Chapter 14
Water Resources

14.1 River Basin Hydrologic Units

Under the federal system, the French Broad River basin is made up of hydrologic areas referred to as cataloging units (USGS 8-digit hydrologic units). The French Broad River basin is made up of three whole cataloging units: the Upper French Broad River, Pigeon River and Nolichucky River. Cataloging units are further divided into smaller watershed units (14-digit hydrologic units or local watersheds) that are used for smaller scale planning like that done by NCEEP (Section 16.3). There are 89 local watershed units in the basin. Table 24 compares the three systems. A map identifying the hydrologic units and subbasins can be found in Appendix I.

Table 24 Hydrologic Subdivisions in the French Broad River Basin

Watershed Name and Major Tributaries	DWQ Subbasin 6-Digit Codes	USGS 8-Digit Hydrologic Units	USGS 14-Digit Hydrologic Units Local Watersheds*
Upper French Broad River East Fork French Broad River North Fork French Broad River West Fork French Broad River Little River Cane Creek Hominy Creek Mud Creek Sandymush Creek Swannanoa River Davidson River Mills River Big Ivy Creek (River) Big Laurel Creek Spring Creek	04-03-01 04-03-02 04-03-03 04-03-04	06010105	070010, 010010, 010020, 010030, 010040, 010050, 010055, 010060, 010080, 020010, 030010, 030020, 030030, 030040, 040010, 040020, 050010, 060010, 060020, 060030, 070020, 070030, 070040, 080010, 080020, 080030, 090010, 090020, 090030, 090040, 010070, 020015, 020020, 020030, 080040, 100010, 100020, 100030, 100040, 110010, 110020, 110030, 110040, 110050, 120010, 120020, 120030, 120040, 130010, 130020, 130030, 130040, 140010
Pigeon River East Fork Pigeon River West Fork Pigeon River Big Creek Cataloochee Creek Jonathan Creek Richland Creek	04-03-05	06010106	010010, 010020, 010030, 010040, 020010, 020020, 020030, 020040, 020050, 020060, 020070, 030010, 030020, 030030, 030040
Nolichucky River Big Rock Creek North Toe River South Toe River Cane River	04-03-06 04-03-07	06010108	010010, 010020, 010030, 010040, 020010, 020020, 020030, 030010, 040010, 050010, 060010, 060020, 100010, 100020, 100030, 120010, 070010, 080010, 080020, 080030, 080040

* Numbers from the 8-digit and 14-digit column make the full 14-digit HU. Example: 06010105070010 is one 14-digit HU.

14.2 Minimum Streamflow

One of the purposes of the Dam Safety Law is to ensure maintenance of minimum streamflows below dams. Conditions may be placed on dam operations specifying mandatory minimum releases in order to maintain adequate quantity and quality of water in the length of a stream affected by an impoundment. The Division of Water Resources (DWR), in conjunction with the Wildlife Resources Commission (WRC), recommends conditions relating to release of flows to satisfy minimum instream flow requirements. The Division of Land Resources (DLR) issues the permits. The Federal Energy Regulatory Commission (FERC) licenses all dams associated with hydropower.

Hydroelectric Dams

There are five operational dams in the French Broad River basin, including three on the French Broad River, one on Ivy Creek, and one on the Pigeon River. Information on each of these dams is presented below.

Craggy Dam is required by FERC to provide a tiered release of 460 cfs from July through January, and 860 cfs the remainder of the year. This dam operates in a run-of-river (non-peaking) mode and bypasses 3,200 feet of natural channel. It is located just downstream of the Beaverdam Creek confluence, and the facility is owned and operated by Buncombe County Metropolitan Sewer District.

Capitola Dam has no minimum release requirement according to their FERC license. This dam operates in a run-of-river (non-peaking) mode and bypasses 1,000 feet of natural channel. It is located just upstream of Marshall, and the facility is owned and operated by the French Broad Electric Membership Corporation.

Redmon Dam has no minimum release requirement according to their FERC license. The dam is operates in a run-of-river (non-peaking) mode and has no bypass stream channel. It is located just downstream of Marshall and the facility is owned and operated by Progress Energy.

Ivy River (Creek) Dam is located in AU# 6-96-(11.7). This facility is required by FERC to provide a 7Q10 flow of 16 cfs. A calibrated gage is required to monitor downstream flows. This dam operates in a run-of-river (non-peaking) mode and has no bypass channel. It is located 2.2 miles upstream of the mouth of Ivy Creek and is owned by Sithe Energies, Inc.

The *Walters* hydroelectric facility is located in AU# 5-(7) and is operated by Progress Energy. This facility is required by FERC to provide a minimum flow of 100 cfs one mile below the powerhouse at Brown's Bridge in Tennessee. A gage is required at Brown's Bridge to monitor flows. From the dam to the powerhouse, the facility bypasses 12 miles of natural channel. The powerhouse is located at the Pigeon River confluence with Big Creek on the North Carolina-Tennessee border.

