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October 1, 2009

MEMORANDUM

TO: The Honorable Timothy M. Kaine and
Members of the Virginia General Assembly

FROM: David K. Paylor

SUBJECT: Status of Virginia's Water Resources: A Report on Virginia's Water Resources Management Activities (2009)

Pursuant to VA. CODE ANN. § 62.1-44.40 (2009), the Virginia Department of Environmental Quality ("DEQ") forwards the attached 2009 Annual Report on the Status of Virginia's Water Resources. DEQ is committed to ensuring that adequate and safe drinking water is available to all citizens of the Commonwealth and protecting the beneficial uses of State waters. The purpose of this report is to provide a summary of the status of the quality and quantity of the Commonwealth's water resource supply. The report also provides a summary of DEQ's water supply and resource planning accomplishments for 2009. DEQ offers this report in electronic format on the DEQ website at: http://www.deq.virginia.gov/regulations/reports/html.

We look forward to continued service to the Virginia General Assembly. Should you require further information concerning this report, please do not hesitate to contact Jeff Reynolds, Water Resource Advisor, Office of Policy, at (804)698-4376.

STATUS OF VIRGINIA'S WATER RESOURCES
A Report on Virginia's Water Resources Management Activities

A report to the Honorable Timothy M. Kaine, Governor
and the General Assembly of Virginia

Virginia Department of Environmental Quality
Office of Surface and Ground Water Supply Planning

October 2009

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ACRONYMS

DEQ: DEPARTMENT OF ENVIRONMENTAL QUALITY

EPA: ENVIRONMENTAL PROTECTION AGENCY

FERC: FEDERAL ENGERY REGULATORY COMMISSION

GWCP: GROUND WATER CHARACTERIZATION PROGRAM

GWMA: GROUND WATER MANAGEMENT AREA

MGD: MILLION GALLONS PER DAY

NURE: NATIONAL URANIUM RESOURCE EVALUATION

PDC: PLANNING DISTRICT COMMISION

SWCD: STATE WATER CONTROL BOARD

SWI: SURFACE WATER INVESTIGATIONS PROGRAM

TMDL: TOTAL MAXIMUM DAILY LOAD

USGS: UNITED STATES GEOLOGICAL SURVEY

VDH: **VIRGINIA DEPARTMENT OF HEALTH**

VWPP: **VIRGINIA WATER PROTECTION PROGRAM**

VWUDS: **VIRGINIA WATER USE DATA SYSTEM**

STATUS OF VIRGINIA'S WATER RESOURCES
A REPORT ON VIRGINIA'S WATER RESOURCES MANAGEMENT PROGRAM ACTIVITIES – OCTOBER 2009

I. EXECUTIVE SUMMARY

This annual report, submitted to the Governor and the Virginia General Assembly in accordance with Chapter 3.2 of Title 62.1 of the Code of Virginia, describes the status of the Commonwealth's surface and ground water resources, provides an overview of climate conditions and impacts on water supplies in the Commonwealth, and provides an update on the Commonwealth's Water Resources Management Program for Calendar Year 2008.

Virginia's estimated 51,021 miles of streams and rivers are part of nine major watersheds. Annual state-wide rainfall averages almost 43 inches. The total combined flow of all freshwater streams in the state is estimated at about 25 billion gallons per day. The 248 publicly owned lakes in the Commonwealth have a combined surface area of 130,344 acres. Additionally, many hundreds of other small privately owned lakes and ponds are distributed throughout the state. Other significant water features of Virginia include approximately 236,900 acres of tidal and coastal wetlands, 808,000 acres of freshwater wetlands, 120 miles of Atlantic Ocean coastline, and more than 2,300 square miles of estuaries. A summary of Virginia's surface water resources is provided in Appendix 1.

Following significant drought conditions during 2007, the 2008 calendar year began with almost the entire Commonwealth under drought conditions. During the months of January and February, some areas of the Commonwealth received well below average precipitation, combined with low streamflows and low groundwater levels. These dry conditions and above average temperatures in late winter were followed by relatively wet conditions and near normal temperatures during March through May, resulting in a much improved drought situation throughout most of Virginia by the end of May. Record high temperatures in June and below average precipitation began a period of worsening drought conditions that continued throughout the summer. While drought conditions improved or stabilized across most of the Commonwealth by October, drought conditions and low reservoir levels persisted in the southwestern and western portions of the Commonwealth through the end of the year. While not as pronounced as the 2007 drought conditions, meteorological conditions such as those experienced in 2008 continued to impact water resources in terms of stressed supplies of stored water, low replenishment rates of reservoirs, and high water demand for irrigation.

The Office of Surface and Ground Water Supply Planning resides within the Water Division of the Virginia Department of Environmental Quality (DEQ). The Office consists of four programs, including Surface Water Investigations, Ground Water Characterization, Water Supply Planning, and Water Withdrawal Permitting (*See* Section III for summaries of programs). The Office of Surface and Ground Water Supply Planning collaborates with other state and federal programs to support local water resources planning. Significant programmatic highlights of the Office of Surface and Ground Water Supply Planning for 2008 include:

- Analysis of 193 surface water, 407 ground water, and 65 Total Maximum Daily Load (TMDL) data sites (Section III.A.);
- Addition of two real-time ground water stations to the monitoring network and development of well construction and geochemical databases (Section III.B.);
- Receipt of three (3) local water supply programs and funding of 18 regional water supply plan development projects (Section III.C.);
- Funding of eight (8) wellhead protection implementation grant projects (Section III.C.);
- Management of 250 active ground water withdrawal permits and 123 active permit applications (Section III.D.);
- Management of 61 active Virginia water protection permits and 13 active permit applications (Section III.D.);
- Observation of public water supplies accounting for the greatest percentage of the total water use in Virginia (Section IV.);
- Observation of decreased demands on surface and ground water resources (Section V.);
- Expansion of the Eastern Virginia Ground Water Management Area (Section VII.);
- Acknowledgement of the need for a secure source of funding for surface and ground water supply planning (Section VII.);

Virginia's public health, environment, and economic growth depends on the availability of quality water resources. To assure water resources are available for future generations and the continued growth of Virginia, effective water resource management must continue to be premised on a process that improves the quality and quantity of water available to the Commonwealth.

II. CLIMATOLOGICAL CONDITIONS

This section of the report provides an overview of the climatological conditions affecting the status and condition of Virginia's Water Resources. Below is a summary of the September 22, 2009 Drought Status Report which is included as Appendix 2.

Drought Status Report
September 22, 2009

Statewide precipitation for the current water year (from October 1, 2008 through September 18, 2009) is within the normal range (93%). Normal precipitation is defined as the mean precipitation for a thirty year period of record. Precipitation greater than 85% of normal is considered to be in the normal range. Precipitation is now within the normal range for all drought evaluation areas for the current water year with the exception of the Middle James (84%). Statewide precipitation from August 1st through September 18, 2009 was below the normal range (83%) with four drought evaluation regions receiving precipitation greater than 100% of normal and nine drought evaluation regions receiving below 100% of normal. Several drought evaluation regions (Middle James, Northern Virginia, Northern Piedmont, Northern Coastal Plain) have seen a significant drop in precipitation since July 1, which may result in some localized drought conditions should this trend continue. To date, no Virginia locality has submitted a request seeking agricultural disaster designation for 2009. Generally, crop conditions are stable with the exception of localized conditions affecting production in the Shenandoah Valley and in southeastern Virginia.

Significant portions of the State are experiencing below normal streamflow conditions. Streamflow gages in the upper James, Shenandoah, and Rappahannock River Basins are recording streamflows that are well below normal. Other areas where streamflow is below normal are the Roanoke and Chowan River Basins. Groundwater monitoring sites in the state Climate-Response well network are reporting water levels in the normal or above normal range except for the well located near Roanoke, Va., which is below normal. Statewide, levels of large reservoirs have continued to drop since mid-August. Four large multi-purpose reservoirs are identified as drought indicators in the *Virginia Drought Assessment and Response Plan* (Plan); Smith Mountain Lake, Lake Moomaw, Lake Anna, and Kerr Reservoir. Of these four reservoirs, Kerr Reservoir is currently in the Drought Watch Stage and the three others are in the normal range as defined in the Plan.

While the Virginia Department of Health has not reported any impacts to public water supplies that have compromised their ability to meet the needs of local communities, 22 systems are under voluntary water conservation requirements and 2 systems are under mandatory water conservation requirements. The number of systems under restrictions has been reduced by one since August 2009. The Department of Game and Inland Fisheries reports that water supply flows at the trout hatcheries are much improved over what they have been in the past few years for the end of summer period. The increased flows, along with the cooler summer have resulted in trout growth at the hatcheries.

III. PROGRAM SUMMARIES

The Office of Surface and Ground Water Supply Planning consists of four programs: Surface Water Investigations, Ground Water Characterization, Water Supply Planning, and Water Withdrawal Permitting.

A. Surface Water Investigations Program

DEQ and the United States Geological Survey (USGS) are the primary agencies responsible for collecting hydrologic data in Virginia. The two agencies work cooperatively to provide a comprehensive picture of real-time and historical hydrologic conditions in the Commonwealth. The mission of the Surface Water Investigations Program (SWI) is to collect systematic and reliable hydrologic data regarding the quantity of surface water and elevation of ground water in the Commonwealth. This is accomplished through a network of real-time satellite telemetry gaging stations[1] and is essential for the successful planning and management of the Commonwealth's water resources.

In 2008, SWI field personnel monitored 74 surface water gages (Figure 1) on an eight week schedule, servicing the real-time satellite equipment and measuring streamflow (discharge). Over 500 discharge measurements were made by SWI personnel for the gaging station network in 2008. Stream depth, width, and velocity are measured in the waterway to determine discharge. From these measurements, a rating curve is developed by correlating discharge with water level in the stream (gage height). The gage height is recorded every 15 minutes by a data logger located in a permanent gage house, saved and transmitted to the USGS database hourly by satellite telemetry, converted into discharge, then updated on the USGS website (http://waterdata.usgs.gov/va/nwis/rt).

Under the Clean Water Act, the United States Environmental Protection Agency (EPA) requires that each state develop a list of impaired water bodies and associated TMDLs. A TMDL or "Total Maximum Daily Load" is the maximum amount of pollutant that may be discharged into a body of water and still meet water quality standards. A TMDL calculation must account for seasonal variation in water quality. The SWI program is a major component of the Commonwealth's TMDL program because it retains the only hydrologist in the state that supplies flow data. In 2008, SWI measured 65 miscellaneous TMDL sites.

The SWI office also provides reliable information on the elevation of the ground water in the Commonwealth to determine the availability of the natural resource. Field personnel monitor 42 real-time ground water stations (Figure 1). Field personnel measure ground water elevation and service the satellite data collection platforms on a 6-8 week schedule. There are also 163 quarterly taped and 35 yearly taped ground water wells that are not real-time. Some of the sites were drilled by DEQ personnel while most were reclaimed from abandoned or discontinued public, private or industry owned wells. The wells are maintained by SWI personnel. The USGS provided water level data for an additional 167 wells. These data are available online at http://groundwaterwatch.usgs.gov/StateMaps/VA.html.

[1] **Gaging station** is a site on a stream, canal, lake, or reservoir where systematic observations of stage, discharge, or other hydrologic data are obtained. http://water.usgs.gov/ADR_Defs_2005.pdf

The ground water and streamflow data are published in an annual report. In the 2008 report, SWI and USGS analyzed a total of 193 streamflow data sites and 407 ground water sites. These data were reviewed, approved, and published with final stream discharge and ground water elevation available through the USGS Water Data website at http://wdr.water.usgs.gov/wy2008/search.jsp.

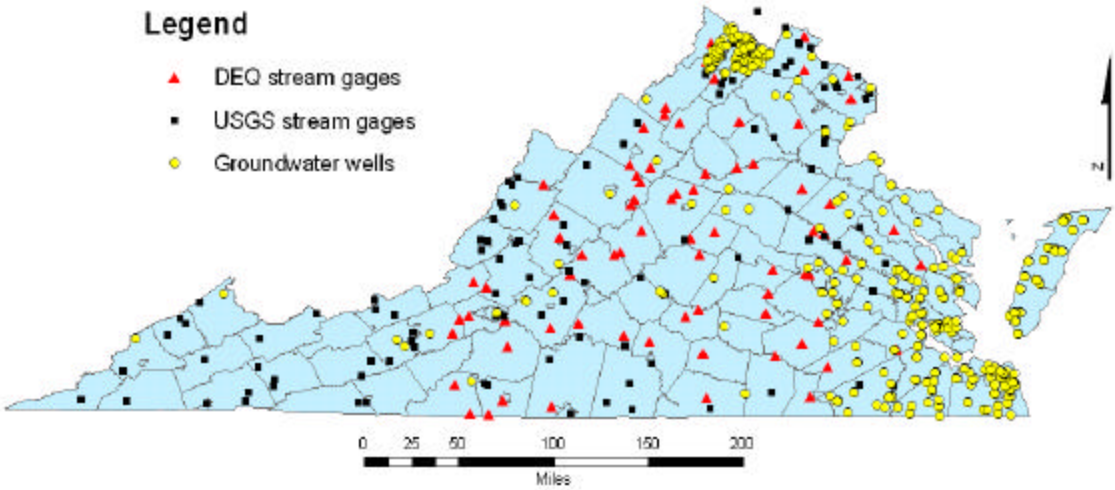


Figure 1: State-wide stream gages and observation wells

B. Ground Water Characterization Program

DEQ established the Ground Water Characterization Program (GWCP) in response to negative impacts experienced by many localities, businesses, and domestic well users during the drought of 2002. The organizational objective of the GWCP is to protect Virginia's environment and promote the health and well being of its citizens by collecting, evaluating, and interpreting technical information necessary to manage ground water resources of the Commonwealth. The GWCP staff works to assure that necessary information is available to support resource management decisions and water supply planning activities, assesses ground water availability, facilitates drought monitoring, and provides technical support for the expansion or creation of ground water management areas. The GWCP staff conducts outreach and education efforts concerning a wide range of ground water related issues. Providing educational outreach to members of the Commonwealth is seen as one of the most important opportunities in gaining awareness of the wide range of viewpoints and issues affecting the region.

Long term goals for the GWCP include expansion of the State Observation Well Network west of the fall line and in Virginia's Northern Neck peninsula and publication of regional ground water resources reports. Although funding for the expansion of the State Observation Well Network remains a challenge, DEQ continues to pursue opportunities to collaborate with local governments and the USGS Virginia Water Science Center. In 2008, the GWCP collaborated with local and state governments to establish two (2) new real-time State Observation wells. The GWCP continues to maintain and provide data from 10 State Observation Wells established in the 2007 calendar year. Information obtained from observation well networks is used in the development of a conceptual regional hydrogeologic framework (Coastal Plain) and in the development of regional ground water resources reports. The regional report format will present Virginia ground water resources based on regional and sub-regional ground water flow systems rather than by political boundaries, document and describe the

geologic controls on the occurrence, movement, and availability of ground water in Virginia, and summarize current ground water withdrawal rates and trends. Draft reports for Valley and Ridge/Cumberland Plateau, and Piedmont/Blue Ridge are under development with an anticipated completion date of 2010. When completed, the regional reports will be made available to the public via the GWCP web site (http://www.deq.virginia.gov/gwcharacterization/homepage.html).

Ground Water Resources Reports

Eighteen Ground Water Resources Reports, completed in the late 1970's and early 1980's by the State Water Control Board (SWCB), are currently available on the GWCP web page. These reports document the availability, utilization rates, and water quality of ground water resources within selected counties and political sub-regions of Virginia. These ground water resource reports are the only readily available published source of information pertaining to the occurrence, movement, and availability of ground water for a large number of the investigated areas.

State-Wide Water Well Construction and Geochemical Databases

Water well construction information is vital for understanding and describing local and regional ground water systems. In 2007 and 2008, the GWCP compiled a Geographic Information System database of approximately 35,000 historic well construction records. Each record describes in varying detail the location and physical properties of the well and the water-bearing properties of the geologic material where the well is located. These records include information from the SWCB, DEQ, USGS, VDH, and the Virginia Department of Geology and Mineral Resources (VDGMR). Considerable effort was invested to review duplicate records and rectify a substantial number of wells with questionable coordinate information. The current coverage of wells incorporated into the state-wide Well Construction Database is displayed in Figure 2.

In 2008, a geochemical database of ground water samples was compiled and geo-referenced by GWCP staff. This database contains information about the natural geochemical conditions of ground water throughout the Commonwealth from approximately 23,000 ground water samples originating from approximately 12,400 wells. Sample data originated from SWCB, USGS, VDH, and National Uranium Resource Evaluation (NURE) data. The data was consolidated and normalized to standard concentrations and uniform reporting units. The current coverage of the geochemical database sample locations is displayed in Figure 3.

The long-term success of the water well construction and geochemical databases as repositories for well construction, hydrogeologic, and geochemical information, and as tools for facilitating hydrogeologic analysis within the Commonwealth, is dependant on the continued addition of historic and new geo-referenced water well construction records. Currently, the absence of accurate well-head location requirements (coordinates) for domestic water well completion reporting forms means that the thousands of residential wells drilled annually have no readily usable spatial representation. Consequently, there is no efficient way to analyze the residential demands on local ground water systems or to effectively analyze the local geologic controls on these systems. Such a reporting requirement, combined with the option of electronic form submittal, would provide a means for such analyses. The GWCP continues to endorse this reporting requirement by educating private well drillers about the importance of voluntarily reporting well coordinate information, and by encouraging the electronic submittal of water well completion reports to VDH so that well data can be more easily converted into a database format.

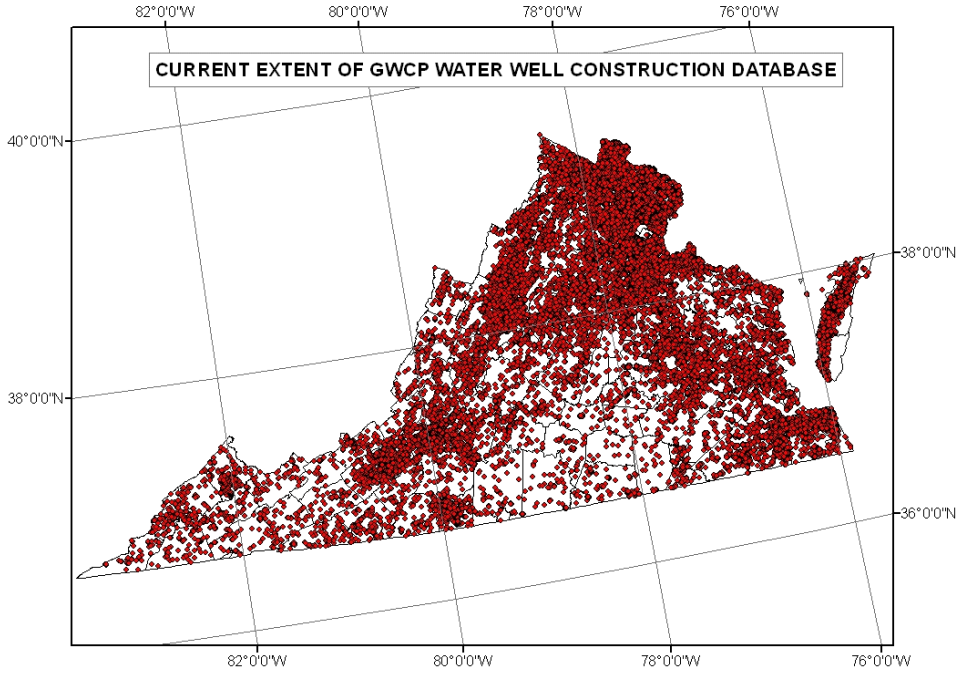


Figure 2: Current extent of GWCP well construction database

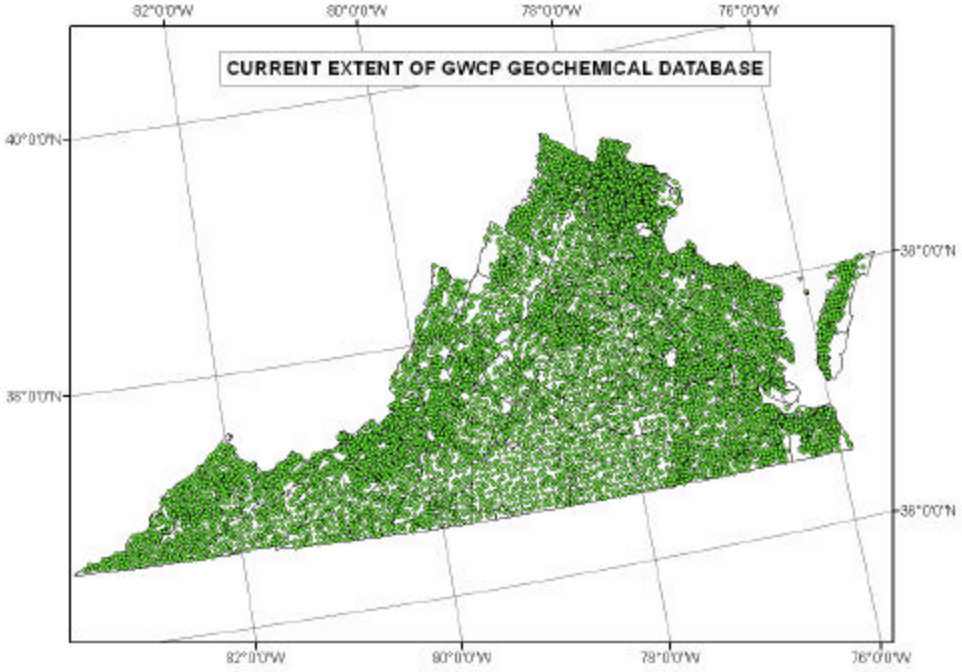


Figure 3: Current extent of GWCP geochemical database

Virginia Spring Database

The GWCP staff have initiated an effort to locate, characterize, and publish a database of springs throughout Virginia with an emphasis on the predominantly carbonate terrains of western Virginia. Springs are important water resources for municipalities, agriculture, and private landowners. Locations and discharge measurements of springs are important components of any hydrogeologic analysis and are increasingly sought after by resource managers. No comprehensive analysis of springs has been undertaken by the Commonwealth since 1930. A spring database structure was formalized in 2007 capable of meshing various historic datasets with more recent field measurements. The new spring database captures site location information, field measurements such as spring discharge, pH, specific conductance, total dissolved solids, dissolved oxygen and temperature, laboratory water quality analyses, scanned images of historic documents, and site photos. Since inception in 2006, the spring database has grown from a little over 200 springs to 729 spring locations associated with over 1,800 field measurements and analyses from 331 water quality sampling events. Data sharing agreements have been developed with sister agencies in the Virginia Department of Conservation and Recreation's Karst Program, Virginia Division of Mines Minerals and Energy, and the USGS in order to accelerate the acquisition of spring data and to prevent duplication of work. A quick and easy-to-use spring reporting form was developed for field personnel at sister agencies to inventory springs encountered during field work.

Geophysical Logging Activities

The GWCP operates, in cooperation with the USGS, a geophysical logging truck used for evaluating wells throughout the Commonwealth. The truck is equipped with borehole geophysical probes used for analyzing the structural, hydrogeologic, and geophysical properties of the host geologic formation(s) penetrated by the well. Borehole geophysical logging provides a means for acquiring important information pertaining to well construction and condition, and is an effective technique for acquiring the geologic and hydrogeologic data required to better understand local and regional ground water systems. In 2008, 51 wells were evaluated with geophysical and camera logs in the Commonwealth.

C. Water Supply Planning Program

November 2, 2008 marked the 3rd anniversary of the implementation of the Local and Regional Water Supply Planning Regulation (9VAC 25-780). Localities' Letter of Intent submissions, due November 2, 2008, revealed 38 commitments to regional water supply planning (Figure 4). Ten local governments have elected to develop local water supply planning programs, including the counties of Amelia, Charles City, King George, New Kent, and Stafford, the City of Richmond, and the towns of Chincoteague, Hillsboro, Port Royal, and Warrenton (Figure 4). The City of Richmond, Stafford County, and the City of Norfolk formally submitted their local water supply planning programs by the applicable November 2, 2008 deadline. The City of Norfolk also is participating in the Hampton Roads Planning District Commission (PDC) regional water supply plan.

Based on the status of state-wide water supply plan development, it is anticipated that five regional draft plans will be submitted to DEQ for review and one local water supply programs will be formally submitted to the SWCB in 2009. Additionally, it is projected that seven regional draft plans will be submitted for DEQ review and seven local water supply programs will be formally submitted to the SWCB in 2010 (Appendix 3, Table 16).

