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SOUTHWEST VIRGINIA WATER SYMPOSIUM '96

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FOREWORD

Problems associated with drinking water, sewage disposal, and nonpoint source pollution of surface and ground water are critical concerns for citizens and public officials in the coal field communities and in many of the 18 counties of southwest Virginia. At present, Virginia Tech, local colleges, Cooperative Extension, state and local agencies, and industries are involved in various water quality/quantity related projects across southwest Virginia. There is an urgent need to coordinate a variety of on-going efforts, prioritize needs, establish strong linkages between various entities, and develop a strategic plan for research, technology transfer, water quality education programs, and institutional requirements in southwest Virginia.

The one-day symposium on October 26, 1996 dedicated the entire morning session to invited presentations and a panel discussion related to drinking water issues in the coal field communities of southwest Virginia. The afternoon session focused on watershed management, stream and groundwater quality, and nonpoint source problems in southwest Virginia.

This symposium proceedings is a summary of the many excellent presentations and discussions that occurred at the symposium. These proceedings provide an expanded information resource for state agency personnel, legislators, environmental educators, researchers and interested citizens on water issues and set the direction for future research, technology transfer, and educational programs in southwest Virginia.

Tamim Younos, Associate Director
Virginia Water Resources Research Center

ACKNOWLEDGMENTS

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Special acknowledgments are due to Donna Stanley, Mountain Empire Community College and Carl Zipper, Virginia Tech, who identified and invited several of the symposium speakers and panelists.

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Finally, the symposium and these proceedings would have not been possible without the enthusiastic participation of the speakers and panelists. Their support and contributions were responsible for the success of this symposium.

OPENING REMARKS

The Honorable Clarence "Bud" Phillips
Virginia House of Delegates

Delegate Phillips represents Dickinson County, most of Wise County, part of Russell County, and the city of Norton in the Virginia House of Delegates. He has been a patron of several pieces of legislation dealing with water issues, one of which a couple of years ago allowed some coal severance taxes to be used for water system development throughout the coal-producing region. Most recently, he introduced legislation in the general assembly to create a commission that's focusing on drinking water issues in the coal-producing counties, and that is looking specifically at the supply problems, as well as funding mechanisms. Delegate Phillips is one of the strongest advocates for providing additional resources to address water problems and has kept statewide attention on the problems that we have in southwest Virginia.

Good Morning. It is indeed a pleasure to see so many people out on a Saturday morning. Water in southwest Virginia has been the focus of my attention over the last two to three years in the General Assembly. I have sponsored a number of pieces of legislation, at times some of them controversial and others popular, depending on which side of the water issue you are on.

For a long time in southwest Virginia, water was thought to be a commodity that was infinite, and that there was no end to water resources. We thought we could take whatever action we wanted in terms of water degradation and pollution without regard to diminishing resources, and that these resources would be there for us in the future. We have not done a good job in the past of looking at water resources to see where they are, what their significance may be, and what the future of those water resources might be for southwest Virginia. One of the first pieces of legislation that I introduced on water required coal companies to replace waters such as springs or wells that were used for domestic supplies. As you can well understand, it was quite controversial because the citizens of my district supported it and coal companies opposed it, and it is an economic issue as well. Coal companies felt it was an economic issue that they did not want to face and wanted to put it off as long as possible. That piece of legislation passed and because of it, coal companies now must replace any domestic water supplies, such as springs or wells, that are diminished as a result of mining activities. The second piece of legislation allowed the coal companies to use a portion of their coal severance tax to replace water supplies, and today some counties are using this revenue. The third piece of legislation that we have introduced is a water study that is ongoing at the present time. The first objective of the study is to determine what is the scope

of the water resource problems in southwest Virginia counties. The second objective is to determine what are the state, local, and federal funding sources, and the adequacies of those funding programs to supply water to communities. And the third objective is to ascertain and determine what the capabilities of the state of Virginia are to supply additional resources to water restoration programs in southwest Virginia. On November 7, we are meeting with the state and federal agencies to make some determination of their present role and to determine what their future role should be in providing water to southwest Virginia.