Scheduled recreational releases are also required at Walters. The Schedule One recreational release is 1,200 cfs from 1:00 pm to 6:00 pm on two weekdays during each week, and 12:00 pm to 6:00 pm on Saturdays between the Saturday of the Memorial Day weekend and the Saturday of the Labor Day weekend. The Schedule Two recreational release is 1,200 cfs from 2:00 pm to

6:00 pm on not less than three weekdays per week during the two weeks prior to the Memorial Day weekend and the two weeks after the Labor Day weekend. The release schedule may be modified based on recreational use. The utility is to provide a toll-free phone number to provide information on the recreational flow releases.

No minimum release will be required in the bypassed natural channel until water quality and biological criteria are met. In lieu of a minimum flow, the utility will contribute funds to the Pigeon River Fund (www.pigeonriverfund.org) that will be administered by the Pigeon River Committee. In exchange for contributions to the fund, the Secretary of DENR will not seek a minimum release from the dam for ten years. When water quality and biological criteria are met, the established minimum release into the bypassed channel will be 30 cfs during May and June, and 20 cfs during the remainder of the year.

The Cascade Power Company surrendered the license to operate the *Cascade* hydroelectric facility on the Little River [AU# 6-38-(1)]. During operation, the facility was required to provide a 7Q10 flow of 23 cfs below the dam. A calibrated gage was established to monitor the flow requirement. The dam release was required to provide water in a run-of-river mode, and it bypassed 1,016 feet of natural stream channel when in operation.

Lake Junaluska located on Richland Creek [AU# 5-16-(16)] previously was a hydroelectric dam. In 1995, The Lake Junaluska Assembly surrendered its license exemption to produce power to FERC. The Assembly is still required to release water from the dam in a run-of-river mode. The Assembly agreed to a lake management plan with the NC Wildlife Resources Commission that allows the lake to be drawn down beginning on November 15 to a level not to exceed 2,448 feet mean sea level and return to full pool by April 15. A 7Q10 flow of 27.7 cfs or inflow, whichever is less, should be maintained below the dam during refill.

Water Supply Impoundments, Withdrawals and/or Miscellaneous Dams

There are additional impoundments that are not licensed hydroelectric dams in this basin. The following are water supply impoundments, withdrawals and/or miscellaneous dams.

- The *Town of Waynesville's* water supply reservoir is located on Allen Creek [AU# 5-16-7-(8.5)]. The dam has a 7Q10 release requirement of 3.5 cfs. A calibrated flume is used to make the release.
- On the *Little East Fork Pigeon River* [AU# 5-2-12-(5.5)] a trout hatchery is permitted to withdraw water only when 6.5 cfs is maintained downstream of the point of withdrawal. A calibrated gage is required to monitor flows.
- A trout hatchery diversion on *Shope Creek* (AU# 6-78-3) was permitted with an installed orifice sized for a 7Q10 release of 0.28 cfs.
- *Long Valley Lake on Long Valley Branch* (AU# 6-75) has a flow requirement of 0.36 cfs.
- *Eagle Lake Dam on Phillips Creek* (AU# 6-26-1) has a flow requirement of 0.5 cfs.
- *Cove Dam* on an unnamed tributary of Swannanoa River near Oteen has a flow requirement of 0.2 cfs.

Instream Flow Studies

The Division of Water Resources (DWR) participated in several instream flow studies during this cycle in the French Broad River basin. The studies and their findings are described below.

DWR conducted an instream flow study on *Jonathan Creek* [AU# 5-26-(5.5) and 5-26-(7)]. DWR along with the NC Wildlife Resources Commission (WRC) and the Maggie Valley Sanitary District reviewed a proposal for an expansion of the water treatment plant from 1.5 MGD to 3.0 MGD. The withdrawal from Jonathan Creek could increase to 3.0 MGD if an 8 cfs flow is maintained downstream of the intake. The installation of a calibrated gage will be required with this expansion, and withdrawal from Campbell Creek [AU# 5-26-8-(2.5)] would remain unchanged.

DWR, the WRC, and the City of Hendersonville participated in an instream flow study for *Mills River* [AU# 6-54-(4.5) and 6-54-(5)]. The study was the result of a proposal to relocate the city's water intake upstream of Highway 191/280. The study found that the city could withdraw 12 MGD without restriction, but withdrawals up to a maximum of 24 MGD would require a minimum flow of 30 cfs.

Further analysis examining the net habitat benefits was conducted for the city's proposal for a plant capacity of 18 MGD. This study indicated that the city could withdraw up to 18 MGD without restrictions in January through June, with an 8 cfs release from the upstream impoundments on North Fork Mills River and Bradley Creek. If there were no withdrawals from the upstream impoundments, then up to 14.2 MGD could be withdrawn in July through December without restrictions. In July through December, withdrawals up to 18 MGD were permissible if North Fork Mills River and Bradley Creek ran free, and the following targets were met below the downstream intake: 30 cfs (July and December); 40 cfs (August, October and November); and 42 cfs (September). Hendersonville must establish a gage downstream of their intake to monitor flows when their maximum daily withdrawal equals or exceeds 14 MGD.

