Water Usage and Rights

6.0

Question 5:

What is the status and apparent trends in water usage and supplies in the Southern Appalachians, including water rights and uses on national forest system land?

Water is often referred to as our most precious natural resource. Every aspect of our lives and all other living organisms depend on water for sustenance and growth. Food, shelter, the production of goods, and all other human activities depend on water. Seldom do we stop to think about the importance of water as our faucets are turned on in anticipation of a hot shower or to prepare our food. We swim, drink from fountains, and water our lawns, rarely thinking about the source of our water. In the United States we are blessed with an abundant supply of clean water. Where supplies may be scarce, technology through the construction of dams and elaborate conveyance systems has permitted development of thriving communities in previously arid areas. As populations increase and place concomitant pressures on our water supplies, the awareness and importance of water will emerge as one of the most significant environmental issues well into the next century.

Water supplies in the South and particularly in the Southern Appalachian Assessment (SAA) area are abundant in the form of year-round rainfall, surface water flowing through streams, and groundwater. Average rainfall within the SAA averages 40 to 60 inches annually, with over 60 inches in the north Georgia mountains and the southwestern tip of North Carolina (Council on Environmental Quality 1989). Groundwater usage in states within the SAA ranges from a low of 394 million gallons per day (Mgal/d) in Alabama to 996 Mgal/d in Georgia (Solley and others 1993). These figures represent entire state averages and are not specific to the SAA study area. However, the combined effects of high runoff, shallow water tables, and abundant streamflows provide substantial water storage in the South. Recharge of shallow aquifers is accomplished in most years by high infiltration rates of southern soils and the annual occurrence of prolonged wet weather in winter. (Healy 1985)

With expanding development and urbanization, there will be an increasing demand on water supplies. Although water supplies have historically been abundant in the Southern Appalachians, there is a need for the compilation and study of water usage patterns in this unique ecosystem.

The categories of water usage include commercial, domestic, hydroelectric, industrial, irrigation, livestock, and mining. Sections 6.1 and 6.2 summarize the more salient water uses and, where possible, discuss some of the apparent trends in usage in the SAA area. Projections for water use, well into the next century, are based on a study by the USDA Forest Service with assumptions of continued uses and patterns of development. Water uses and rights on National Forest System land are discussed to provide background information on how that water use is monitored.

6.1 WATER USAGE AND SUPPLIES

Introduction

The Southern Appalachians are headwaters for nine major rivers. These rivers provide drinking water for much of the southeastern United States. Recent short-term droughts and reports of water pollution have further heightened concern over water quality and quantity issues that could take on increasing significance as we approach the end of the 20th century. The management of our water resources is transitioning from one of water-supply development to that of water-demand management and conservation (Solley 1993).

The expanding land uses in the South

Table 6.1.1 Total water use in the Southern Appalachian Assessment area in million gallons per day (mgd) from 1985–1990. From county water use data.

	Use Category								
	Commercial		Domestic		Industrial		Agriculture		Total
Year	(mgd)	(%)	(mgd)	(%)	(mgd)	(%)	(mgd)	(%)	
1985	124.4	5.0	462.9	18.4	1804.8	71.8	121.3	4.8	2513.6
1990	156.1	7.7	453.3	22.4	1324.5	65.5	87.4	4.3	2021.2

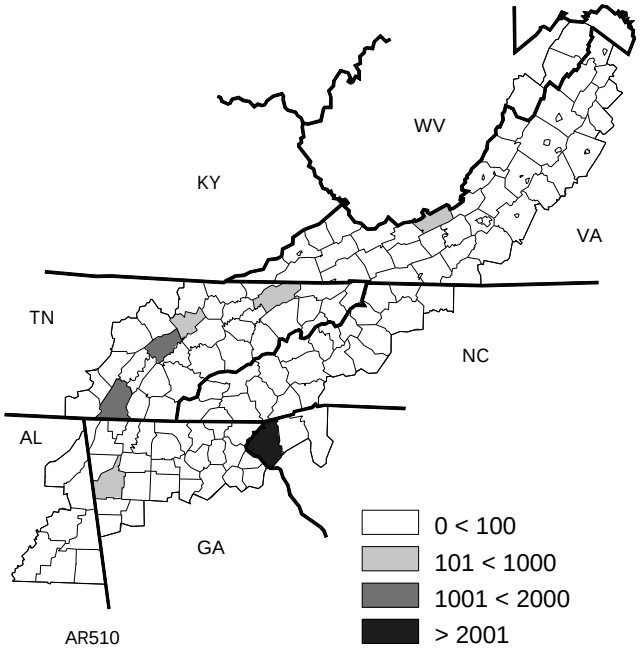

Figure 6.1.1 Range of thermoelectric water use (million gallons per day) by county in the SAA area for 1990. Actual use shown in table 6.1.2.

require an abundance of water – water needed for homes, businesses, industry, and irrigation. Although the total consumptive use of water in the South as a whole is only a fraction of what is available, there are some localities which suffer shortages (Healy 1985). Local water shortages may result from inadequate conveyance systems, the lack of adequate infrastructure to supply water, or localized drought. The importance of high-quality water is becoming increasingly critical, and some users are taking steps to establish legal rights in anticipation of future competition. Furthermore, in many places surface water or groundwater has become severely polluted from unwise land-use practices, further increasing the demand and strain on water resources. Water use patterns in the South have also changed over the last 40 years. Water use has increased more

Table 6.1.2 Total water use in million gallons per day (mgd) in the Southern Appalachian Assessment area for thermoelectric cooling during 1985 and 1990.