We have communities in southwest Virginia that have been without water, some of them for over thirty years. These are not one or two isolated families. These are communities with as many as 160 families without adequate water supplies, without ANY water supplies in their community. That means they have to make do with whatever water resources they have. These families either buy it, haul it, or catch it in basins or cisterns and try to utilize those sources. There are families who are going to abandon mines to get water to haul back to their cisterns or put into tanks. A number of studies have been conducted by Virginia Tech and Cooperative Extension to determine the scope of the problems that exist in the coal fields. According to their findings, even if the water supplies are there, the water supplies in many cases are contaminated with metals or other contaminants making the water dangerous to drink. So for all intents and practical purposes, in my opinion and I think this is supported by research, groundwater supplies in southwest Virginia are not reliable, are contaminated, and are unusable in most instances for homes, businesses, or commercial use. The only way we're going to be able to solve these problems for the communities in southwest Virginia is to: 1) protect the waters that exist in southwest Virginia (i.e. streams such as the North Fork and South Fork, the Holston River, the Clinch River, the Powell River, as well as the John Flannagan, and the Russell Fork streams.) These are the major waterways of southwest Virginia and what most people do not realize is that these particular streams and waterways are the future of southwest Virginia. These streams and rivers affect the way we live, the way we develop our roads, our houses, and our industry, and most importantly they determine the economic development capacity and the quality of life for southwest Virginia.

We have communities in southwest Virginia that have been without water, some for over thirty years.

There's a lot at stake here in southwest Virginia with water and we must realize that as a region, all parties must come together to support the protection of water resources. We must come together to determine the best funding capabilities and seek cooperation from local, state, and federal agencies in seeing that water supplies are available for the 21st century, and to insure that we have adequate and safe water supplies for our communities. Without planning, without help from local, state, and federal agencies, at some point and

time in the future, we're going to run into enormous water quality and water supply problems in southwest Virginia. There is an enormous problem that must be resolved in our lifetime, and we have a big challenge in front of us. And the big challenge is to use our collective wisdom to plan for the 21st century to ensure that communities have adequate and safe water supplies. To do less at any level, whether it be local, state, or federal, will be dooming our citizens to a substandard quality of life and will be dooming our region to a substandard economic opportunity. But it takes planning. A lot of people are afraid to plan and are afraid to face issues. We've got to challenge people to overcome their fears. For example, for a long time coal companies were afraid to discuss water problem issues because they felt it was going to cost them money, and it was going to cost them production, and they didn't want to be blamed for any of the problems.

Now don't take my comments to say that coal companies are blamed for all the problems. They're not. Water problems in southwest Virginia have a multitude of resource problems. Coal companies in the long run have caused many problems but they need to be part of the solution. We cannot point fingers saying you did this and you need to do this. We need to come together and discuss how to correct this problem and move forward in the future without pointing fingers and making accusations. So in closing, I welcome you here and look forward to a healthy debate. We should never be afraid of debating issues. No matter what those issues are, we should always look at pros and cons and work those issues out. That's the way to resolve problems in this country and our region. I look forward to a very vigorous discussion and debate and discussion of these issues today.

WATER IN SOUTHWEST VIRGINIA: PROBLEMS AND PROMISE

Keynote Address

John Randolph
Department of Urban Affairs and Planning
Virginia Tech

Southwest Virginia, especially the coalfield counties from Lee to Buchanan, have long faced many economic, social, and environmental problems. Under-employment, pockets of poor living conditions, and an environment impacted by resource extraction industries have characterized Virginia's center of Appalachia. In reviewing the range of concerns, it is curious to note how one resource, water, reflects not only the difficulties facing the region, but also the prospects for the region's development.

Sustainable Development in Far Southwest Virginia and the Role of Water

By "development" I mean "sustainable development," an over-used term, but one embraced by planners and policy makers interested in long-term development patterns that respond to economic and employment needs while addressing concerns of social equity and environmental quality. Simply put,

> Sustainable development is meeting social needs, developing economic opportunities, and protecting environmental quality in a manner that does not compromise future capacity to do the same.

This concept is quite different from the traditional development patterns in the coalfield counties. Despite a substantial population drawn to the region by its employment opportunities in the first half of this century, the coalfield counties have had a long history of limited infrastructure development and poor living conditions. As recently as 1970, 40% of the region's then 63,000 households lacked adequate plumbing and used outdoor privies. The economy, long dependent on the coal industry, is not sustainable, as the once-thought-plentiful coal resource base is being depleted, and coal production and employment continue to decline. For decades, the impacts of coal mining, including abandoned mine lands and acid-mine-drainage, scarred the region's natural beauty and environmental quality.

