

Amendment to the Comprehensive Plan Natural Resources and Cultural Assets Plan – Water Resources section (pages 39-49).

Watershed Management Planning

Surface water supply protection has been a special concern in Albemarle County since 1972 when the City and County adopted a joint resolution forming the Rivanna Water and Sewer Authority. In November 1973, the Authority appointed an advisory committee to study the reservoir pollution problem. In 1975 a study of the South Fork Rivanna Reservoir was undertaken by Betz Environmental Engineers, Inc. for the Rivanna Water and Sewer Authority. This study recommended the implementation of a comprehensive watershed management plan that included reservoir management, water treatment modifications, point and non-point source controls, and routine watershed monitoring.

Staff Note: The following section was significantly edited by removing references to water supply planning and by condensing major watershed management planning action items into bullets.

Since that time the County has taken numerous proactive steps to protect water quality through land use management, which are bulleted below:

- 1977 Albemarle County Board of Supervisors adopted a Runoff Control Ordinance applicable in all water supply impoundment watersheds (see Map 2 – 3: Water Supply Watersheds). The purpose of this ordinance was to protect against and minimize the pollution and eutrophication of the public drinking water supply impoundments resulting from land development in the watershed areas
- 1978 Albemarle County Board of Supervisors rezoned all publicly owned properties except school sites within water supply watersheds to a conservation district designation.
- 1979 South Rivanna Reservoir Watershed Management Plan was prepared by F. X. Browne and Associates, Inc. and the Watershed Management Plan Committee.
- 1980 amendments to the 1977 Comprehensive Plan removed all land from the Urban Area also located in the South Fork Rivanna Watershed.
- 1980 comprehensive rezoning of the County placed major limitations on development in the Rural Areas. Special use permit criteria addressed proposed developments located within water supply watersheds
- 1982 revisions to the Comprehensive Plan removed watershed properties from Growth Areas

in Crozet, Scottsville, Earlysville, and Ivy. These properties, containing over 1,000 acres, were rezoned to Rural Areas the following year. Crozet and Ivy, both located entirely in water supply watersheds, were scaled back in size.

- 1982 Section 208 Watershed Management Study of the South Rivanna Reservoir was completed by F. X. Browne and Associates, Inc. The study concluded that the watershed plan developed in 1977 and refined in 1979 was still valid and should be fully implemented.
- 1988 Crozet Sewer interceptor goes on-line to alleviate point source discharges and failing septic systems.
- 1993 Lickinghole Creek Sedimentation Basin completed in Crozet to alleviate impacts from nonpoint source discharges from the Crozet Community.
- 1998 Water Protection Ordinance adopted, which consolidated and streamlined the existing stormwater, erosion and sediment, and stream buffer ordinances. These changes included strengthening the stream buffer requirements, updating stormwater removal criteria, and strengthening the relationship of water quality protection in relation to land use issues.
- 2007 Water Protection Ordinance amended to include the watershed of the North Fork Rivanna River public water supply intake in the definition of “water supply protection areas” to which extended the requirement of stream buffers to all intermittent streams in that watershed.
- 2008 Water Protection Ordinance amended to expand the stream buffer requirements to all intermittent streams in the Rural Areas, providing the entire Rural Areas the same protection previously afforded only to specific water supply protection areas. The 2008 amendments also clarified the ability for development projects to impact buffers with stream crossings and set specific design criteria for those crossings.

~~The 1977 report resulting from this initial study, (Water Quality Management Study of the South Rivanna Reservoir and Tributary Area) by Betz Environmental Engineers, Inc., provided the basic guidelines for future measures taken to provide water supply protection in the area. The first step toward implementing the recommended watershed plan was taken by the Albemarle County Board of Supervisors in September, 1977, when they adopted a Runoff Control Ordinance applicable in all water supply impoundment watersheds (see Map 2—3: Water Supply Watershed). The purpose of this ordinance was to protect against and minimize the pollution and eutrophication of the public drinking water supply impoundments resulting from land development in the watershed areas.~~

~~In July 1977, a (Report on Alternative Water Supply Sources) prepared by Camp, Dresser & McKee, Inc. was published. It concluded that the only viable alternatives were: (1) expansion of~~

the South Fork Rivanna Reservoir by the addition of flashboards; (2) development of the Buck Mountain system as a supplement to the South Fork Rivanna Reservoir; and, (3) development of the James River and abandonment of the South Fork Rivanna Reservoir. This study reaffirmed the importance of protecting the South Fork Rivanna Watershed.

