

Aquatic Habitats of the Big Creek Watershed

The Big Creek (BC) system is part of the French Broad River watershed, originating in North Carolina, but flowing into Tennessee. Aquatic habitats include ephemeral streams, intermittent streams, perennial streams with no fish, coldwater and coolwater streams, a warmwater river, and ephemeral waterholes. Wetlands are addressed in the Rare Communities section.

Streams

The BC watershed contains 17 miles of perennial streams (Table 1) on Cherokee National Forest (CNF) lands that support fish, including Trail Fork and Gulf Fork systems and a few streams flowing directly into the French Broad and Pigeon Rivers. The lower portions of most streams flow through private lands with a mixture of small farms, forests, and residential areas.

Table 1. Streams and latest surveys of BC watershed.

Stream Name	Miles	Latest Survey
Bearpen Branch	0.5	6/24/2008
Brown Gap Creek	0.5	4/3/1991
Deep Gap Creek	0.2	10/23/2006
Double Branch	0.6	11/22/2006
Dry Fork	1.1	7/6/1994
Gulf Fork	0.7	7/23/2004
Middle Prong Gulf Fork	1.6	9/13/1991
Hunter Creek	0.4	Not Surveyed
Laurel Creek	0.8	8/17/2006
Laurel Creek, Unnamed Trib	0.5	8/17/2006
Lemon Prong	0.6	8/22/2002
Moss Camp Creek	0.5	Not Surveyed
Rattlesnake Branch	0.6	8/22/2002
Rock Creek	0.2	9/1/1994
Rock Creek, Unnamed Trib	0.6	9/1/1994
Sowbed Branch	0.3	8/6/2002
Spicewood Branch	1.2	10/1/2003
Tom Creek	1.9	8/6/2002
Trail Fork Big Creek	3.5	10/12/2001
Green Corner Branch	0.5	11/24/2006
Pigeon River	2.1	2006
Tobes Creek	0.2	7/18/2006
Tobes Creek, Trail Fork	0.2	Not Surveyed

Tennessee Wildlife Resources Agency (TWRA) and the CNF have inventoried fish populations and water quality throughout the watershed in the past 17 years. The streams are primarily coldwater habitats providing homes for a variety of fish including three species of trout and 13 other non-game fish species.

Banded sculpin	Longnose dace	Swannanoa darter
Central stoneroller	Mottled sculpin	Warpaint Shiner
Creek chub	Northern hogsucker	Western blacknose dace
Fantail darter	River chub	
Greenfin darter	Saffron shiner	

Habitat

The North Zone CNF fisheries crew surveyed stream habitat in ten stream reaches in 2006-7 (Table 2). The highest quality habitat is in Dry Fork, Gulf Fork, and the Trail Fork gorge. More than half of the streams are lacking in pools and/or adequate water depth and could use habitat improvement.

The CNF Revised Land and Resource Management Plan requires a minimum of 200 pieces of large woody debris (LWD) per stream mile. The streams in this assessment area on average contain 750 pieces (as small as four inches diameter by four feet long) of LWD per stream mile. An average of 183 snags and hemlock trees along each mile of stream may contribute LWD over the next 10 years. LWD levels in most streams meet this requirement, with the exception of Tom's Creek and the lower reach of Trail Fork, which are along roads. However, much of the wood is too small to have a measurable effect on stream habitat, with the upper portions of Trail Fork. Twelve fish habitat improvement structures were installed in Reach 4 of Trail Fork in 1995 with funds generated from a timber sale. Many are still in place today.

Table 2. Stream habitat characteristics of BC streams.

Stream	Depth (meters)	Width (meters)	% Slope	% Pools	LWD/ Mile	LWD/Mile >15' long	Future LWD/Mi
Deep Gap Creek	0.2	2	2	48	932	124	83
Dry Fork	0.3	6	10	37	1331	55	NM
Green Corner Branch	0.2	2	10	35	332	0	207
Gulf Fork	0.4	7	3	53	371	64	228
Laurel Creek	0.2	3	NM	24	217	20	NM
Middle Prong Gulf Fork	0.3	3	NM	39	1057	100	171
Rock Creek	0.1	2	NM	23	924	396	NM
Tom's Creek	0.2	4	4	43	122	9	197
Trail Fork, Reach 1	0.3	5	2	26	114	0	NM
Trail Fork, Reach 3	0.5	5	16	51	1222	268	109
Trail Fork, Reach 4	0.2	4	6	41	1037	182	290
Trail Fork, Reach 5	0.2	3	NM	72	761	178	NM

NM = Not Measured; *Standing snags and hemlocks along streams.