In many ways, sustainable development in southwest Virginia depends on water:

- Social well-being of the populace depends on the development of a safe and reliable water supply.
- Economic development and employment hinge on water availability for new

industry to offset loss in traditional jobs.

- Unique, ecologically sensitive waters serve as an indicator of the region's environment and an attraction for recreation and scientific study.

Developing an adequate, safe, and reliable water supply is the key to improvement in social conditions and economic diversification. At the same time, however, sustainable development requires protection of the region's natural waters. A major challenge facing the region is how to achieve these multiple objectives that may in some cases conflict.

Inherent Water Problems in Southwest Virginia

This challenge becomes clear when reviewing the several inherent water problems in the coalfield counties.

1. **Poor groundwater resources.** The heart of the region (Buchanan, Dickenson, Wise, much of Lee, and the northern portion of Russell and Tazewell counties) is in the Appalachian or Cumberland Plateau physiographic province which is characterized by shales and cemented sandstones that are poor materials for groundwater aquifers. Even in the Valley and Ridge Plateau which makes up much of the remainder of the region, where a higher conductor of water (limestone) dominates, sandstone and shale typically underlay the ridges and upland areas. For these reasons, water sources in the coalfields, particularly individual systems, are unreliable. For example, the coalfield region experiences severe water quantity problems during drought periods. Some municipal groundwater sources and many individual wells have dried out during drought periods. Even some water utilities reported unacceptable, low yields during dry summer months. While perched aquifers and resulting springs are prevalent in the region, they are prone to contamination due to the thin soil cover (which inhibits filtration of surface water as it infiltrates into the ground) and the region's land use activity discussed below.

2. **Sensitive natural waters.** The geology, physiography, and hydrology of the region have evolved to create unique ecological conditions for freshwater species. The Clinch River alone is home to more than 100 freshwater fish species, including 16 rare species such as the yellowfin madtom. The river also supports 40 species of mussels (down from once 60), 26 of which are globally rare, making it one of the most diverse freshwater mussel habitats on earth. Facing threats from zebra mussel infestation from the south, nonpoint source water pollution from coal mining, forestry, and agriculture, as well as reduced flows from further water supply development, this habitat requires special care and protection.

3. **Topography.** The topography of the region affects water in two ways. First, the steep terrain accelerates rainfall runoff, exacerbating

nonpoint source pollution and limiting both groundwater recharge and the ability of small streams to serve as water supplies during dry periods. While some reservoirs, e.g. the John Flannagan, Pound, Big Cherry, Benges Branch, and Coeburn reservoirs, currently provide important sources, new reservoirs are becoming increasingly difficult to site due to minimum instream flow and ecological constraints. Second, the topography determines the pattern of land development which winds linearly along narrow valley floors and ridge tops. The linear water line extensions needed to serve this development pattern tend to be more costly per unit served than the traditional water mains and radial distribution lines are prevalent in flat terrain.

4. **Land use.** The region's pattern of land use activity, characterized by extractive coal and forest product industries, agriculture, and on-site wastewater disposal, impacts the availability and especially the quality of individual water supplies. Coal mining can impact groundwater and surface supplies. Agriculture and timber harvesting activities pollute runoff and affect surface water and springs. Heavy reliance on on-site septic systems in the region's generally thin soils also creates the potential for contamination of ground and surface sources.

Limited financial resources. The region has had a long history of limited infrastructure development, poor living conditions, and limited local budgets, all of which place the region in a situation of "economic catch-up." As mentioned above, in 1970, more than 40% of households lacked adequate indoor plumbing. While the region has worked hard to improve conditions, there is still considerable progress to be made. As of 1990, less than one-half of households had public water and less than one-third had public sewer (see Tables 1 and 2). Funding has been a serious constraint to further progress. Most of the easy extensions of public water and sewer services have been made; what remains are more difficult and costly improvements. The income level of many unserved households inhibits rate-based financing of costly water supply options. While the planning district commissions (PDCs) offer some regional planning, and the county public service authorities and local water utilities continue development projects as they can, the region lacks an effective institutional mechanism to provide necessary oversight, and especially funding to support necessary water supply development.