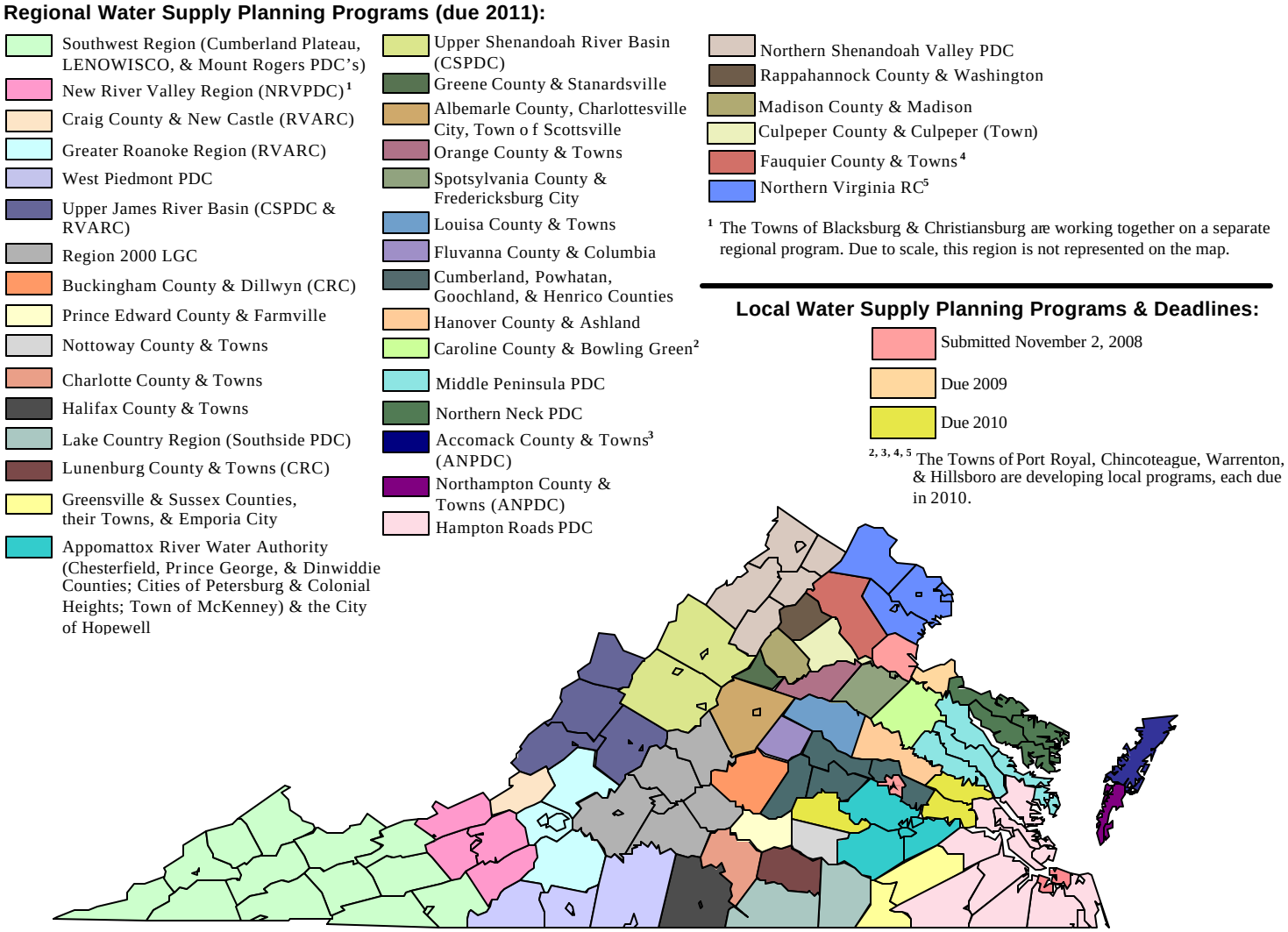


Figure 4: Local and regional water supply plan development status as of August 31, 2009. Solid shading represents regional water supply planning partnerships with program submission deadlines of November 2, 2011 (Total = 38). Dashed shading indicates localities that have not regionalized, with local program submission deadlines of November 2, 2008, 2009, or 2010 (Total =10). The City of Norfolk is denoted by pink dashed shading as they submitted a local water supply program by November 2, 2008 and are also participating in the Hampton Roads PDC regional water supply plan

Water Supply Planning Grant Funding Status

Since January 2006, DEQ's Water Supply Planning program has provided grants totaling $1,298,418 to partially fund water supply plan development efforts for a total of 55 local government authorities. DEQ awarded $200,000 in Fiscal Year 2009 to assist 18 regional water supply plan development projects. Due to the state budget shortfall, Fiscal Year 2010 grant funds available to localities for initiation or continuation of water supply plan development activities were reduced to $90,000.

Wellhead Protection Implementation Grants

Since December 2005, DEQ and VDH have collaborated to provide grants totaling $507,213 to fund wellhead protection implementation projects at seven municipalities with ground water based

community water supplies. Localities benefiting from this funding are Accomack-Northampton PDC, James City Service Authority, Town of Lovettsville, Town of Stanley, Wythe County, Rye Valley Service Authority, Town of Burkeville, and Augusta County Service Authority. The funding source is a combination of Federal Clean Water Act and Safe Drinking Water Act dollars while the projects are managed by DEQ. This competitive process will continue in 2009.

D. Water Withdrawal Permitting Program

Ground Water Withdrawal Permitting Efforts

The Virginia Ground Water Act of 1973 recognizes the duty of the SWCB to manage ground water resources and declare management areas. Subsequently, two Ground Water Management Areas (GWMAs) were declared, including the Eastern Virginia GWMA and the Eastern Shore GWMA (Figure 5). In 1992, the statute was amended, resulting in the current permitting program operating under regulations developed pursuant to the Ground Water Management Act of 1992. Ground Water Withdrawal Permits are required in the management areas for any withdrawal in excess of 300,000 gallons in any month. Permit applications for new withdrawals or for increases to existing withdrawals are evaluated for sustainability, considering the combined impacts from all existing lawful withdrawals.

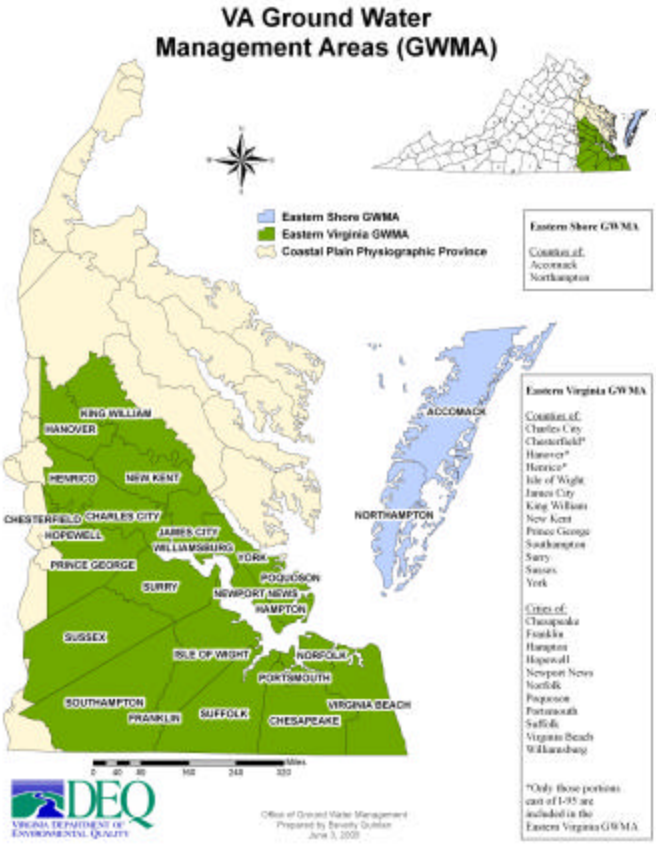


Figure 5: Ground Water Management Areas of Virginia

Applications for new or expanded withdrawals are recommended for denial in areas where the ground water resource is predicted or identified through monitoring to be below resource protection limits established by regulation. Technical evaluations of impacts and resource sustainability are developed by specialized ground water modeling staff. Program staff meet with all prospective permit applicants to discuss the permitting process and technical requirements prior to application submission. Program staff also provide technical support to applicants by reviewing and providing comments on all proposals for field data collection in support of permit development. The areal extent of the two existing GWMAs results in regional permitting programs in DEQ's Tidewater and Piedmont Regional Offices. There are 250 active permits (Figure 6) and 123 active applications in process with the GWMAs.

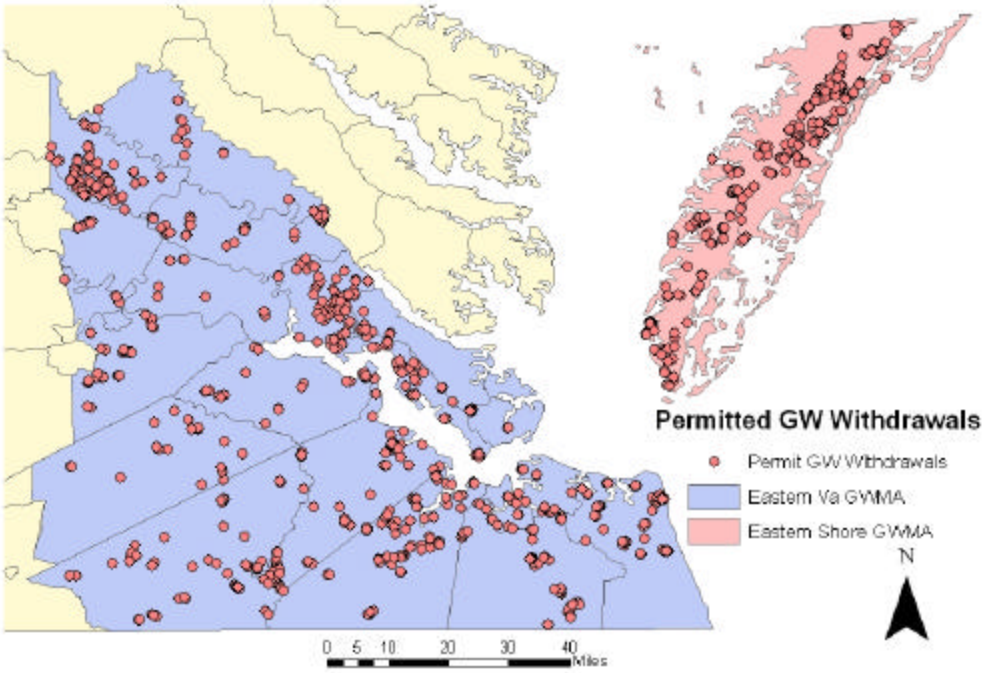


Figure 6: Permitted Ground Water Withdrawals Within Virginia's Ground Water Management Areas

SWCB is required by the Ground Water Management Act of 1992 "to conserve, protect and beneficially utilize the ground water of this Commonwealth and to ensure the public welfare, safety and health (§ 62.1-254.)." The confined aquifers of the Coastal Plain Aquifer System have historically yielded high rates of ground water satisfying much of the area's industrial, commercial, municipal, and agricultural demands. Large withdrawals from these aquifers produce overlapping cones of depression and some interference among wells has occurred. In addition, decades of water level observations in these aquifers indicate a declining trend in water levels. For example, water levels are falling at a rate of about 2 feet per year in the Middle Potomac Aquifer.

The Ground Water Withdrawal Regulations (9 VAC 25-610 *et seq*.) define the limit of allowable drawdown for each confined aquifer such that 20% of their pre-development water level/pressure is reserved. This limit, or "critical surface", is intended to protect the aquifers from dewatering and compaction. The most recent Total Permitted Simulation identifies four confined aquifers with areas

where the water levels are predicted below this threshold. This means any proposals that would result in additional impacts in those areas cannot be permitted. Maps identifying these problem areas are included in Appendix 6. The full report is available for download at http://www.deq.virginia.gov/gwpermitting/forms.html (*"Simulations of Ground Water Use in the Virginia Coastal Plain"*).

Surface Water Withdrawal Permitting Efforts

Water withdrawal projects involve planning, modeling, and engineering long before any permits are obtained. DEQ's Office of Surface and Ground Water Supply Planning is responsible for assisting the public with such planning and permitting.

Many projects involving surface water impacts from surface water withdrawals, related permanent structures, fill, or back-flooding are regulated under the Virginia Water Protection Permit Program (VWPP), which is administered by the DEQ Office of Wetlands and Water Protection. The VWPP Program issues Virginia Water Protection permits for surface water impacts through use of the Joint Permit Application process. The regulation concerning water withdrawals and associated activities permitted under the Virginia Water Protection Permit Program is described in regulation at 9 VAC 25-210 *et seq*. The issuance of Virginia Water Protection Permits for surface water withdrawal activities is authorized under the Code of Virginia §§62.1-44.15.20 and 62.1-44.15.22.

The Virginia Water Protection Permit Program serves as Virginia's Section 401 certification program for federal Section 404 permits issued under the authority of the Clean Water Act. Section 404 permits are often required for the construction of dams and intake structures. State law requires that a VWP permit be obtained before disturbing a wetland or stream by clearing, filling, excavating, draining, ditching or flooding. Application is made through the Joint Permit Application process for concurrent federal and state project review, although federal and state agencies may issue permits independently. There are 61 active VWP permits and 13 VWP applications for surface water withdrawals in process state-wide (Figure 7).

2008 surface water withdrawal planning and permitting efforts included:

- In October 2008, the SWCB issued a VWP permit to Appalachian Power Company for the Smith Mountain Project. The permit sets new rules for minimum releases from the project; however, the rules will not become effective until the facility receives a new Federal Energy Regulatory Commission (FERC) license. The previous FERC license required a constant release and had a tendency to drain Virginia's second largest lake to unacceptable levels. The new VWP permit conditions feature a comprehensive release strategy that varies releases by time of year and reduces releases as a drought worsens.
- DEQ reissued a VWP permit to the Rapidan Service Authority in October 2008 for the continuation of surface water withdrawals from the Rapidan River.
- A major modification of an existing permit for the East Coast Transport, Inc. James River intake was completed in March 2008. This modification extended a deadline for contracting with potential water customers, which ultimately affects the authorized withdrawal volumes.
- DEQ continued to develop a VWP permit for a combined water supply system for the Amherst County Service Authority in 2008. A final permit is expected in late 2009.

- Staff from the Office of Surface and Ground Water Supply Planning and the Office of Wetlands and Water Protection participated in review and comment committees throughout 2008 for a flow release study in Leesville Lake, as it relates to the Smith Mountain Lake project, and for the Claytor Lake Hydroelectric Project. DEQ expects to receive a Joint Permit Application from American Electric and Power Company in 2009 for the Claytor Lake Project.

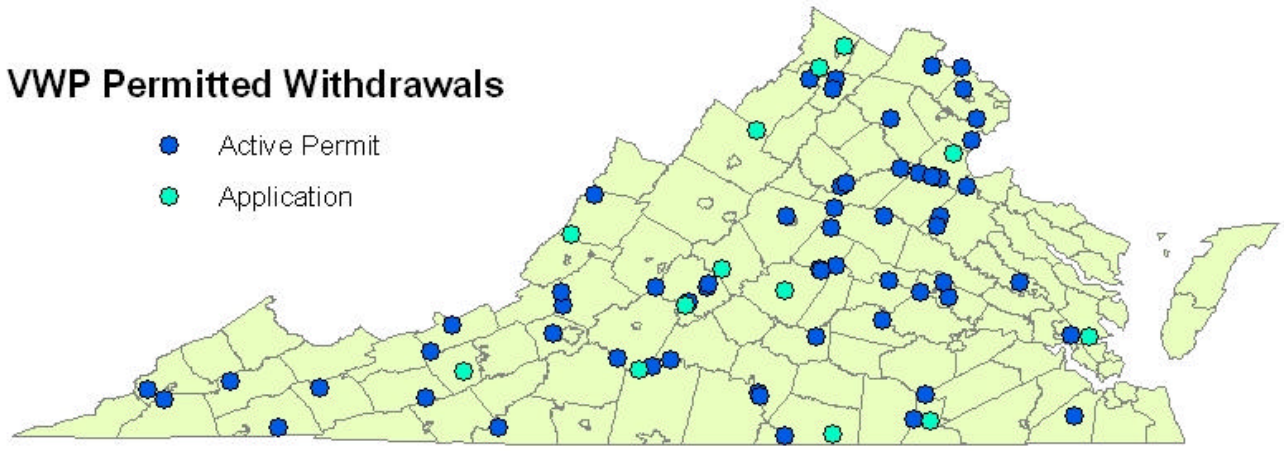


Figure 7: Current Virginia Water Protection (VWP) Active Permits and Applications for Surface Water Withdrawals Across the Commonwealth

IV. SUMMARY OF WATER WITHDRAWALS IN 2008

The Virginia Water Withdrawal Reporting Regulation (9 VAC 25-200-10 *et seq*.) requires that individuals or facilities that withdraw water at volumes greater than 10,000 gallons per day (gpd)(one million gallons per month for crop irrigators) must measure and report annually to DEQ the monthly volume of water withdrawn. The Virginia Water Use Data System (VWUDS) contains withdrawal data collected since 1982 under this regulation. The information presented below represents reported water withdrawals by category as set forth by the water withdrawal reporting regulation. The categories of water withdrawals identified in the VWUDS database include agriculture, commercial, irrigation, manufacturing, mining, power fossil, hydropower, nuclear power, and public water supply. Withdrawals of less than 10,000 gallons per day are exempt from the reporting requirements and are not included in this report.

Appendix 4 lists the top 20 individual non-power generating water withdrawals ranked by the amount of their 2008 reported withdrawals. Figures for power generation, including fossil fuel, nuclear, and hydro are not provided in this report. Hydropower withdrawals are largely non-consumptive water uses and are no longer tracked in VWUDS. However, fossil fuel and nuclear power utilize water for cooling and are considered consumptive. Improvements in the VWUDS database are anticipated in calendar years 2009 and 2010. Water use information for these two categories will be available in future reports. The sum of all reported withdrawals in Virginia in 2008 is equal to approximately 1.2 billion gallons per day. The relative contribution of surface and ground water sources to 2008 non-power generation withdrawals is illustrated in Figure 8, which shows that large water demands are primarily met by surface water sources. Users of ground water sources outnumber surface water users; however, the amount of ground water withdrawn from aquifers is less than is withdrawn from streams and reservoirs. Figure 9 and Figure 10 display the 2008 total withdrawals by locality (county or city) for ground water and surface water, respectively.

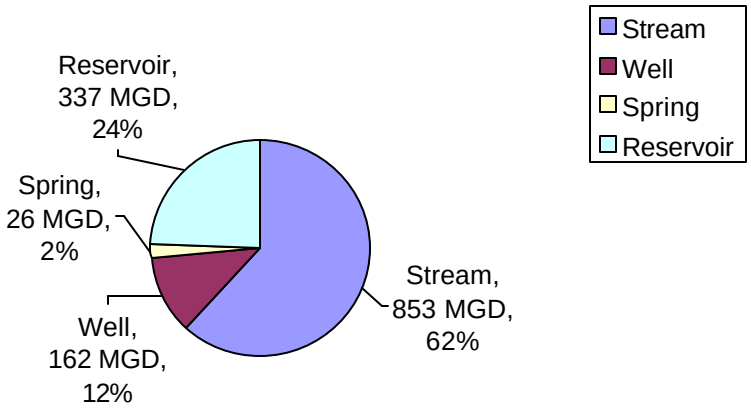


Figure 8: Total Water Withdrawals by Source in 2008

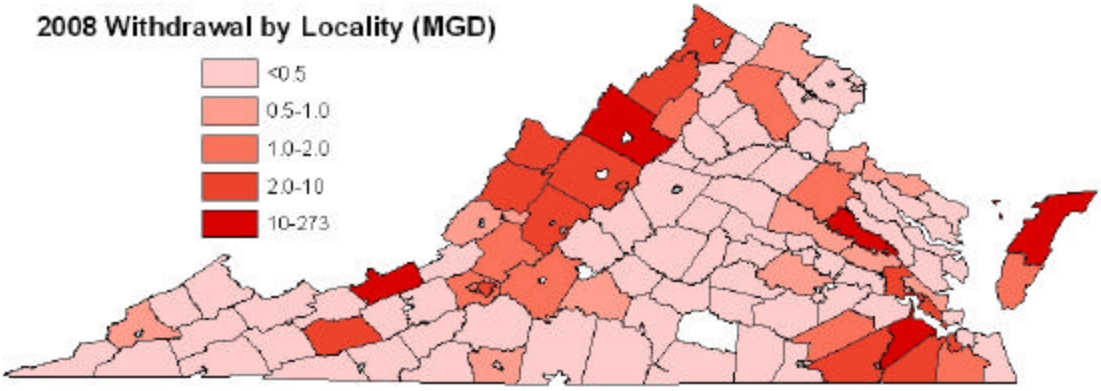


Figure 9: 2008 Total Ground Water Withdrawals by Locality (County or City)

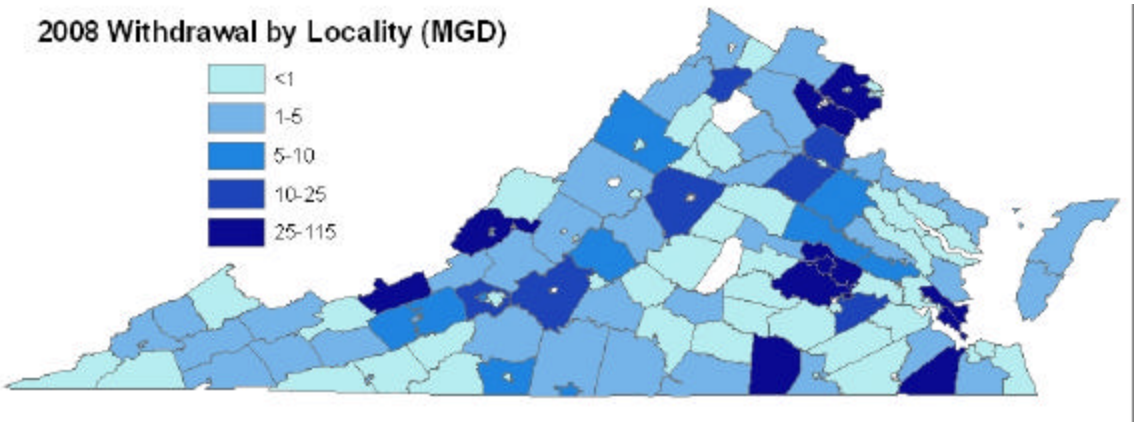
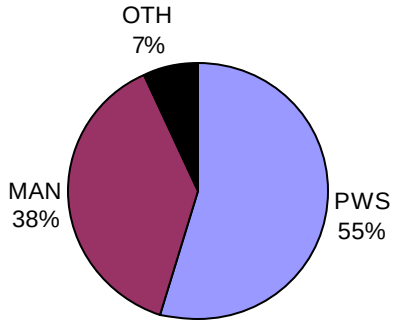


Figure 10: 2008 Total Surface Water Withdrawals by Locality (County or City)

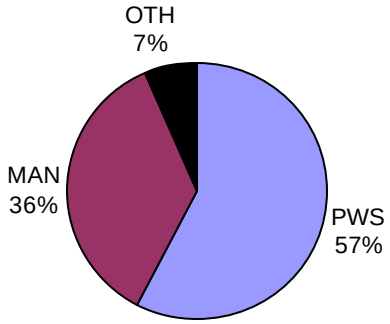
Figure 11 summarizes 2008 water withdrawals in Virginia by category along with the average water use from 2004 – 2008 by category. Figure 11(a) shows the total water withdrawals in 2008 by category with public water supplies accounting for the greatest percentage (55%) of the total ground water and surface water withdrawals in Virginia. Manufacturing remained significant as well in 2008 with 38% of the total ground water and surface water withdrawals. Figure 11(d) shows the average total water withdrawals by category over the past five years (2004 – 2008). A comparison of 2008 (Figure 11(a)) versus the five-year average water withdrawals (Figure 11(d)) shows a similar pattern of use, with the percentage of 2008 total withdrawals for public water supply being 2% lower than the five-year average percentage of total withdrawals for public water supply.

Figure 11(b) and (e) show ground water withdrawals by category, illustrating that the distribution of 2008 ground water withdrawals by category is similar to the average distribution of ground water withdrawals over the past five years. Public water supply withdrawals account for a slightly smaller percentage of the total ground water withdrawals in 2008. A larger percentage of ground water withdrawals are used for other categories including agriculture and irrigation than the percentage of surface water withdrawals used for these purposes. Figure 11(c) and (f) show the distribution of surface water withdrawals by category, illustrating that the pattern of water use in 2008 closely resembles water use over the past five years. The reduction in the percentage of public water supply in 2008 as compared to the five year average most likely results from a reduction in responses received by DEQ from public water supply facilities in 2008.

