

CHAPTER TOPICS

- 💧 Understanding Stream Flow
- 💧 Managing Flow from Impoundments
- 💧 Water Supply, Demand, Availability & Planning
- 💧 SWAP

CHAPTER 5

WATER QUANTITY

IN THE NEW RIVER BASIN

UNDERSTANDING STREAM FLOW

Stream flow is monitored by U.S. Geological Survey gaging stations at [selected stations](#) across the state. Flow, often abbreviated as “Q”, is measured in terms of volume of water per unit of time, usually cubic feet per second (cfs). Minimum flows are intended to be only occasional short-term events that maintain stream conditions at a survivable level for aquatic life. One example of such a minimum flow requirement is the “7Q10 flow” - the lowest flow occurring for seven consecutive days, with a probability of occurring once every 10 years. This is a drought flow statistic that is used to determine wastewater discharge effluent limits such that the pollutant load can still be assimilated and chemical water quality standards can still be maintained during the driest week occurring once every 10 years. This type of minimum flow will not protect ecological integrity if it is frequently the only flow in the stream, and/or occurs for long periods of time. The potential for global climate change to change the patterns of water availability adds to the importance of protecting ecological flows, not just maintaining minimum flows of increasing duration.

A minimum flow approach does not incorporate critical characteristics of a flow regime (magnitude, timing, frequency, duration, variability and rate of change) needed to protect ecological integrity. Minimum flows lack the variability between different times of year (monthly and seasonal), as well as the inter-annual variability between different types of years (wet, dry, average).

For additional information about stream flow see [DWR’s Environmental Flows](#) web page.

MANAGING FLOW FROM IMPOUNDMENTS

MINIMUM RELEASE REQUIREMENTS

One of the purposes of the Dam Safety Law is to ensure maintenance of minimum streamflows below dams. Conditions may be placed on dam operations specifying mandatory minimum releases in order to maintain adequate quantity and quality of water downstream of the impoundment. The [Division of Water Resources](#) (DWR), in conjunction with the [Wildlife Resources Commission](#) (WRC), recommends conditions related to release of flows to satisfy minimum instream flow requirements. The [Division of Land Resources](#) (DLR) issues the permits and is responsible for enforcement. The Federal Energy Regulatory Commission (FERC) licenses most dams associated with hydropower under the Federal Power Act. Flow requirements may also be established for

non-dam projects that require a Finding of No Significant Impact to satisfy a state or federal environmental review or as a condition of a permit required by the Clean Water Act. Calculated minimum stream flows for impoundments in the New River Basin are listed in Table 5-1. If the inflow is less than the minimum release, the minimum release becomes that inflow rate.

TABLE 5-1: MINIMUM RELEASE FROM IMPOUNDMENTS IN THE NEW RIVER BASIN

NAME OF DAM	PURPOSE	WATERBODY	DRAINAGE AREA	MINIMUM RELEASE
Hydroelectric Dams				
Sharpes Falls (FERC #: 6322)	Hydroelectricity Production	North Fork New River	112 mi ²	None ^a
Impoundment Dams/Weirs				
Roaring Gap (Lake Louise)	Amenity & Irrigation	Laurel Branch	1.06 mi ²	1.4 cfs
Old Beau Upper	Amenity & Irrigation	Laurel Branch	1.33 mi ²	None ^b
Old Beau Lower	Amenity & Irrigation	Laurel Branch	1.54 mi ²	1.6 cfs
South Fork New River Weir	Town of Boone Water Supply	South Fork	19.5 mi ²	4.0 ^c cfs
Winkler Creek Dam	Town of Boone Water Supply	Winkler Creek	5.7 mi ²	2.4 ^c cfs

^a Even though there is no minimum flow, the project must operate in a run-of-river mode; i.e., instantaneous inflow equals instantaneous outflow. Note: A noncompliant project can noticeably alter the stream flow.

^b The upper and lower ponds were built in series so that the system will provide 1.6 cubic feet/second (cfs) downstream.

^c The Section 404 permit, issued by the U.S. Army Corp of Engineers, also states "the Town of Boone will in all cases be permitted to withdraw a maximum of 4.6 cfs from the combined sources."