Year	Total Use	Percent Increase
1985	5201	
1990	6766.1	30.1

than 70 percent since 1960. The rate of irrigation use has leveled off, while industrial use has increased more than tenfold.

The purpose of this report is to document known information regarding water supplies and usage within the Southern Appalachians and to look at apparent trends established over the past 40 years to provide some basis for future water demand.

Historically, the Southern Appalachian region has enjoyed an abundant supply of water. The Southern Appalachians receive an average of 50 to 60 inches of precipitation annually. Average annual runoff is 10 to 20 inches with higher amounts in the southern high-mountainous areas (Council on Environmental Quality 1989). For this report, water usage data for industrial, commercial, domestic, agricultural, and thermoelectric uses were compiled by county within the study area for the period 1985 to 1990. The following key findings and apparent trends are based on an assumption of reliable data with projections dependent on assumed population growth and future development within the South.

Key Findings

- Approximately two-thirds of the water use within the study area is industrial, and the remainder is divided between commercial, domestic, and agricultural (table 6.1.1).
- Overall, water usage in the domestic, industrial, and agricultural categories decreased 19.6 percent between 1985 and 1990,

Table 6.1.3 Water use by county for hydroelectric power in million gallons per day (mgd) in 1990. Counties are identified with a range of use in figure 6.1.1.

		Water Use	
FIPS[1] Code	County	(mgd)	(%)
51167	Russel	12.5	0.2
51071	Giles	345.8	5.1
47145	Roane	1170.3	17.3
47073	Hawkins	602.7	8.9
47065	Hamilton	1295.5	18.2
47001	Anderson	511.4	7.6
45073	Oconee	2352.7	34.8
37021	Buncombe	1.7	0
13115	Floyd	416.5	6.2
13015	Bartow	57	0.8

[1]FIPS = Federal Information Processing System

primarily due to a decrease of 26.6 percent in industrial use. Agricultural and domestic use also declined, whereas commercial use increased.

- Thermoelectric water usage increased 30 percent from 1985 to 1990 (fig. 6.1.1, table 6.1.2). Over 70 percent of the thermoelectric usage is by the three nuclear generating facilities: Oconee Plant, operated by Duke Power, 34.8 percent; Sequoyah Plant, 19.2 percent, and Watts Bar Plant, 17.3 percent, both operated by Tennessee Valley Authority (TVA) (table 6.1.3).
- Over 22 percent of water use in the study area occurs in Sullivan County, Tennessee, where industrial use exceeds 450 million gallons per day. Other industrial usage by county ranges from 0.5 to 82 million gallons per day (table 6.1.4).
- Of the total off-stream water withdrawals in the Southern Appalachian states, approximately 76 percent is surface water and the remaining 24 percent groundwater (fig. 6.1.2).

Data Sources

Water data were compiled by the U.S. Geological Survey (USGS). The water use program in the USGS, Water Resources Division, collects and publishes water use information at 5-year intervals. The categories of data are industrial, mining, public supplies, thermoelectric, livestock, and irrigation. The water use data are collected in cooperation with individual states and other federal agencies. Data may be gathered from existing manual and electronic files, collected in the field, or alternatively modeled using climatic or econometric models (Hutson 1995).

Under federal guidance, the standardized collection and analysis methods allow evaluations based on similar assumptions and comparable data. The data are used to provide historic water-use information to enable scientists to project the hydrologic effects of future water demands, such as reduced reservoir levels and lower groundwater levels (Hutson 1995; Solley 1993).

Analysis, Spatial Patterns, and Trends

The trend in decreasing water usage within the study area from 1985 to 1990 is consistent with water usage patterns nationally, where the rate of water usage increased steadily between 1950 and 1980 (figs. 6.1.3, 6.1.4) and then began an overall decline (Solley 1993). Two exceptions to this decreasing trend were the public supply and thermoelectric power categories. Withdrawals for both of these categories were about 5 percent and 30 percent more, respectively, during 1990 than during 1985. The Southern Appalachian area water usage increase of 30 percent in thermoelectric is a striking exception to the national rate.

Even though population increased nationally 4 percent between 1985 and 1990, withdrawal and consumptive use estimates increased by only 2 percent. Consumptive use within the Southern Appalachians, however, showed a decrease of 2 percent. This can be attributed to

Table 6.1.4 Water use in million gallons per day for each county in the Southern Appalachian Assessment (SAA) area.