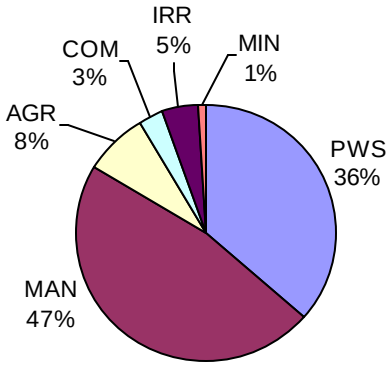
Figure 11: (a)-(c) 2008 Water Use by Category and (d)-(f) Average Water Use from 2004-2008 by Category (AGR=agricultural, COM=commercial, IRR=irrigation, MAN= manufacturing, MIN=mining, PWS=public water supply)



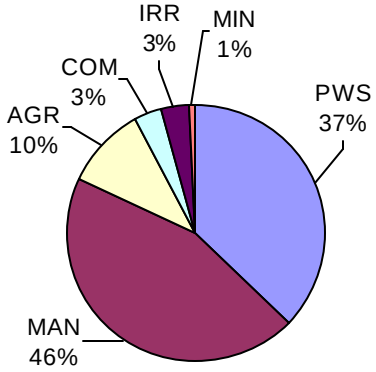
(a) 2008 Total Water Withdrawals by Category (2008 Total Withdrawals = 1,224 MGD)
OTH: IRR 3%, MIN 2%, AGR 2%, COM 1%



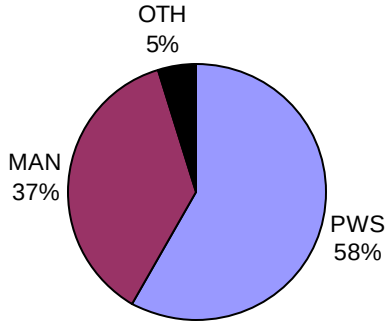
(d) Average Total Water Use by Category for 2004-2008 (Avg. Total Use = 1,369 MGD)
OTH: IRR 2%, MIN 2%, AGR 2%, COM 1%



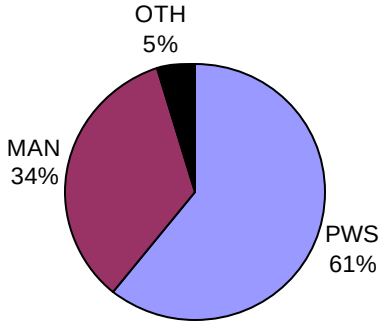
(b) 2008 Ground Water Use by Category (2008 Ground Water Use = 198 MGD)



(e) Average Ground Water Use by Category for 2004-2008 (Avg. Ground Water Use = 203 MGD)



(c) 2008 Surface Water Use by Category (2008 Surface Water Use = 1,026 MGD)
OTH: IRR 2%, MIN 2%, AGR 0.5%, COM 0.5%



(f) Average Surface Water Use by Category for 2004-2008 (Avg. Surface Water Use = 1,166 MGD)
OTH: IRR 1%, MIN 2%, AGR 0%, COM 1%

V. RECENT TRENDS IN WATER WITHDRAWALS IN VIRGINIA

A summary of the water withdrawal data from the Virginia Water Use Data System (VWUDS) for the years 2004 through 2008 is presented in Table 1. The data are aggregated by category of use and by source water type.

Table 1: Virginia Water Use Summary 2004-2008

	Category	2004 MGD	2005 MGD	2006 MGD	2007 MGD	2008 MGD	Average MGD	difference between 2008 water withdrawals and average water withdrawals quantified in millions of gallons per day (MGD)	% change in 2008 water withdrawals from average water withdrawals
Ground Water	Agriculture	24.4	20.9	21.9	22.6	15.0	21.0	-6.0	-28%
	Irrigation	7.1	4.3	7.8	6.4	9.3	7.0	2.3	33%
	Commercial	7.6	6.7	6.5	6.6	6.4	6.8	-0.4	-5%
	Mining	0.7	2.5	2.0	2.1	1.5	1.8	-0.3	-15%
	Manufacturing	89.8	93.7	92.2	83.3	93.4	90.5	2.9	3%
	Other	0.4	0.3	0.3	2.7	0.3	0.8	-0.5	-59%
	Public Water Supply	73.1	73.0	76.7	80.8	71.9	75.1	-3.2	-4%
	Total GW	203.1	201.4	207.4	204.5	197.9	202.9	-5.0	-2%
Surface Water	Agriculture	3.9	5.7	6.7	0.9	5.7	4.6	1.1	24%
	Irrigation	6.0	15.1	14.0	23.0	21.7	15.9	5.7	36%
	Commercial	8.2	10.6	14.7	11.8	6.2	10.3	-4.1	-40%
	Mining	38.0	27.3	20.1	17.7	17.0	24.0	-7.0	-29%
	Manufacturing	407.6	424.6	396.2	395.9	376.3	400.1	-23.8	-6%
	Other	0.0	1.4	1.1	0.8	0.5	0.8	-0.3	-40%
	Public Water Supply	697.7	752.3	753.3	750.5	598.4	710.4	-112.1	-16%
	Total SW	1161.3	1236.8	1206.1	1200.6	1025.6	1166.1	-140.5	-12%
TOTAL	Agriculture	28.3	26.6	28.7	23.5	20.7	25.5	-4.9	-19%
	Irrigation	13.1	19.4	21.7	29.4	31.0	22.9	8.1	35%
	Commercial	15.9	17.3	21.2	18.4	12.6	17.1	-4.5	-26%
	Mining	38.7	29.7	22.0	19.8	18.5	25.7	-7.3	-28%
	Manufacturing	497.4	518.3	488.4	479.2	469.6	490.6	-20.9	-4%
	Other	0.4	1.7	1.5	3.5	0.8	1.6	-0.8	-49%
	Public Water Supply	770.7	825.2	830.0	831.4	670.3	785.5	-115.3	-15%
	Total	1364.4	1438.3	1413.5	1405.1	1223.5	1368.9	-145.5	-11%

VI. CATEGORIES OF WATER WITHDRAWALS IN VIRGINIA

The information in this section illustrates the water use for individual categories over the last five years (2004 – 2008). Two issues should be considered while interpreting the data presented on the following pages:

Transfers of water: Water withdrawn in the Commonwealth may be used by the withdrawing entity or locality, or it may be *transferred* to another entity/locality. The water use presented in this report is compiled from database records that detail water withdrawn by a locality or entity (withdrawals), water transferred to another locality (*releases*), and water purchased from another locality (*receipts*). In theory, the total amount of water reported as *released* should equal the total reported as *received*. In reality, reported receipts in the state are 20-25% less than the amount reported as released. This discrepancy is most likely a result of low reporting rates from facilities that purchase water. In order to avoid double counting, this report will generally refer to "water use" as synonymous with "water withdrawn", and any reporting or illustration of water transfers will be clearly marked as "water transferred." The information for categories of water withdrawals with significant transfers of water includes a table presenting the amount of water purchased along with the seller and purchaser of the water. A summary of how water transfers are stored in the database can be found in Appendix 5.

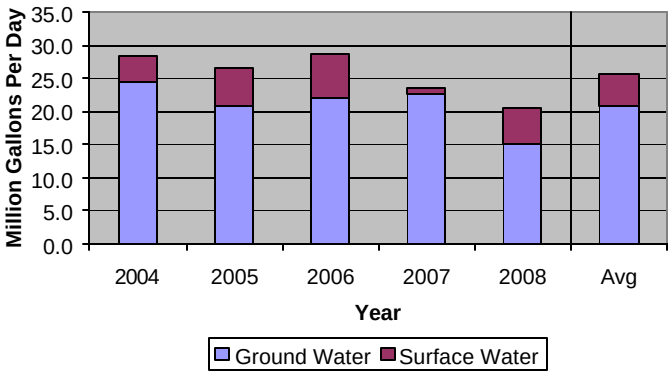
Reporting inconsistencies: Apparent trends in the water use data may reflect the changing demand for water; however, the trends are also affected by the lack of consistent, accurate reporting. There was approximately 150 MGD reported in 2007 from users that did not report any water withdrawals in 2008. It is possible that some of these users went out of operation in 2008, but more than likely the majority are still withdrawing water and not reporting their use to VWUDS. Therefore, it is likely that the actual total water use in Virginia in 2008 is significantly higher than the amounts presented. It is also likely that there are some users that started reporting in 2008 that had not reported in previous years. These reporting discrepancies make it difficult to create an accurate picture of the trends in water use.

Further inquiries into specific users, certain aspects of the VWUDS database or reporting requirements may help to explain some of the apparent trends. Specific questions about the data presented in this report can be directed to the Office of Surface and Ground Water Supply Planning.

A. Agricultural Water Withdrawals in Virginia

Agriculture includes operations such as commodity farms, fish farms, and hatcheries. Figure 12 shows the state-wide total of ground water and surface water use for agriculture from 2004-2008. Ground water is the major source of water for agriculture. There are no major transfers of water for agricultural purposes, so the water withdrawals also represent water use. Reported use in 2007 was substantially lower than previous years due to large users reporting no withdrawals; however, reporting responses increased in 2008. The total 2008 agricultural withdrawal was below the historical average, showing a slight decrease from 2007 (4.9 MGD less than the historical average). Table 2 shows the largest agricultural water withdrawals in 2008. The withdrawals listed in this table account for 82% of all agricultural water use in the state. The average withdrawals of all other reported agricultural users in the state were approximately 0.15 MGD (Figure 12). A substantial portion of reported withdrawals now include sub-category information in VWUDS. Ninety-seven percent of reported agricultural withdrawals include sub-category information for 2008 versus 31% from 2007. All sub-categories of agriculture are listed in Table 3.

Figure 12: 2004-2008 Agricultural Water Withdrawals by Source Type, Absolute Change in Withdrawals in Million Gallons per Day (MGD), and Percent Change in Withdrawals



Source Type	2004 MGD	2005 MGD	2006 MGD	2007 MGD	2008 MGD	Avg. MGD	Abs. change[1] (MGD)	% change[2]
Total GW	24.4	20.9	21.9	22.6	15.0	21.0	-6.0	-28%
Wells	0.5	0.4	0.5	0.5	0.5	0.5	0.0	9%
Springs	24.0	20.5	21.4	22.1	14.5	20.5	-6.0	-29%
Total SW	3.9	5.7	6.7	0.9	5.7	4.6	1.1	24%
Streams	3.9	5.7	6.7	0.9	5.7	4.6	1.1	24%
Reservoirs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0%
TOTAL GW+SW	28.3	26.6	28.7	23.5	20.7	25.5	-4.9	-19%

[1]Abs change = difference between 2008 water withdrawals and average water withdrawals (MGD)

[2]% change = percent change in 2008 water withdrawals from average water withdrawals

Table 2: Top Water Withdrawals for Agriculture in 2008

Owner Name	Facility	City/County	Type	Source	Avg. MGD[3]	2008 MGD
Commonwealth of Virginia	Coursey Spring Fisheries	Bath County	GW	Coursey Spring	9.8	5.0
Virginia Trout Company Inc	Terry Place Plant	Highland County	GW	Blue Spring	4.1	3.5
Commonwealth of Virginia	Wytheville Fish Hatchery	Wythe County	GW	West Springs, Boiling Springs	3.9	3.3
Commonwealth of Virginia	Marion Fish Cultural Station	Smyth County	SW	Staley's Creek	2.3	2.6
Virginia Trout Company Inc	Monterey Plant	Highland County	GW	Vandevender Spring	2.4	2.5

[3]Avg. MGD = Average water withdrawals from 2004-2008 (MGD)

Figure 13: 2008 Agricultural Water Withdrawals in Million Gallons per Day (MGD) by Withdrawal Point.

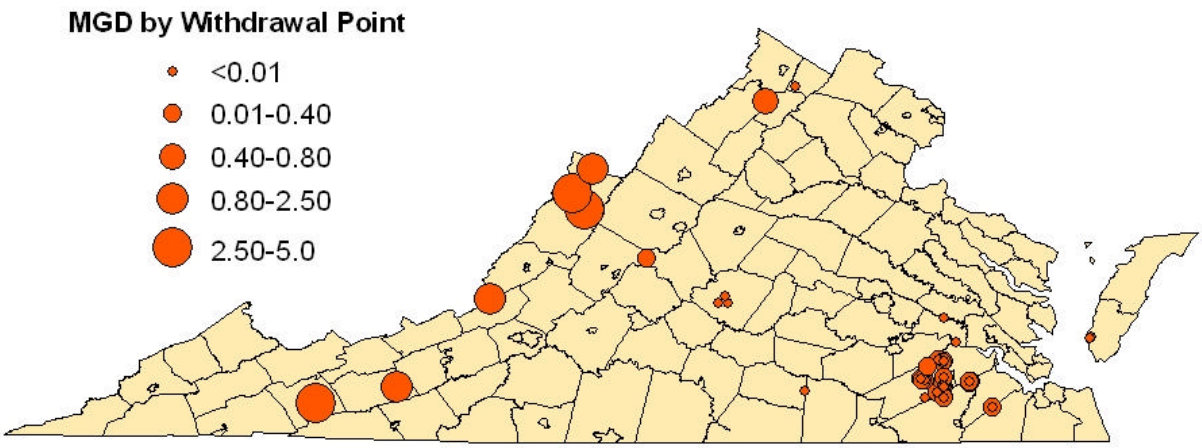


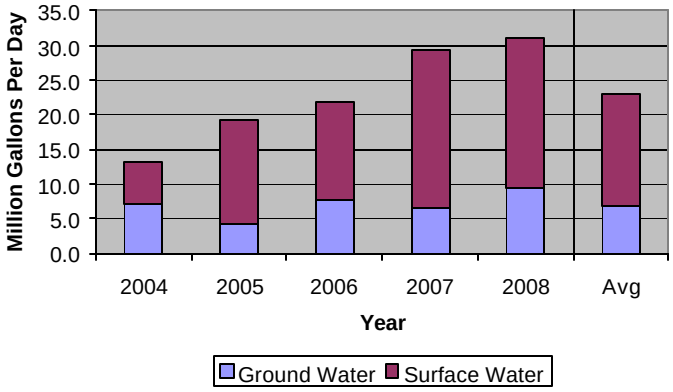
Table 3: Sub-Categories of Agriculture

General Sub-Category	Sub-Category Group	Specific Sub-Category
Agricultural Production-Livestock	Animal Specialties	Animal aquaculture
		Animal specialties not elsewhere classified
		Fur-bearing animals and rabbits
		Horses and other equines
	Dairy Farms	Dairy farms
	General Farms, Primarily Animal	General farms, primarily animal
	Livestock, Except Dairy and Poultry	Beef cattle feedlots
		Beef cattle, except feedlots
		General livestock not classified
		Hogs
		Sheep and goats
	Poultry and Eggs	Broiler, fryer, and roaster chickens
		Chicken eggs
		Poultry and eggs not classified
		Poultry hatcheries
		Turkeys and turkey eggs
Agricultural Services	Animal Services, Except Veterinary	Animal specialty services
		Livestock services, except veterinary
	Crop Services	Cotton ginning
		Crop harvesting
		Crop planting and protecting
		Crop preparation services for market
	Farm Labor and Management Services	Farm labor contractors
		Farm management services
	Landscape and Horticultural Services	Landscaping counseling and planning
		Lawn and garden services
		Ornamental shrub and tree services
	Soil Preparation Services	Soil preparation services
	Veterinary Services	Veterinary services for livestock
		Veterinary services, specialties
Fishing, Hunting, and Trapping	Commercial Fishing	Finfish
		Miscellaneous marine products
		Shellfish
	Fish Hatcheries and Preserves	Fish hatcheries and preserves
	Hunting, Trapping, Game Propagation	Hunting, trapping, game propagation
Forestry	Forest Products	Forest products
	Forestry Services	Forestry services
	Timber Tracts	Timber tracts

B. Irrigation Water Withdrawals in Virginia

Irrigation withdrawals are used to promote growth in crops such as tobacco, corn, soybeans, turf grass, and ornamental nursery products. Figure 14 shows the state-wide total of ground water and surface water withdrawals for irrigation from 2004-2008. Surface water is the major source of water for irrigation. There are no major transfers of water for irrigation, so the water withdrawals also represent water use. Reported water withdrawals for irrigation in 2008 increased by 35% from the average withdrawals over the past five years. Possible explanations for the increase include the drought conditions experienced in some regions of the state, the increase in demand for certain crops or an increase in the number of irrigators reporting their water withdrawals. Table 4 shows the top water withdrawals by specific source for irrigation in 2008. The majority of irrigation water withdrawals in 2008 occurred on the Eastern Shore where irrigation users in Accomack County accounted for 30% of the state-wide water withdrawals for irrigation. The majority of Accomack farms grow tomatoes, cucumbers, soybeans, and corn. Elsewhere in the state, localities with the largest irrigation withdrawals are the City of Chesapeake and the counties of Nelson, King William, Caroline, and Westmoreland (Figure 15). An increasingly large portion of the reported water withdrawals for irrigation now have a reported sub-category in VWUDS. Non-categorized withdrawals represent 51% of the 2008 irrigation withdrawals as compared to 98% in 2007. Table 5 lists all sub-categories of irrigation.

Figure 14: 2004-2008 Irrigation Water Withdrawals by Source Type, Absolute Change in Withdrawals in MGD, and Percent Change in Withdrawals



Source type	2004 MGD	2005 MGD	2006 MGD	2007 MGD	2008 MGD	Avg. MGD	Abs. change[1] MGD	% change[2]
Total GW	7.1	4.3	7.8	6.4	9.3	7.0	2.3	33%
Wells	1.3	1.3	1.7	2.8	2.4	1.9	0.5	25%
Springs	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0%
Reservoirs[3]	5.8	2.9	6.1	3.6	6.9	5.1	1.9	37%
Total SW	6.1	15.1	14.0	23.0	21.8	16.0	5.8	36%
Streams	2.4	8.8	7.3	14.0	14.4	9.4	5.1	54%
Reservoirs	3.7	6.3	6.7	9.0	7.3	6.6	0.7	11%
TOTAL GW+SW	13.1	19.4	21.7	29.4	31.1	23.0	8.1	35%

[1]Abs change = difference between 2008 water withdrawals and average water withdrawals (MGD); [2]% change = percent change in 2008 water withdrawals from average water withdrawals; [3]GW Reservoirs = irrigation ponds recharged by GW

Table 4: Top Water Withdrawals by Specific Source for Irrigation in 2008

Owner Name	Facility	City/County	Type	Source	Avg. MGD[1]	2008 MGD
Robert C Darby and Sons	Arbuckle Farms	Accomack County	GW	6 Dug Ponds	3.1	4.2
E Phillip and David L Hickman		Accomack County	SW/GW	13 Farm Ponds, 1 Dug Pond	2.3	2.3
Greenbrier Farms, Inc.	Greenbrier Farms Nursery	Chesapeake City	SW	Moalco Canal	1.0	2.0
Saunders Brothers, Inc.		Nelson County	SW/GW	6 surface water sources, 1 ground water source	0.8	1.1
Bryan S. Pearson	Difficult Hill Farm	King William County	SW	Pamunkey River	0.6	1.1

[1]Avg. MGD = Average water withdrawals from 2004-2008 (MGD)

Figure 15: 2008 Irrigation Water Withdrawals in MGD by Withdrawal Point

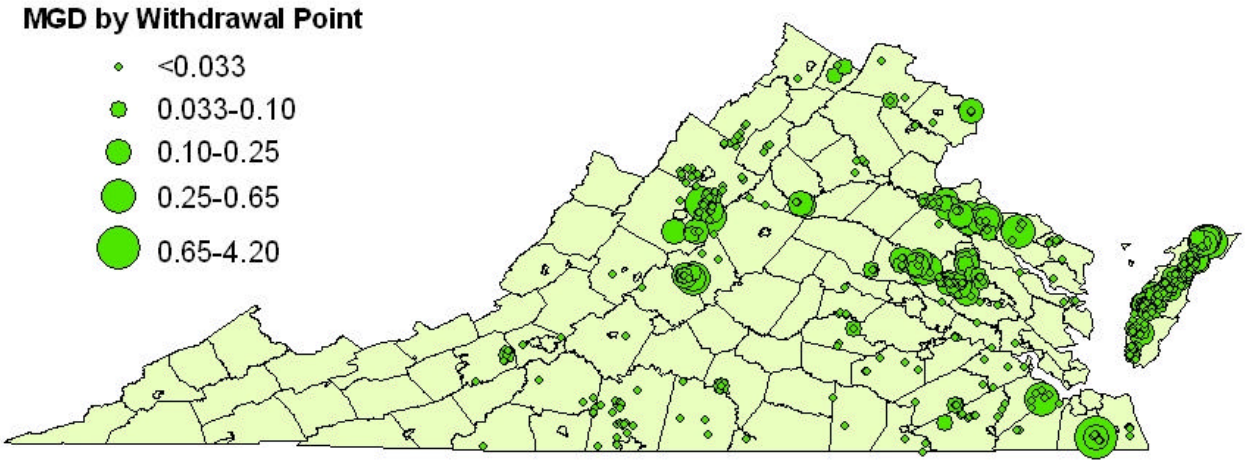


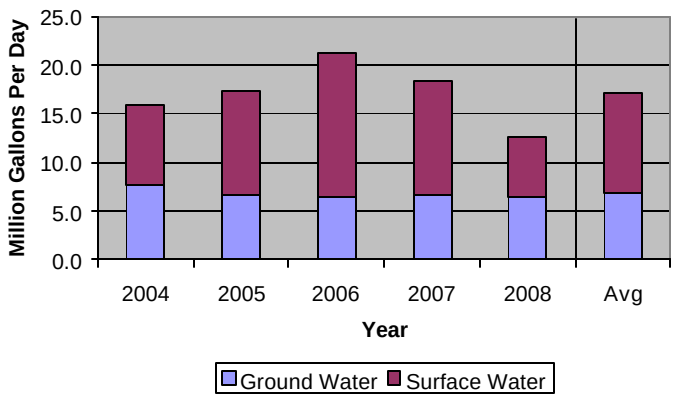
Table 5: Sub-Categories of Irrigation

General Sub-Category	Sub-Category Group	Specific Sub-Category
Agricultural Production-Crops	Cash Grains	Wheat
		Rice
		Corn
		Soybeans
		Cash grains not elsewhere classified
	Field Crops, Except Cash Grains	Cotton
		Tobacco
		Sugarcane and sugar beets
		Irish potatoes
		Field crops, except cash grains not elsewhere classified
	Vegetables and Melons	Vegetables and melons
	Fruits and Tree Nuts	Berry crops
		Grapes
		Tree nuts
		Citrus fruits
		Deciduous tree fruits
		Fruits and tree nuts not elsewhere classified
	Horticultural Specialties	Ornamental nursery products
		Food crops grown under cover
	General Farms, Primarily Crop	General farms, primarily crop

C. Commercial Water Withdrawals in Virginia

Commercial operations include golf courses, local and federal installations, hotels, and laundromats. Figure 16 shows the state-wide total of ground water and surface water withdrawals for commercial purposes from 2004-2008. Surface water is typically the major water source for commercial operations. Total water withdrawals for commercial operations in 2008 decreased by 26% from the average withdrawals over the past five years. The localities with the highest commercial water withdrawals for 2008 are Nelson County, Bath County, and the City of Williamsburg, followed by New Kent and James City Counties (Table 6, Figure 16). In addition to water withdrawals, the total commercial water use in some counties also includes water transferred from elsewhere in the state. The top transfers of water for commercial operations in the state are shown in Table 7 and Figure 17. The majority of commercial water withdrawals is subcategorized in the database. Sports and recreation clubs (*i.e.* private golf courses) represent 35% of the 2008 commercial use, while hotels/motels, and public golf courses each represent 23% and 22% of withdrawals, respectively (Table 8, Figure 18).