WATER SUPPLY, DEMAND, AVAILABILITY & PLANNING

Division of Water Resources summarized water quantity in the New River Basin in 2001 in a [four page document](#) on their web site. Information included in this document includes:

- 💧 Water demand and use,
- 💧 Local Water Supply Plans,
- 💧 Self-Supplied use and registered water withdrawals,
- 💧 Water availability, and
- 💧 Interbasin transfers of surface water.

WATER WITHDRAWALS

North Carolina General Statute G.S. 143-215.22H, originally passed in 1991, requires surface water and ground water withdrawals that meet conditions established by the General Assembly to register the water withdrawals and surface water transfers with the State and update those registrations at least every five years. Agricultural water users that withdraw one million gallons of water a day or more and non-agricultural water users that withdraw one hundred thousand gallons of water a day are required to register. Administrative rules that became effective in March 2007 (15A NCAC 02E.0600) stipulate that registrants must also report their water usage annually to the Department of Environment and Natural Resources. In its 2008 session, the General Assembly established civil penalties for failure to comply with these requirements.

In the New River Basin, there are five registered users that withdraw surface water (Table 5-2).

TABLE 5-2: CURRENT SURFACE WATER WITHDRAWALS BY LOCAL WATER SUPPLY SYSTEMS*

COUNTY	SYSTEM NAME	SOURCE	PUBLIC WATER SUPPLY ID LINK ¹	OWNERSHIP
Ashe	Jefferson	New River	01-05-015	Municipality
Watauga	Blowing Rock	Flat Top Branch	01-95-020	Municipality
Watauga	Boone	South Fork NR	01-95-010	Municipality
Watauga	Boone	Winklers Creek	01-95-010	Municipality
Watauga	Appalachian State University	Norris Branch	01-95-101	State

¹ Additional information on average water use by day and month along with a wide variety of other information about the water supply (the facilities LWSP) can be found at the Public Water Supply ID Link supplied in this table.

* **Note:** This is not necessarily a complete list. Omission from this list does not excuse any party from meeting their permit conditions.

LOCAL WATER SUPPLY PLAN (LWSP)

Units of local government that supply or plan to supply water to the public are required to prepare a Local Water Supply Plan (LWSP). Like the withdrawal registrations, a LWSP must be updated at least every five years and systems required to prepare a LWSP must also report water usage annually to the [Division of Water Resources](#). Preparing a LWSP and keeping it updated meets a local government’s obligation to register their water withdrawals under General Statute 143-215.22H. The LWSPs for the five registered users are linked in Table 5-2. Other LWSP reports can be searched on [DWRs Water Supply Planning](#) website.

The Town of Sparta

The Town of Sparta updated their LWSP in 2007. At that time the plan stated that “Sparta and the Town of Independence, Va. are currently pursuing an interconnection with water being drawn from the New River which will replace the existing well systems currently serving each town.”

That status of that project is progressing and is projected to be completed in 2011.

The Town of Boone

A Finding of No Significant Impact (FONSI) was issued by the U.S. Department of Agriculture, Rural Development State Office for a new run-of-river withdrawal for the Town of Boone to be located on the Watauga County side of the South Fork New River just upstream of the community of Brownwood. The drainage area at the proposed intake is estimated by the applicant to be 101.7 square miles. The intakes proposed permitted capacity is 4.0 million gallons per day (MGD), or 6.18 cubic feet per second (cfs). The proposed project’s purpose and need included an emergency source to the Town of Blowing Rock of 0.5 MGD, or 0.77 cfs, through an interconnection. The project is supposed to address Boone’s projected 2030 maximum daily demand of 6.8 MGD, or 10.5 cfs, in combination with its existing water sources. The withdrawal mechanism will be a sub-channel infiltration gallery.

The applicant estimated the 7Q10 flow at the proposed intake to be 35.61 cfs, or 23.0 MGD. Twenty percent of this value is 7.12 cfs, or 4.6 MGD. Excepting certain circumstances, DWR has historically considered the withdrawal of a volume less than that representing 20 percent of the 7Q10 as not triggering an intensive field study. The applicant did examine the impact of withdrawals on water depth at the first riffle complex downstream of the intake in consideration of the extensive use of the river for boating.