County	State	Commercial	Domestic	Industrial	Agriculture	Total[1]	Thermoelectric
Calhoun	AL	2.3	11.39	4.94	2.04	20.67	0
Cherokee	AL	0.4	3.55	0.15	1.56	5.66	0
Clay	AL	0.09	1.53	0.11	0.89	2.62	0
Cleburne	AL	0.49	1.03	0.93	0.86	3.31	0
De Kalb	AL	0.26	4.54	2.45	4.87	12.12	0
Randolph	AL	0.03	1.72	0.34	1.25	3.34	0
Talladega	AL	0.81	4.19	75.62	1.4	82.02	0
Banks	GA	0.25	0.78	0.07	0.71	1.81	0
Bartow	GA	0.85	6.05	9.14	0.69	16.73	57
Catoosa	GA	0.16	3.69	0.01	0.76	4.62	0
Chattooga	GA	1.08	2.88	7.64	0.12	11.72	0
Cherokee	GA	0.54	6.31	0.56	1.17	8.58	0
Dade	GA	0.13	1.14	0	0.1	1.37	0
Dawson	GA	0.03	0.69	0	0.22	0.94	0
Fannin	GA	0.09	1.15	0	0.1	1.34	0
Floyd	GA	2.62	6.39	30.32	3.87	43.2	416.5
Forsyth	GA	0.72	3.71	1.08	0.82	6.33	0
Franklin	GA	0.26	1.93	0.02	1.03	3.24	0
Gilmer	GA	0.22	1.97	1.51	0.51	4.21	0
Gordon	GA	1.31	3.12	8.59	0.61	13.63	0
Habersham	GA	0.41	3.01	1.85	1.06	6.33	0
Hall	GA	3.15	6.33	3.87	2.53	15.88	0
Haralson	GA	0.06	2.51	0	0.29	2.86	0
Lumpkin	GA	0.16	1.47	0	0.91	2.54	0
Murray	GA	0.23	2.39	0.88	0.47	3.97	0
Paulding	GA	0.02	3.65	0	0.51	4.18	0
Pickens	GA	0.22	1.5	0	0.36	2.08	0
Polk	GA	0.08	1.9	1.95	0.13	4.06	0
Rabun	GA	0.28	1.17	1.87	0.13	3.45	0
Stephens	GA	0.26	1.98	2.3	0.32	4.86	0
Towns	GA	0.08	0.55	0	0.06	0.69	0
Union	GA	0.08	0.85	0	0.14	1.07	0
Walker	GA	0.58	5.64	5.8	0.41	12.43	0
White	GA	0.1	1.41	0	0.48	1.99	0
Whitfield	GA	7.39	6.17	22.16	0.81	36.53	0
Alleghany	NC	0.04	0.55	0	0.82	1.41	0
Ashe	NC	0.05	1.36	0.44	0.77	2.62	0
Avery	NC	0.21	0.82	0.01	1.45	2.49	0
Buncombe	NC	12.47	11.59	9.78	0.92	34.76	1.7
Burke	NC	1.27	3.93	11.29	0.95	17.44	0
Caldwell	NC	0.65	3.94	1.94	0.64	7.17	0
Cherokee	NC	0.35	1.5	0.27	0.23	2.35	0
Clay	NC	0.02	0.41	0	0.13	0.56	0
Graham	NC	0.09	0.41	0.03	0.02	0.55	0
Haywood	NC	1.15	2.58	52.23	0.51	56.47	0
Henderson	NC	1.27	3.87	2.83	0.77	8.74	0
Jackson	NC	0.53	0.9	0.01	1.64	3.08	0
McDowell	NC	0.29	1.77	4.35	0.23	6.64	0
Macon	NC	0.61	1.31	0.04	0.23	2.19	0
Madison	NC	0.36	1.5	0.01	0.43	2.3	0
Mitchell	NC	0.26	1.01	0.46	0.13	1.86	0
Surry	NC	1.26	3.49	6.88	2.02	13.65	0
Swain	NC	0.13	0.66	0.01	0.07	0.87	0
Transylvania	NC	0.2	1.47	31.11	0.19	32.97	0
Watauga	NC	1.57	2	0.03	0.4	4	0
Wilkes	NC	1.22	3.78	4.7	2.56	12.26	0
Yancey	NC	0.08	0.92	1.2	0.26	2.46	0

Table 6.1.4 (cont.) Water use in million gallons per day for each county in the Southern Appalachian Assessment (SAA) area.