In 1978, the Board of Supervisors rezoned all publicly owned properties except school sites within water supply watersheds to a conservation district designation.

In August 1979, a second study was completed; the (South Rivanna Reservoir Watershed Management Plan) was prepared by F. X. Browne and Associates, Inc. and the Watershed Management Plan Committee, made up of representatives of agencies and interest groups involved with water supply in Albemarle and Charlottesville. The report recommended: (1) creating the position of a Watershed Management Official; (2) eliminating major point source discharge; (3) that the Virginia Department of Transportation install and maintain erosion and sedimentation control measures as specified in its manual; and, (4) integrating watershed management goals into agricultural, technical, and financial assistance programs.

After 1979, significant efforts were made to deal with watershed pollution problems. A \$5.8 million sewer interceptor was constructed from the Moore's Creek interceptor to Crozet. This allowed for collection of sewage in Crozet through a public system, eliminating several major point discharges and failing septic systems. A \$5 million sewage collection system was completed in Crozet. To alleviate non point discharge from the Crozet Community, the Lickinghole Creek Sedimentation Basin was completed in 1994.

In 1980, Land Use Plan amendments to the 1977 Comprehensive Plan were adopted which removed all land from the Urban Area also located in the South Fork Rivanna watershed.

In August 1980, a moratorium was enacted on development in the proposed Buck Mountain Creek impoundment watershed. It remained in place until agreement was reached between the City and County regarding the extent of land necessary to be purchased for the potential future impoundment and the means of financing the purchases.

In December 1980, a comprehensive rezoning of the County placed major limitations on development in the Rural Areas. Special use permit criteria addressed proposed developments located within water supply watersheds. A 1982 revision to the Plan removed watershed properties from Growth Areas in Crozet, Scottsville, Earlysville, and Ivy. These properties, containing over 1,000 acres, were rezoned to Rural Areas the following year. Crozet and Ivy, both located entirely in water supply watersheds, were scaled back in size. In Crozet, the Growth Area was planned to drain into the Lickinghole Creek Sedimentation Basin.

In 1982, a *Section 208 Watershed Management Study of the South Rivanna Reservoir* was completed by F. X. Browne and Associates, Inc. The study concluded that the watershed plan developed in 1977 and refined in 1979 was still valid and should be fully implemented.

A *Report on the James River* prepared by the Rivanna Water and Sewer Authority in 1982 updated the 1977 study of alternative water supply sources. It concluded that the quantity of water

in the James River is more than adequate, but the cost of supplying the City of Charlottesville with water from the James River was over \$20 million (1982 dollars) greater than the Buck Mountain Reservoir alternative.

A recent watershed activity was a Phase II EPA Clean Lakes project federally funded to implement agricultural and highway Best Management Practices projects in a portion of the South Fork Rivanna watershed. The final report from the Phase II project was completed by F.X. Browne in April, 1993. The report recommends further monitoring on the South Fork Rivanna Reservoir and for the new Lickinghole Creek facility. The report also reiterates the validity of the Section 208 Watershed Management Study.

In November, 1994, Black & Veatch prepared the (Urban Raw Water Management Plan) for RWSA to provide and update information for planning, permitting, and implementing additional raw water supplies to the year 2040. Three memoranda were prepared regarding the (Buck Mountain Reservoir Evaluation Update), (South Rivanna Bathymetric Study), and the (Feasibility of Flashboards on the South Rivanna Dam).

The plan reports that the RWSA's projected average daily demand in the year 2040 for the urban area will be 18.7 million gallons per day (mgd). Current sources are capable of supplying only 10.1 mgd in year 2040 to satisfy the average daily demands. A deficit of 8.6 mgd is anticipated by year 2040. Additional supplies must be on-line by year 2015 to meet the average daily demands of the Charlottesville Urban Services Area.

Staff Note – The following new section has been added.

Comprehensive Water Supply Planning

In 2003 the Code of Virginia was amended to require the development of a comprehensive statewide planning process. As part of this requirement, localities are required to submit water supply plans either independently or as part of a region to the Virginia Department of Environmental Quality (DEQ). DEQ will review all local and regional plans and localities will need to review their plans every five years to assess adequacy. Albemarle County elected to join the City of Charlottesville and the Town of Scottsville to develop a regional plan, and each locality passed a resolution in May 2006 authorizing the Rivanna Water and Sewer authority to develop the regional plan, which is due to DEQ in November 2011.