Anticipating events that may temporarily prevent the use of the downstream source, such as in the event of a spill, the upstream impoundments may be used at any time. Conservation efforts or interconnection purchases should be used to maintain the 8 cfs downstream requirement. During storms, if nonpoint contaminants prevent use of the downstream source, the upstream impoundments may be used as long as the 8 cfs downstream flow can be maintained and more than 160 cfs (mean annual flow) is maintained at the US Geological Survey gage (#03446000).

The City of Hendersonville uses impoundments on *North Fork Mills River* [AU# 6-54-2-(1)] and *Bradley Creek* [AU# 6-54-3-17-(0.5)] as water supply sources. The city withdraws a combined volume of 5.5 MGD on average. The DWR participated in a study on these waters with the NC WRC, the US Department of Agriculture-Forest Service, and the City of Hendersonville. The study was used, in part, to issue a special use permit for Hendersonville from the U.S. Forest Service. All parties agreed upon an 8 cfs release below each of the water supply impoundments with gages to monitor the releases.

14.3 Interbasin Transfers

In addition to water withdrawals (discussed above), water users in North Carolina are also required to register surface water transfers with the Division of Water Resources (DWR) if the amount is 100,000 gallons per day or more. In addition, persons wishing to transfer two million gallons per day (MGD) or more, or increase an existing transfer by 25 percent or more, must first obtain a certificate from the Environmental Management Commission (G.S. 143-215.22I). The river basin boundaries that apply to these requirements are designated on a map entitled *Major River Basins and Sub-Basins in North Carolina*, on file in the Office of the Secretary of State. These boundaries differ from the 17 major river basins delineated by DWQ. Table 25 summarizes interbasin transfers within the French Broad River basin.

In determining whether a certificate should be issued, the state must determine that the overall benefits of a transfer outweigh the potential impacts. Factors used to determine whether a certificate should be issued include:

- The necessity, reasonableness and beneficial effects of the transfer;
- The detrimental effects on the source and receiving basins, including effects on water supply needs, wastewater assimilation, water quality, fish and wildlife habitat, hydroelectric power generation, navigation and recreation;
- The cumulative effect of existing transfers or water uses in the source basin;
- Reasonable alternatives to the proposed transfer; and
- Any other facts and circumstances necessary to evaluate the transfer request.

A provision of the interbasin transfer law requires that an environmental assessment or environmental impact statement be prepared in accordance with the State Environmental Policy Act as supporting documentation for a transfer petition. For more information on interbasin transfers, visit the website at http://www.ncwater.org or call DWR at (919) 733-4064.

Table 25 Estimated Interbasin Transfers in the French Broad River Basin (1997)

Supplying System	Receiving System	Source Subbasin	Receiving Subbasin	Estimated Transfer (MGD)
Hendersonville	Hendersonville	French Broad River	Broad River	<0.1
Hendersonville	Saluda	French Broad River	Broad River	0.151

14.4 Water Quality Issues Related to Drought

Water quality problems associated with rainfall events usually involve degradation of aquatic habitats because the high flows may carry increased loadings of substances like metals, oils, herbicides, pesticides, sand, clay, organic material, bacteria and nutrients. These substances can be toxic to aquatic life (fish and insects) or may result in oxygen depletion or sedimentation. During drought conditions, these pollutants become more concentrated in streams due to reduced flow. Summer months are generally the most critical months for water quality. Dissolved oxygen is naturally lower due to higher temperatures, algae grow more due to longer periods of sunlight, and streamflows are reduced. In a long-term drought, these problems can be greatly

exacerbated, and the potential for water quality problems to become catastrophic is increased. This section discusses water quality problems that can be expected during low flow conditions.

The frequency of acute impacts due to nonpoint source pollution (runoff) is actually minimized during drought conditions. However, when rain events do occur, pollutants that have been collecting on the land surface are quickly delivered to streams. When streamflows are well below normal, this polluted runoff becomes a larger percentage of the water flowing in the stream. Point sources may also have water quality impacts during drought conditions even though permit limits are being met. Facilities that discharge wastewater have permit limits that are based on the historic low flow conditions. During droughts, these wastewater discharges may make up a larger percentage of the water flowing in a stream than during normal climatic and streamflow conditions. These discharges may also contribute to lowered dissolved oxygen concentrations and increased levels of other pollutants during drought conditions.

As streamflows decrease, there is less habitat available for aquatic insects and fish, particularly around lake shorelines. There is also less water available for irrigation and for water supplies. The dry conditions and increased removal of water for these uses further increases strain on the resource. With lesshabitat, naturally lower dissolved oxygen levels and higher water temperatures, the potential for large kills of fish and aquatic insects is very high. These conditions may stress the fish to the point where they become more susceptible to disease and where stresses that normally would not harm them result in mortality.

These are also areas where longer retention times due to decreased flows allow algae to take full advantage of the nutrients present resulting in algal blooms. During the daylight hours, algae greatly increase the amount dissolved oxygen in the water, but at night algal respiration and die off can cause dissolved oxygen levels to drop low enough to cause fish kills. Besides increasing the frequency of fish kills, algae blooms can also cause difficulty in water treatment resulting in taste and odor problems in finished drinking water.