County	State	Commercial	Domestic	Industrial	Agriculture	Total[1]	Thermoelectric
Greenville	SC	19.03	24.01	6.56	0.49	50.09	0
Oconee	SC	1.97	4.31	3.38	0.25	9.91	2352.7
Pickens	SC	4.47	7.04	3.34	0.16	15.01	0
Anderson	TN	2.92	10.17	6.03	0.38	19.5	511.4
Bledsoe	TN	0.38	0.75	0.05	0.42	1.6	0
Blount	TN	1.77	5.78	4.7	0.42	12.67	0
Bradley	TN	2.1	4.95	9.08	0.63	16.76	0
Campbell	TN	0.35	2.21	0.1	0.06	2.72	0
Carter	TN	0.81	5.53	20.73	0.11	27.18	0
Claiborne	TN	0.33	1.83	0.06	0.23	2.45	0
Cocke	TN	0.91	2.18	0.74	0.35	4.18	0
Cumberland	TN	0.5	2.93	0.44	0.57	4.44	0
Grainger	TN	0.11	1.08	0.05	0.36	1.6	0
Greene	TN	3.31	3.18	0.82	1.11	8.42	0
Hamblen	TN	0.79	2.72	25.05	0.18	28.74	0
Hamilton	TN	14.43	18.6	26.94	0.72	60.69	1295.5
Hancock	TN	0.07	0.42	0.06	0.1	0.65	0
Hawkins	TN	0.38	3.24	73.46	0.37	77.45	602.7
Jefferson	TN	1.14	2.55	0.24	0.62	4.55	0
Johnson	TN	0.17	1	0.47	0.13	1.77	0
Knox	TN	5.01	35.47	8.15	0.59	49.22	0
Loudon	TN	0.52	2.14	7.24	0.31	10.21	0
McMinn	TN	0.63	2.13	73.47	0.86	77.09	0
Marion	TN	0.45	2.03	0.11	0.14	2.73	0
Meigs	TN	0.08	0.68	0.04	0.56	1.36	0
Monroe	TN	0.57	2.29	0.32	0.36	3.54	0
Morgan	TN	0.03	1.07	0.03	0.07	1.2	0
Polk	TN	0.15	1.59	29.04	0.15	30.93	0
Rhea	TN	0.54	1.76	0.54	0.45	3.29	0
Roane	TN	1.22	3.29	3.02	0.3	7.83	1170.3
Sequatchie	TN	0.09	0.66	0.05	0.07	0.87	0
Sevier	TN	2.93	3.01	0.7	0.22	6.86	0
Sullivan	TN	1.47	4.52	450.72	0.44	457.15	0
Unicoi	TN	0.23	1.55	0.35	0.14	2.27	0
Union	TN	0.15	0.86	0.06	0.06	1.13	0
Washington	TN	3.16	10.48	3.86	1.35	18.85	0
Albemarle	VA	0.26	8.13	0.07	0.65	9.11	0
Alleghany	VA	0.69	1.86	59.56	0.06	62.17	0
Amherst	VA	2.46	7.1	14.4	0.26	24.22	0
Augusta	VA	3.51	7.32	14.98	3.08	28.89	0
Bath	VA	1.62	0.36	0.01	0.12	2.11	0
Bedford	VA	0.55	3.88	28	0.81	33.24	0
Bland	VA	0.34	0.48	0	0.2	1.02	0
Botetourt	VA	0.89	1.87	0.21	0.36	3.33	0
Buchanan	VA	0.11	2.35	0.31	0.01	2.78	0
Carroll	VA	0.68	2.24	0.69	0.64	4.25	0
Craig	VA	0.05	0.33	0	0.11	0.49	0
Dickenson	VA	0.2	1.32	0	0.04	1.56	0
Floyd	VA	0.07	0.9	0	0.46	1.43	0
Franklin	VA	0.43	2.97	0.29	1.46	5.15	0
Frederick	VA	0.2	5.07	0.3	0.35	5.92	0
Giles	VA	0.44	1.23	66.68	0.17	68.52	345.8
Grayson	VA	0.13	1.24	0.02	0.36	1.75	0
Greene	VA	0.11	0.77	0	0.16	1.04	0
Highland	VA	0.01	0.2	1.42	0.19	1.82	0
Lee	VA	0.13	1.84	0.01	0.37	2.35	0
Madison	VA	0.21	0.9	0	0.52	1.63	0
Montgomery	VA	1.72	7.52	27.53	0.51	38.48	0

Table 6.1.4 (cont.) Water use in million gallons per day for each county in the Southern Appalachian Assessment (SAA) area.

County	State	Commercial	Domestic	Industrial	Agriculture	Total[1]	Thermoelectric
Nelson	VA	0.17	0.95	0	0.75	1.87	0
Page	VA	0.42	1.63	0.35	0.81	3.21	0
Patrick	VA	0.18	1.31	0.37	0.29	2.15	0
Pulaski	VA	1.55	2.59	1.87	0.38	6.39	0
Rappahannock	VA	0.04	0.49	0	0.19	0.72	0
Roanoke	VA	7.28	14.96	4.92	0.27	27.43	0
Rockbridge	VA	0.5	1.38	2.96	0.6	5.44	0
Rockingham	VA	0.83	7.62	15.38	6.08	29.91	0
Russell	VA	0.17	2.15	0.03	0.53	2.88	12.5
Scott	VA	0.22	1.74	0.57	0.33	2.86	0
Shenandoah	VA	0.73	2.37	2.5	1.03	6.63	0
Smyth	VA	0.77	2.42	0.61	0.48	4.28	0
Tazewell	VA	0.92	3.45	0.56	0.39	5.32	0
Warren	VA	1.57	1.96	1.22	0.16	4.91	0
Washington	VA	0.96	4.82	0.78	0.95	7.51	0
Wise	VA	0.59	3.29	0.53	0.04	4.45	0
Wythe	VA	0.9	1.91	0.36	0.72	3.89	0
Hampshire	WV	0.11	1.11	0.46	0.14	1.82	0
Hardy	WV	0.09	0.8	1.41	0.47	2.77	0
Pendleton	WV	0.05	0.54	0.62	0.37	1.58	0
Totals		155.87	453.85	1321.76	87.29	2019.97	6766.1