Required elements of the plan include a detailed description of all existing water sources and all existing water use for the entire locality, including both public systems and individual private wells. The plan requires an assessment of the projected water demand and future need for the entire locality and an analysis of potential alternatives for identified deficits. The plan must also include a description of the condition of all existing water resources, a description of any water management actions, a copy of any relevant plans or ordinances, a resolution approving the plan from each locality that is party to the plan, and proof of a local public hearing.

Some of the required plan elements have already been completed during the water supply planning process for the Urban Service Area, and are discussed in the Utilities component of the

County's Land Use Plan. Analysis of the remainder of the County, including Beaver Creek and Totier Creek Reservoirs, the County's numerous community wells, and the segment of the County served by private wells is underway to complete the plan by the 2011 deadline.

Water Conservation/Drought Response

OBJECTIVE: Support water conservation and use-efficiency measures to minimize impacts to water resource systems and the environment and to prolong the life of existing and future water supplies.

Water conservation and use-efficiency are important overall objectives for water resources management in the County and the region, for both users of public water and for private groundwater derived systems. Water conservation and use-efficiency measures have the potential to prolong the life of existing and future water supplies in both the Development Areas and the Rural Areas, which is important for economic, ecological, and ethical reasons. The Albemarle County Service Authority provides guidance for conserving water in homes and businesses, offers conservation kits that contain water saving devices such as aerators and low-flow showerheads, and offers rebates to customers for replacing pre-1992 toilets with new low-flow toilets. Water conservation tips are posted in all bathrooms in all County buildings, and the bathrooms are equipped with either push activated metered faucets or sensor activated faucets, and waterless hand soap. On a broader scale, the County anticipates addressing water conservation and use-efficiency as part of its Environmental Management System, which is a set of processes and practices that enable an organization to reduce its environmental impacts and increase its operating efficiency.

In 2004 a Rivanna Regional Drought Response Committee was formed to work cooperatively to provide a coordinated response to drought in the community. Members of the Committee include staff representing the County, the City, RWSA, and ACSA. The Committee developed a *Drought Response and Contingency Plan* to define a method for predicting and identifying drought conditions and specify drought stages that correspond to Virginia's Local and Regional Water Supply Planning Regulations. The plan identifies appropriate use restrictions for each drought stage, and clearly defines the process of public notification and information dissemination. Drought stages are derived from the use of software that analyzes statistical probabilities as to the rate at which the water supply levels would diminish, using the historical period of record, current operating procedures, and existing water demand projections.

The software model currently utilizes stream flow as an indicator of reservoir levels and potential stress to surface and groundwater systems. Stream flow and rain gauge data can be graphed to clearly depict past drought cycles. Staff analysis of County monitoring wells has also shown a direct correlation of groundwater levels to stream flow and rain gauge data. At this time the County does not possess sufficient well monitoring data to predict drought, but it is clear that the water depth in the wells represents in real time the cumulative recharge that drives the drought cycle. It will be important for the County to continue acquiring additional well monitoring data

so that a more complete picture of hydrologic conditions can be utilized when predicting and managing drought conditions.

Ultimately, water conservation and use efficiency must be viewed as an issue of community-wide impact. As stated, the need for a water conservation program is imminent for users of the public system. Users of public water should realize that their consumption (or over-consumption) jeopardizes natural stream flow in the headwater streams that feed the reservoirs. Withdrawals for water supply conflict with other human or ecological uses supplied by the natural flow of a stream or river. On the other hand, rural residents in the water supply watersheds must understand that proper stewardship of the land is needed to protect the reservoirs and their tributaries, upon which the public system users depend. Furthermore, residents of all of Albemarle's rural areas cannot ignore water conservation for their own groundwater-derived systems. Prudent use of well water during the summer months will not only prevent household water shortages, but will also help sustain stream flow in the County's rural streams and springs. Thus, the need for a clean, safe, and sufficient water supply binds together urban, suburban, and rural residents of the County.