Table 1: Drinking Water in Coalfield Counties
(Percent of Households)

Census Year	Public Water	Private Well	Other Source
1970	37%	38%	25%
1980	43%	39%	18%
1990	48%	37%	15%

Table 2: Sewage/Plumbing in Coalfield Counties
(Percent of Households)

Census Year	Public Sewer	Septic/ Cess-pool	Other Disposal	Inadequate Plumbing
1970	24%	37%	40%	41%
1980	28%	58%	14%	13%
1990	30%	63%	7%	6%

Signs of Hope for Improving Drinking Water in the Coalfield Counties

Since 1990, a variety of agencies and programs have responded to these inherent problems and together provide considerable promise for water supply development and service to presently unserved households in the coalfield counties. These responses are categorized in the following five areas.

1. **Planning Studies (1990s):**
   - The two planning district commissions (PDC), the county public service authorities (PSA), and other local water utilities have conducted an increasing number of water supply plans and engineering studies. As a result, there are now available (a) a much clearer understanding of the magnitude of needs for water extensions, and (b) preliminary and, in some cases, detailed project plans.
   - The Powell River Project and the Virginia Environmental Endowment jointly sponsored a two-year study of the water supply situation in the coalfield counties. The study highlighted the major issues and technical options and developed a method for analyzing the financial and rate impacts of project development.

2. **Coal-impacted Water Supply Replacement Legislation (1992):**
   Most coal mining in Virginia is by high-extraction underground methods which by design cause subsidence of the land above the mine. This subsidence can and has impacted wells and springs in proximity to the mining operation. The 1977 Surface Mining Control and Reclamation Act (SMCRA) initially

required the replacement of water supplies impacted by underground mining, but that requirement was voided by a 1980 court ruling which was reflected in revised 1983 regulations. For ten years under this rule, coal companies were not required to repair or replace damaged water supplies. Although many companies did replace supplies, this policy placed considerable uncertainty on local residents who lobbied for greater protection. The 1992 federal National Energy Policy Act changed the policy and once again required coal operators to replace water supplies damaged by underground mining; Virginia followed with similar legislation in 1993.

3. **Individual Water Supply Monitoring (1994-96):**
Clarification and awareness of the water supply situation in the region has been enhanced by monitoring programs.
   - Although it does not have a formal well monitoring program, the Virginia Department of Health (VDH) is the principal recipient of calls and concerns about domestic water quality. With this information, VDH has helped to monitor individual supply problems and to identify and raise awareness of pockets of water problems in the coalfields.
   - A well and spring water testing program implemented by the Virginia Tech Cooperative Extension and supported by the Powell River Project was conducted in the coalfield counties during 1994-96. Not only were reliability problems noted in 19% of households with individual systems, but several water samples revealed contamination exceeding the national drinking water standards. Dickenson County samples had the highest percentage exceeding the iron standard (11%), while Wise County had the highest percentage exceeding sulfate (7%), total dissolved solids (9%), and sodium (53%). Bacterial contamination was very high in well (9-24%), and especially spring (38-64%), samples in all but Wise County. Nitrate levels were generally within the standard of 10 mg/l, but more than 20% of Russell and Scott counties' samples approached that standard.

4. **Funding for Community Water Supply (1995-96):**
Recognition of the need for financial resources to address the water supply problems in the coalfields has led to initiatives to secure funding.
   - Coalfield Water Development Fund: The aim of the fund is to establish an endowment which can provide long term support of water supply development and extensions. With a seed grant of $300,000 from the Environmental Protection Agency, the Fund has begun a gap-financing program to help planned projects move forward by providing a last increment of funding.

- Federal Safe Drinking Water Act Amendments of 1996: The 1996 amendments established a revolving loan program for community drinking water systems. The program should bring about $30 million to Virginia for a revolving loan fund for public water supply improvements and extensions.

5. **Political Support: HJR 104 (1996):** House Joint Resolution 104 of 1996 established the Joint Subcommittee Studying Drinking Water Supply Problems in Southwestern Virginia. The subcommittee has brought political focus to the water supply problems of the region and generated several legislative recommendations to continue the effort to resolve those problems. The 1997 General Assembly extended this attention with the adoption of two additional resolutions: HJR 592 calls for a two-year study by the State Water Commission and the Virginia Water Resources Research Center of innovative technologies for providing safe, reliable, and affordable domestic water supplies; HJR 590 calls on the Cumberland Plateau and LENOWISCO Planning District Commissions to jointly study the most cost-effective means of providing drinking water to their residents and to develop a comprehensive regional water supply plan for the area.

Signs of Hope for Improving Natural Waters in the Coalfield Counties

In addition to actions designed to improve the drinking water conditions of the region, several government and non-government programs have set the stage for further improvement in the area's natural waters.