Figure 16: 2004-2008 Commercial Water Withdrawals by Source Type, Absolute Change in Withdrawals in MGD, and Percent Change in Withdrawals



Source Type	2004 MGD	2005 MGD	2006 MGD	2007 MGD	2008 MGD	Avg. MGD	Abs. change[1] MGD	% change[2]
Total GW	7.6	6.7	6.5	6.6	6.4	6.8	-0.4	-5%
Wells	6.6	5.7	5.5	6.5	5.5	6.0	-0.5	-8%
Springs	1.0	1.0	1.1	0.1	0.9	0.8	0.1	13%
Total SW	8.2	10.6	14.7	11.8	6.2	10.3	-4.1	-40%
Streams	3.7	4.6	8.1	3.6	2.1	4.4	-2.4	-54%
Reservoirs	4.5	6.0	6.6	8.1	4.1	5.9	-1.8	-30%
TOTAL GW+SW	15.9	17.3	21.2	18.4	12.6	17.1	-4.5	-26%

[1]Abs change = difference between 2008 water withdrawals and average water withdrawals (MGD)
[2]% change = percent change in 2008 water withdrawals from average water withdrawals

Table 6: Top Water Withdrawals for Commercial Operations in 2008

Owner Name	Facility	City/County	Type	Source	Avg. MGD[3]	2008 MGD
Wintergreen Partners, Inc .	Lake Monocan	Nelson County	SW	Lake Monocan	0.9	1.0
Homestead Water Co. L.C.,	Virginia Hot Springs	Bath County	GW	Cascades, Chaplin, Mcallister Springs	0.9	0.9
Colonial Williamsburg, Inc.	Colonial Williamsburg Hotel	Williamsburg City	GW	6 Wells	0.6	0.5
Colonial Downs Racetrack	Colonial Downs	New Kent County	GW	NKD Wells	0.4	0.4
Busch Properties, Inc.	King's Mill Golf Course	James City County	SW	Kings' Mill Pond, Wareham's Pond, Busch Gardens Lake	0.2	0.3

[3]Avg. MGD = Average water withdrawals from 2004-2008 (MGD)

Table 7: Top Water Transfers for Commercial Operations in 2008

Source	Purchaser Owner Name	Purchaser Facility	Purchaser Location	2008 MGD
Commonwealth of Virginia- James River Correctional Facility WTP	County of Goochland	Goochland Courthouse Service Area	Goochland County	0.83
Commonwealth of Virginia- Catawba WTP	Commonwealth of Virginia	Catawba Hospital	Roanoke County	0.11
York County	City of Newport News	Newport News Service Area	Newport News, City of	0.10
US Government- Post Camp Service Area	Town of Quantico	Quantico Service Area	Prince William County	0.04

Figure 17: 2008 Commercial Water Withdrawals and Purchases in Million Gallons per Day (MGD)

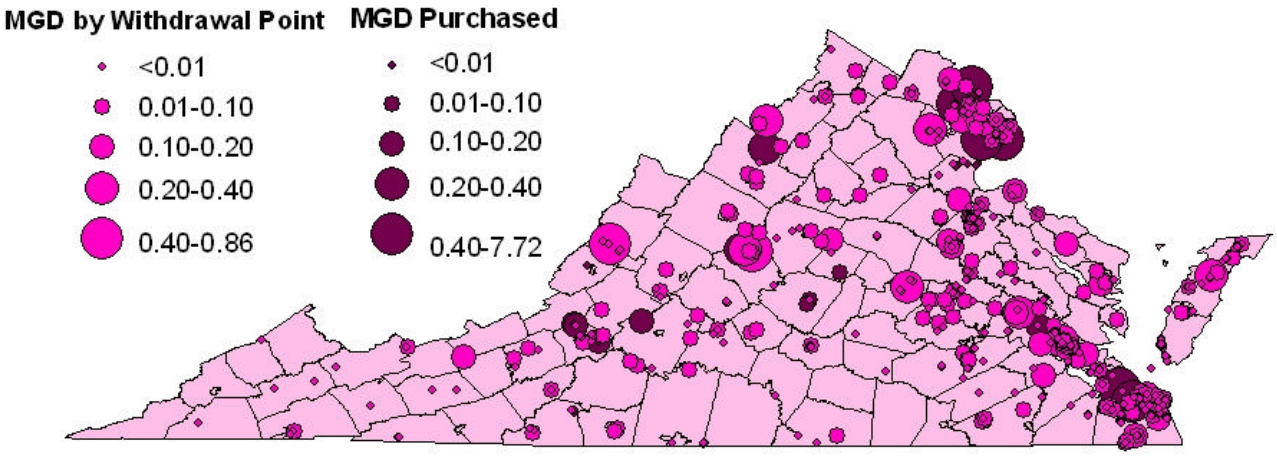
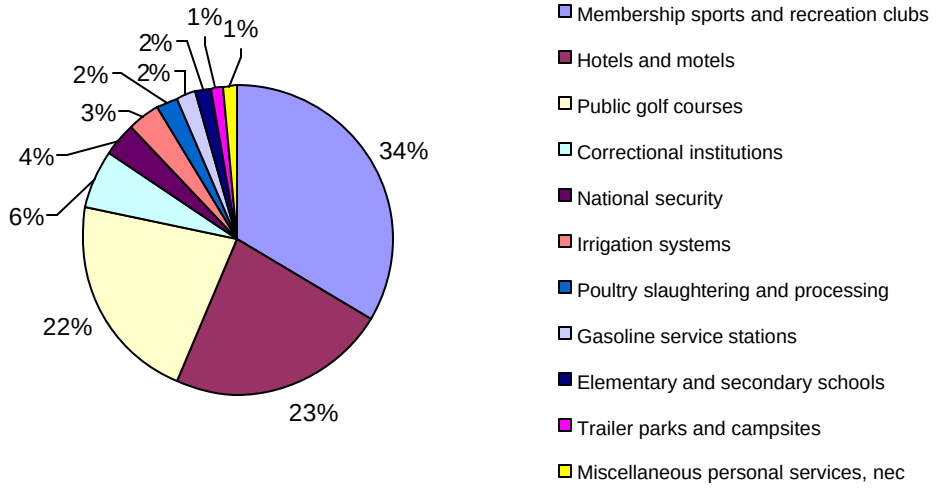


Table 8: 2004-2008 Commercial Water Withdrawals by Sub-Category

General Sub-Category	Specific Sub-Category	2004 MGD	2005 MGD	2006 MGD	2007 MGD	2008 MGD	Avg. MGD
Amusement and Recreation Services	Membership sports and recreation clubs	2.8	3.9	4.8	5.2	3.4	4.0
Hotels and Other Lodging Places	Hotels and motels	2.1	2.4	2.2	1.4	2.3	2.1
Amusement and Recreation Services	Public golf courses	2.3	2.5	5.9	3.0	2.2	3.2
Justice, Public Order, and Safety	Correctional institutions	1.6	1.6	1.6	1.6	0.6	1.4
National Security and Intl. Affairs	National security	1.6	2.0	2.4	3.0	0.4	1.9
Electric, Gas and Sanitary Services	Irrigation systems	0.1	0.2	0.2	0.2	0.3	0.2
Food and Kindred Products	Poultry slaughtering and processing	0.2	0.3	0.3	0.2	0.2	0.2
Automotive Dealers/Service Stations	Gasoline service stations	0.1	0.1	0.1	0.1	0.2	0.1
Educational Services	Elementary and secondary schools	0.2	0.2	0.2	0.2	0.2	0.2
Hotels and Other Lodging Places	Trailer parks and campsites	0.2	0.2	0.2	0.2	0.1	0.2
Personal Services	Miscellaneous personal services	0.0	0.1	0.2	0.2	0.1	0.1

(This table includes only the sub-categories that had > 0.1 MGD of withdrawals in 2008)

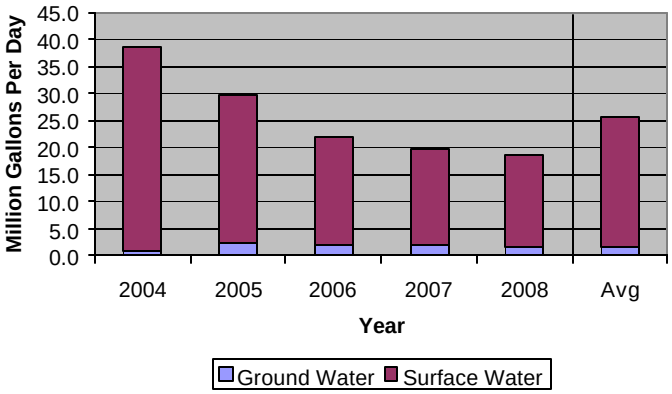
Figure 18: 2008 Commercial Water Withdrawals by Sub-Category



D. Mining Water Withdrawals in Virginia

Mining includes operations such as sand, rock, and coal mining. Figure 18 shows the state-wide total of ground water and surface water withdrawals for mining from 2004-2008. The major source of water for mining is surface water. There are no major transfers of water for mining purposes, so the water withdrawals also represent water use. For 2008, mining water withdrawals decreased by 28% from the five-year withdrawal average (Figure 19). The localities with the highest mining related water withdrawals for 2008 included Hanover, Russell, Giles, Dickenson, and Prince William Counties (Table 9, Figure 20). Crushed and broken granite accounted for 45% of the 2008 water withdrawals for mining. Twenty-eight percent of the mining activities were not sub-categorized or specified by reporting facilities on their 2008 withdrawal reports (Table 10, Figure 21).

Figure 19: 2004-2008 Mining Water Withdrawals by Source Type, Absolute Change in Withdrawals in Million MGD, and Percent Change in Withdrawals



Source Type	2004 MGD	2005 MGD	2006 MGD	2007 MGD	2008 MGD	Avg. MGD	Abs. change[1] MGD	% change[2]
Total GW	0.7	2.5	2.0	2.1	1.5	1.8	-0.3	-15%
Wells	0.7	2.5	2.0	2.1	1.5	1.8	-0.3	-15%
Springs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0%
Total SW	37.9	27.3	20.1	17.7	17.0	24.0	-7.0	-29%
Streams	13.2	16.3	13.1	9.3	10.4	12.4	-2.0	-16%
Reservoirs	24.8	11.0	7.0	8.4	6.6	11.5	-5.0	-43%
TOTAL GW+SW	38.7	29.7	22.0	19.8	18.5	25.7	-7.3	-28%

[1]Abs change = difference between 2008 water withdrawals and average water withdrawals (MGD)

[2]% change = percent change in 2008 water withdrawals from average water withdrawals

Table 9: Top Water Withdrawals for Mining in 2008

Owner Name	Facility	City/County	Type	Source	Avg. MGD[3]	2008 MGD
Martin Marietta Materials	Doswell Quarry	Hanover County	SW	Quarry	1.3	2.2
Dickenson-Russell Coal Co. LLC	Moss No. 3 Preparation Plant	Russell County	SW	Chaney Creek	2.1	2.1
APG Lime Corporation	Kimballton Plant 2	Giles County	SW	Stoney Creek	1.7	1.7
Dickenson-Russell Coal Co. LLC	McClure #1 Mine & Prep Plant	Dickenson County	SW	Caney Creek	0.8	1.5
Vulcan Construction Materials	Manassas Plant	Prince William County	SW	Pump Silting Basin #1	1.1	1.5
Vulcan Construction Materials	Skippers Plant	Greensville County	SW	Fontaine Creek, Pit Pump	1.1	1.3
Vulcan Construction Materials	Royal Stone Plant	Goochland County	SW/GW	Pit Sump, Little Tuckahoe Creek UT, Well #1	1.2	1.2
Boxley Materials Company	Blue Ridge Plant	Bedford County	GW	Quarry Sump	0.9	1.0

[3]Avg. MGD = Average water withdrawals from 2004-2008 (MGD)

Figure 20: 2008 Mining Water Withdrawals in MGD by Withdrawal Point

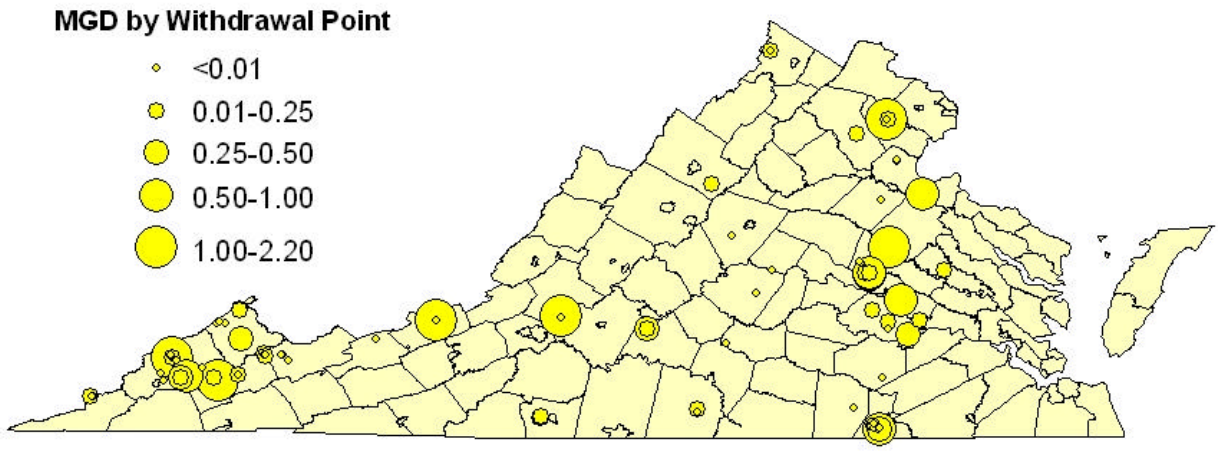
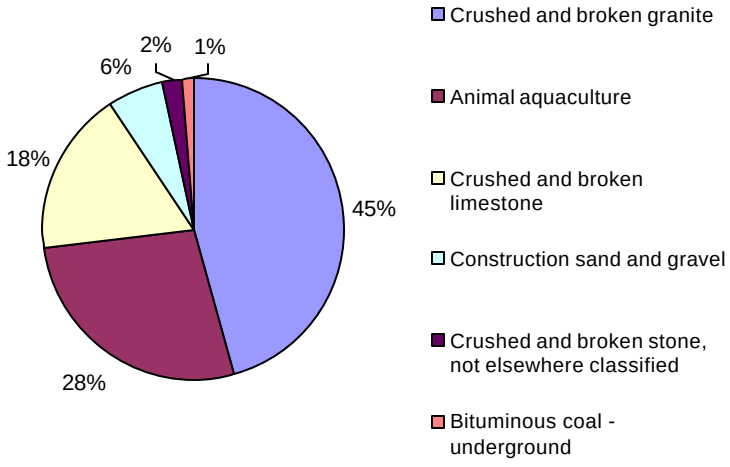


Table 10: 2004-2008 Mining Water Withdrawals by Sub-Category

General Sub-Category	Specific Sub-Category	2004 MGD	2005 MGD	2006 MGD	2007 MGD	2008 MGD	Avg. MGD
Nonmetallic Minerals, Except Fuels	Crushed and broken granite	9.1	10.7	9.9	9.6	8.4	9.5
Mining Withdrawals not sub-categorized		4.7	5.8	3.4	2.9	5.1	4.4
Nonmetallic Minerals, Except Fuels	Crushed and broken limestone	1.8	4.7	3.8	2.2	3.2	3.1
Nonmetallic Minerals, Except Fuels	Construction sand and gravel	7.9	7.5	3.7	4.3	1.1	4.9
Nonmetallic Minerals, Except Fuels	Crushed and broken stone	0.6	1.0	0.9	0.5	0.4	0.7
Coal Mining	Bituminous coal - underground	0.1	0.1	0.2	0.2	0.2	0.2
Nonmetallic Minerals, Except Fuels	Clay and related minerals	14.4	0.0	0.0	0.0	0.0	2.9
Coal Mining	Coal mining services	0.0	0.0	0.0	0.0	0.0	0.0
Nonmetallic Minerals, Except Fuels	Industrial sand	0.0	0.0	0.0	0.1	0.0	0.0

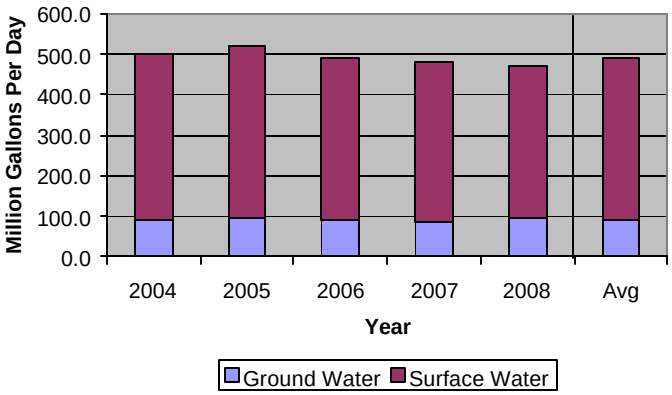
Figure 21: 2008 Mining Water Withdrawals by Sub-Category



E. Manufacturing Water Withdrawals in Virginia

Manufacturing includes operations such as paper mills, food processors, drug companies, furniture, and concrete companies. Figure 22 shows the state-wide total of ground water and surface water withdrawals for manufacturing from 2004-2008. Surface water is the major source of water for manufacturing. There are no major transfers of water for manufacturing purposes, so the water withdrawals also represent water use. Water withdrawals for manufacturing in 2008 were fairly consistent with the average withdrawals over the past five years. Table 11 and Figure 23 outline the largest manufacturing water withdrawals in 2008. Sub-categories of manufacturing water withdrawals are well defined in the database. Chemical preparations represent 25% of the 2008 commercial withdrawals, while paperboard mills and petroleum refining represent 20% and 14%, respectively (Table 12 and Figure 24).

Figure 22: 2004-2008 Manufacturing Water Withdrawals by Source Type, Absolute Change in Withdrawals in MGD, and Percent Change in Withdrawals



Source Type	2004 MGD	2005 MGD	2006 MGD	2007 MGD	2008 MGD	Avg. MGD	Abs. change[1] MGD	% change[2]
Total GW	89.8	93.7	92.2	83.3	93.4	90.5	2.9	3%
Wells	89.4	93.1	91.7	82.2	93.1	89.9	3.2	4%
Springs	0.4	0.6	0.5	1.1	0.3	0.6	-0.3	-44%
Total SW	407.6	424.6	396.2	395.9	376.3	400.1	-23.8	-6%
Streams	405.0	422.0	393.5	393.1	373.4	397.4	-24.0	-6%
Reservoirs	2.6	2.6	2.7	2.8	2.9	2.7	0.2	6%
TOTAL GW+SW	497.4	518.3	488.4	479.2	469.7	490.6	-20.9	-4%

[1]Abs change = difference between 2008 water withdrawals and average water withdrawals (MGD)
[2]% change = percent change in 2008 water withdrawals from average water withdrawals

Table 11: Top Water Withdrawals for Manufacturing in 2008

Owner Name	Facility	City/County	Manufacturing Sub-Category	Type	Source	Avg. MGD[3]	2008 MGD
Honeywell International, Inc.	Hopewell Plant	City of Hopewell	Chemicals & Allied Products	SW	James River	121.1	115.1
Western Refining Yorktown, Inc.	Yorktown Refinery	York County	Petroleum & Coal Products	SW	York River	59.3	62.0
Duke Energy Generation Services of Narrows	Celco Plant	Giles County	Chemicals & Allied Products	SW	New River	60.4	59.4
International Paper Corp.	Franklin Mill	Isle of Wight County	Paper & Allied Products	SW/GW	Blackwater River, 16 Wells	36.5	37.1
Meadwestvaco Corporation	Covington Plant	Alleghany County	Paper & Allied Products	SW	Jackson River	39.2	37.1
Dupont E I DeNemours & Co.	Spruance Plant	Chesterfield County	Chemicals & Allied Products	SW	James River	29.0	30.4

[3]Avg. MGD = Average water withdrawals from 2004-2008 (MGD)

Figure 23: 2008 Manufacturing Water Withdrawals in MGD by Withdrawal Point

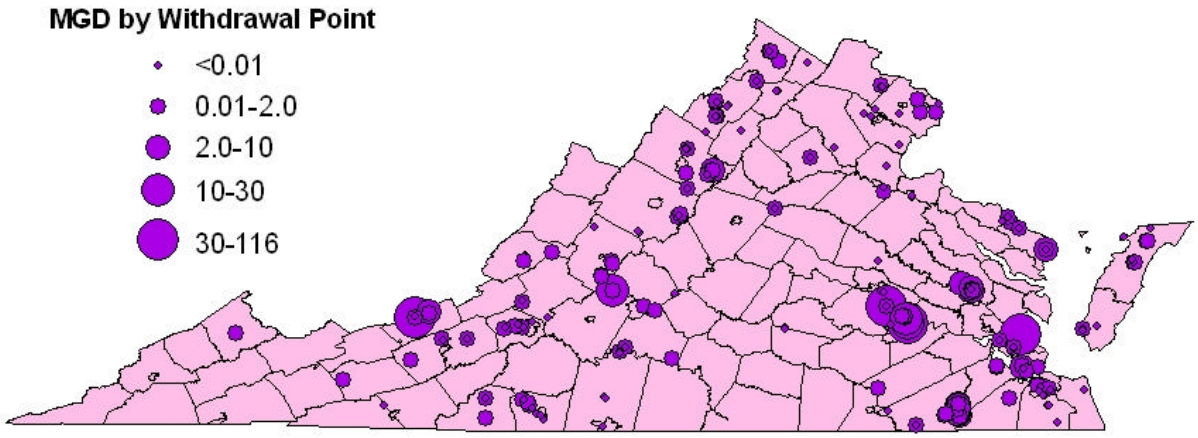
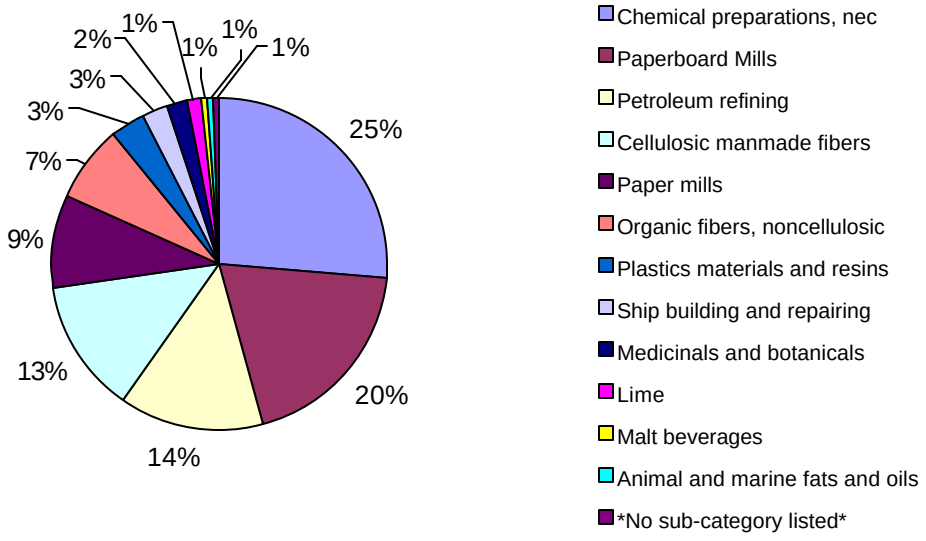


Table 12: 2004-2008 Manufacturing Water Withdrawals by Sub-Category

General Sub-Category	Specific Sub-Category	2004 MGD	2005 MGD	2006 MGD	2007 MGD	2008 MGD	Avg MGD
Chemicals and Allied Products	Chemical preparations not elsewhere classified	132.8	133.2	126.0	120.1	119.6	126.3
Paper and Allied Products	Paperboard Mills	87.6	87.4	84.5	86.5	89.0	87.0
Petroleum and Coal Products	Petroleum refining	54.7	59.1	60.0	60.6	62.0	59.3
Chemicals and Allied Products	Cellulosic manmade fibers	62.4	60.2	60.3	59.6	59.4	60.4
Paper and Allied Products	Paper mills	39.4	39.2	38.9	40.1	40.8	39.7
Chemicals and Allied Products	Organic fibers, noncellulosic	34.1	32.7	33.4	32.2	33.5	33.2
Chemicals and Allied Products	Plastics materials & resins	23.1	21.3	19.4	20.2	15.6	19.9
Transportation Equipment	Ship building & repairing	6.3	8.6	6.5	8.3	11.8	8.3
Chemicals and Allied Products	Medicinals & botanicals	8.6	8.4	8.9	8.1	8.7	8.5
Stone, Clay, and Glass Products	Lime	0.7	7.0	6.9	0.0	5.6	4.0
Food and Kindred Products	Malt beverages	1.0	1.0	1.0	1.9	3.1	1.6
Food and Kindred Products	Animal and marine fats & oils		2.55	1.35	2.44	2.56	2.2
Manufacturing Withdrawals not sub-categorized		2.26	3.09	2.35	2.1	2.27	2.4

Notes: This table includes only the sub-categories that had > 2 MGD of withdrawals in 2008.

Figure 24: 2008 Manufacturing Water Withdrawals by Specific Sub-Category

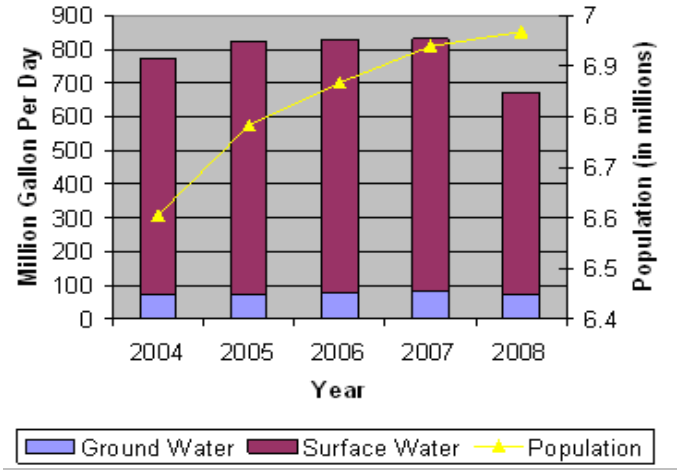


F. Public Water Supply Water Withdrawals in Virginia

Public water supply includes municipal and private water purveyors.

Figure 25 shows the state-wide total of ground water and surface water withdrawals for public water supply from 2004-2008. Surface water is the major source of water for public water supply. For 2008, water withdrawals for public water supply decreased by 15% from the five- year withdrawal average (Figure 25). Table 13 lists the top 2008 water withdrawals for public water supply. There are several major transfers of water that occur for public water supply. Therefore, the total water withdrawals for public water supply in each locality includes the water withdrawals in that locality as well as water transferred into that locality from elsewhere in the state, or from out of state (and minus the water sold to other localities) (Table 14, Figure 26). The VWUDS database does not keep track of water withdrawals by private households; therefore, all of the water withdrawals for public water supply were reported from public water systems. Table 15 shows the number of water systems in the state in 2008 and the population served by these systems.