Strategies:

- **Promote the concept of water conservation as a community-wide issue.**
- **Continue to initiate proactive measures to encourage community-wide water conservation and use efficiency through multi-agency programs.**
- **Support the Albemarle County Service Authority, City of Charlottesville, and Rivanna Water and Sewer Authority and the University of Virginia's water conservation and use-efficiency efforts. Implement recommended measures that require County action through regulatory or non-regulatory programs.**
- **Continue efforts to implement and enhance water conservation and use-efficiency measures at existing and new County-owned buildings and facilities.**
- **Promote rainwater harvesting as a method of efficiently utilizing the water that falls on our county."**
- **Continue participation in the Rivanna Regional Drought Response Committee, and implement the Drought Response and Contingency Plan in cooperation with the City, RWSA, and the ACSA.**
- **Promote the collection and inclusion of groundwater data in water conservation planning and drought response.**

Map 2 – 3: Water Supply Watershed

Staff Note: The following sections have been deleted because discussions of water supply and drought response have been moved to the Utilities section

Planning for the Future Water Supply

The Rivanna Water and Sewer Authority (RWSA) has retained the firm of Vanasse Hangen Brustlin, Inc. (VHB) to assist with the task of future water supply permitting. The permitting process must identify and evaluate all realistic sources of water for the community. The study has produced to date a water needs analysis for the urban system consisting of a *Demand Analysis* report and a *Supply Analysis* report. These reports update the figures provided in the Black & Veatch study. According to the reports, water demand in the year 2050 is projected to be between 18 and 21 mgd. Current safe yield (the amount of water the system can supply during a drought of historic record) is between 11.9 and 12.6 mgd, and is expected to decrease to between 4.5 and 4.8 mgd in the year 2050 based on current water supplies. Based on data provided in these reports, additional supplies would be needed as soon as the year 2003 or 2004 if the area were to experience a drought similar to the drought of record used in the analyses.

Current and future goals of the study involve identifying possible water supply alternatives; developing criteria to evaluate the alternatives (e.g., feasibility, environmental impacts); narrowing the list of alternatives based on the evaluation, and, ultimately, selecting a preferred alternative and promoting this to the state and federal agencies responsible for water supply permitting. The previously proposed Buck Mountain Reservoir is one of the available alternatives that will be considered in the present study, along with other alternatives, such as flashboards on the South Fork Rivanna Reservoir, dredging the South Fork Rivanna Reservoir, obtaining water from the James River, water conservation, and any other alternatives that will be identified in the study. The discovery of the James spinymussel, a federally listed endangered species, in Buck Mountain Creek will be one of the factors considered in the evaluation of alternative supplies.

Developing a Water Conservation/Efficiency Program

OBJECTIVE:—Support water conservation and use efficiency measures to prolong the life of existing and future water supplies.

Water conservation and efficiency of water use will be strong factors considered in the future water supply permitting process. The permitting agencies will require this analysis as part of the future water supply permitting process. While the permitting process is likely to drive this analysis, the principles listed at the beginning of this chapter suggest that water conservation and efficiency are important overall objectives for water resources management in the County and the region. Water conservation and use efficiency measures have the potential to prolong the life of existing and future water supplies, which is important for economic, ecological, and ethical reasons. Water conservation affects the demand on the Sugar Hollow Reservoir, for example, which in turn impacts the amount of instream flow in the Moorman's River (page 28).

Many activities related to water conservation and efficiency will be directed by the Albemarle County Service Authority and City of Charlottesville (Public Works Department) as measures that are implemented by those suppliers based on the characteristics of their respective customer bases. Other measures, if implemented, will require a stronger role for the County, such as providing for the use of drought-tolerant landscaping (xeriscaping). The Rivanna Water and Sewer Authority will play a key supporting role in designing and implementing any water conservation or efficiency measures.

Current water conservation efforts of the Albemarle County Service Authority include leak surveys, funding for a water conservation curriculum in schools, conservation information for new customers, speakers, bill inserts, public service announcements, leak trouble shooting for customers, and pilot conservation programs in selected neighborhoods. Also, some measures can be implemented during emergency drought conditions. Additional measures ultimately chosen for implementation will be evaluated by the current Vanasse Hangen Brustlin, Inc. (VHB) study and other related efforts. Some of the potential measures include:

- Water conservation devices for new construction.
- Water conservation devices retrofit into existing structures, beginning with institutional buildings.
- Additional public education materials inserted with water bills and through other media.
- Possible reuse of certain waste streams for landscape maintenance and other non-drinking water uses.
- Use of xeriscaping (drought-tolerant landscape design).
- Utility rate restructuring.
- Mandatory water conservation during dry periods.