Erosion and sedimentation appear to have influence on the substrate in some of the streams measured. Silt is minimal in the streams, with the exception of portions of Deep Gap and Tom Creek. The amount of sand is considerably higher in Trail Fork at Boomer Den, Deep Gap Creek, Laurel Creek and Middle Prong Gulf Fork. The conditions on these streams may be characteristic of head water streams in flat valleys, but are likely to also be influenced by the

roads in their watersheds. Table 3 lists the percentage of dominate substrates of each stream surveyed.

Table 3. Dominate substrates of BC streams.

Stream	Bedrock	Boulder	Cobble	Gravel	Sand	Silt	Organic
Deep Gap Creek	0.0%	0.0%	30.5%	34.1%	30.8%	4.6%	0.0%
Dry Fork	2.7%	47.3%	26.3%	19.7%	4.0%	0.0%	0.0%
Green Corner Branch	20.9%	26.8%	17.8%	27.2%	7.3%	0.0%	0.0%
Gulf Fork	6.3%	33.3%	30.7%	26.1%	3.6%	0.0%	0.0%
Laurel Creek	15.0%	0.0%	32.3%	33.3%	19.3%	0.0%	0.0%
Middle Prong Gulf Fork	5.4%	18.6%	26.3%	33.3%	16.3%	0.0%	0.0%
Rock Creek	5.3%	11.6%	36.1%	44.7%	2.3%	0.0%	0.0%
Tom Creek	18.8%	18.1%	29.8%	28.5%	1.2%	3.6%	0.0%
Trail Fork, Reach 1	23.2%	33.9%	26.3%	12.5%	4.1%	0.0%	0.0%
Trail Fork, Reach 3	41.2%	19.8%	6.8%	25.8%	6.3%	0.0%	0.0%
Trail Fork, Reach 5	8.9%	22.5%	26.4%	14.9%	26.1%	1.2%	0.0%

Road Crossings

Sixteen road crossings were surveyed in the BC watershed in 2006 to determine if they restrict movement of aquatic organisms (Table 4). Many of the stream crossings were on headwater streams with little or no fish, therefore fish movement is not an issue (N/A). A culvert from an abandoned road crossing Deep Gap Creek was not measured, but appears to restrict movement of fish, including brook trout. Movement of fish up Trail Fork was indeterminate to impassable, but movement is already greatly restricted through the gorge with a multitude of natural barriers.

Table 4. Influence of road crossings on fish movement in the BC watershed.

Stream & Road Crossing	Adult Trout	Young Trout & Dace	Sculpins & Darters
Lemon Prong, CR107 & FS3249	N/A	N/A	N/A
Shelton Branch, CR107 & FS96	N/A	N/A	N/A
Rattlesnake Branch, CR107 & FS3249	N/A	N/A	N/A
Spicewood Branch & FS209	N/A	Impassable	N/A
Spicewood Branch Tributaries & FS209	N/A	N/A	N/A
Hunter Creek Tributary & FS22441	N/A	N/A	N/A
Hunter Creek & FS22441 #1	Passable	Passable	Passable
Hunter Creek & FS22441 #2	Indeterminate	Impassable	Impassable
Trail Fork & Bluemill Road	Indeterminate	Impassable	Impassable
Trail Fork & FS3249	Indeterminate	Indeterminate	Impassable
Trail Fork Tributary & FS3249	N/A	N/A	N/A
Middle Prong Gulf Fork & FS2251-4	N/A	N/A	N/A
Brown Gap Creek & FS2251-3	N/A	N/A	N/A

Most of the crossings had culverts where the width of the pipe was only 30-50% of the width of the stream. This reduction concentrates the flow, increasing the speed and force of the water downstream, ultimately altering the channel for a short distance and creating the potential for

accelerated erosion. Four culverts had an outlet drop of over a foot, creating the potential for headcutting and undermining the pipes.

Demand Species – Wild and Stocked Trout

In 1950, biologists documented reproducing rainbow trout populations in Trail Fork and Gulf Fork of Big Creek. Recent fish surveys conducted by TWRA indicate that both streams have average trout populations (Habera et al 2002 and 2005). The lower sections of these streams, below CNF lands were stocked with rainbow trout and managed as a “put-and-take” fisheries, beginning in 1951 and continuing today. In the late 1990’s and 2001, TWRA biologists stocked brown trout fingerlings in these two streams, and those efforts have proven to be successful in the Gulf Fork. TWRA stocked rainbow trout fingerlings in Tom Creek in 1973 and 1993 (TWRA 2004). However, only one trout was found in the stream during recent surveys. The rest of the tributaries in the assessment area on CNF land are generally small and have sparse populations of trout.