Figure 25: 2004-2008 Public Water Supply Water Withdrawals by Source Type, Absolute Change in Withdrawals in MGD, and Percent Change in Withdrawals



Source Type	2004 MGD	2005 MGD	2006 MGD	2007 MGD	2008 MGD	Avg. MGD	Abs. change[1] MGD	% change[2]
Total GW	73.1	73.0	76.7	80.8	71.9	75.1	-3.2	-4%
Wells	53.3	54.6	59.9	66.2	59.0	58.6	0.4	1%
Springs	19.8	18.4	16.8	14.7	10.4	16.0	-5.6	-35%
Other GW	0	0	0	0	2.5	–	–	–
Total SW	697.7	752.3	753.3	750.5	598.7	710.5	-111.8	-16%
Streams	344.4	373.7	360.5	366.9	289.9	347.1	-57.2	-16%
Reservoirs	353.3	378.6	392.8	383.6	308.8	363.4	-54.6	-15%
TOTAL GW+SW	770.7	825.2	830.0	831.4	670.6	785.6	-115.0	-15%

[1]Abs change = difference between 2008 water withdrawals and average water withdrawals (MGD)

[2]% change = percent change in 2008 water withdrawals from average water withdrawals

Table 13: Top Water Withdrawals for Public Water Supply in 2008

Owner Name	Facility	City/County	Type	Source	Avg. MGD[3]	2008 MGD
City of Manassas Park	Manassas Park Service Area	City of Manassas Park	GW	Well #4, Well #9	54.7	272.5
United States Government	Dalecarlia Water Treatment Plant (WTP)	Arlington County	SW	Potomac River-Little Falls	163.7	158.1
Fairfax County Water Authority	Potomac River WTP	Fairfax County	SW	Potomac River Intake	88.1	83.5
City of Richmond	City of Richmond WTP	City of Richmond	SW	James River and Kanawa Canal	71.9	70.0
City of Norfolk	Western Branch Reservoir	Suffolk County	SW	Western Branch Reservoir	61.9	69.1
Fairfax County Water Authority	Occoquan Reservoir	Prince William County	SW	Occoquan Reservoir	63.7	61.2
City of Virginia Beach	Virginia Beach Service Area	Brunswick County	SW	Lake Gaston	27.1	35.1
City of Newport News	Lee Hall WTP and ROF	City of Newport News	SW	Lee Hall Reservoir	26.6	26.5
Henrico County	Henrico County WTP	Henrico County	SW	James River	23.94	25.62

[3]Avg. MGD = Average water withdrawals from 2004-2008 (MGD)

Table 14: Top Water Transfers for Public Water Supply in 2008

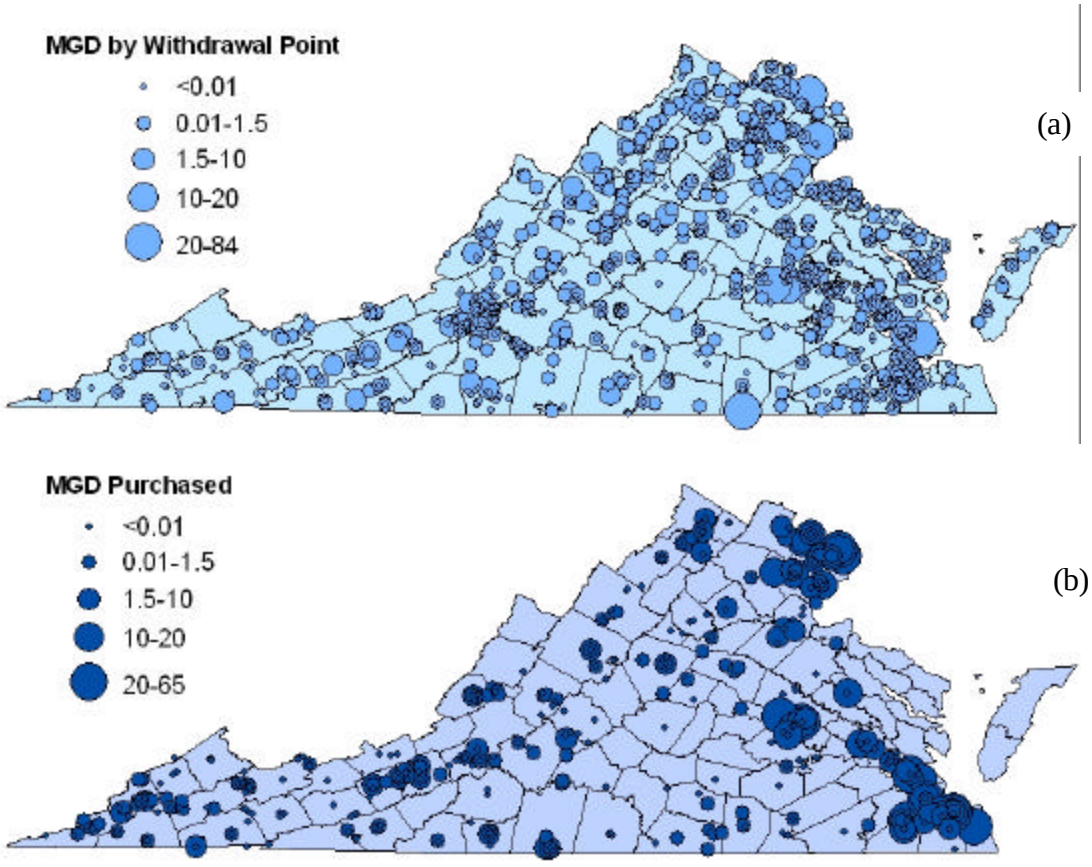
Source	Purchaser Owner Name	Purchaser Facility	Purchaser Location	2008 MGD
From City of Norfolk	City of Virginia Beach	Virginia Beach Service Area	City of Virginia Beach	45.02
From US Government-Dalecarlia WTP	Arlington County	Arlington County Service Area	Arlington County	23.15
From Fairfax County-Potomac River WTP	Loudon County Sanitation Authority	Lower Broad Run Service Area	Loudon County	18.24
From US Government-Dalecarlia WTP	Falls Church	Falls Church Service Area	City of Falls Church	17.22
From Fairfax County Water Authority	Prince William County Service Authority	OWDT Service Area	Prince William County	17.21
From City of Richmond	Henrico County	County Contract Service Area	Henrico County	15.92
From Fairfax County Water Authority	Virginia American Water Company	Alexanrdia Service Area	City of Alexandria	15.5

Table 15: Number of Public Water Systems and Population Served by Public Water Systems in Virginia in 2008

	Total	Ground water	Surface water
# systems	2,930	2,555	375
population served	6,968,252	791,337	6,176,915

Source: www.epa.gov/ogwdw000/databases/pdfs/data_factoids_2008.pdf, page 6.

Figure 26: 2008 Public Water Supply (a) Water Withdrawals and (b) Water Purchases in MGD



VII. WATER RESOURCES - WHAT'S ON THE HORIZON

Although Virginia has historically enjoyed plentiful water resources relative to demand, the growth of the Commonwealth's economy and population presents challenges for maintaining both the quality and quantity of these resources. This problem is compounded by traditional behaviors and perceptions oriented toward the promotion of water resource consumption. Water resources serve a variety of important and sometimes competing in-stream and off-stream uses, resulting in the necessary expansion of water resource regulation and management. Increased demand and competition for water coupled with reduced rainfall have established a greater sense of urgency in Virginia's approach to resource management. As Virginia nears the margins of the state's ability to satisfy water demand, resource management priorities must incorporate a focus on influencing consumer perceptions and behavior. This task requires promoting a shift in consumer behavior from consumption to conservation and re-use. Continued efforts to conserve Commonwealth water resources will ensure the sustainability of all beneficial water demands for the state's welfare, environment, and economy.

1) **KEY WATER RESOURCE SIGNALS** - Based on water division activities to date, the following are important water resource signals observed across the Commonwealth:

- Decreased demands on the surface and ground water resources of the Commonwealth have been observed through the state water withdrawal reporting process and local water supply planning activities.

- Ground water levels along the fall line and portions of southeast Virginia are reaching critically low levels.

- In several locations, current local demands for ground water to support desired growth in established Ground Water Management Areas can no longer be sustained by the coastal plain aquifer system. This statement is based on ground water model scenarios showing violations of the regulatory criteria for a number of pending permit applications and field observations that show water levels are lower than predicted by the model, including some approaching aquifer tops.

- DEQ estimates that approximately 90% of all existing surface water withdrawals in Virginia are excluded by statute from Virginia Water Protection permit requirements. Amendments to the VWP regulation in 2007 require these excluded or grandfathered users provide DEQ with total annual withdrawal, maximum daily withdrawal, and month of maximum daily withdrawal information. DEQ is in the process of collecting and analyzing this information and anticipates this data will provide a more comprehensive view of current resource allocation in Virginia's watersheds. Significantly less water may be available in certain watersheds for new and expanded uses than previously assumed. DEQ anticipates the need for increased storage and the expanded use of conjunctive systems to meet future water demands in some areas of the Commonwealth.

Recently available economic stimulus money, coupled with the initiatives by the federal government to implement "clean coal" technologies to reduce green house emissions, has sparked a large interest in carbon sequestration of liquid carbon dioxide (CO_2) into the subsurface aquifers in Virginia. Although EPA currently administers federal Underground Injection Control regulations in Virginia, it is anticipated that injection of liquid CO_2 into the subsurface geologic units and aquifers will ignite much debate.

2**) WATER RESOURCE MANAGEMENT OPPORTUNITIES** - Based on the observed water resource management signals mentioned in the previous section, DEQ is exploring the following partnership/collaboration opportunities with local, state, federal, and non-profit organizations to increase its knowledge of Commonwealth water resources and their ability to sustain social and environmental demands:

Ground water levels in the undesignated portion of Virginia's coastal plain are continuing to decline. Impacts from ground water withdrawals are propagating along the fall line into the undesignated portion of Virginia's coastal plain and have the potential to interfere with wells in these areas without assigned mitigation responsibilities. Given current ground water declines, the entire coastal plain aquifer system must be managed to maintain a sustainable future supply of ground water. This will require applicable amendments to the Eastern Virginia Ground Water Management Area Regulation (9VAC25-600) and the Ground Water Withdrawal Regulation (9VAC25-610) to address the increasing demand on limited ground water resources, changes to the administrative review process, and regulatory changes necessitated by new information on the coastal plain aquifer system. The Eastern Virginia Ground Water Management Area will be expanded to include the following additional counties and one city: Caroline, King and Queen, Gloucester, Mathews, Middlesex, Essex, Spotsylvania (part), Stafford (part), Prince William (part), King George, Westmoreland, Richmond, Lancaster, Northumberland, Fairfax (part), Arlington (part); and Alexandria City (Figure 27).

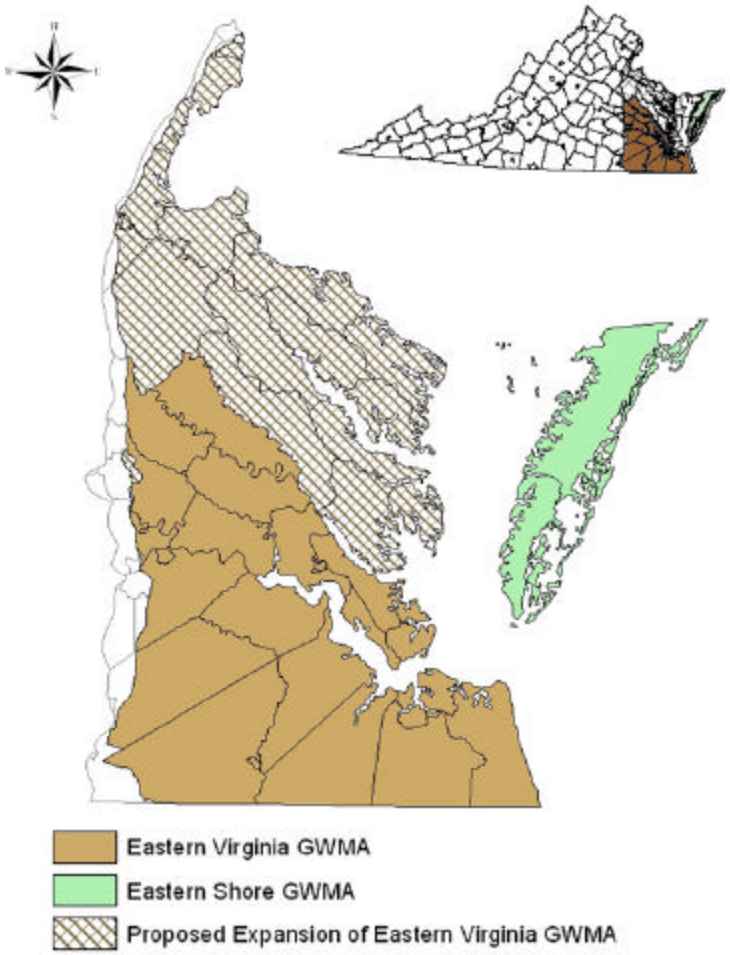


Figure 27: Proposed Expansion of the Eastern Virginia Ground Water Management Area.

Significant data gaps exist in the State Observation Well Network west of the fall line and in Virginia's Northern Neck. DEQ has ongoing local government collaborations to identify existing wells that meet established criteria for inclusion in the network. Ten opportunities for observation well network expansion were realized in 2008 as DEQ, the USGS, and local governments partnered to develop data collection wells for water quantity and quality

information that is integral to water supply planning. DEQ anticipates these opportunities will increase as water supply plans are drafted and local resource managers look for reliable data to support resource management decisions.

Major watersheds lack established science-based in-stream flow targets to protect fish and wildlife habitat, recreational uses, and navigation uses specific to individual watersheds. Essential to determining water availability is defining the unique set of beneficial water uses within each watershed and assigning the requisite in-stream flow necessary to sustain those uses in each watershed. DEQ staff is collaborating with The Nature Conservancy, Virginia Department of Game and Inland Fisheries, and USGS staff to initiate a peer review process that synthesizes the best available in-stream flow science to support sustained management of Virginia's diverse water resources and uses.

Accounting of surface water used and available for future use is becoming increasingly important as availability diminishes due to increased demands and more frequent drought events. Water resources are vital to performing water quality and quantity functions, necessitating a need for greater accounting accuracy as the Commonwealth reaches the margins of the resource's ability to meet demand.

In 2008, DEQ staff assembled a surface water modeling system for the purpose of analyzing cumulative impacts of off-stream uses on in-stream resources, as well as downstream users. This system went into operation in summer of 2008 and was successfully used in pilot projects to evaluate the effects of proposed withdrawals and optimization alternatives for the management of existing withdrawals and release schedules. Limitations in the accuracy of current un-metered, water use reporting may require future regulatory changes to adequately account for water use and availability.

Complete and consistent data on the location and construction of wells (especially residential, commercial, industrial, and irrigation wells that do not currently fall under the regulatory authority of DEQ) throughout the Commonwealth is needed to address the increasing complexity of ground water management issues and the tools available to respond. Timely, accurate, and easily accessible information supports resource characterization efforts that enable managers to understand how the resource responds to stresses from both demand and climatic events. Such information also facilitates local government implementation and maintenance of their local and regional water supply plans. DEQ has initiated talks with VDH concerning specific revisions to the private water well regulations that are essential to the effective use of the State-wide Well Construction Database.

3) **WATER RESOURCE MANAGEMENT INVESTMENT CHALLENGES** - To effectively manage water resources for current and future generations, continued financial investment is necessary for responsible management, policy development and implementation, and improved local government and public participation.

The number of long term monitoring data stations for surface water flow, ground water levels, and water resource use has consistently declined over the last twenty years. Sustained funding to support surface water flow and ground water level data collection and analysis is essential to the overall mission of the agency to accurately account for the Commonwealth's water resources. Such surface and ground water data are an integral part of many DEQ programs

including numerous permitting programs, establishment of TMDLs, water supply planning, and overall resource characterization.

Investment in regional water supply program development and implementation is necessary to build long-term local government stewardship of local and regional water resources. A secure source of funding for planning grants to local governments should be identified and implemented as a fundamental element to the success of initial water supply plan implementation and long-term plan maintenance.

An estimated 20,000 wells are drilled in Virginia each year by approximately 400 water well drillers. Resources required to obtain well location (latitude/longitude to sub meter accuracy) and enter well construction information into a geo-referenced database have historically not been available. Members of the Virginia Water Well Association have expressed interest in implementing a grass roots program to obtain sub-meter coordinates at the time the well is drilled, as well as entering construction information into a data base that can be made available to resource managers. Funding is required to obtain commercially available hardware, software, and Global Positioning System units for distribution to water well contractors cooperating with the Commonwealth to obtain well locations and other information used by ground water resource managers.

VIII. Appendices

Appendix 1: Virginia's Water Resources Data

State Population (2005 Estimate) - 7,567,465

State Surface Area – 42,769 square miles

Major River Basins (with Current Estimates of Flow):

Potomac/Shenandoah (5,808 square miles) – 1,842 MGD
Rappahannock (2,891 square miles) – 1,131 MGD
York (2,701 square miles) – 1,099 MGD
James (10,253 square miles) – 5,558 MGD
Chesapeake Bay/Small Coastal (1,712 square miles) – 97 MGD
Chowan River/Albemarle Sound (4,122 square miles) – 1,777 MGD
Roanoke (6,378 square miles) – 2,277 MGD
New (4,703 square miles) - 3,296 MGD
Tennessee/Big Sandy (4,202 square miles) – 2,618 MGD

Perennial River Miles (freshwater) - 50,537 miles

Publicly Owned Lakes and Reservoirs

Larger than 5,000 acres	5	109,838 acres
Smaller than 5,000 acres	243	52,392 acres
Total	248	162,230 acres

Freshwater Wetlands - 808,000 acres

Tidal and Coastal Wetlands - 236,900 acres

Estuary - 2,557 Square Miles

Atlantic Ocean Coastline - 120 Miles

State-wide Average Annual Rainfall - 42.8 inches

Average Freshwater Discharge of All Rivers - Approximately 25 billion gallons per day

Average Freshwater Discharge into the Chesapeake Bay – Approximately 9.73 billion gallons per day

Appendix 2: Drought Monitoring Task Force Report

VIRGINIA DROUGHT MONITORING TASK FORCE
Drought Status Report
September 22, 2009

Statewide precipitation for the period from October 1, 2007 through September 18, 2009 was in the normal range (93% of normal). Normal precipitation is defined as the mean precipitation for a thirty year period of record for the area. Precipitation greater than 85% of normal is considered to be in the normal range. No drought evaluation regions were below the normal range for this time period although precipitation deficits still persist in eleven of the thirteen drought evaluation regions. Only the Southeast Virginia and Eastern Shore drought evaluation regions have received precipitation above 100% of normal for this time period. Statewide precipitation for the current water year (from October 1, 2008 through September 18, 2009) is within the normal range (93%). Precipitation is now within the normal range for all drought evaluation areas for the current water year with the exception of the Middle James (84%). Statewide precipitation from August 1st through September 18, 2009 was below the normal range (83%), with four drought evaluation regions receiving precipitation greater than 100% of normal and nine drought evaluation regions receiving below 100% of normal. Appendix 2-A contains precipitation tables for periods dating from October 1, 2007 provided by the Climatology Office of the University of Virginia.

The National Weather Service Climate Prediction Center 6-10 day climatologic outlooks call for above normal precipitation and below normal temperatures for the Commonwealth. Temperatures are expected to be below normal and precipitation is expected to be in the normal range over the 8-14 day period. The three month outlook calls for equal chances of below normal, normal and above normal precipitation and temperatures for the Commonwealth through the middle of December 2009.

The latest NOAA drought monitor indicates "abnormally dry" conditions exist in portions of south central Virginia and southeastern Virginia along the North Carolina border. The total area experiencing "abnormally dry" conditions has increased over a three month period from less than 1% to approximately 4% of the Commonwealth's land area. The U.S. National Drought Monitor is included as Appendix 2-B. Appendix 2-C contains information from the national drought monitor with only Virginia displayed. No changes are forecasted for any part of Virginia in the Seasonal Drought Outlook for the United States from now through December 2009 (see Appendix 2-D).

While the Virginia Department of Health has not reported any impacts to public water supplies that have compromised their ability to provide the needs of their customers, 22 systems are under voluntary water conservation requirements and 2 systems are under mandatory water conservation requirements. The number of systems under restrictions has been reduced by one since August 2009. Of the 46 systems listed in the VDH report, 6 have been rated as having a "Better" overall water supply situation, 1 has been rated as having a "Worse" overall water supply situation and all other systems are reported as being in a "Stable" situation. Appendix 2-E contains a table of waterworks from this month's report, which includes systems that are under water conservation requirements.

The Virginia Department of Forestry (VDOF) reports light fire activity in September 2009. From January 1st through September 18th, the VDOF responded to 856 wild land fires that burned 6,947 acres. Since the August 20, 2009 Drought Status Report, 7 wild land fires that burned 19 acres were reported. Fire activity is anticipated to increase into October and November during the typical fall wildfire season.

The Department of Game and Inland Fisheries reports that water supply flows at the trout hatcheries are much improved over what they have been in the past few years for the end of summer period. The increased flows, along with the cooler summer have resulted in good trout growth at the hatcheries. Streamflows also look good for this time of the year, and the outlook for the beginning of trout stocking season (October) is encouraging. All boating access sites across the state have adequate water levels for recreational access.

Reports from the Climatology Office of the University of Virginia, the National Weather Service, the Virginia Department of Environmental Quality, the United States Geological Survey, and the Virginia Department of Agriculture and Consumer Services, follow.

Report of the Climatology Office of the University of Virginia

The first two-thirds of September in Virginia have been very dry with the exception of some areas in the Tidewater. The lowest proportion of normal rainfall has been in the central and northern Valley region.

Although persistent high pressure has helped to suppress precipitation, much of the shortfall can be linked to the lack of tropical cyclone activity. At this time of year, tropical systems (hurricanes, tropical storms, tropical depressions) and their remnants supply a substantial portion of normal precipitation.

Along with lowering sun angles and decreasing day length, the seasonal drop in temperatures from mid-summer is reducing the evaporation rates. This will allow the available rain a better opportunity to soak into the soil. Short-range forecasts (out to two weeks) suggest higher than normal precipitation and lower temperatures throughout Virginia. The longer-range outlooks (one to three months) are clouded by the lack of a strong El Niño signal in the tropical Pacific Ocean, and they give little guidance at this time.

Report of the National Weather Service

A surface front has passed through the area and has settled down into North Carolina. This triggered a few showers and thunderstorms on Wednesday, September 16, 2009. Over the next few days, an upper trough will rotate through the region on Thursday (9/17) which will trigger some showers. With the frontal boundary stalled down to the south, the chance for showers will linger at least into late Friday and early Saturday (9/19) primarily across the southern portions of the state. Drier air will move in sometime on Saturday. Mid-range models have the developing upper trough moving gradually to the east and another slow moving cold front arriving during the first part of the week of September 21st. A chance for intermittent showers could be possible each day until mid-week; however rainfall amounts are uncertain and depends upon the next system's development and movement. The next few days are expected to be mostly cloudy; therefore temperatures are expected to be below normal for the period. The NWS '6 to 10' day outlook calls for above normal precipitation.

United States Geological Survey
Streamflow and Ground Water Levels

Significant portions of the State are showing below normal streamflow conditions. Streamflow gages in the upper James, Shenandoah, and Rappahannock River Basins are recording streamflows that are well below normal. Other areas where streamflow is below normal are the Roanoke and Chowan River Basins (Appendices F and G). Ground-water levels across the State as shown by the Climate-Response well network are recording water levels in the normal range or above except for the well located near Roanoke, Va., which is well below normal(Appendix H).

Virginia Department of Environmental Quality
Conditions of Major Reservoirs

Levels of large reservoirs statewide have continued to drop since mid-August. Four large multi-purpose reservoirs are identified as drought indicators in the *Virginia Drought Assessment and Response Plan* (Plan); Smith Mountain Lake, Lake Moomaw, Lake Anna and Kerr Reservoir. Of these four reservoirs, Kerr Reservoirs is currently in the Drought Watch Stage and the three others are in the Normal Range as defined in the Plan. Below is a summary of reservoir conditions statewide:

- Lake Moomaw on the Jackson River has declined approximately 4.7 feet since August 19th and currently has 52% of its conservation storage remaining.
- Smith Mountain Lake is currently at elevation 793.1 feet (1.9 feet below full) and has dropped approximately 1.4 feet since August 19th. The Drought Watch Stage for Smith Mountain Lake is elevation 793 feet and below.
- Lake Anna is currently at elevation 249.3 feet (0.7 feet below full) and has dropped approximately 0.3 feet since August 19th. The Lake Anna level is approximately average for this time of year based on the last ten years of record.
- Kerr Reservoir is currently 4.15 feet below guide curve which is within the Drought Watch Stage defined in the Plan. The reservoir level has dropped 1.64 feet since August 19th. September inflows into the reservoir have been the 4th lowest (47% of median) based on 79 years of record.
- Phillpott Lake is approximately 1.35 feet below guide curve and has dropped 2.35 feet since August 19th. September inflows into the reservoir have been the 7th lowest in 55 years of record.
- South Holston Lake, straddling the Virginia and Tennessee border, is within the normal range and above the balancing guide. The reservoir level has dropped 5.3 feet since August 19th.
- The two major reservoirs for the Roanoke area, Carvins Cove and Spring Hollow Reservoirs are 2.7 feet and 3.9 feet below full, respectively. These levels correspond to 92% storage remaining at Carvins Cove and 95% storage remaining at Spring Hollow.
- The Rivanna Water and Sewer Authority reservoirs are in good shape for this time of year and are all anticipated to be full by spring.