Ultimately, water conservation and use efficiency must be viewed as an issue of community-wide impact. As stated, the need for a conservation program is imminent for users of the public system. Users of public water should realize that their consumption (or over-consumption) jeopardizes natural stream flow in the headwater streams that feed the reservoirs. Withdrawals for water supply conflict with other human or ecological uses supplied by the natural flow of a stream or river. On the other hand, rural residents in the water supply watersheds must understand that proper stewardship of the land is needed to protect the reservoirs and their tributaries, upon which the public system users depend. Furthermore, residents of all of Albemarle's rural areas cannot ignore water conservation for their own groundwater-derived systems. Prudent use of well water during the summer months will not only prevent household water shortages, but will also help sustain stream flow in the County's rural streams and springs. Thus, the need for a clean, safe, and sufficient water supply binds together urban, suburban, and rural residents of the County.

Strategy: Support the Albemarle County Service Authority, City of Charlottesville, and Rivanna Water and Sewer Authority to develop a water conservation and efficiency program through the future water supply permitting process. Implement recommended measures that require County action through regulatory or non-regulatory programs.

~~**Strategy:** Promote the concept of water conservation as a community wide issue. Initiate proactive measures to encourage community wide water conservation and use efficiency through multi-agency programs.~~

~~**Strategy:** Implement water conservation and use efficiency measures at existing and new County owned buildings and facilities.~~

North Fork Water Supply/Chris Greene Lake

~~**OBJECTIVE:** Use Chris Greene Lake to supplement water supply to the North Fork System.~~

~~Chris Greene Lake on Jacob's Run was constructed in 1967-68 to provide a drinking water supply. In 1970, the Board approved the recreational development of the lake. Chris Greene Lake can be used to enhance the water supply to the North Fork Rivanna water supply intake and water treatment plant. The Chris Greene Lake watershed is part of the larger North Fork Rivanna watershed for the North Fork Rivanna intake. The North Fork Rivanna watershed is not currently subject to the runoff control ordinance.~~

~~Black and Veatch completed the Urban Raw Water Management Study in November 1994, for the Rivanna Water and Sewer Authority (RWSA). An addendum to the report outlined the possibility, based on computer models, of augmenting the safe yield of the North Fork water system by using supplemental releases of water from Chris Greene Lake. According to the study, the North Fork system could increase its safe yield from 1 million gallons per day to approximately 2 million gallons per day, which is the current treatment capacity of the North Fork plant. Black and Veatch also predicted that supplemental releases would not measurably affect the recreational use of Chris Greene Lake. The Virginia Department of Health has provided preliminary comment to RWSA that continued use of Chris Greene Lake for recreational purposes during supplemental releases would be acceptable, since the water intake is a mile downstream in the North Fork Rivanna River.~~

~~Chris Greene Lake is now designated as a supplemental water supply to the North Fork system. In addition the lake's watershed is now protected with the same measures utilized in other drinking water watersheds through designation in the Water Protection Ordinance. Continued recreational use of the lake should be pursued through coordination with the County's Parks and Recreation Department, RWSA, and the Virginia Department of Health.~~

~~Applying watershed protection measures to the entire North Fork Rivanna River watershed above the water intake should be considered and evaluated. Cooperative agreements with Greene County for watershed protection should be pursued.~~

~~**Strategy:** Pursue a cooperative agreement with Greene County to protect the North Fork Rivanna watershed.~~

*Amendment to the Comprehensive Plan Land Use Plan – Utilities
section (pages 116-123)*

Water Service to the Development Areas

Staff Note: This section has been edited by deleting outdated figures and expanding the description of the Urban Service Area

The geology of Albemarle County makes it necessary to rely on surface water sources for sizeable water supply. All existing water supply facilities are operated by the RWSA. The RWSA Urban Service Area includes the Development Areas Neighborhoods 1-7, Hollymead, Piney Mountain, and Rivanna. In addition, the Urban Service area also encompasses the City of Charlottesville and the University of Virginia.

The RWSA Urban Service Area is supplied by finished water from the following three water treatment plants (WTP): (1) South Rivanna WTP, (2) Observatory WTP, and (3) North Fork Rivanna WTP. These water treatment plants receive raw water from four reservoirs and one river intake. The South Rivanna WTP is served by the South Fork Rivanna Reservoir. Water from the Sugar Hollow Reservoir can be released into the South Fork Rivanna Reservoir via the Moormans River, a tributary to the South Fork Rivanna River. The Observatory WTP is supplied by water from the Upper and Lower Ragged Mountain Reservoirs via an 18-inch diameter pipeline and from Sugar Hollow Reservoir via another 18-inch diameter pipeline. Excess water from Sugar Hollow Reservoir can also be transferred to the Ragged Mountain Reservoir. The North Fork Rivanna WTP treats water pumped from an intake on the North Fork Rivanna River.