Boone’s water treatment plant’s treatment capacity will also be expanded from 3.0 MGD to 4.5 MGD, or 6.95 cfs as part of the proposed project.

SOURCE WATER ASSESSMENT & PROTECTION (SWAP) OF PUBLIC WATER SUPPLIES IN THE NEW RIVER BASIN

INTRODUCTION

The Federal Safe Drinking Water Act (SDWA) Amendments of 1996 emphasize pollution prevention as an important strategy for the protection of ground and surface water resources. This new focus promotes the prevention of drinking water contamination as a cost-effective means to provide reliable, long-term and safe drinking water sources for public water supply (PWS) systems. In order to determine the susceptibility of public water supply sources to contamination, the amendments also required that all states establish a Source Water Assessment Program (SWAP). Specifically, Section 1453 of the SDWA Amendments require that states develop and implement a SWAP to:

- 💧 Delineate source water assessment areas;
- 💧 Inventory potential contaminants in these areas; and
- 💧 Determine the susceptibility of each public water supply to contamination.

In North Carolina, the agency responsible for the SWAP is the Public Water Supply (PWS) Section of the DENR Division of Environmental Health (DEH). The PWS Section received approval from the EPA for their SWAP Plan in November 1999. The SWAP Plan, entitled North Carolina's Source Water Assessment Program Plan, fully describes the methods and procedures used to delineate and assess the susceptibility of more than 9,000 wells and approximately 207 surface water intakes. To review the SWAP Plan, visit the [PWS website](#).

DELINEATION OF SOURCE WATER ASSESSMENT AREAS

The SWAP Plan builds upon existing protection programs for ground and surface water resources. These include the state's Wellhead Protection Program and the Water Supply Watershed Protection Program.

Wellhead Protection (WHP) Program

North Carolinians withdraw more than 88 million gallons of groundwater per day from more than 9,000 water supply wells across the state. In 1986, Congress passed Amendments to the SDWA requiring states to develop wellhead protection programs that reduce the threat to the quality of groundwater used for drinking water by identifying and managing recharge areas to specific wells or wellfields.

Defining a wellhead protection area (WHPA) is one of the most critical components of wellhead protection. A WHPA is defined as "the surface and subsurface area surrounding a water well or wellfield, supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or wellfield." The SWAP uses the methods described in the state's approved WHP Program to delineate source water assessment areas for all public water supply wells. More information related to North Carolina's WHP Program can be found on the [SWAP website](#).

Water Supply Watershed Protection (WSWP) Program

DWQ is responsible for managing the standards and classifications of all water supply watersheds. In 1992, the WSWP Rules were adopted by the EMC and require all local governments that have land use jurisdiction within water supply watersheds adopt and implement water supply watershed protection ordinances, maps and management plans. SWAP uses the established

water supply watershed boundaries and methods established by the WSWP program as a basis to delineate source water assessment areas for all public water surface water intakes. Additional information regarding the [WSWP Program](#) can be found at their website.

SUSCEPTIBILITY DETERMINATION – NC’S OVERALL APPROACH

The SWAP Plan contains a detailed description of the methods used to assess the susceptibility of each PWS intake in North Carolina. The following is a brief summary of the susceptibility determination approach.

Overall Susceptibility Rating

The overall susceptibility determination rates the potential for a drinking water source to become contaminated. The overall susceptibility rating for each PWS intake is based on two key components: a contaminant rating and an inherent vulnerability rating. For a PWS to be determined “susceptible”, a potential contaminant source must be present and the existing conditions of the PWS intake location must be such that a water supply could become contaminated. The determination of susceptibility for each PWS intake is based on combining the results of the inherent vulnerability rating and the contaminant rating for each intake. Once combined, a PWS is given a susceptibility rating of higher, moderate or lower (H, M or L).