Virginia Department of Agriculture and Consumer Services
Status of Agricultural Drought

Overview: According to the USDA Crop Weather Report released on September 14, 2009, 63% of topsoil moisture ranged from adequate to surplus. Some areas of the state, such as the Virginia Beach area, experienced heavy rainfall during the first half of September and as a result the harvesting of some crops has been delayed. Other areas of the state, such as Northern Virginia and the Shenandoah Valley, experienced extremely dry weather in late August and early September. Some farmers in eastern Augusta County reported that they are turning in crop insurance claims due to the dry conditions. To date, no Virginia locality has submitted a request seeking agricultural disaster designation for 2009.

Impact on Crops: Overall crop conditions are good around the state. Producers in southwest and southern Virginia are reporting good yields for forage and corn crops. Producers in Virginia Beach are reporting that significant rainfall (6 to 12 inches) in the region in early September is affecting strawberry planting. Farmers in that region need to begin fumigating in preparation for strawberry planting. If farmers are not able to fumigate soon, strawberry yields in the spring could be negatively impacted. The corn crop in the Shenandoah Valley has been particularly affected due to dry conditions in that region.

Impact on Livestock: Pasture conditions vary across the state, but overall pastures are in fair condition. Pasture grazing is still abundant. In the Winchester area, pastures are starting to become very dry as there has been no measurable rainfall in the past six weeks.

Impact on Creeks, Rivers, and Wells: There have been no reports of wells going dry and no water restrictions by municipalities. Creeks and streams are lower than a month ago, but are in better condition than this time last year.

APPENDIX 2-A
Precipitation Departures by Drought Evaluation Region

PRELIMINARY PRECIPITATION SUMMARY

Prepared: 9/21/09

	DROUGHT REGION	OBSERVED	Sep 1, 2009 NORMAL	- Sep 18, 2009 DEPARTURE	% OF NORM.
1	Big Sandy	1.01	2.08	-1.06	49%
2	New River	1.41	2.05	-0.63	69%
3	Roanoke	0.69	2.54	-1.85	27%
4	Upper James	0.36	2.10	-1.74	17%
5	Middle James	0.93	2.48	-1.55	38%
6	Shenandoah	0.49	2.20	-1.72	22%
7	Northern Virginia	0.82	2.44	-1.62	34%
8	Northern Piedmont	1.00	2.57	-1.57	39%
9	Chowan	1.68	2.66	-0.97	63%
10	Northern Coastal Plain	0.79	2.45	-1.66	32%
11	York-James	5.87	2.94	2.93	200%
12	Southeast Virginia	5.15	2.66	2.49	194%
13	Eastern Shore	6.17	2.17	4.01	285%
	Statewide	1.25	2.40	-1.15	52%

	DROUGHT REGION	OBSERVED	Aug 1, 2009 NORMAL	- Sep 18, 2009 DEPARTURE	% OF NORM.
1	Big Sandy	5.71	5.91	-0.20	97%
2	New River	5.40	5.36	0.04	101%
3	Roanoke	4.59	6.26	-1.67	73%
4	Upper James	3.42	5.43	-2.01	63%
5	Middle James	4.61	6.30	-1.69	73%
6	Shenandoah	3.79	5.53	-1.74	69%
7	Northern Virginia	4.41	6.29	-1.88	70%
8	Northern Piedmont	4.70	6.39	-1.68	74%
9	Chowan	5.35	6.97	-1.62	77%
10	Northern Coastal Plain	3.70	6.31	-2.61	59%
11	York-James	9.59	7.81	1.78	123%
12	Southeast Virginia	14.48	7.78	6.70	186%
13	Eastern Shore	10.46	6.04	4.42	173%
	Statewide	5.16	6.23	-1.07	83%

	DROUGHT REGION	OBSERVED	Jul 1, 2009 NORMAL	- Sep 18, 2009 DEPARTURE	% OF NORM.
1	Big Sandy	11.33	10.39	0.94	109%
2	New River	9.57	9.15	0.43	105%

3	Roanoke	8.35	10.65	-2.30	78%
4	Upper James	8.46	9.47	-1.01	89%
5	Middle James	7.91	10.71	-2.80	74%
6	Shenandoah	6.94	9.29	-2.35	75%
7	Northern Virginia	6.16	10.06	-3.90	61%
8	Northern Piedmont	7.53	10.79	-3.26	70%
9	Chowan	9.21	11.48	-2.27	80%
10	Northern Coastal Plain	6.92	10.76	-3.84	64%
11	York-James	17.13	12.91	4.22	133%
12	Southeast Virginia	17.96	12.85	5.11	140%
13	Eastern Shore	16.20	10.04	6.16	161%
	Statewide	9.02	10.57	-1.55	85%

	DROUGHT		Jun 1, 2009	- Sep 18, 2009	
	REGION	OBSERVED	NORMAL	DEPARTURE	% OF NORM.
1	Big Sandy	16.61	14.53	2.08	114%
2	New River	14.52	13.00	1.52	112%
3	Roanoke	14.39	14.54	-0.14	99%
4	Upper James	11.93	13.18	-1.25	91%
5	Middle James	12.41	14.22	-1.81	87%
6	Shenandoah	11.74	13.00	-1.26	90%
7	Northern Virginia	11.93	13.92	-2.00	86%
8	Northern Piedmont	13.20	14.80	-1.59	89%
9	Chowan	15.04	15.13	-0.08	99%
10	Northern Coastal Plain	12.06	14.32	-2.26	84%
11	York-James	20.67	16.32	4.35	127%
12	Southeast Virginia	23.03	16.46	6.57	140%
13	Eastern Shore	19.67	13.02	6.66	151%
	Statewide	14.11	14.36	-0.25	98%

	DROUGHT		May 1, 2009	- Sep 18, 2009	
	REGION	OBSERVED	NORMAL	DEPARTURE	% OF NORM.
1	Big Sandy	23.22	19.35	3.88	120%
2	New River	22.23	17.21	5.02	129%
3	Roanoke	20.62	18.87	1.75	109%
4	Upper James	18.47	17.46	1.01	106%
5	Middle James	17.94	18.46	-0.52	97%
6	Shenandoah	18.50	16.84	1.66	110%
7	Northern Virginia	19.90	18.26	1.63	109%
8	Northern Piedmont	20.26	19.02	1.24	107%
9	Chowan	20.52	19.22	1.30	107%
10	Northern Coastal Plain	17.01	18.48	-1.47	92%
11	York-James	25.98	20.59	5.39	126%
12	Southeast Virginia	27.96	20.32	7.64	138%
13	Eastern Shore	23.26	16.54	6.73	141%

	Statewide	20.34	18.62	1.72	109%

	DROUGHT REGION	OBSERVED	Apr 1, 2009 NORMAL	- Sep 18, 2009 DEPARTURE	% OF NORM.
1	Big Sandy	26.26	23.11	3.15	114%
2	New River	25.12	20.76	4.36	121%
3	Roanoke	23.84	22.67	1.17	105%
4	Upper James	22.01	20.86	1.15	106%
5	Middle James	20.91	21.80	-0.89	96%
6	Shenandoah	21.82	19.76	2.05	110%
7	Northern Virginia	24.03	21.56	2.47	111%
8	Northern Piedmont	23.81	22.31	1.50	107%
9	Chowan	22.62	22.65	-0.03	100%
10	Northern Coastal Plain	19.86	21.57	-1.72	92%
11	York-James	29.52	23.89	5.63	124%
12	Southeast Virginia	30.66	23.57	7.09	130%
13	Eastern Shore	25.78	19.46	6.32	133%
	Statewide	23.43	22.04	1.39	106%

	DROUGHT REGION	OBSERVED	Mar 1, 2009 NORMAL	- Sep 18, 2009 DEPARTURE	% OF NORM.
1	Big Sandy	30.56	27.36	3.21	112%
2	New River	29.52	24.43	5.09	121%
3	Roanoke	28.35	26.94	1.41	105%
4	Upper James	25.20	24.65	0.55	102%
5	Middle James	24.96	25.86	-0.89	97%
6	Shenandoah	23.86	22.96	0.90	104%
7	Northern Virginia	26.56	25.22	1.33	105%
8	Northern Piedmont	27.55	26.12	1.44	105%
9	Chowan	28.97	27.02	1.95	107%
10	Northern Coastal Plain	26.28	25.85	0.42	102%
11	York-James	35.53	28.58	6.95	124%
12	Southeast Virginia	36.88	27.77	9.11	133%
13	Eastern Shore	30.69	23.77	6.92	129%
	Statewide	27.77	26.08	1.69	106%

	DROUGHT REGION	OBSERVED	Feb 1, 2009 NORMAL	- Sep 18, 2009 DEPARTURE	% OF NORM.
1	Big Sandy	32.66	30.94	1.73	106%
2	New River	30.67	27.36	3.31	112%
3	Roanoke	29.41	30.25	-0.84	97%
4	Upper James	26.13	27.50	-1.37	95%
5	Middle James	25.57	28.98	-3.41	88%
6	Shenandoah	24.35	25.37	-1.02	96%

7	Northern Virginia	27.01	27.89	-0.88	97%
8	Northern Piedmont	28.11	29.09	-0.97	97%
9	Chowan	29.76	30.19	-0.43	99%
10	Northern Coastal Plain	26.61	28.99	-2.39	92%
11	York-James	36.47	32.11	4.36	114%
12	Southeast Virginia	37.84	31.27	6.57	121%
13	Eastern Shore	31.07	26.96	4.12	115%
	Statewide	28.66	29.21	-0.55	98%

	DROUGHT REGION	OBSERVED	Jan 1, 2009 NORMAL	- Sep 18, 2009 DEPARTURE	% OF NORM.
1	Big Sandy	38.22	34.67	3.55	110%
2	New River	34.17	30.57	3.60	112%
3	Roanoke	32.78	34.17	-1.39	96%
4	Upper James	29.23	30.78	-1.55	95%
5	Middle James	27.81	32.64	-4.83	85%
6	Shenandoah	26.51	28.22	-1.71	94%
7	Northern Virginia	29.54	31.17	-1.63	95%
8	Northern Piedmont	30.31	32.61	-2.30	93%
9	Chowan	31.87	34.30	-2.43	93%
10	Northern Coastal Plain	28.52	32.74	-4.22	87%
11	York-James	38.37	36.25	2.11	106%
12	Southeast Virginia	39.86	35.43	4.43	113%
13	Eastern Shore	32.90	30.52	2.38	108%
	Statewide	31.52	32.85	-1.33	96%

	DROUGHT REGION	OBSERVED	Dec 1, 2008 NORMAL	- Sep 18, 2009 DEPARTURE	% OF NORM.
1	Big Sandy	43.05	38.31	4.74	112%
2	New River	37.52	33.28	4.24	113%
3	Roanoke	36.51	37.42	-0.91	98%
4	Upper James	32.68	33.73	-1.05	97%
5	Middle James	31.76	35.81	-4.05	89%
6	Shenandoah	30.14	30.81	-0.67	98%
7	Northern Virginia	32.55	34.27	-1.73	95%
8	Northern Piedmont	33.87	35.89	-2.01	94%
9	Chowan	35.74	37.32	-1.58	96%
10	Northern Coastal Plain	31.48	36.02	-4.54	87%
11	York-James	42.47	39.64	2.83	107%
12	Southeast Virginia	43.69	38.61	5.08	113%
13	Eastern Shore	38.05	33.76	4.29	113%
	Statewide	35.29	35.97	-0.68	98%

	DROUGHT REGION	OBSERVED	Nov 1, 2008 NORMAL	- Sep 18, 2009 DEPARTURE	% OF NORM.
1	Big Sandy	45.60	41.59	4.01	110%
2	New River	39.19	36.31	2.88	108%
3	Roanoke	39.50	40.78	-1.28	97%
4	Upper James	35.09	37.09	-2.00	95%
5	Middle James	34.86	39.32	-4.46	89%
6	Shenandoah	32.03	33.86	-1.83	95%
7	Northern Virginia	34.62	37.68	-3.06	92%
8	Northern Piedmont	36.24	39.69	-3.45	91%
9	Chowan	38.98	40.43	-1.45	96%
10	Northern Coastal Plain	35.08	39.16	-4.08	90%
11	York-James	46.83	43.01	3.82	109%
12	Southeast Virginia	48.66	41.68	6.98	117%
13	Eastern Shore	42.77	36.70	6.07	117%
	Statewide	38.10	39.20	-1.10	97%

	DROUGHT REGION	OBSERVED	Oct 1, 2008 NORMAL	- Sep 18, 2009 DEPARTURE	% OF NORM.
1	Big Sandy	47.37	44.47	2.90	107%
2	New River	40.38	39.48	0.91	102%
3	Roanoke	41.28	44.49	-3.20	93%
4	Upper James	36.49	40.34	-3.85	90%
5	Middle James	36.45	43.16	-6.70	84%
6	Shenandoah	33.66	37.05	-3.40	91%
7	Northern Virginia	36.10	41.16	-5.06	88%
8	Northern Piedmont	37.88	43.68	-5.80	87%
9	Chowan	40.42	44.01	-3.59	92%
10	Northern Coastal Plain	36.62	42.67	-6.05	86%
11	York-James	48.52	46.54	1.98	104%
12	Southeast Virginia	50.15	45.34	4.81	111%
13	Eastern Shore	43.88	39.91	3.97	110%
	Statewide	39.67	42.70	-3.03	93%

	DROUGHT REGION	OBSERVED	Sep 1, 2008 NORMAL	- Sep 18, 2009 DEPARTURE	% OF NORM.
1	Big Sandy	49.45	47.93	1.52	103%
2	New River	42.92	42.89	0.04	100%
3	Roanoke	45.62	48.72	-3.10	94%
4	Upper James	38.63	43.84	-5.21	88%
5	Middle James	41.66	47.29	-5.62	88%
6	Shenandoah	37.40	40.72	-3.32	92%
7	Northern Virginia	41.86	45.23	-3.37	93%
8	Northern Piedmont	43.19	47.96	-4.76	90%
9	Chowan	47.04	48.44	-1.40	97%

10	Northern Coastal Plain	41.68	46.76	-5.09	89%
11	York-James	54.44	51.44	3.00	106%
12	Southeast Virginia	57.89	49.77	8.12	116%
13	Eastern Shore	47.99	43.52	4.48	110%
	Statewide	44.09	46.70	-2.61	94%

	DROUGHT		Aug 1, 2008	- Sep 18, 2009	
	REGION	OBSERVED	NORMAL	DEPARTURE	% OF NORM.
1	Big Sandy	53.52	51.76	1.77	103%
2	New River	47.39	46.20	1.20	103%
3	Roanoke	50.26	52.44	-2.17	96%
4	Upper James	42.72	47.17	-4.45	91%
5	Middle James	46.46	51.11	-4.65	91%
6	Shenandoah	40.92	44.05	-3.13	93%
7	Northern Virginia	43.90	49.08	-5.18	89%
8	Northern Piedmont	46.29	51.78	-5.49	89%
9	Chowan	50.06	52.75	-2.69	95%
10	Northern Coastal Plain	43.98	50.62	-6.64	87%
11	York-James	57.08	56.31	0.77	101%
12	Southeast Virginia	60.12	54.89	5.23	110%
13	Eastern Shore	50.91	47.39	3.52	107%
	Statewide	47.84	50.53	-2.69	95%

	DROUGHT		Jul 1, 2008	- Sep 18, 2009	
	REGION	OBSERVED	NORMAL	DEPARTURE	% OF NORM.
1	Big Sandy	58.24	56.24	2.01	104%
2	New River	51.32	49.99	1.33	103%
3	Roanoke	53.69	56.83	-3.14	94%
4	Upper James	46.82	51.21	-4.39	91%
5	Middle James	50.29	55.52	-5.22	91%
6	Shenandoah	45.23	47.81	-2.58	95%
7	Northern Virginia	46.86	52.85	-5.99	89%
8	Northern Piedmont	50.13	56.18	-6.04	89%
9	Chowan	53.48	57.26	-3.77	93%
10	Northern Coastal Plain	47.50	55.07	-7.57	86%
11	York-James	60.80	61.41	-0.61	99%
12	Southeast Virginia	65.80	59.96	5.84	110%
13	Eastern Shore	54.81	51.39	3.43	107%
	Statewide	51.74	54.87	-3.13	94%

	DROUGHT		Jun 1, 2008	- Sep 18, 2009	
	REGION	OBSERVED	NORMAL	DEPARTURE	% OF NORM.
1	Big Sandy	61.78	60.38	1.41	102%
2	New River	53.80	53.84	-0.04	100%

3	Roanoke	56.60	60.72	-4.12	93%
4	Upper James	49.42	54.92	-5.50	90%
5	Middle James	52.41	59.03	-6.62	89%
6	Shenandoah	49.12	51.52	-2.41	95%
7	Northern Virginia	51.50	56.71	-5.21	91%
8	Northern Piedmont	55.39	60.19	-4.80	92%
9	Chowan	55.20	60.91	-5.71	91%
10	Northern Coastal Plain	51.94	58.63	-6.70	89%
11	York-James	62.93	64.82	-1.89	97%
12	Southeast Virginia	67.71	63.57	4.14	107%
13	Eastern Shore	59.37	54.37	5.00	109%
	Statewide	54.84	58.66	-3.82	93%

	DROUGHT		May 1, 2008	- Sep 18, 2009	
	REGION	OBSERVED	NORMAL	DEPARTURE	% OF NORM.
1	Big Sandy	64.36	65.20	-0.84	99%
2	New River	56.37	58.05	-1.67	97%
3	Roanoke	60.45	65.05	-4.60	93%
4	Upper James	52.78	59.20	-6.42	89%
5	Middle James	56.63	63.27	-6.64	90%
6	Shenandoah	53.65	55.36	-1.71	97%
7	Northern Virginia	59.96	61.05	-1.10	98%
8	Northern Piedmont	61.58	64.41	-2.83	96%
9	Chowan	58.60	65.00	-6.40	90%
10	Northern Coastal Plain	58.19	62.79	-4.61	93%
11	York-James	65.69	69.09	-3.40	95%
12	Southeast Virginia	71.49	67.43	4.06	106%
13	Eastern Shore	64.67	57.89	6.78	112%
	Statewide	59.05	62.92	-3.87	94%

	DROUGHT		Apr 1, 2008	- Sep 18, 2009	
	REGION	OBSERVED	NORMAL	DEPARTURE	% OF NORM.
1	Big Sandy	68.68	68.96	-0.27	100%
2	New River	61.16	61.60	-0.43	99%
3	Roanoke	65.84	68.85	-3.01	96%
4	Upper James	57.61	62.60	-4.99	92%
5	Middle James	62.83	66.61	-3.78	94%
6	Shenandoah	59.05	58.28	0.77	101%
7	Northern Virginia	65.62	64.35	1.27	102%
8	Northern Piedmont	67.60	67.70	-0.10	100%
9	Chowan	65.81	68.43	-2.62	96%
10	Northern Coastal Plain	64.15	65.88	-1.74	97%
11	York-James	72.00	72.39	-0.39	99%
12	Southeast Virginia	78.17	70.68	7.49	111%
13	Eastern Shore	69.10	60.81	8.29	114%

	Statewide	64.68	66.34	-1.66	97%

	DROUGHT REGION	OBSERVED	Mar 1, 2008 NORMAL	- Sep 18, 2009 DEPARTURE	% OF NORM.
1	Big Sandy	73.06	73.21	-0.15	100%
2	New River	63.80	65.27	-1.47	98%
3	Roanoke	69.05	73.12	-4.07	94%
4	Upper James	60.43	66.39	-5.96	91%
5	Middle James	66.12	70.67	-4.55	94%
6	Shenandoah	61.85	61.48	0.37	101%
7	Northern Virginia	68.06	68.01	0.05	100%
8	Northern Piedmont	70.70	71.51	-0.81	99%
9	Chowan	69.72	72.80	-3.07	96%
10	Northern Coastal Plain	66.63	70.16	-3.54	95%
11	York-James	75.84	77.08	-1.25	98%
12	Southeast Virginia	81.10	74.88	6.22	108%
13	Eastern Shore	70.88	65.12	5.76	109%
	Statewide	67.86	70.38	-2.52	96%

	DROUGHT REGION	OBSERVED	Feb 1, 2008 NORMAL	- Sep 18, 2009 DEPARTURE	% OF NORM.
1	Big Sandy	76.26	76.79	-0.53	99%
2	New River	65.81	68.20	-2.38	97%
3	Roanoke	71.33	76.43	-5.10	93%
4	Upper James	62.64	69.24	-6.60	90%
5	Middle James	68.77	73.79	-5.02	93%
6	Shenandoah	64.15	63.89	0.26	100%
7	Northern Virginia	70.85	70.68	0.17	100%
8	Northern Piedmont	73.34	74.48	-1.14	98%
9	Chowan	72.57	75.97	-3.40	96%
10	Northern Coastal Plain	69.19	73.30	-4.11	94%
11	York-James	79.14	80.61	-1.47	98%
12	Southeast Virginia	85.22	78.38	6.84	109%
13	Eastern Shore	74.18	68.31	5.87	109%
	Statewide	70.50	73.51	-3.01	96%

	DROUGHT REGION	OBSERVED	Jan 1, 2008 NORMAL	- Sep 18, 2009 DEPARTURE	% OF NORM.
1	Big Sandy	79.24	80.52	-1.28	98%
2	New River	67.09	71.41	-4.32	94%
3	Roanoke	72.22	80.35	-8.13	90%
4	Upper James	64.28	72.52	-8.24	89%
5	Middle James	69.82	77.45	-7.63	90%
6	Shenandoah	65.16	66.74	-1.58	98%

7	Northern Virginia	72.05	73.96	-1.91	97%
8	Northern Piedmont	74.41	78.00	-3.59	95%
9	Chowan	73.64	80.08	-6.44	92%
10	Northern Coastal Plain	70.35	77.05	-6.70	91%
11	York-James	81.85	84.75	-2.91	97%
12	Southeast Virginia	86.63	82.54	4.09	105%
13	Eastern Shore	76.12	71.87	4.25	106%
	Statewide	71.86	77.15	-5.29	93%

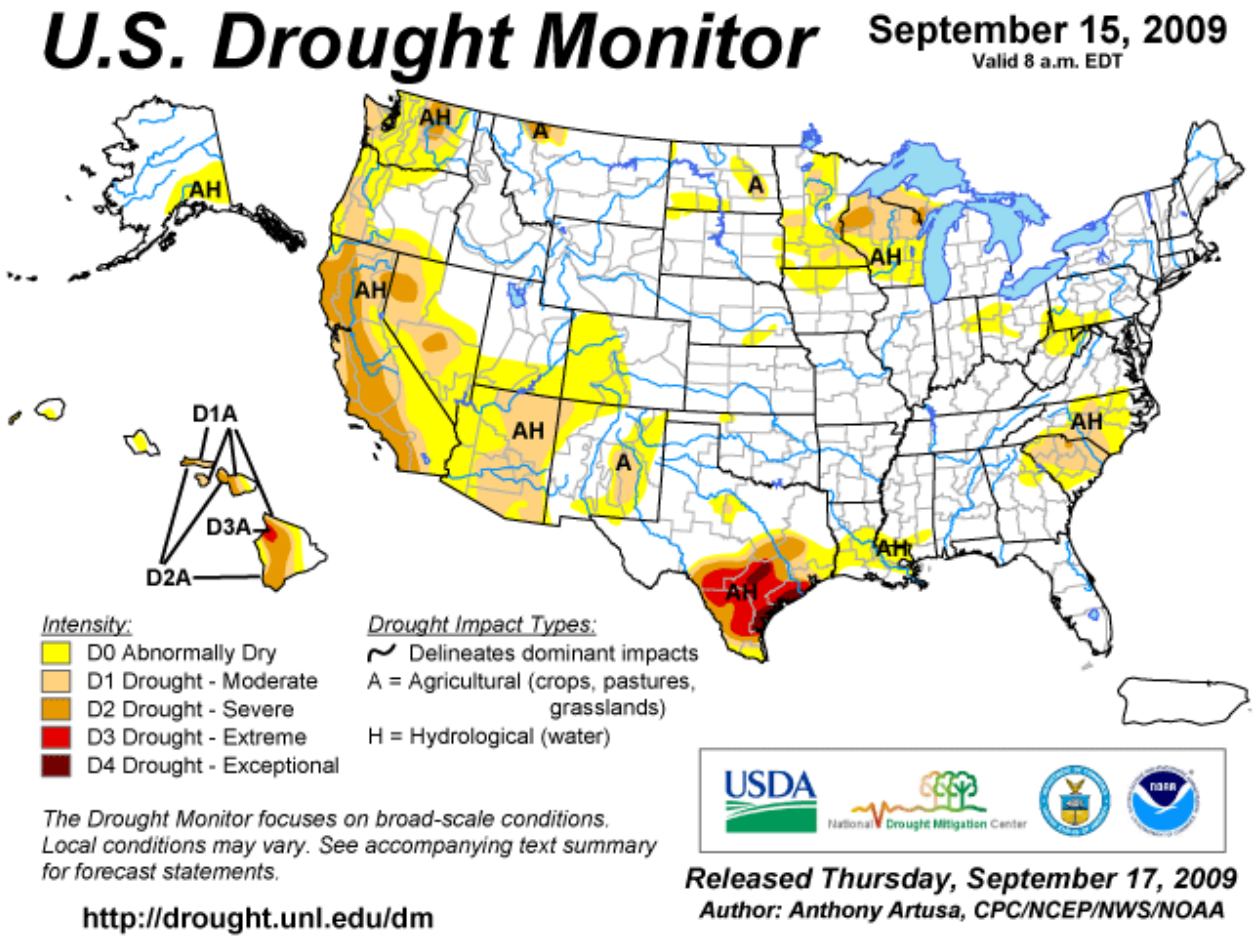
	DROUGHT		Dec 1, 2007	- Sep 18, 2009	
	REGION	OBSERVED	NORMAL	DEPARTURE	% OF NORM.
1	Big Sandy	82.53	84.16	-1.63	98%
2	New River	69.69	74.12	-4.43	94%
3	Roanoke	75.52	83.60	-8.08	90%
4	Upper James	67.58	75.47	-7.89	90%
5	Middle James	73.03	80.62	-7.59	91%
6	Shenandoah	68.19	69.33	-1.14	98%
7	Northern Virginia	75.04	77.06	-2.02	97%
8	Northern Piedmont	77.76	81.28	-3.52	96%
9	Chowan	77.89	83.10	-5.21	94%
10	Northern Coastal Plain	73.47	80.33	-6.87	91%
11	York-James	85.96	88.14	-2.19	98%
12	Southeast Virginia	90.48	85.72	4.76	106%
13	Eastern Shore	80.81	75.11	5.71	108%
	Statewide	75.19	80.27	-5.08	94%