The towns of Crozet and Scottsville are not a part of the Urban Service Area, but are still served by reservoirs and facilities managed by RWSA. The Beaver Creek Reservoir serves as the source of water for the Town of Crozet, and the water from the Reservoir is treated at the nearby Crozet Water Plant. The Town of Scottsville is served by the Totier Creek Reservoir, where water is treated at the Scottsville Water Plant.

~~The geology of Albemarle County makes it necessary to rely on surface water sources for sizeable water supply. All existing water supply facilities, including Totier Creek Reservoir in Scottsville, are operated by the RWSA. The Sugar Hollow/Ragged Mountain Reservoir System, the South Rivanna Reservoir and the North Rivanna River Diversion serve the Urban Service Area (Neighborhoods 1-7, Hollymead, Piney Mountain, Rivanna and the City). The combined existing safe yield of the three water sources is 18.0 million gallons per day (mgd). However, the safe yield of the Sugar Hollow Reservoir is in question due to the flooding and siltation in the summer of 1995. A bathymetric study of the reservoir will be conducted to determine the impact of the floods on the safe yield. Beaver Creek Reservoir serves the Crozet Community and has a safe yield of 2.0 mgd. Totier Creek Reservoir serves the Town of Scottsville and has a safe yield of~~

1.0 mgd. Safe yield is defined as the maximum amount of water that can be withdrawn from the source during severe drought conditions. Assuming no remedial action is taken, such as dredging, the volume of the South Rivanna Reservoir will continue to decrease. The safe yield of Sugar Hollow/Ragged Mountain Reservoir and North Rivanna system is expected to remain constant.

MAP I: COMMUNITY UTILITIES

Staff Note: This section has been updated by deleting outdated figures and information, and providing current information on the community water supply.

Future Water Demand

Urban Service Area – The safe yield available from the RWSA Urban Service Area source water system is diminishing with time due to the significant loss of storage capacity from its primary source, the South Fork Rivanna Reservoir. Since the South Fork Rivanna Reservoir was constructed in 1966 approximately 40 percent of the total reservoir storage capacity has been lost due to sedimentation. Projected water demand for a 50-year planning horizon (2055) is 18.7 mgd, which will exceed the system’s safe yield. For complex water intake systems (impoundments in conjunction with streams), safe yield is defined as the minimum withdrawal rate available to withstand the worst drought of record in Virginia since 1930.

In planning for the provision of additional water supply within the Urban Service Area, RWSA, in coordination with Albemarle County, the City of Charlottesville, and the Albemarle County Service Authority explored 32 possible alternatives, then narrowed those alternatives using federal and state environmental impact criteria to a final four alternatives. The four alternatives included a short bladder on the South Fork Rivanna Reservoir Dam, dredging of the South Fork Rivanna Reservoir, a new intake and pipeline from the James River, and a new dam at the Ragged Mountain Reservoir. After significant public input it was determined that an expansion project of the Ragged Mountain Reservoir and the construction of a pipeline between South Fork Rivanna Reservoir and Ragged Mountain Reservoir was the least environmentally damaging practicable alternative available for expanding the water supply to the Urban Service Area. The Albemarle County Board of Supervisors voted to endorse this plan for the Urban Service Area at the June 7, 2006 regular Board meeting.

Numerous studies and reports have been completed that fully document demand analysis, safe yield of the existing resources, and alternatives analysis and selection. These studies are listed below and include as appendices other historical studies. The suite of documents is housed at RWSA and should be referenced for detailed information.

- *Safe Yield Study*, Gannett Fleming, January 2004
- *Demand Analysis for the Urban Service Area*, Gannett Fleming, May 2004
- *Safe Yield Study Supplement No.1*, Gannett Fleming, July 2004
- *Joint Permit Application*, Gannett Fleming and Vanasse Hangen Brustlin, Inc., June 2006
- *Permit Support Document*, Gannett Fleming and Vanasse Hangen Brustlin, Inc., May 2006
- *Conceptual Stream and Wetland Mitigation Plan*, Vanasse Hangen Brustlin, Inc., December 2006

The long term viability of the South Fork Rivanna Reservoir as not only a water supply, but also as an important recreational and natural resource continues to be of paramount concern to the County. In June 2008 the County endorsed a separate cooperative study with the City of Charlottesville and RWSA to study the merits of maintenance dredging, siltation prevention, and other appropriate initiatives to protect and enhance the aquatic health and water quality of the reservoir as a long-term resource for the community.