[1]Total does not include thermoelectric use

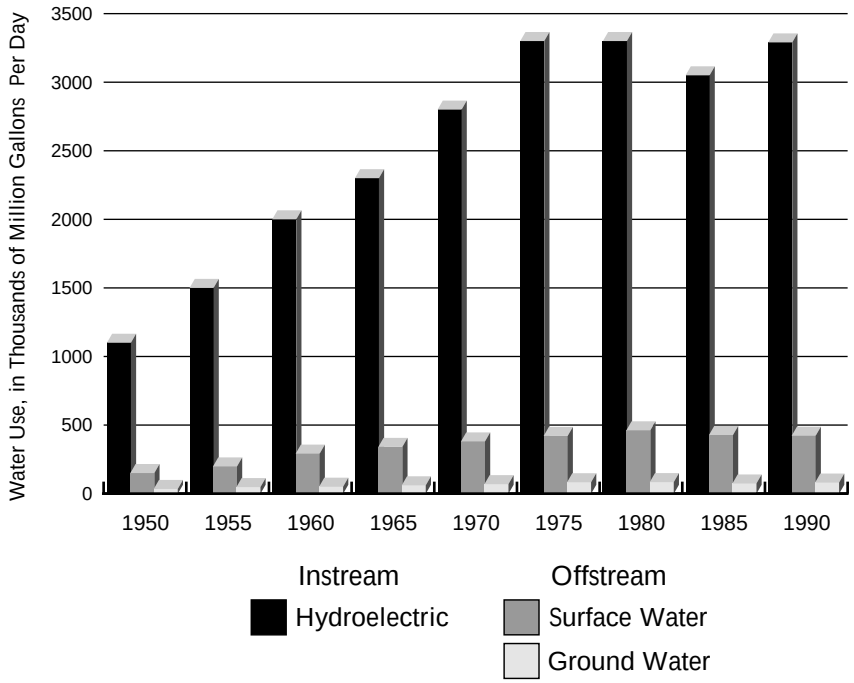

Figure 6.1.2 Trends in offstream and instream water uses, 1950-1990. Offstream use includes public supply, rural and domestic livestock, irrigation, and industrial (thermoelectric and other industrial). (Source: US Geological Survey Circular #1081)

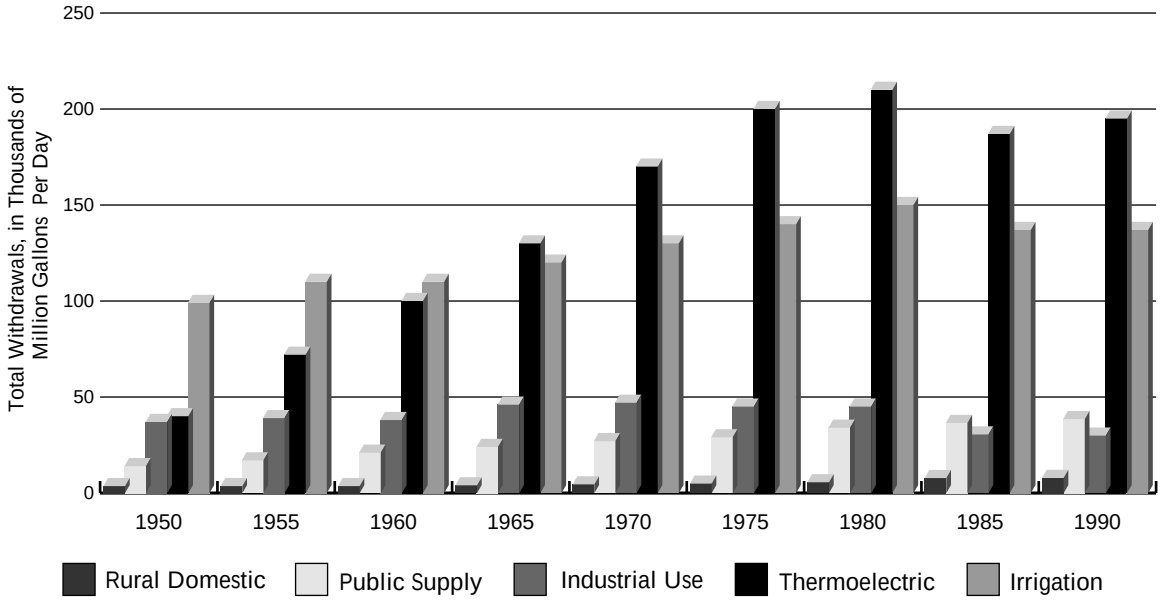

Figure 6.1.3 Trends in freshwater withdrawals by water use category for rural, public supply, industry, thermoelectric, and irrigation from 1950-1990. (Source: US Geological Survey circular #1081)