	DROUGHT		Nov 1, 2007	- Sep 18, 2009	
	REGION	OBSERVED	NORMAL	DEPARTURE	% OF NORM.
1	Big Sandy	84.70	87.44	-2.74	97%
2	New River	70.25	77.15	-6.89	91%
3	Roanoke	76.09	86.96	-10.87	87%
4	Upper James	68.61	78.83	-10.22	87%
5	Middle James	73.69	84.13	-10.43	88%
6	Shenandoah	69.56	72.38	-2.82	96%
7	Northern Virginia	76.54	80.47	-3.93	95%
8	Northern Piedmont	78.97	85.08	-6.11	93%
9	Chowan	78.52	86.21	-7.69	91%
10	Northern Coastal Plain	74.74	83.47	-8.74	90%
11	York-James	86.76	91.51	-4.76	95%
12	Southeast Virginia	91.04	88.79	2.26	103%
13	Eastern Shore	81.83	78.05	3.78	105%
	Statewide	76.20	83.50	-7.30	91%

	DROUGHT		Oct 1, 2007	- Sep 18, 2009	

	REGION	OBSERVED	NORMAL	DEPARTURE	% OF NORM.
1	Big Sandy	87.38	90.32	-2.93	97%
2	New River	76.37	80.32	-3.95	95%
3	Roanoke	81.82	90.67	-8.84	90%
4	Upper James	72.64	82.08	-9.44	89%
5	Middle James	78.69	87.97	-9.28	89%
6	Shenandoah	72.99	75.57	-2.58	97%
7	Northern Virginia	80.77	83.95	-3.19	96%
8	Northern Piedmont	83.45	89.07	-5.61	94%
9	Chowan	83.36	89.79	-6.43	93%
10	Northern Coastal Plain	79.66	86.98	-7.33	92%
11	York-James	91.29	95.04	-3.76	96%
12	Southeast Virginia	96.21	92.45	3.76	104%
13	Eastern Shore	85.51	81.26	4.26	105%
	Statewide	80.82	87.00	-6.18	93%

APPENDIX 2-B


U.S. Drought Monitor
September 15, 2009
Valid 8 a.m. EDT
AH
A
D1A
D3A
D2A
Intensity:
D0 Abnormally Dry
D1 Drought - Moderate
D2 Drought - Severe
D3 Drought - Extreme
D4 Drought - Exceptional
Drought Impact Types:
Delineates dominant impacts
A = Agricultural (crops, pastures, grasslands)
H = Hydrological (water)
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.
http://drought.unl.edu/dm
USDA
National Drought Mitigation Center
Released Thursday, September 17, 2009
Author: Anthony Artusa, CPC/NCEP/NWS/NOAA

APPENDIX 2-C

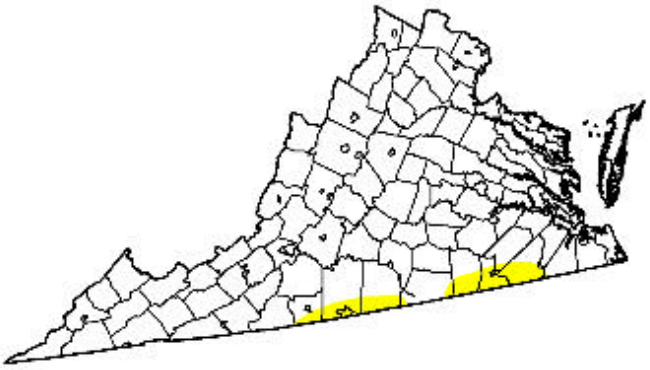
U.S. Drought Monitor

September 15, 2009
Valid 7 a.m. EST

Virginia

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	95.9	4.1	0.0	0.0	0.0	0.0
Last Week (09/08/2009 map)	95.9	4.1	0.0	0.0	0.0	0.0
3 Months Ago (06/23/2009 map)	99.7	0.3	0.0	0.0	0.0	0.0
Start of Calendar Year (01/06/2009 map)	63.0	37.0	24.7	0.0	0.0	0.0
Start of Water Year (10/07/2008 map)	57.8	42.2	25.1	1.6	0.0	0.0
One Year Ago (09/16/2008 map)	50.1	49.9	28.7	2.9	0.0	0.0



Intensity:

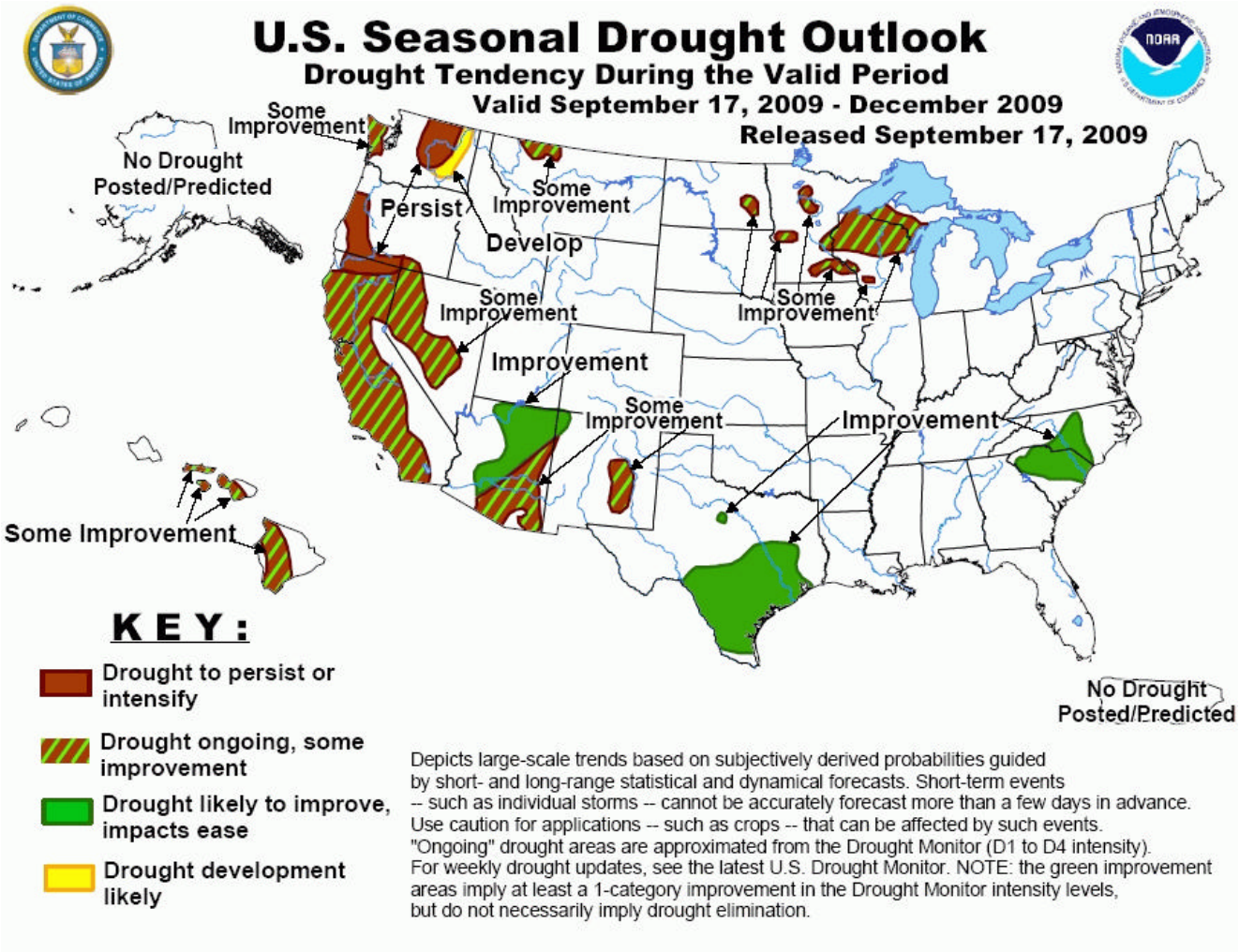
- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements

http://drought.unl.edu/dm

Released Thursday, September 17, 2009
Author: Anthony Artusa, CPC/NOAA

APPENDIX 2-D


U.S. Seasonal Drought Outlook
Drought Tendency During the Valid Period
Valid September 17, 2009 - December 2009
Released September 17, 2009
Some Improvement
No Drought Posted/Predicted
Persist
Some Improvement
Develop
Some Improvement
Some Improvement
Improvement
Some Improvement
Improvement
Some Improvement
No Drought Posted/Predicted
KEY:
Drought to persist or intensify
Drought ongoing, some improvement
Drought likely to improve, impacts ease
Drought development likely
Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Short-term events -- such as individual storms -- cannot be accurately forecast more than a few days in advance. Use caution for applications -- such as crops -- that can be affected by such events. "Ongoing" drought areas are approximated from the Drought Monitor (D1 to D4 intensity). For weekly drought updates, see the latest U.S. Drought Monitor. NOTE: the green improvement areas imply at least a 1-category improvement in the Drought Monitor intensity levels, but do not necessarily imply drought elimination.

APPENDIX 2-E
Condition of Public Water Supplies
September 4, 2009

ODW Drought Situation Report

Date: **9/4/09**

	Restriction totals
Mandatory	2
Voluntary	22
Total	**24**

N-None
M-Mandatory
V-Voluntary

B-Better
S-Stable/Same
W-Worse

PWSID	Waterworks	Source Name	Restrictions	Situation	Population Served
3053280	DCWA Central (Dinwiddie County)	Appomattox River Water Authority (ARWA)	V	S - 09/02/09 - Voluntary restrictions began on 7/29/08. ARWA lifted voluntary restrictions September 2008. No formal action taken to rescind voluntary restrictions in Dinwiddie County to date.	6,800
3081550	GCWSA - Jarratt	Nottoway River	N	S - 09/01/09 - Waterworks production rate reduced due to lower demand; river level sufficient to allow plant operation at 2.0 mgd.	7,190
3093120	Isle of Wight County	Suffolk	V	B - 09/02/09 - Obtains water from Suffolk. Follows Suffolk's lead on conservation.	1,284
3550050	Chesapeake - Western Branch system	City of Portsmouth	V	S -09/02/09 This portion of the city is consecutive to (receives water from) the city of Portsmouth. City Council voted to go to voluntary conservation city-wide - it took effect on 24 Oct 2007. Still following Portsmouth's lead on conservation.	36,404

3550051	Chesapeake	Northwest River, City of Norfolk Raw Water (Lake Gaston)	V	B - 09/02/09 Chesapeake is in good shape. There is no active water use restriction in place. For the past eight month greater than average rainfall levels observed. There is a surplus of 6.44 inch. Chlorides are used as an indicator of drought, the higher the levels the more concentrated the contaminant in a lesser amount of surface water. The chlorides remain slightly elevated in the NWR. Current levels are in the range of 40-50 mg/l. The average since June was 63 mg/l. Continuing to purchase raw water from Norfolk (7.0 MGD average)	102,292
3550052	Chesapeake - South Norfolk system	City of Norfolk	V	S -09/02/09-This portion of the city is consecutive to (receives water from) the city of Norfolk. City Council voted to go to voluntary conservation city-wide - it took effect on 24 Oct 2007. Still following Norfolk's lead on conservation.	38,706
3570150	Colonial Heights	ARWA	V	S - 09/02/09 - Lifted mandatory restrictions on 12/1/07. Voluntary restrictions currently in place.	17,286
3595250	Emporia	Meherrin River	N	S - 09/02/09 - Water flowing over dam, reservoir level sufficient for normal operation.	5,600
3670800	Virginia-American Water Company (Hopewell)	Appomattox & James Rivers	N	S - 09/03/2009 - Level at intakes still sufficient to supply plant. August rainfall slightly below monthly and yearly averages.	25000 - Primary / 42463 Total including Consecutive System (Ft. Lee)
3700500	Newport News	Chickahomony River, Skiffs Creek, Diascand, Little Creek, Harwoods Mill, Lee Hall	N	B -- 08/30/09 - Total reservoir capacity at 90.26%. This is up from 2008 (73%) and 2007 (87%). Some of the current "emptiness" is the intentional lowering of one of the impoundments for work on the dam.	406,000

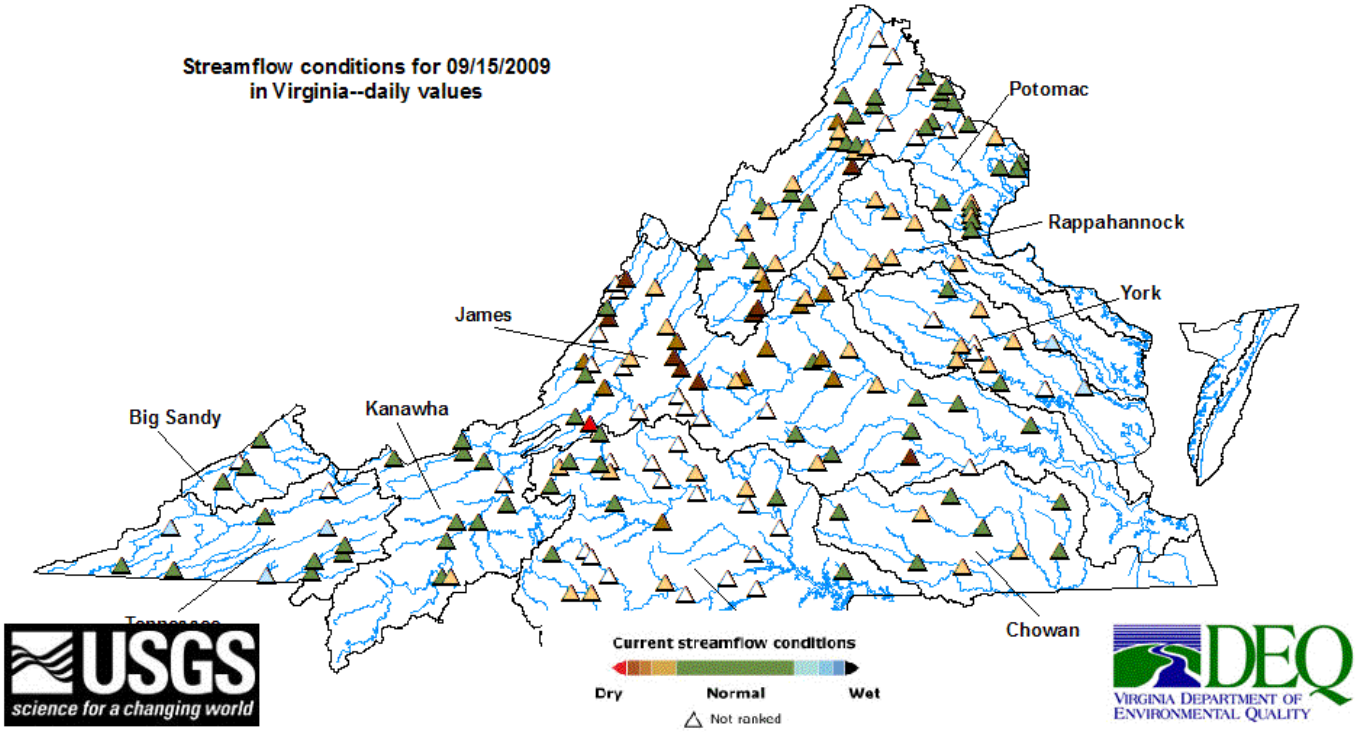
				Last report was 89.5%	
3710100	Norfolk	Lake Prince, Lake Burnt Mills, Western Branch reservoir, Nottoway River, Blackwater River, 4 western wells; Little Creek reservoir, Lakes Smith, Lawson, Whitehurst, and Wright. Lake Gaston.	V	B - As of 08/24/09 (latest data), reservoirs at 88.3% (up from from 84% on 08/03/09). Historic reservoir capacity is 86.3% at this time of year. Avg. pumping from Lake Gaston = 48.2 MGD. Called for voluntary conservation 11/1/07.	261,250 - Primary / 755,617 - Total including consecutive systems (Va Beach + military bases).
3740600	Portsmouth	Lakes Cohoon, Meade, Kilby, and Speights Run	V	S - As of 08/28/09, reservoirs at 96% (from 95% on 08/07/09). Median reservoir capacity is 94% for the month and historical average capacity is 90% (period of 1969-2008). The emergency wells are off. Called for voluntary conservation on 10/10/07.	100,400 - Primary / 120,400 Total including consecutive systems (military bases)
3800805	Suffolk	Lone Star Lakes, Cumps Mill Pond	V	B -09/02/09-Will follow Portsmouth's lead and the region as far as conservation. Average reservoir levels : Southern Lakes at 72.06.0% capacity, for the Northern Lakes at 97.61% and Crumps Mill Pond at 95.85% The Southern Lakes are for emergency use only. Overall they are at 92.66% capacity for the reservoirs for the period (June-August 2009). The operator states that thiey are in better condition this year when compared to 2008 (73.50%) for the same period. Still purchasing water from Portsmouth per their contract, no drought measure taken to date.	62,562
3810900	Virginia Beach	Norfolk	V	B - 08/24/09 - Obtains water from Norfolk. Called for voluntary conservation on 9/19/07.	423,743

3830850	Williamsburg	Waller Mill Reservoir	N	W (than last month, but in line with historic situation) - 09/01/09: 8" below primary spillway - about 84% capacity. The average level over the past 10 years is 9 inches below the spillway. Last month was 1.5 inches.	16,400
4041035	APPOMATTOX RIVER WATER AUTHORITY	Surface water; Lake Chesdin	N	S- Wholesaler to Chesterfield County, Prince George County, Dinwiddie County; Cities of Petersburg and Colonial Heights. Reservoir is at full level.	200,000
4041845	CHESTERFIELD CO CENTRAL WATER SYSTEM	Surface water; Swift Creek reservoir; purchases finished water	N	S- Purchases water from the City of Richmond and the Appomattox River Water Authority. Reservoir is at full level.	286,000
4057800	TAPPAHANNOCK, TOWN OF	Groundwater wells	N	S	2,100
4073311	GLOUCESTER CO WATER TREATMENT PLT	Surface water, Beaverdam reservoir; 2 deep groundwater wells	N	S-Reservoir is full.	8,870
4075283	EASTERN GOOCHLAND CENTRAL WATER SYSTEM	Purchased surface water	N	S-purchases water from Henrico County	2,500
4075735	JAMES RIVER CORRECTIONAL CTR	Surface water; James River	V	S- Conservation at all DOC facilities	9,300
4085398	HANOVER SUBURBAN WATER SYSTEM	Surface water; North Anna River; some groundwater wells; purchases finished water	V	S (see Richmond)	71,000
4085770	SPRING MEADOWS-MEADOW GATE	Groundwater wells	N	S- A replacement well has been drilled and other improvements are proposed in the PER.	2,300
4087125	HENRICO COUNTY WATER SYSTEM	Surface water; James River	V	S (see Richmond)	289,000
4101900	WEST POINT, TOWN OF	Groundwater wells	N	S	3,000
4127110	DELMARVA PROPERTIES	Groundwater wells	V	S-New Kent Co. encourages conservation at all county owned waterworks.	7,700
4145675	POWHATAN COURTHOUSE	Groundwater wells	N	S	2,600
4193280	COLONIAL BEACH, TOWN OF	Groundwater wells	N	S	3,300
4760100	RICHMOND, CITY OF	Surface water; James River	V	S- water levels do not affect intake; James River Regional Flow Management Plan set restrictions based on	197,000

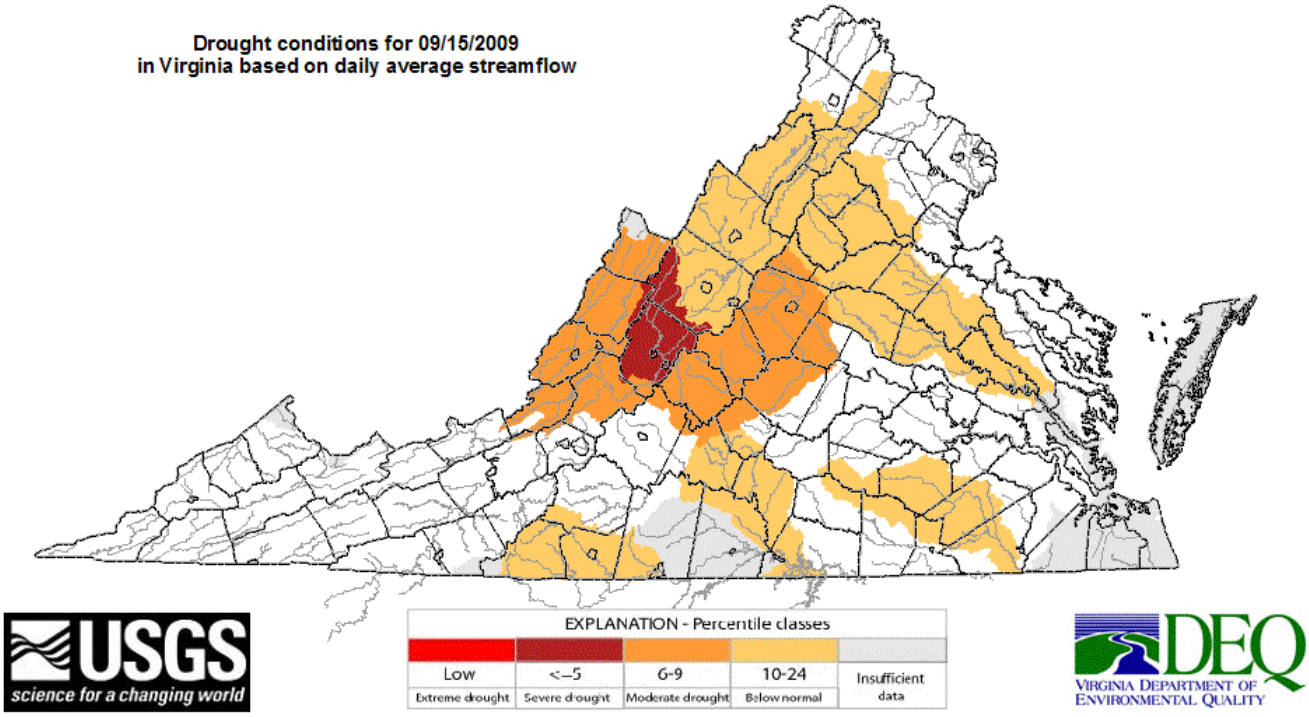
				James River level for counties of Henrico, Chesterfield, Goochland, and Hanover counties, which purchase water from the City.	
5143210	Town of Gretna	Georges Creek Res	N	S	2,500
5029085	Buckingham County	Troublesome Creek Reservoir	N	S- water levels over spillway are sufficient	5,751
5037300	Town of Keysville	Keysville Reservoir	N	S	800
5780600	HCSA-South Boston	Dan River	N	S	11,388
5141640	Town of Stuart	South Mayo River	N	S	1,500
5147170	Town of Farmville	Appomattox River	N	S -river level at normal height	7,011
5011050	Town of Appomattox	Wells	V	S	1,708
5067265	Hales Point	Wells	N	S - hauling water	46
5067348	Westlake Water Co	Wells	V	S - hauling water	620
5690400	City of Martinsville	Beaver Creek Reservoir	N	S - reservoir 10 incles below spillway as of 8/17/09	16,000
6061200	Marshall	Groundwater	M	S - The WSA Alert Messaging Service maintains the Water Use Restriction Notice as of 9/3/2009. The mandatory water use restriction is not directly drought related but depends on water source development.	2,134
6107150	Town of Hamilton	Groundwater	V	S - 9/3/09 No water supply problems. Voluntary water use restrictions until new Well 14 is placed in service.	2,000
6107200	Town of Hillsboro	Spring/Well	V	S - 9/3/09 Combined yield from new well and spring has not been consistently adequate to meet current demand. A leak survey revealed 10 potential leaks in the distribution system.	58
6107601	LCSA Raspberry Falls Subdivision	Groundwater	V	S -9/3/09 Both wells in service. No problems with water supply - quantity. Voluntary conservation in place beginning 3/11/08.	400
6107400	Town of Lovettsville	Groundwater	V	S -9/3/09 Voluntary water use restrictions remain in place; however there is no problem with water supply.	1,280
6107650	Town of Round Hill	Groundwater	V	S - 9/3/09 - No water supply problems.Voluntary water use restrictions replace	3,156

				mandatory water use restrictions on 4/1/08.	
6153260	Woodbridge Mobile Home Park	Groundwater	M	S -- 9/3/09 Low water pressure problem continues. Waterworks continues to have low pressure due to inadequate sources and leaks in the distribution system. This problem is indirectly related to drought as source problems existed previously. A new well was drilled in November 2008. Developmental Testing completed in December 2008, all water quality results reviewed by VDH ODW. Plans for connecting new well to waterworks have been reviewed and comments issued to owner.	320