1. **The Nature Conservancy Clinch Valley Bioreserve (1990s):** In the early 1990s, The Nature Conservancy established the Clinch Valley Bioreserve, one of 40 places worldwide named part of the conservancy's "Last Great Places." The reserve encompasses the watersheds of the Clinch, Powell, and Holston rivers, extending for 2200 square miles across 7 counties. The Virginia sections of the Clinch and Powell are the only undammed headwaters of the Tennessee River system. The region is the most ecologically diverse region of Virginia. Including the rare freshwater species discussed earlier, the Bioreserve is home to more than 400 rare plants and animals, 22 of which are federally listed as endangered. The Bioreserve program involves community outreach, scientific study, and sustainable development initiatives to enhance protection of the ecosystem while fostering economic development and prosperity that is compatible with the sensitive environment.

2. **TVA Watershed Management Projects (1990s):**
The Tennessee Valley Authority has established a goal of making the Tennessee River system the cleanest and most productive in the United States. To achieve this goal, TVA has established River Action Teams (RATs) to work with local groups to monitor water quality and implement restoration projects to improve streams and riparian habitats. Local groups have been established in the main subwatersheds in southwest Virginia, including the Middle Fork Holston Water Quality Committee which has actively engaged public school students in education and restoration.

3. **Powell River Project coal mine reclamation, environmental research (1980s, 90s):** The Powell River Project, a cooperative effort of Virginia Tech, the state, and industry in southwest Virginia, was established in 1980 to enhance environmental improvement, economic development, and social well-being in the coalfields. This project has supported an extensive research and education program dealing with mine-land reclamation methods, water and wastewater issues, and economic development concerns. Also, the project works cooperatively with other agencies and organizations in the region, including The Nature Conservancy, TVA, VDH, Virginia Water Project, Virginia Division of Mine Land Reclamation (DMLR), among others, to address the needs of the region.

4. **Division of Mine Land Reclamation Abandoned Mine Land Program (1980s, 90s):**
DMLR has implemented the federal abandoned mine land (AML) program in Virginia, and has converted devastated lands that often contributed pollution into streams and rivers into environmentally productive lands. In addition, the program funds water supply projects for communities whose water sources have been disrupted by abandoned mines. While program funding limits the rate of reclamation, over time Virginia's lands are being returned to a productive state. Recent initiatives for remining old mines, while providing for reclamation and stabilization, has helped accelerate the progress.

5. **Virginia Water Project on-site wastewater initiatives (1980s, 90s):**
The Virginia Water Project, with state and foundation funding, has worked for nearly two decades to improve water and wastewater service in rural Virginia. Its activities in the Virginia coalfield counties have focused on indoor plumbing and on-site wastewater treatment. Improvements in wastewater handling has a considerable positive impact on natural waters.

6. **State nonpoint source pollution control programs (1990s):**
One of the major threats to natural water quality in southwest Virginia is runoff or nonpoint source pollution. While Virginia does not have a mandatory program for runoff pollution control, three agencies (Division of Soil and Water Conservation, Department of Forestry, and DMLR) work with property owners to employ land management practices, such as

vegetative buffers, runoff detention and infiltration, nutrient and chemical management in agriculture, forestry, and mining.

Keys to Improving Water Conditions in Southwest Virginia

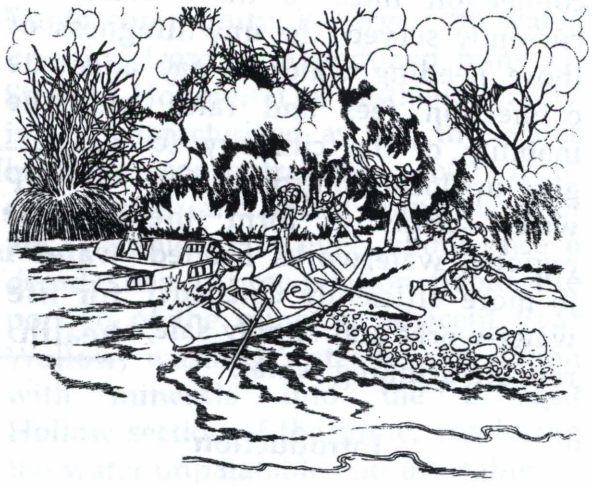
While these programs provide considerable promise for addressing the water supply and natural water quality problems in far southwest Virginia, more is needed. The four critical elements for further improvement are summarized below:

- **Money**: The region needs to attract additional financial support for water supply and water quality improvement projects. These may include revolving loans, grants, coal severance tax revenues, and other fund-raising. Efforts by the Coalfield Water Development Fund and new federal revolving loan funds should be encouraged.