For both Crozet and Scottsville the projected average daily demand for a 30-year planning horizon (2035) is within each system's safe yield, and no expansion to these systems is projected. The following studies have been performed, are also housed at RWSA, and should be referred to for more detailed information:

- *Beaver Creek Reservoir Safe Yield Study*, Gannett Fleming, June 2008
- *Totier Creek Reservoir Safe Yield Study*, Gannett Fleming, June 2008

Providing new sources of water is an expensive proposition. As the population in the Development Areas expands, water demand will increase. Educating the public on water conservation techniques is an inexpensive method to extend the region's water supply.

Table IV: Public Surface Water Sources and Water Demand for the Urban Service Area Crozet and Scottsville (1995)		
Urban Service Area		
	Safe Yield	Current Demand
Sugar Hollow/Ragged Mountain System	5.4 mgd	5.325 mgd
South Rivanna Reservoir	11.8 mgd	5.779 mgd
North Rivanna Diversion	.8 mgd	.192 mgd
Total for Urban System	18.0 mgd	11.296 mgd
Crozet and Scottsville		
Crozet—Beaver Creek	2.0 mgd	.661 mgd
Scottsville—Totier Creek	1.0 mgd	.138 mgd

Source: Albemarle County Service Authority

Future Water Demand

Urban Service Area—The projected average daily water demands for the Urban Service Area (Neighborhoods 1-7, Hollymead, Piney Mountain, Rivanna and City) are shown below:

Table V: Projected Average Daily Water Demand/Safe Yield for the Urban Service Area (1995—2040)			
Year	Demand Yield	Safe Yield	Safe Yield w/ Buck Mtn. & Chris Greene Lake
1995	11.3 mgd	18.0 mgd	-
2000	12.1 mgd	17.1 mgd	-
2005	12.9 mgd	16.2 mgd	-
2010	13.7 mgd	15.3 mgd	30.8 mgd
2015	14.6 mgd	14.4 mgd	29.9 mgd
2020	15.4 mgd	13.6 mgd	29.1 mgd
2025	16.2 mgd	12.7 mgd	28.2 mgd
2030	17.1 mgd	11.8 mgd	27.3 mgd
2035	17.9 mgd	11.0 mgd	26.5 mgd
2040	18.7 mgd	10.1 mgd	26.5 mgd

Source: Urban Raw Management Summary Report

The volume of the South Rivanna Reservoir will continue to be reduced over time due to the sediment accumulation in the reservoir. The safe yield of the Sugar Hollow/Ragged Mountain Reservoir System is assumed to remain constant throughout the planning period, i.e., no reduction in safe yield due to sediment. The reduction in the safe yield of the South Rivanna Reservoir is projected to be 877,800 gallons every five years. This figure was derived from calculations in the Urban Raw Water Management Plan Summary Report.

~~Based on the above projections, the existing raw water supply is estimated to be incapable of meeting projected water consumption of the Urban Service Area after 2015. Therefore, an additional source must be on-line prior to 2015 to meet the average daily demands of the Urban Service Area.~~

~~The future need for an additional water supply to serve the County's Development Areas and City has been recognized since the 1970's. Possible alternatives for additional water supply that have been examined over the years include the following: 1) pumping and piping of the James River; 2) adding flashboards to increase the yield of the South Fork Rivanna Reservoir; and 3) development of a new reservoir on Buck Mountain Creek.~~

~~In 1993, the RWSA retained the consulting firm of Black and Veatch to prepare the Urban Raw Water Management Plan. Components of this plan initially included: 1) a current assessment of the safe yield of the existing water supply serving Charlottesville and the County's Urban Area; 2) a forecast of water demand to the year 2040 for Charlottesville and the Urban Area; 3) a determination of additional safe yield and feasibility from the installation of flashboards to the dam on the South Fork Rivanna River Reservoir; and 4) preliminary (engineering) plans for the development of the Buck Mountain Reservoir. The consultants were then requested at a later date to evaluate the safe yield of the North Fork Rivanna Water System with focus on Chris Greene Lake.~~

~~Based on the factors analyzed, the consultants concluded that adding flashboards to the South Fork Rivanna River Dam and developing Buck Mountain Reservoir are both feasible projects from an engineering standpoint but the flashboards may not be financially feasible. The conclusion of the study was that permitting should be initiated to build Buck Mountain Reservoir, with an option to add flashboards to the South Rivanna River Dam in the future. Buck Mountain Reservoir is expected to have a safe yield of 13.5 million gallons a day (mgd) and construction of this reservoir will meet the Authority's water demands through the year 2040. However, the necessary permitting process has not been completed. Recent history in other localities would indicate that the review/approval process for a new impoundment can be lengthy and complicated.~~