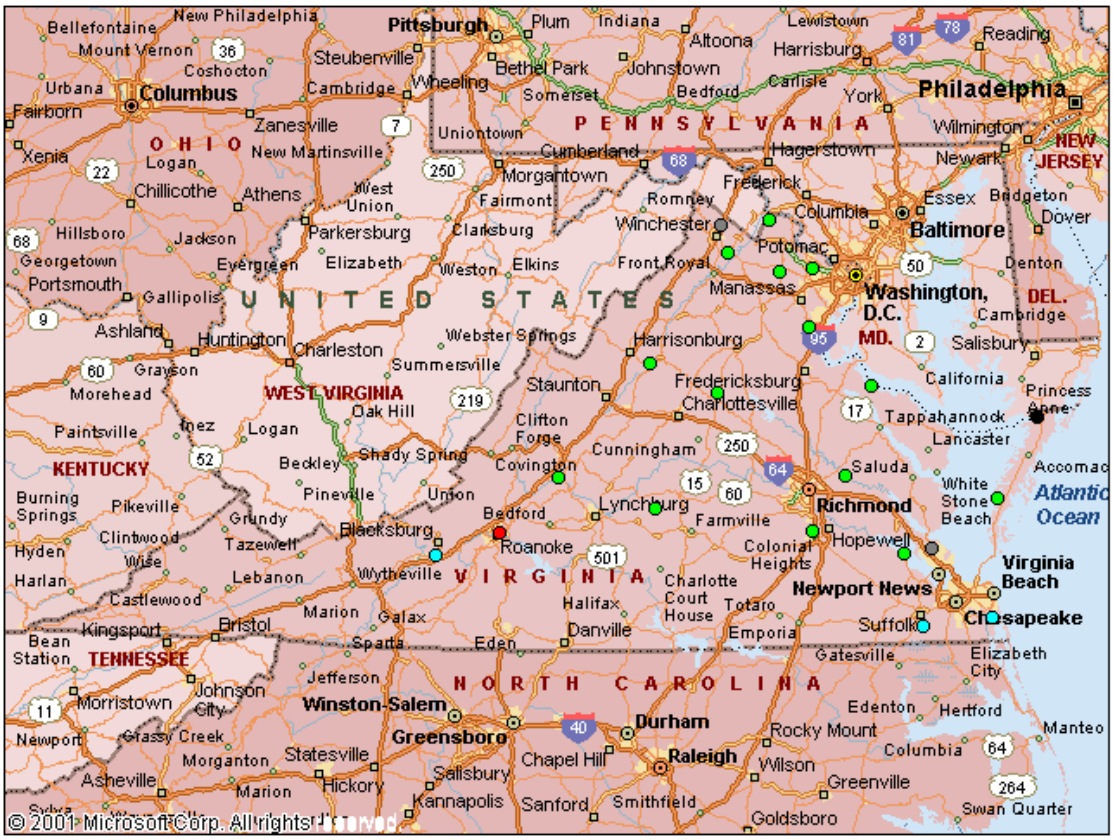
APPENDIX 2-F


Streamflow conditions for 09/15/2009
in Virginia--daily values
Potomac
Rappahannock
York
James
Big Sandy
Kanawha
Chowan
Current streamflow conditions
Dry
Normal
Wet
Not ranked
USGS
science for a changing world
DEQ
Virginia Department of Environmental Quality

APPENDIX 2-G
Drought Watch -- USGS State Information on Drought
Map of below normal 7-day average streamflow



APPENDIX 2-H
Virginia Climate Response Network
September 16, 2009



Explanation - Percentile classes (symbol color based on most recent measurement)							
New Low	<10 Much Below Normal	10-24 Below Normal	25-75 Normal	76-90 Above Normal	>90 Much Above Normal	New High	Not Ranked

Map generated 9/16/2009 9:52:48 AM

Appendix 3: Anticipated Water Supply Planning Draft Plan &/or Formal Program Submissions for 2009 - 2010

Table 16. Summary of local and regional water supply plan development status for those entities submitting draft water supply plans to DEQ for review and/or formally submitting water supply planning programs to SWCB in 2009 and 2010.

DEQ Region	Lead Agency	Participating Counties	Participating Cities	Participating Towns	Status of Planning Process
Blue Ridge - Roanoke	New River Valley Planning District Commission	Floyd, Giles, Montgomery, and Pulaski	Radford	Dublin, Glen Lyn, Pembroke, Floyd, Narrows, Pearisburg, Pulaski, and Rich Creek	Project support is also being provided by Giles County PSA, Floyd-Floyd County PSA, Blacksburg, Christiansburg, and VPI-PSA. The PDC received funding in FY09 to incorporate DEQ comments into a revised draft. The project is on schedule to submit a final draft to DEQ for team review in Fall 2009 and formally submit the regional water supply planning program to the SWCB in 2011.
Blue Ridge – Lynchburg & Roanoke	West Piedmont Planning District Commission	Henry, Patrick, and Pittsylvania	Danville and Martinsville	Stuart, Gretna, Hurt, Chatham, and Ridgeway	Project support is also being provided by the Henry County PSA and Pittsylvania County SA. The PDC received funding in FY07 and FY08 to develop their water supply plan. The region is currently working on Phase III of the water supply planning process, focusing on the statement of need and alternatives (section 130) and developing a complete draft of their regional plan. This phase of the plan will also include public participation workshops. The project is on schedule to submit a draft plan to DEQ for team review Summer 2010 and formally submit the regional water supply program to the SWCB in 2011.
Blue Ridge - Roanoke	Roanoke Valley-Alleghany Regional Commission	Bedford, Botetourt, Franklin, and Roanoke	Bedford, Roanoke, and Salem	Boones Mill, Buchanan, Fincastle, Rocky Mount, Troutville, and Vinton	The plan builds on a regional water plan developed in 2003. Public information meetings and workshops were held in 2008. The region is currently drafting demand projections (Section 100) and the statement of need and alternatives (Section 130). The project is on schedule to submit a draft plan to DEQ for team review in Spring 2010 and formally submit the regional water supply program to the SWCB in 2011.

Table 16, continued. Summary of local and regional water supply plan development status for those entities submitting draft water supply plans to DEQ for review and/or formally submitting water supply planning programs to SWCB in 2009 and 2010.

DEQ Region	Lead Agency	Participating Counties	Participating Cities	Participating Towns	Status of Planning Process
Blue Ridge – Roanoke	Cumberland, LENONWISCO, & Mount Rogers Planning District Commissions	Bland, Buchanan, Carroll, Dickenson, Grayson, Lee, Russell, Scott, Smyth, Tazewell, Washington, and Wise	Bristol, Galax, and Norton	39 participating towns	The region received grant funding in FY07, FY08, and FY09. The existing water source (Section 70), existing water use (Section 80), and existing resource conditions (Section 90) portions of the plan are complete. The region is currently revising the demand projections (Section 100) and regional drought response (Section 120) and drafting their statement of need and alternatives (Section 130). The project is on schedule to submit a draft plan to DEQ for team review in 2010 and formally submit the regional water supply program to the SWCB in 2011.
Blue Ridge - Lynchburg	Region 2000 Local Government Council	Amherst, Appomattox, Bedford, Campbell, and Nelson	Bedford and Lynchburg	Altavista, Amherst, Appomattox, Brookneal, and Pamplin	Region 2000 received WSP grant funding in FY06 and FY08. Project support is also provided by the Amherst County SA, Bedford County PSA, Campbell County Utilities and Service Authority, and Nelson County SA. A community stakeholder workshop to present the draft regional water supply plan occurred in July 2008. A draft regional plan was submitted to DEQ for team review in March 2009 and the project is on schedule to formally submit the regional water supply program to the SWCB in 2011.
Blue Ridge - Lynchburg	Southside Planning District Commission	Mecklenburg and Brunswick and		Alberta, Brodnax, Lawrenceville, La Crosse, South Hill, Boydton, Chase City, and Clarksville	Southside PDC received grant funding in FY06, 07, and 08 to develop their regional water supply plan. The PDC hosted drought management workshops in 2008 with DEQ staff, local administrators and water personnel to develop a their regional drought response and contingency plan and drought management ordinance (Section 120). The project is on schedule to submit a draft plan to DEQ for team review in 2010 and formally submit the regional water supply program to the SWCB in 2011.

Table 16, continued. Summary of local and regional water supply plan development status for those entities submitting draft water supply plans to DEQ for review and/or formally submitting water supply planning programs to SWCB in 2009 and 2010.

DEQ Region	Lead Agency	Participating Counties	Participating Cities	Participating Towns	Status of Planning Process
Blue Ridge - Lynchburg	Nottoway County	Nottoway		Blackstone, Burkeville, and Crewe	Nottoway received FY07 grant funding to develop a draft regional water supply plan (sections 70 – 130). Nottoway received funding in FY09 to incorporate DEQ comments into a revised draft. The DEQ water supply planning team reviewed and provided comments on the draft regional plan. Nottoway is currently addressing DEQ comments into a final draft plan. The project is on schedule to conduct public hearings in 2010 and submit the regional water supply planning program to the SWCB by 2011.
Piedmont (covered by Blue Ridge – Roanoke Planner)	Amelia County	Amelia County			County officials completed the existing water source (Section 70) and existing water use (Section 80) portions of their plan. They recently contracted with a consultant to complete the remaining portions of the plan. The local plan is due in 2010.
Piedmont (covered by Blue Ridge – Lynchburg Planner)	Appomattox River Water Authority	Chesterfield, Dinwiddie, Prince George	Colonial Heights Petersburg Hopewell	McKenney	DEQ staff will be reviewing the Authority's draft regional plan in Fall 2009. Hopewell is working concurrently to develop their sections of the plan. The project is on schedule to submit a revised draft plan to DEQ for team review in 2010 and formally submit the regional water supply planning program to the SWCB in 2011.
Piedmont (covered by Blue Ridge – Roanoke Planner)	Charles City County	Charles City County			County officials completed the existing water source (Section 70) and existing water use (Section 80) portions of their plan. They recently contracted with a consultant to complete the remaining portions of the plan. The local plan is due in 2010.

Table 16, continued. Summary of local and regional water supply plan development status for those entities submitting draft water supply plans to DEQ for review and/or formally submitting water supply planning programs to SWCB in 2009 and 2010.

DEQ Region	Lead Agency	Participating Counties	Participating Cities	Participating Towns	Status of Planning Process
Piedmont (covered by Valley Planner)	Greensville County Water and Sewer Authority	Greensville and Sussex	Emporia	Jarratt, Stony Creek, Wakefield, and Waverly	The region received grant funds in FY07 and 08 to develop a draft regional water supply plan (sections 70 – 130). The Authority received funding in FY09 to incorporate DEQ comments into a revised draft. The DEQ water supply planning team reviewed and provided comments on the draft regional plan. The Authority is currently addressing DEQ comments into a final draft plan. The project is on schedule to conduct public hearings in 2010 and submit the regional water supply planning program to the SWCB by 2011.
Piedmont (covered by Blue Ridge – Lynchburg Planner)	New Kent	New Kent			County officials and their consultant have completed the existing water source (Section 70), existing water use (Section 80), water demand management (Section 110), and drought response and contingency (Section 120) portions of their local plan. They are currently working on demand projections (Section 100). The project is on schedule to formally submit their local water supply planning program to the SWCB by the 2010 deadline.
Tidewater (covered by Blue Ridge – Lynchburg & Valley Planners)	Hampton Roads Planning District Commission	Gloucester, Isle of Wight, James City, Southampton, Surry, and York	Chesapeake, Franklin, Hampton, Newport News, Norfolk, Poquoson, Portsmouth, Suffolk, Virginia Beach, and Williamsburg	Boykins, Branchville, Capron, Courtland, Ivor, Newsoms, Smithfield, Windsor, Claremont, Dendron, and Surry	HRPDC staff are currently working on the demand projection (Section 100) and drought response and contingency plan (Section 120) portions of the regional plan. The project is on schedule to submit a revised draft plan to DEQ for team review in 2010 and formally submit the regional water supply planning program to the SWCB in 2011.

Table 16, continued. Summary of local and regional water supply plan development status for those entities submitting draft water supply plans to DEQ for review and/or formally submitting water supply planning programs to SWCB in 2009 and 2010.

DEQ Region	Lead Agency	Participating Counties	Participating Cities	Participating Towns	Status of Planning Process
Tidewater (covered by Blue Ridge – Roanoke Planner)	Town of Chincoteague			Chincoteague	Town staff are completing a draft of their local plan and will meet with DEQ staff in Fall 2009 to discuss the draft plan. The project is on schedule to formally submit their local water supply planning program to the SWCB by the 2010 deadline.
Northern	Town of Hillsboro			Hillsboro	The local water supply planning program is due to the SWCB in 2010.
Northern	King George County	King George			King George County began water supply plan development in 2007. The local water supply planning program is due to the SWCB in 2009.
Northern	Town of Port Royal			Port Royal	The local water supply planning program is due to the SWCB in 2010.
Northern	Town of Warrenton			Warrenton	Town staff and their consultant began water supply plan development in 2006. The local water supply planning program is due to the SWCB in 2010.
Valley	Rivanna Water and Sewer Authority	Albemarle	Charlottesville	Scottsville	The region received grant funding in FY07 to complete a partial draft water supply plan (sections 70-100). The project is on schedule to submit a draft plan to DEQ for review in late 2009 and submit the regional water supply planning program to the SWCB by 2011..
Valley	Central Shenandoah Planning District Commission	Augusta and Rockingham	Harrisonburg, Staunton, and Waynesboro	Bridgewater, Broadway, Craigsville, Dayton, Elkton, Grottoes, Mount Crawford, and Timberville	The PDC received grant funding in FY06, 07, and 08 to develop their regional water supply plan. The project is on schedule to submit a draft plan to DEQ for review in late 2009 and submit the regional water supply planning program to the SWCB by 2011.

Appendix 4: TOP 20 WATER USERS IN 2008 (NON-POWER GENERATION)

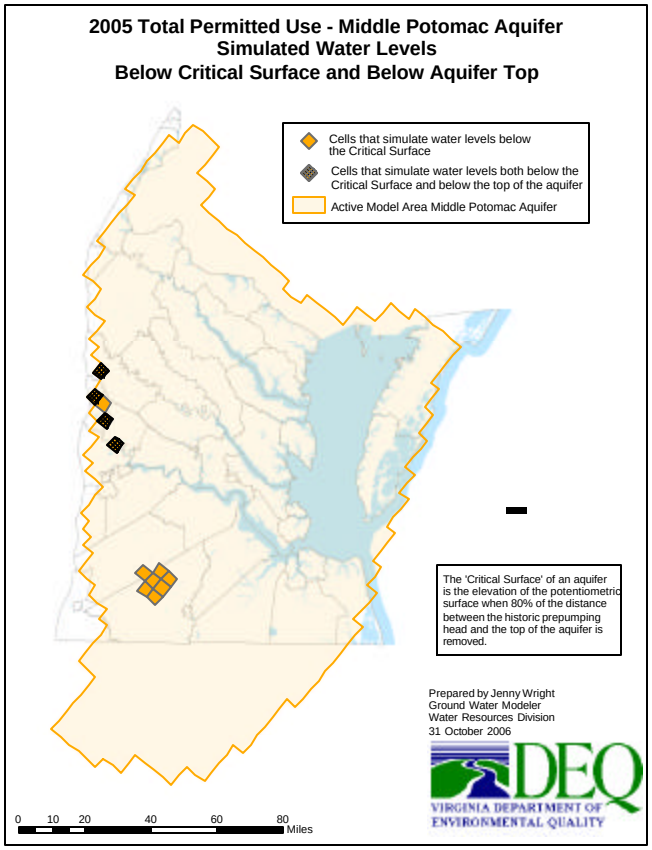
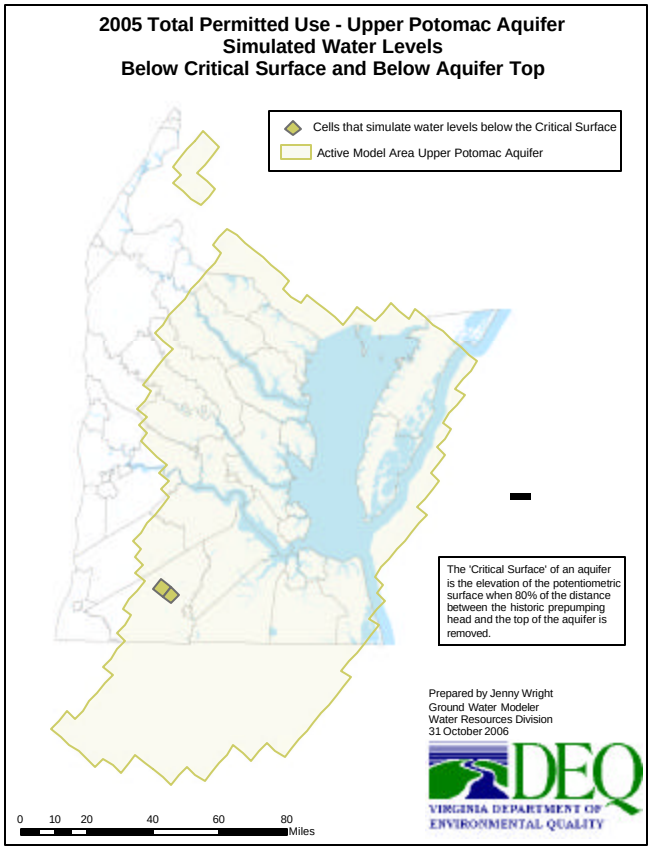
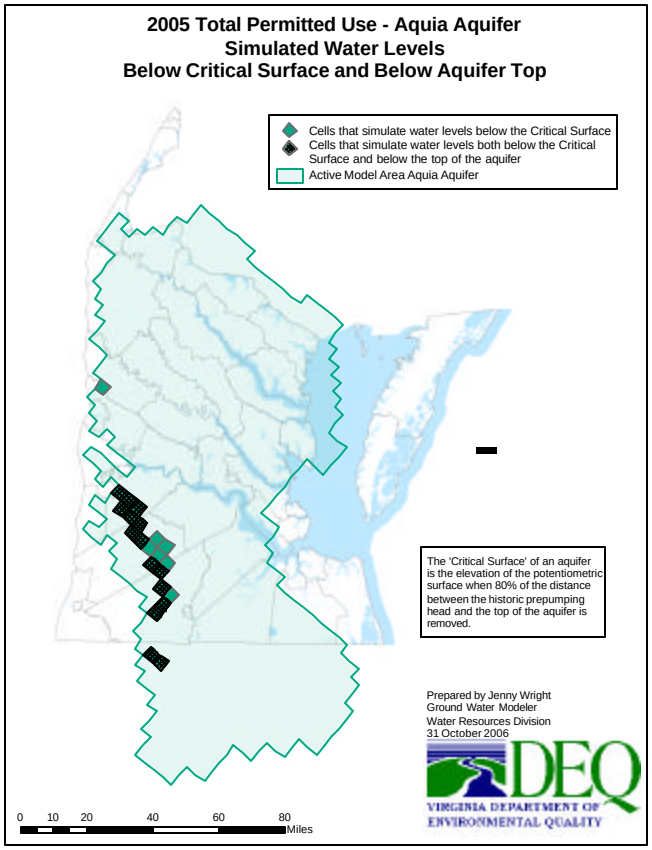
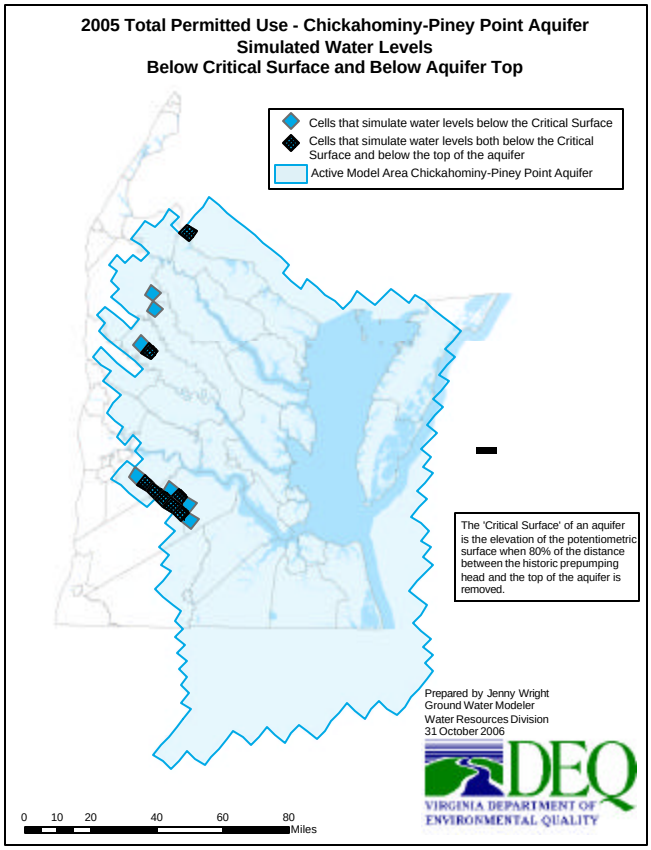
Owner	System	Category*	Total (MGD)
Honeywell International, Inc.	Hopewell Plant	MAN	115.07
Fairfax County Water Authority	Potomac River WTP	PWS	83.53
Richmond, City of	Richmond (City) WTP	PWS	69.97
Norfolk, City of	Western Branch Reservoir	PWS	69.09
Western Refining Yorktown Inc	Yorktown Refinery	MAN	62.02
Fairfax County Water Authority	Occoquan Reservoir	PWS	61.16
Duke Energy Generation Services of Narrows	Celco Plant	MAN	59.37
International Paper Corp.	Franklin Mill	MAN	37.06
Meadwestvaco Corporation	Covington Plant	MAN	37.05
Virginia Beach, City of	Virginia Beach Service Area	PWS	35.13
Dupont E I De Nemours & Co	Spruance Plant	MAN	30.4
Newport News, City of	Lee Hall WTP And ROF	PWS	26.53
Henrico County	Henrico County WTP	PWS	25.62
Newport News, City of	Harwood's Mill WTP	PWS	23.46
Smurfit-Stone Container Corp.	West Point Plant	MAN	19.24
Smurfit-Stone Container Corp.	Hopewell Plant	MAN	16.27
Honeywell Resins & Chemicals LLC	Chesterfield Plant	MAN	15.62
Portsmouth, City of	Lake Kilby WTP	PWS	15.29
Manassas, City of	Manassas WTP	PWS	12.4
Newport News Shipbuilding	Newport News Shipbuilding	MAN	11.7
		TOTAL	**826.0**

*Category: MAN= Manufacturing, PWS= Public Water Supply

Appendix 5: Water Transfers in the VWUDS Database

Water use is tracked in the VWUDS database by recording different actions: WL = withdrawal, RL = release, DL = delivery, SR = System Release, and SD = System Delivery. Withdrawals from a water source (ground water or surface water), in general, account for the largest portion of a locality's actual water use. Additionally, a locality may buy water from (or sell water to) another locality, or a portion of their water use for the year may come from water already stored at a water treatment plant. Therefore, the actual water use in a particular locality is equal to

Water Use = Withdrawals – Water Sold + Water Bought + Water Released from WTP
(i.e., Use = WL – RL + DL + SR)

Currently it is difficult to give an accurate estimate of actual water use in a locality because not all transfers are consistently reported to the VWUDS database. For example, in several instances there are localities who have reported water releases (RL), but there are no corresponding data indicating the water has been received and used by another locality (DL). Or, some localities reportedly sell water (RL), but have no reported means of receiving water (WL or DL or SR).

Appendix 6: Ground Water Withdrawal Problem Areas