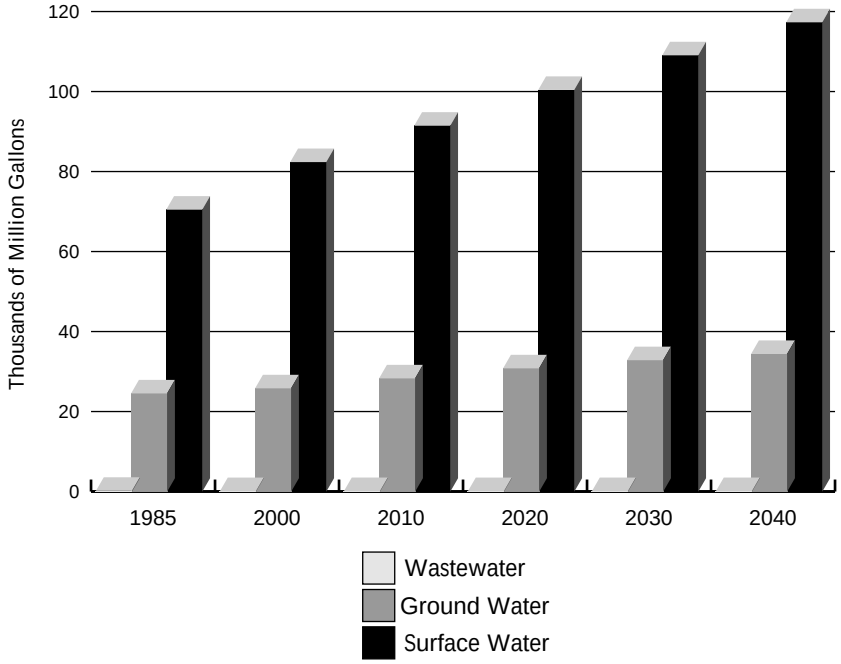

Figure 6.1.4 Total freshwater withdrawals in million gallons per day in the South from 1960-1985 with projections to the year 2040. (Source: An Analysis of the Water Situation in the United States: 1989–2040, USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Gen. Tech. Report #RM–177–178 pp.)

a number of factors, from water availability to implementation of conservation measures.

National trends in water use from 1950 to 1990 can be attributed in part to the factors listed below (Solley 1993). These trends can be inferred for the Southern region, as well.

- Availability of water is a primary determinant in the quantity of water used for irrigation and hydroelectric power generation.
- Higher energy prices, improved application techniques, increased competition for water, declines in farm commodity prices, and a downturn in the farm economy in the 1980s reduced the demand for irrigation water.
- New technologies requiring less water, improved plant efficiencies, increased water recycling, higher energy prices, the economic slowdown, and changes in laws and regulations to reduce the discharge of pollutants resulted in decreased requirements for industrial water and less water being returned to the natural system after use.
- The public in general has become more aware of the strain on water resources and the need to conserve. Additionally, many states have reduced water demand.

Likely Future Trends

A study by the USDA Forest Service (1989) projects water withdrawals and consumptive use to the year 2040 (figs. 6.1.4, 6.1.5). The projections, which show a gradual increase in use, are based on the availability of reliable data and assumptions for future population growth, economic conditions, energy-resource development, and environmental regulations.

It seems likely that water withdrawals will continue to increase as populations increase. However, based on trends established over the past 40 years, it is probable that the per-capita use rate will actually decline. This is based on an assumption of increasing water delivery costs, active conservation measures, and competition for multiple uses of water ranging from recreation and esthetic enjoyment to greater emphasis on fish and wildlife habitat needs (Hutson 1995).

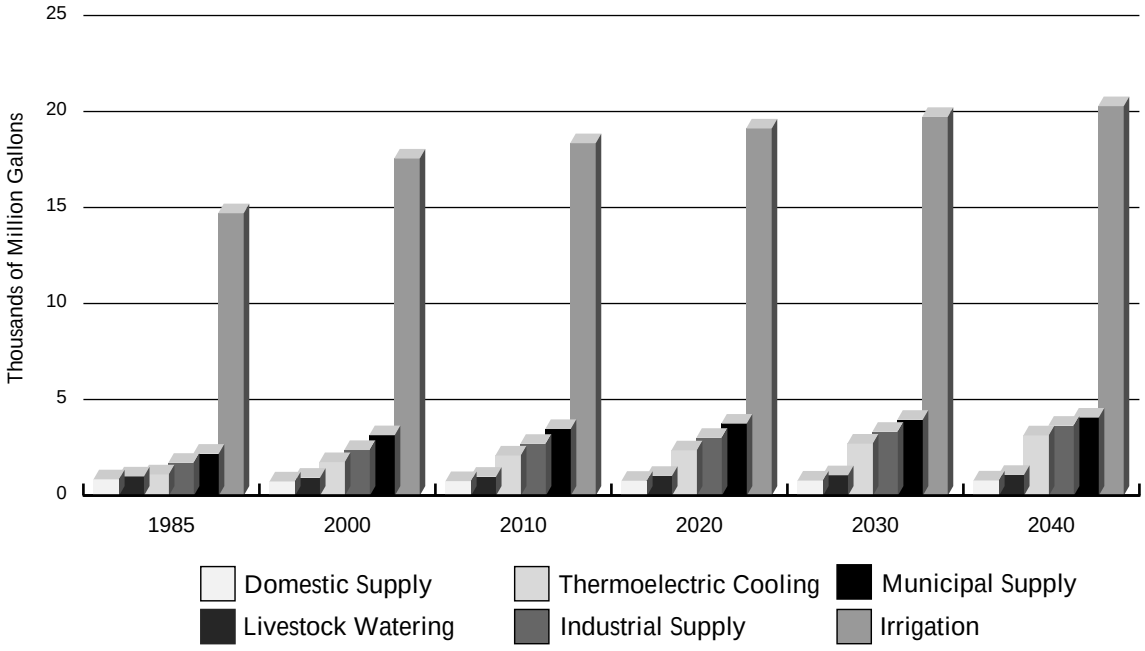

Figure 6.1.5 Total freshwater consumption (millions of gallons per day) in the South as projected from 1985-2040. Projected use categories are domestic, livestock, thermoelectric, industrial, municipal, and irrigation. See table 6.1.6. (Source: An Analysis of the Water Situation in the United States: 1989–2040, USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Gen. Tech. Report #RM–177–178 pp.)

