Lost** -- none.

Data Analysis

Watershed -- the extreme headwaters of the Tar River basin; drains the eastern edge of Person and part of Granville counties; no municipalities or NPDES dischargers in the watershed. **Landuse 2006** (from USGS, http://water.usgs.gov/osw/streamstats/north_carolina.html, only landuse categories ≥ 5% are reported) -- 55% forest, 24% cultivation, and 12% grassland/herbaceous; since 1992 forested land has decreased from 77 to 55%, grassland herbaceous has increased from 7 to 12%, and developed land has increased from <0.3 to 3.1%. **Habitat** -- high quality Carolina Slate Belt-type stream; shallow and deep pools; shallow riffles and rocky runs; no habitat changes since last cycle. **Water Quality** -- very low flow in 2012, specific conductance was near the normal range for the site, previous range 69-81 µS/cm. **2012** -- diverse (most species ever collected at this site) and very abundant (n=779) community; one specimen of the Carolina Darter (*Etheostoma collis* , a state Special Concern species) and five specimens of Mimic Shiner (*Notropis volucellus* , a state Significantly Rare species) were collected; improvement in rating was due to a more balanced trophic structure in 2012 than in 2007. **2002-2012** -- moderate-high species diversity; 28 species known from the site including 4 darters, 4 suckers, 6 cyprinids, 7 sunfish, and 4 intolerant species (Pinewoods Shiner, Mimic Shiner, Roanoke Darter, and Chainback Darter); dominant species is the intermediate Swallowtail Shiner; Roanoke Bass (*Ambloplites cavifrons* , a state Significantly Rare species) has not been collected since October 1999; Mimic Shiner is consistently collected; since 1999 site has rated Good to Excellent, even in 2012 during a low flow period the site rated Excellent. **Recommendation** -- continued basinwide assessment of this regional reference site in 2017. Overall, no long-term change in water quality in the upper Tar River watershed.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
N FK TAR R	SR 1151	04/16/12	OF60	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
GRANVILLE	1	03020101	36.299579	-78.7007895	28-5	Carolina Slate Belt

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV;NSW	21.2	380	6	0.3	No

	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
Visible Landuse (%)	85	5	10	0

Upstream NPDES Dischargers (> 1MGD or <1 MGD and within 1 mile)	NPDES Number	Volume (Q_w, MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	17.0
Dissolved Oxygen (mg/L)	6.0
Specific Conductance (µS/cm)	116
pH (s.u.)	6.3

Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	11
Bottom Substrate (15)	4
Riffle Habitat (16)	3
Pool Variety (10)	4
Erosion (7)	3
Bank Vegetation (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	56

Site Photograph

Substrate Sand, gravel

Sample Date	Sample ID	Species Total	NCIBI	NCIBI Rating
04/16/12	2012-01	18	50	Good
04/09/07	2007-08	18	58	Excellent
10/14/99	99-64 @ US 158	15	46	Good
06/24/99	99-54 @ US 158	20	48	Good
04/06/99	99-02 @ US 158	18	48	Good
04/14/97	97-21 @ US 158	23	54	Excellent
04/07/92	92-05 @ US 158	16	46	Good

Most Abundant Species, 2012 Bluehead Chub and White Shiner (n= 78 and 74, 23% and 22%, respectively.

Exotic Species Green Sunfish (n=16)

Species Change Since Last Cycle **Gained** -- Golden Shiner (n=5), Pirate Perch (n=1), Warmouth (n=6), and Black Crappie (n=1). **Lost** -- Highfin Shiner (n=1), Pinewoods Shiner (n=9), White Sucker (n=2), Northern Hog Sucker (n=2), Chain Pickerel (n=3), sunfish hybrid (n=1), Roanoke Bass (n=3), and Largemouth Bass (n=1).

Data Analysis

Watershed -- drains north-central Granville County; no municipalities or NPDES dischargers in the watershed; tributary to the Tar River; site is ~ 1.2 miles upstream from the creek's confluence with the river; watershed includes the Northern Outer Piedmont and the Carolina Slate Belt ecoregions. **Landuse 2006** (from USGS, http://water.usgs.gov/osw/streamstats/north_carolina.html, only landuse categories ≥ 5% are reported) -- 59% forest, 27% cultivation, 5% developed, and 9% grassland/herbaceous; since 1992 forested land has decreased from 69 to 55% and developed land has increased from 0.8 to 5.5%. **Habitat** -- shallow pools, snags, and small gravel riffles; deeply entrenched with sloughing banks with moderate erosion. **Water Quality** -- low flow, dissolved oxygen at 62% of saturation; specific conductance was the greatest ever recorded at the site, previous range was 78-94 µS/cm. **2012** -- slight decrease in the diversity of suckers and intolerant species, low percentage of piscivores, and a moderately high percentage of Bluegill with popeye disease (caused by a parasitic nematode which seems to preferentially infect Bluegill) resulted in the rating decline from Excellent to Good; rating decline was related to low flow conditions resulting in habitats loss and crowding of fish. **1992-2012** -- very high species diversity; 34 species known from the site including 3 darters, 5 suckers, 10 cyprinids, 9 sunfish, and 3 intolerant species (Pinewoods Shiner, Roanoke Darter, and Chainback Darter); dominant species is the omnivorous Bluehead Chub; ratings have varied from a low Good to a high Excellent depending upon the flow; the mean annual discharge (ft^3/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^3/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.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
FISHING CR	**SR 1609**	**06/20/12**	**OF76**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
WARREN	4	03020102	36.339067	-78.128844	28-79-(1)	Northern Outer Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C,NSW	75.8	215	11	0.4	No

	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
Visible Landuse (%)	100	0	0	0

Upstream NPDES Dischargers (> 1MGD or <1 MGD and within 1 mile)	NPDES Number	Volume (Q_w, MGD)
Town of Warrenton's WWTP	NC0020834	2.0

Water Quality Parameters

Temperature (°C)	20.8
Dissolved Oxygen (mg/L)	5.8
Specific Conductance (µS/cm)	134
pH (s.u.)	6.7

Water Clarity: Slightly turbid; greenish

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	10
Bottom Substrate (15)	2
Riffle Habitat (16)	0
Pool Variety (10)	10
Erosion (7)	6
Bank Vegetation (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	60

Site Photograph

Substrate: Sand, silt, clay

Sample Date	Sample ID	Species Total	NCIBI	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

Most Abundant Species, 2012: Redbreast Sunfish and Pinewoods Shiner (n=58 and 55, 18% and 17%, respectively).

Exotic Species: None, only 1 fish (a single Green Sunfish) has been collected out of 1,371 fish at this site.

Species Change Since Last Cycle: **Gained** -- Bull Chub (n=2), Mimic Shiner (n=19), White Sucker (n=1), Notchlip Redhorse (n=2), Redfin Pickerel (n=2), Bluegill (n=1), and Mud Sunfish (n=1). **Lost** -- Northern Hog Sucker (n=7), Yellow Bullhead (n=1), Green Sunfish (n=1), and Glassy Darter (n=11).

Data Analysis

Site was moved one bridge (2.7 miles) downstream due to beaverdam at the SR 1600 site; difference in the drainage area was 17.4 mi^2; 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 ≥ 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.