Table 5. Trout species of the BC watershed assessment area by stream.

Stream Name	Brook Trout	Brown Trout	Rainbow Trout
Brown Gap Creek			
Deep Gap Creek			
Double Branch			
Dry Fork			
Gulf Fork			
Middle Prong Gulf Fork			
Laurel Creek			
Lemon Prong			
Rattlesnake Branch			
Tom Creek			
Trail Fork Big Creek			
Green Corner Branch			
Pigeon River			
Tobes Creek			

Only brook trout are native to Tennessee, but rainbow and brown trout were introduced in the early 1900’s. All three are popular demand species that live in coldwater streams. Trout have high water quality needs for spawning and feeding and are sensitive to temperature increases and metals in the water. They are dependent on instream structure for hiding and feeding, and this type of habitat is in limited supply in most forest streams (USDA Forest Service 2004). In general, trout densities and standing crop in southern Appalachian streams are typically low. The coldwater streams of the mountains generally have soft water with low alkalinity, resulting in metals leaching into the water and limited food production. Weather events such as floods and droughts have major impacts on wild trout populations in the southern Appalachians (Strange and Habera 1995). Populations fluctuate from year to year, but their overall trends are stable (USDA Forest Service 2004). Approximately 17 miles of stream on CNF lands support

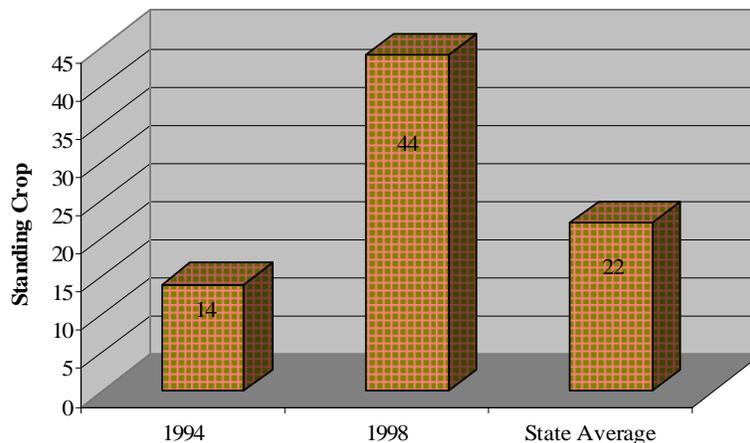
wild trout in the BC watershed (Table 5).

Demand Species – Brook Trout

The BC watershed only has a few brook trout streams with roughly 3.5 miles of stream supporting populations (Table 5). The brook trout in Brown Gap Creek, Dry Fork, and Middle Prong Gulf Fork are of native, southern Appalachian heritage (Habera et al 2007). A previously undocumented brook trout population was discovered in the Deep Gap Creek in 2006, and its origin is undetermined, but likely southern strain.

The state stocked rainbow trout in Dry Fork starting in 1951. In 1961, they stocked several hundred brook trout, and continued stocking rainbow trout until 1976. A barrier was constructed on Dry Fork in 1983, and rainbow trout were removed upstream the same year and then again in 1987. Surveys were conducted above the barrier in 1994 and 1998 (Figure 1). The standing crop (kilograms of fish per hectare) in 1994 was 14.3, below average (20) for Tennessee brook trout streams (Strange and Habera 1995, Habera et al 1999). In 1998, the standing crop had risen to 44, well above average, indicating a successful restoration. A habitat survey in 2006 revealed that the barrier was washed out.

Figure 1. Brook trout standing crop Dry Fork compared to the State average.