Table 6.1.5 Total freshwater withdrawals in million gallons per day in the South, 1960–1985, with projections of demand to 2040.

	1960	1965	1970	1975	1980	1985
Groundwater	15570	21820	19165	23650	24040	24520
Surface Water	34635	42765	57415	68265	83295	70460
Wastewater	30	5	20	65	70	175
				Projected		
		2000	2010	2020	2030	2040
Groundwater		25795	28280	30790	32830	34390
Surface Water		82360	91450	100400	109050	117300
Wastewater		100	110	100	105	105

(Source: USDA Forest Service, 1989. An analysis of the water situation in the United States: 1989–2040, Rocky Mountain Forest and Range Experiment Station, Gen. Tech. Report #RM–177–178 pp.)

Table 6.1.6 Total freshwater consumption in million gallons per day in the South, 1960–1985, with projections of demand to 2040.

	1960	1965	1970	1975	1980	1985
Domestic self–supplies	519	798	721	661	842	843
Industrial self–supplies	1524	1581	2220	2075	2781	1702
Irrigation	9143	14913	12646	17564	16356	14701
Livestock watering	416	472	540	680	769	992
Municipal central supplies	1139	1301	1612	2323	2172	2176
Thermoelectric steam cooling	96	228	568	1061	1536	1089
				Projected		
		2000	2010	2020	2030	2040
Domestic self–supplies		732	750	766	777	783
Industrial self–supplies		2378	2690	3003	3317	3633
Irrigation		17550	18349	19116	19717	20278
Livestock watering		925	977	1022	1054	1073
Municipal central supplies		3140	3464	3742	3942	4056
Thermoelectric steam cooling		1739	2083	2351	2703	3132

(Source: USDA Forest Service, 1989. An analysis of the water situation in the United States: 1989–2040, Rocky Mountain Forest and Range Experiment Station, Gen. Tech. Report #RM–177–178 pp.)

Conclusion

Despite major droughts and chronic water shortages in some localities, the nation as a whole and particularly the South is not "running out" of water. Concerns about water shortages arise because of uneven distribution of water in relation to regional and seasonal distribution of water demands (Council on Environmental Quality 1989). The more serious problem facing the Southern Appalachians is the adverse impact on water quality impacts from man as development continues to accelerate. Impacts on water quality are addressed in chapter 5 of this report.

6.2 WATER RIGHTS AND USES ON NATIONAL FOREST LANDS

Introduction

A number of federal laws and judicial doctrines are in place to protect rights to water for mining, agriculture, manufacturing, and other purposes. The Organic Act of 1897 is the authority for watershed management and explicitly states that one purpose for establishing the national forests is securing favorable water flows. The act allows waters within the national forest boundaries to be used for domestic, mining, or irrigation purposes under the laws of the states wherein the national forest boundaries are situated, or under U.S. law. Subsequent laws and legal decisions that affect National Forest System water rights and uses include judicial doctrine (Winters v. United States, 207 U.S. 568 – also known as the Winters Doctrine), the General Exchange Act, the Organic Act of 1944, and the McCarran Amendment.

The Winters Doctrine established federal reserved water rights in 1908. The rulings implicitly reserve water needed for reservation purposes and include groundwater as well as surface water. Federal reserved water rights, unlike state water rights, are not lost by nonuse and may provide for future needs. The priority date is the date of withdrawal of the reservation. The General Exchange Act (March 20, 1992-42 Stat. 465 as amended 16 U.S.C. 485, 486) "provides authority for accepting title to lands within National Forests in exchange for National Forest lands reserved from the public domain." Lands so acquired do not have reserved status for purposes of claiming water under the reservation principle. However, such acquired lands may carry with them water rights established under state laws. A provision of the Organic Act of 1944 authorizes appropriations for Forest Service investigation, establishment, and purchase and protection of water rights needed for Forest Service administration use. The McCarran Amendment of 1952 allows the United States to be joined as a defendant in lawsuits related to water rights adjudication and the administration of such rights if the United States is the owner or in the processing of acquiring such rights.

All of the states in the Southern Appalachians have water rights governed by the "riparian right" doctrine. Riparian owners are entitled to make reasonable use of water where water flows through their land. There is a general stipulation that the water use cannot unreasonably interfere with downstream uses. This liberalized use of water in most states is being modified by state agencies with the development of comprehensive controls of water use to deal with common water quality and quantity problems (Dewsnut and others 1973).

The Forest Service water use, rights, and requirements (WURR) program is national in scope with specific guidance on data collection, storage, and retrieval of water rights files. The purpose of the program is to provide a uniform data file for recording and storing information on water uses, requirements, and water rights. The information is needed in the planning and implementation of programs on National Forest System land and provides ready access at all organizational levels to water rights information. The system also allows administration of special uses for permittees where water is used off National Forest System land. The primary users of the WURR system are land managers, water resource specialists, hydrologists, planners, and water-rights specialists who may be involved in legal proceedings or administrative determinations.