Inherent Vulnerability Rating

Inherent vulnerability refers to the physical characteristics and existing conditions of the watershed or aquifer. The inherent vulnerability rating of groundwater intakes is determined based on an evaluation of aquifer characteristics, unsaturated zone characteristics and well integrity and construction characteristics. The inherent vulnerability rating of surface water intakes is determined based on an evaluation of the watershed classification (WSWP Rules), intake location, raw water quality data (i.e., turbidity and total coliform) and watershed characteristics (i.e., average annual precipitation, land slope, land use, land cover, groundwater contribution).

Contaminant Rating

The contaminant rating is based on an evaluation of the density of potential contaminant sources (PCSs), their relative risk potential to cause contamination, and their proximity to the water supply intake within the delineated assessment area.

Inventory of Potential Contaminant Sources (PCSs)

In order to inventory PCSs, the SWAP conducted a review of relevant, available sources of existing data at federal, state and local levels. The SWAP selected sixteen statewide databases that were attainable and contained usable geographic information related to PCSs.

SOURCE WATER PROTECTION

The PWS Section believes that the information from the source water assessments is the basis for future initiatives and priorities for public drinking water source water protection (SWP) activities. The PWS Section encourages all PWS system owners to implement efforts to manage identified sources of contamination and to reduce or eliminate the potential threat to drinking water supplies through locally implemented protection planning.

To encourage and support local SWP, the state offers PWS system owners assistance with local SWP planning as well as materials such as:

- 💧 Fact sheets outlining sources of funding and other resources for local SWP efforts.
- 💧 Success stories describing local SWP efforts in North Carolina.

💧 Guidance about how to incorporate SWAP and SWP information in Consumer Confidence Reports (CCRs).

Information related to [SWP](#) can be found online.

PUBLIC WATER SUPPLY SUSCEPTIBILITY DETERMINATIONS IN THE NEW RIVER BASIN

In April 2004, the PWS Section completed source water assessments for all drinking water sources and generated reports for the PWS systems using these sources. The assessments are updated regularly; the most recent updates were published in May 2010. The results of the assessments can be viewed in two different ways, either through the interactive ArcIMS mapping tool or compiled in a written report for each PWS system. To access the ArcIMS mapping tool, simply click on the “NC SWAP Info” icon on the [web page](#). To view a report, select the PWS System of interest by clicking on the “Source Water Assessment Results-2010” link found on the SWAP web page.

In the New River Basin, 201 public water supply sources were identified. Six are surface water sources, one is groundwater under the influence of surface water (i.e. a spring) and 194 are groundwater sources. Of the 194 groundwater sources, 2 of them have a Higher, 176 have a Moderate and 16 have a Lower susceptibility rating. The one groundwater under the influence of surface water has a Moderate susceptibility rating. Table 10-1 identifies the surface water sources and their overall susceptibility ratings. It is important to note that a susceptibility rating of Higher does not imply poor water quality. Susceptibility is an indication of a water supply’s potential to become contaminated.

TABLE 5-3: SWAP RESULTS FOR SURFACE WATER SOURCES IN THE NEW RIVER BASIN

PWS ID NUMBER	INHERENT VULNERABILITY RATING	CONTAMINANT RATING	OVERALL SUSCEPTIBILITY RATING	NAME OF SURFACE WATER SOURCE	PWS SYSTEM NAME
0105015	H	L	M	South Fork of NR	Town of Jefferson
0195010	H	L	M	South Fork of NR	Town of Boone
0195010	H	L	M	Winklers Creek	Town of Boone
0195020	M	L	M	Town Lake	Town of Blowing Rock
0195101	H	L	M	Howard’s Creek	Appalachian State Univ.
0195101	M	L	M	Norris Branch	Appalachian State Univ.

REFERENCES

North Carolina Department of Environment and Natural Resources (NCDENR). Division of Water Resource (DWR). March 2007. *Water Use During Droughts and Water Supply Emergencies*. North Carolina Administrative Code: 15A NCAC 2E .0600. Raleigh, NC. (http://www.ncwater.org/Rules_Policies_and_Regulations/Planning/drought_rules.pdf)

_____. DWR. 1991. § 143-215.22H. *Registration of Water Withdrawals and Transfers Required*. Raleigh, NC.

Note: URL addresses for hyperlinks found in this plan are listed in the [Acronyms & Definitions Chapter](#).