- **Information**: We do not know all we need to know to address the region's water problems effectively. Continued monitoring of natural waters and private water supplies would clarify needs and help develop priorities. Further research in technical options for water supply provision and restoration of natural waters would help screen options. Analysis of financing mechanisms can determine the most efficient means of investing limited funds.

- **Collaboration:** One agency or government alone cannot adequately address the water problems of the region. The keys to success are to form partnerships, involve stakeholders, resolve conflicts, attract political support, engage existing institutions, and form new ones as needed. Only a collaborative regional effort will succeed in designing effective programs for sustainable development.

- **Planning:** Although the coalfield communities have long been noted for their independence, regional approaches are likely to provide the most promise for the region as it nears the turn of the century. Regional arrangements will require careful institutional, financial, and project planning to ensure appropriate involvement of communities, institutions, and citizens. These regional approaches must include water project planning as well as watershed, wellhead, and spring protection and water conservation to protect supplies and preserve natural waters.



DRINKING WATER PROBLEMS IN COAL COUNTIES, SOUTHWEST VIRGINIA

Charles Rest, P.E.,
Virginia Department of Health

Abstract

The problems involved in providing a safe, reliable drinking water supply to all the citizens in the coal counties are geological, topographical, technical, economic, and sociological in nature. Shales in coal beds contribute to aesthetic degradation of water by adding iron and manganese. Coal mines dewater some areas and concentrate minerals in the water supply in other areas. Karst formations contribute microbiological contamination in non-coal bearing portions of the coal counties. However, sufficient excess water treatment capacity already exists to provide an adequate water supply to all citizens in the coal counties. The major problems are the tremendous cost in extending water connection lines to those areas not currently served, the unwillingness of those needing water to pay adequate connection fees and rates, and the inability of the citizenry to give up local control of the water supply to form the regional waterworks needed to more efficiently construct water-works and supply safe, reliable drinking water.

A supply of safe, reliable drinking water is essential for life and good health.

Introduction

Safe, reliable drinking water is essential for life and good health. A safe, reliable drinking water supply:

- protects a community from the numerous disease-causing micro-organisms that are common in nature and present in so many of the world's drinking waters;
- protects a community from harmful chemicals that exacerbate cancer or long-term chronic diseases of the heart and nervous system;
- provides aesthetically pleasing water at adequate pressures whenever a consumer opens a tap to fill the glass, prepare food, shower, or attend to daily needs; and,
- is not available to many of the citizens of the Commonwealth who reside in the coal counties.

The seven Virginia coal counties include Buchanan, Dickenson, Lee, Russell, Scott, Tazewell, and Wise. The coal bearing portions of the counties consist of sandstone and shale formations with coal beds. They are generally characterized as mountainous with drastic relief, resulting in steep hollows and narrow ridges. The non-coal bearing portions of the counties generally have alternating wider valleys composed of karstified dolomite and ridges capped with sandstone. The population is well organized into towns of various sizes which serve as trade and government centers but is not well organized in counties where

the population is strung out along transportation corridors in valleys and on ridges. The remote valleys and ridges of the coal counties initially attracted those who yearned for independence from too much government, or those who wished to be free to do as they desired on their patch of land. These early immigrants settled in a diffuse pattern, farming and timbering the land and passing it on to the next generation to do likewise and establishing small towns as centers of trade and government. A later wave of immigrants was attracted by the economic draw of working in the coal mines. These immigrants settled in labor camps, often company camps remote from the centers of trade and government established by the first wave of settlers, and were generally subservient to the coal companies.

Below, I will address the drinking water problems in the coal counties which are geological, topographical, technical, economic, and sociological in nature.