Currently, the WURR database is being maintained at the regional office level. For the Southern Region, (Atlanta, GA, USDA Forest Service, Regional Office) WURR files are maintained in an Oracle database that provides detailed information on water uses, location, purpose of use, amount of use, and the source type of water. The water source categories include streams, springs, impoundments, lakes, ponds, and groundwater. Water from national forest land is used for many purposes. In the Southern Region, predominant uses are for domestic household, irrigation, recreation, municipalities, and to maintain fish and wildlife habitat. Currently the WURR system is undergoing a significant change. The Region is working to update the storage and retrieval system to improve record keeping and accessibility by adopting an improved system.

The Forest Service Regional Office in Atlanta, currently maintains water rights files for all states within the study area. Water rights and usages are catalogued by the National Hydrologic Unit Coding (HUC) system. This system is based on major watersheds that often cross county and state boundaries. The WURR database does not lend itself to integration with water uses identified by state or county boundaries. Consequently, a direct comparison of water usage on National Forest System land with those portrayed within the SAA boundary is not possible and only general qualitative comparisons can be made.

This report summarizes the predominant uses on National Forest System land by state. This information can be used to identify watersheds that supply water and identify specific types of uses. Future trends in water usage on National Forest System land are also discussed.

Key Findings

- Water usage on National Forest System lands ranges from 1,700 gallons per day in Alabama to 1,315,000 gallons per day in Virginia. The Chattahoochee National Forest uses approximately 81,000 gallons per day, and the National Forests in North Carolina

Table 6.2.1 Water use estimates in thousands of gallons of water per day (tgd) on national forest land based on Water Use Rights Records (WURR).

		Domestic		Municipal		Industrial		Fish/Wildlife		Recreation	
Forest	Total Use	(tgd)	(%)	(tgd)	(%)	(tgd)	(%)	(tgd)	(%)	(tgd)	(%)
Alabama	1.7	1.7	100								
Georgia	81.4	21.1	26	60.3	74						
North Carolina	172.2	97.6	57	38	22	500	19	36.1	20		
South Carolina	No use information reported for the three counties within the SAA										
Tennessee	359.7	194.5	54	165.2	45						
Virginia	1314	350.5	27	190	14			614	47	160.6	12

% = percentage of total use

uses 172,000 gallons per day. The Cherokee National Forest in Tennessee uses 360,000 gallons per day. Only three counties in South Carolina are included in the assessment and no water rights were recorded for this area. The forests in South Carolina do maintain rights for 39 sites within 4 watersheds in the SAA area.

- Of the 1,315,000 gallons per day of usage in Virginia, 1,126,000 are drawn from the Holston River. Industrial withdrawals from the Holston River for Sullivan County, Tennessee, and Scott and Washington, VA, are the highest within the SAA study area.
- Water impoundments from the Holston River in Virginia for fish and wildlife (614,000 gallons per day) represents the largest use on National Forest System land within the SAA boundary.

Water usage on national forest land is minuscule in comparison to county usage.

Data Sources

Information presented is from known water use levels from available forest data. The information is not intended to reflect the complete list of water uses or water rights needed to protect and support beneficial water uses on national forest land.

Water rights and use data were compiled from the Forest Service Regional Office Oracle database. Water rights entries vary considerably by forest. South Carolina had no water rights entries within the SAA study area. Only three counties from South Carolina are included in the study area. South Carolina has 39 water use sites identified within 4 watersheds. Water rights uses are approximate and used on a very broad scale for comparative purposes. There is a need to update the water rights files once a new database system is in place. This is anticipated to be completed in 1996.

Analysis, Spatial Patterns, and Trends

A general comparison was made between two counties in Tennessee and the Nolichucky watershed on the Cherokee National Forest. Johnson and Carter Counties used approximately 30 million gallons per day in 1990. Comparatively, national forest water rights estimates for this watershed are approximately 51,594 gallons per day or less than 0.2 percent of the two-county usage rate. Another comparison was made for the total water used in Swain and Macon Counties, North Carolina, with national forest usage within the Upper Little Tennessee watershed. Combined water usage within the two counties was approximately 3 million gallons per day, whereas national forest usage was 6,030 gallons per day, which is approximately 0.2 percent on a comparative basis. It is probable that this ratio would hold true for most county/watershed comparisons, since usage on national forest land pales in comparison to county usage.

Table 6.2.1 compares the usage categories and rates for each forest. Virginia uses the greatest amount of water and Alabama uses the least – 1,315,000 and 1,700 gallons per day, respectively. North Carolina draws water from 20 watersheds, whereas Tennessee draws from 11. Georgia uses water from five watersheds and Virginia only three. This variability is due to the size of streams, available water, types of uses that demand water, and population density.

Likely Future Trends

Water usage on national forest land within the Southern Region has not been a significant issue for forest managers. Water supplies have historically been abundant and demands on water supplies have been easily managed. As populations continue to increase in the Southern Region, there will be greater demand and competition for water resources. Water usage increases on national forest will more than likely mirror trends projected in the South. However, usage rates on national forest land should be minimal due to the nature of management activities and limited future development. There may, however, be an increasing trend in the number of requests for special use permits off national forest land, especially in rural and suburban areas that abut national forests.