Pigeon River

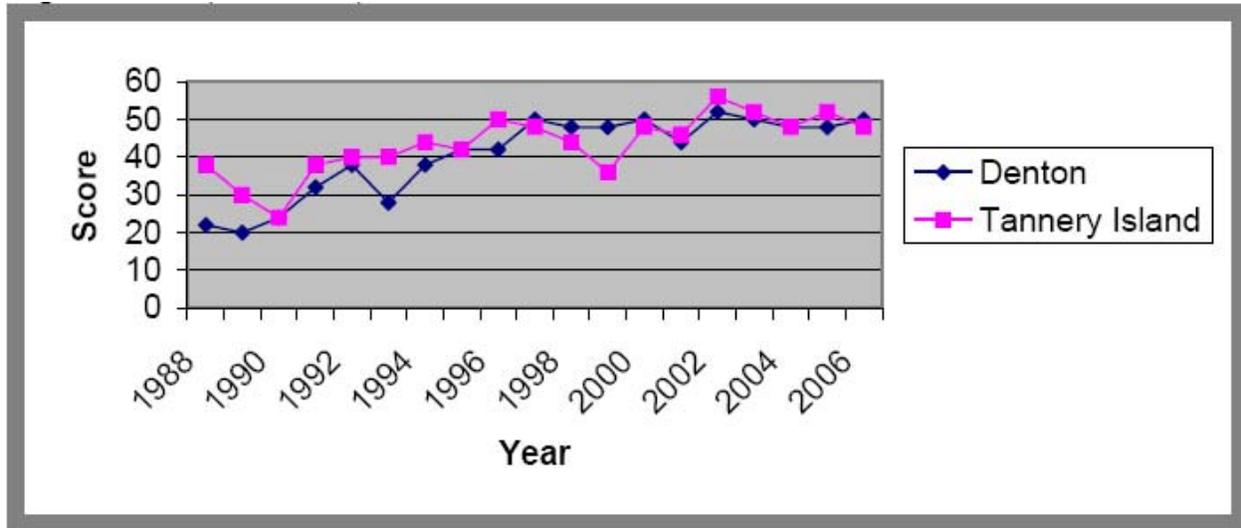
Two miles of the Pigeon River flows through the western edge of the assessment area. Today, it is a diverse river with almost 50 species of fish. However, it is a river with a rocky past. A large papermill was built in North Carolina in the early 1900's and discharged considerable amounts of dioxin and particulate matter in the Pigeon River. The river was brown, foamy, and had a foul odor. Attention to the pollution problem began to heighten in the late 1980's, and eventually the papermill began clean-up efforts. Consumption of all fish was prohibited up until 1996 when the ordinance was downgraded, limiting consumption of carp, catfish, and redbreast sunfish. The consumption advisories were lifted completely in 2003 (Carter et al 2007).

Walters dam was constructed in 1930 just upstream of the state line, providing water for the hydropower plant at Waterville (Wikipedia 2007). The dam prevents movement of aquatic species between Tennessee and North Carolina. The plant now maintains minimum flow

through all times of the year (Carter p.c. 2007), and releases water during the summer for whitewater rafting.

TWRA and Tennessee Valley Authority (TVA) have conducted assessments to determine the Index of Biotic Integrity (IBI) of the habitat and aquatic communities of the river since 1988 (Figure 2). The scores were very poor during the early years, but they have steadily increased and are now in good and stable condition.

Figure 2. Trends in IBI scores on the Pigeon River, 1988-2006.

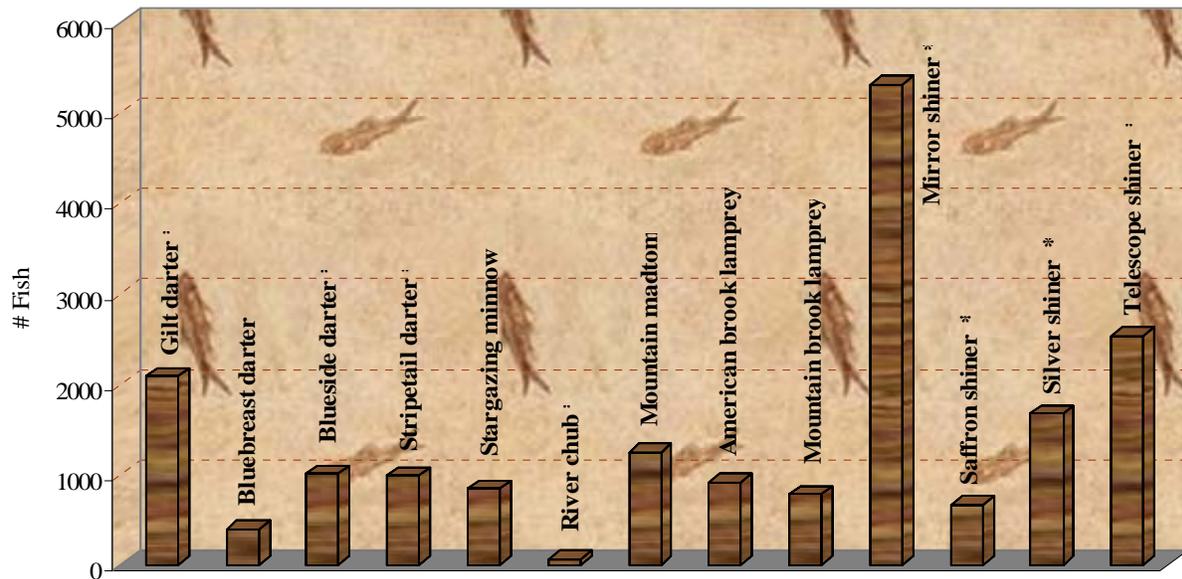


A few species (e.g. silver shiner, telescope shiner) have returned as a result of improved water quality. Now the river is home to at least 40 different species.