Groundwater Problems

The groundwater in coal-bearing formations is generally of poor aesthetic quality. It generally contains high concentrations of iron and manganese, which lend a bitter taste to beverages and food prepared with it and which tends to stain laundry orange, brown, or black, depending on the relative mineral concentrations. Furthermore, in areas where deep mining has occurred, the quantity of water available is often insufficient to meet families' needs or not available at all. This is because water travels through the ground taking the path of least resistance, i.e., it travels through mined out coal seams to a drain. These quality and quantity problems have generated public demand for the extension of community water systems. On the other hand, when mines are abandoned and the mine drains closed, water accumulates in underground lakes and floods the seams, dissolving the minerals in the adjacent shales. For example, the Dante community is served by water draining from an abandoned mine in Straight Hollow. The aesthetic quality is best characterized as fair, the water having concentrations of iron, manganese, and other minerals that are tolerable. However, about once a decade, heavy precipitation floods the portion of the mine in adjacent Bear Wallow, washing water heavily laden with minerals into the Straight Hollow section of the mine, rendering the water unpalatable and unusable.

The groundwater in the non-coal-bearing formations may be of poor microbiological quality. Water dissolves limestone and dolomite

forming solution channels, which over a period of thousands of years, grow into caves and form the low-lying springs typically found in those areas. These solution channels serve as conduits for the rapid transfer of surface precipitation into the ground-water system. This precipitation picks up microbiological contaminants while flowing across the surface. The conduits short-circuit the natural filtration ability of the rock. Limestone and dolomite are similar to an insect screen with a one-inch hole poked through it. Insects can pass through the hole. Similarly, microbes pass through the solution channels formed in the limestone and dolomite.

In those areas where the surface precipitation must pass through a sandstone layer, it may be adequately filtered to remove microbiological contaminants. Sandstone and granite rock can be compared to a new insect screen, air can pass through the screen and insects can not. Similarly water can pass through the pores in sandstone and granite, but microbes can not. That is why the water is generally microbiologically pure in the coal-bearing formations, where the water passes through layers of sandstone. However, in the non-coal-bearing portion of the counties, sandstone formations are generally on the ridge tops presenting less area for precipitation to pass through than do the valleys, and thus have smaller recharge areas. Wells and springs originating in ridge top formations generally have a small quantity of water and tend to dry up during droughts.

History of Public Water Supply

Purifying water is a relatively expensive process in comparison to capturing water from a spring or pumping water from a well. In the coal counties, treatment plants have traditionally been built to clean the microbiological contaminants from the water or to remove iron and manganese. Those water treatment plants initially constructed in the coal counties in the 1920s and 30s were constructed by coal companies that needed to keep laborers close to the mine or were built by towns that had the population base over which to spread the cost, and in one case, was built by the Works Progress Administration.

The private sector has not been able to meet the challenge of providing safe, reliable water service in this area. Historically, private sector initiatives involved the provision of water supply to small subdivisions. As early as the 1920s, town governments began assuming responsibility for operating waterworks that were first created by the private sector. The private sector was unable to obtain the capital to create efficient distribution systems nor the rate structure necessary to provide adequate maintenance of their existing sources and waterlines. Similarly, coal companies did not have an interest in doing more than the minimum required to get water to houses, and after the coal ran out, sought to transfer responsibility for water supply to other parties. Towns were forced to step in when water service deteriorated.

In the 1960s, many towns realized they needed sources that were more reliable than the springs, wells, or ancient surface treatment facilities they were operating. The towns of Bluefield, Richlands, Tazewell, Coeburn, St. Paul, Pound, Gate City, Big Stone Gap, and Wise constructed or upgraded surface water treatment facilities at that time.

Counties were late getting into the business of providing drinking water to their citizens. Tazewell County created an authority to provide water and sewer service to the Raven and Doran areas of the county in the early 1960s and constructed a water treatment plant on the Clinch River. During the 1970s, two counties recognized the need for pure water and created authorities to construct and operate treatment facilities, leading to the construction of the John Flannagan Water Authority Water Treatment Plant to serve Buchanan County and the town of Clintwood and the Wise County Public Service Authority Water Treatment Plant at Carfax. Unfortunately for their citizens, the political leadership of our other counties did not recognize the need for pure water, the failure of the private sector to be able to meet the demand and need, and the necessity for intensive government involvement if water was to be supplied. These counties are now playing catch-up.

Nonetheless, a sufficiently under-utilized surface water treatment capacity exists in the coal counties to be able to supply the demands of the coal counties. Regional water plants operating at less than 60% of capacity are located at Carfax, Flannagan Lake, Richlands, and in neighboring states at Ada, West Virginia, and the Arthur Shawnee Utility District in Tennessee. Surplus capacity also exists at smaller water plants at Pocahontas, Raven, Wardell, St. Paul, Lebanon, Duffield, Appalachia, and elsewhere.