~~Chris Greene Lake can be used as a water supply source to add water capacity to the system and could delay the need for the Buck Mountain Reservoir for a 3 to 5 year period. According to the Black and Veatch study for the Rivanna Water and Sewer Authority, with supplemental releases from Chris Greene Lake, the North Fork system could increase its safe yield from 1 mgd to 2 mgd, which is the capacity of the North Fork Treatment plant. The supplemental release from the lake would have no measurable effect on the recreational use of Chris Greene Lake.~~

~~**Crozet**—Water supply in Crozet is provided by Beaver Creek Reservoir. The current safe yield is 2.0 mgd. The projected average daily demand under a build-out scenario is 1.4 mgd. Therefore, the water source for Crozet appears adequate for the long term.~~

~~**Scottsville**—Water for the Town of Scottsville is provided by Totier Creek Reservoir. The current safe yield is 1.0 mgd. The average daily demand for the Town is 0.138 mgd. The amount of water usage in Scottsville depends greatly on the UniRoyal Plant's usage and therefore can fluctuate from year to year. During the past fifteen years the highest daily average water use for~~

the Scottsville area was 0.145 mgd. With growth expected to be minimal, the current water source serving this area appears adequate for the long term.

Recommendations

- Continually monitor total capacity needs of the Development Areas and City to ensure sufficient water supply to meet projected demands for the County, City and Town of Scottsville without taxing the County's economic and/or water supply resources.
- Continue to design, construct and fill Buck Mountain Reservoir. Attempt to have the reservoir operational five years prior to the projected date when existing supplies will equal water demands.
- Utilize Chris Greene Lake as a water supply source and apply watershed protection measures.
- Develop a comprehensive water conservation program to encourage the efficient use of the region's water supply to extend the life of existing water supply sources.

Staff Note: The following section has been added

Water Conservation/Drought Response

Water conservation and efficiency are important overall objectives for water resources management in the County and the region, for both users of public water and for private groundwater derived systems. The Albemarle County Service Authority provides guidance for conserving water in homes and businesses, offers conservation kits that contain water saving devices such as aerators and low-flow showerheads, and offers rebates to customers for replacing pre-1992 toilets with new low-flow toilets. Water conservation tips are posted in all County buildings in all bathrooms, and the bathrooms are equipped with either push activated metered faucets or sensor activated faucets, and waterless hand soap. On a broader scale, the County anticipates addressing water conservation and efficiency as part of its Environmental Management System, which is a set of processes and practices that enable an organization to reduce its environmental impacts and increase its operating efficiency.

In 2004 a Rivanna Regional Drought Response Committee was formed to work cooperatively to provide a coordinated response to drought in the community. Members of the Committee include staff representing the County, the City, RWSA, and ACSA. The Committee developed a *Drought Response and Contingency Plan* to define a method for predicting and identifying drought conditions and specify drought stages that correspond to Virginia's Local and Regional Water Supply Planning Regulations. The plan identifies appropriate use restrictions for each drought stage, and clearly defines the process of public notification and information dissemination. Drought stages are derived from the use of software that analyzes statistical probabilities as to the rate at which the water supply levels would diminish, using the historical period of record, current operating procedures, and existing water demand projections.

The software model currently utilizes stream flow as an indicator of stress or reservoir levels. Stream flow and rain gage data can be graphed to clearly depict past drought cycles. Staff analysis of County monitoring wells has also shown a direct correlation of groundwater levels to this stream and rain gage data. At this time the County does not possess sufficient well monitoring data to predict drought, but it is clear that the water depth in the wells represents in real time the cumulative recharge that drives the drought cycle. It will be important for the County to continue acquiring additional well monitoring data so that a more complete picture of hydrologic conditions can be utilized when predicting and managing drought conditions.

Staff Note – The following section has been updated.

Recommendations

- Support construction of the Ragged Mountain Reservoir expansion and connecting pipeline from the South Fork Rivanna Reservoir
- Support and participate in evaluating the need and feasibility for maintenance dredging of the South Fork Rivanna Reservoir to preserve its integrity as a water supply and a recreational resource.
- Continue to initiate proactive measures to encourage community-wide water conservation and use efficiency through multi-agency programs (see *Water Supply Planning* section in the Natural Resources and Cultural Assets section of the Comprehensive Plan).