- | | | | |
|------------------|--------------------|--------------------|------------------|
| Banded sculpin | Gizzard shad | River redhorse | Spotted bass |
| Bigeye chub | Golden redhorse | Rock bass | Telescope shiner |
| Black buffalo | Greenside darter | Rosyface shiner | Walleye |
| Black crappie | Largemouth bass | Sauger | White catfish |
| Black redhorse | Logperch | Silver redhorse | White crappie |
| Bluegill | Longnose dace | Silver shiner | White sucker |
| Channel catfish | Northern hogsucker | Smallmouth bass | Whitetail shiner |
| Chestnut lamprey | Rainbow trout | Smallmouth buffalo | Yellow bullhead |
| Common carp | Redbreast sunfish | Snubnose darter | |
| Freshwater drum | Redline darter | Spotfin shiner | |

Because of the improved water quality conditions, TWRA, North Carolina Wildlife Resources Commission, TVA, Tennessee Department of Environment and Conservation, University of Tennessee, and other cooperators are now working together on an intensive recovery effort focused on reintroductions of native fish and mollusk species (Carter et al 2007). The cooperators have been stocking fish in the river since 2001 (Figure 3).

Figure 3. Fish re-introduced into the Pigeon River, 2001-2007.



Demand Species – Black Bass, Sunfish, Walleye, Rainbow Trout

The Pigeon River provides anglers opportunities to catch many species of black bass and sunfish. It is known for its “trophy” status smallmouth bass fishery, the best in East Tennessee. Special regulations apply to the Pigeon River from its confluence with the French Broad River upstream to the North Carolina state line. Only one smallmouth bass per day, with a minimum length of 20 inches can be harvested. Rock bass are the most plentiful type of sunfish. The river also hosts a good walleye fishery (Carter et al 2007).

TWRA has documented sporadic occurrences of rainbow trout in the river since their surveys began in 1997. They documented the highest numbers of trout in 2006, reporting above average sizes (9-17 inches) and good conditions. Many anglers reported catching them, particularly in the spring (Carter et al 2007).

TWRA conducted an angler survey along the Pigeon River from April through September of 2006. Anglers fished a total of 23,393 hours, catching 23,133 fish, and releasing 83%. Smallmouth bass were caught most frequently, followed by walleye and rainbow trout, although the bass and trout were rarely harvested. Walleye and catfish had the highest harvest rates. Most anglers were Tennessee residents, with 77% from Cocke County. They spent an estimated \$162,831 on fishing the river during the survey period (Carter et al 2007).

Fishing Access

Most of the trout streams and the Pigeon River on CNF lands are accessible by vehicle at some point. Access appears to be adequate at this time, with the exception of the Trail Fork gorge below Boomer Den. This stream is very rugged with only a small, precarious path along its slopes. Public access to much of this stream is also difficult due to inholdings of private land.

Prepared by:

/s/ Marcia S. Carter

MARCIA S. CARTER
North Zone Biologist
June 24, 2008

Literature Cited

Carter, B.D. 2007. Personal communication (pc).

Carter, B.D., C.E. Williams, R.D. Bivens, and J.W. Habera. 2007. Warmwater Stream Fisheries Report Region IV 2006. Tennessee Wildlife Resources Agency.

Habera, J.W., R.D. Bivens, B.D. Carter, C.E. Williams. 1999. Trout Fisheries Report, Region IV, 1998 . Tennessee Wildlife Resources Agency.

Habera, J.W., R.D. Bivens, B.D. Carter, C.E. Williams. 2002-2007. Region IV Trout Fisheries Report. Tennessee Wildlife Resources Agency.

Strange, R.J., J.W. Habera. 1995. Wild Trout Project Annual Report, 1994. University of Tennessee and Tennessee Wildlife Resources Agency.

Tennessee Wildlife Resources Agency. 2004. TWRA. Big Creek Stocking History Data.

USDA Forest Service. 2004. Final Environmental Impact Statement for the Revised Land and Resource Management Plan, Cherokee National Forest. Management Bulletin R8-MB 114B.

Wikipedia, The Free Encyclopedia. Wikipedia. 2007. Pigeon River (Tennessee-North Carolina). Website: [http://en.wikipedia.org/wiki/Pigeon_River_\(Tennessee_-_North_Carolina\)](http://en.wikipedia.org/wiki/Pigeon_River_(Tennessee_-_North_Carolina)).