The Problems With Utilizing Existing Water Sources

If this surplus exists, what is the problem?

Location: The population that is easily served from community waterworks is already served. The areas in coal counties that are not served by public surface water systems are generally remote. The population is spread out along a main thoroughfare. Relatively large amounts of waterlines/ connections must be installed in order to get the water to the customer.

Control: It is often human nature for the political leadership of local government and the citizenry to generally restrict their concern to within the borders of their own community. Towns, which first developed water sources, hesitate to give up control of their resources to regional waterworks. County authorities, which are seeking to extend service to areas outside of towns, often have difficulties reaching agreements that are satisfactory to both parties. Some towns often view water supply as a 'profit' item to supplement the town budget and decrease town tax burdens, thus seeking to extract what the 'market will bear' from county water authorities. Such attitudes have delayed construction of water service

to some communities in the coal fields for well over a decade. Such attitudes have caused one authority to serve their customers water of a lesser aesthetic quality from a source they control, rather than purchase better quality water from the local government from whom the waterworks were designed to receive water. Such attitudes have utilized precious funds developing sources and distribution facilities that can be called 'our own' rather than connect or to help create regional waterworks that could provide less expensive and more reliable water service. Such attitudes keep small, relatively inefficient water treatment plants and waterworks in service and prevent the mergers that would allow relatively large, more administratively efficient waterworks to develop.

Attitude: Willingness to pay the cost of obtaining water is another problem. Citizens who have a good water supply are often unwilling to pay the rates required to continue to provide good service and keep up the maintenance on their existing waterworks, let alone keep up the waterworks, or extend it. In this day and age, no small government entity should be in the water business! If the seven coal counties are to advance economically, they must learn to work together as a region. The very political essence of towns and counties often prevents this. Towns and counties were organized to attend to local needs and they provided a service to their citizens by developing and operating community drinking water supplies. Now the entire region needs a safe, dependable drinking water supply. Most towns have a safe, dependable drinking water supply, and have plenty to worry about trying to provide other services to their citizens. Thus, regional water supply is not a high priority. The water needs are outside of towns and often require the cooperation of towns if they are to be met. Towns and counties could contribute to the long term development and stability of the region by turning over their water production and distribution facilities to a larger entity that has the ability to deal with regional issues. Town and county ownership of water production and distribution facilities often stands in the way of regional development of water supplies.

The West Virginia American Water Works is currently constructing a 25 Million/Gallon/per day (MGD) water treatment facility on the Bluestone River and is constructing waterlines to serve southern West Virginia, and is merging with several individual waterworks which have become inefficient to continue to operate in the current times. Seven counties in South Carolina have united to construct a 34 MGD water treatment plant and distribution system to efficiently serve themselves. Meanwhile, we in the coalfields of Virginia struggle mightily among ourselves to put together coalitions to construct 2.5 MGD water plants.

Our vision is too small and our desire for local political control is too great!

COAL REGION GROUNDWATER RESOURCES: POTENTIAL MINING IMPACT AND REGULATORY

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Abstract

Groundwater in the southwest Virginia coalfield area is predominately derived from a shallow fracture flow system. Water supplies developed in this shallow fracture system are often of marginal quantity and quality and, subsequently, are readily susceptible to a variety of natural and manmade impacts. Coal mining activity represents one potential impact. Water supplies adversely impacted by surface coal mining operations are required to be replaced by the mine operator for operations conducted under Virginia's Coal Surface Mining Reclamation Regulations. Under state law, certain domestic water supplies impacted by underground mining conducted after October 24, 1992, are also required to be replaced. Additionally, Virginia's Abandoned Mined Land program can develop water systems for communities where water supplies are predominately adversely impacted by mining conducted prior to the effective date of Virginia's coal surface mining regulatory program, December 15, 1981.

Geologic Setting of the Southwest Virginia Coalfields

The coal-producing region of southwest Virginia includes the counties of Buchanan, Dickenson, Wise, Lee, Russell and Scott (Figure 1). This area lies wholly within the Appalachian Plateau Physiographic Province, which in Virginia includes the Cumberland Overthrust Block and the Logan Plateau (1). The Cumberland Overthrust Block is topographically expressed in Virginia by Pine Mountain, which is the northernmost terminus of the block and forms the Kentucky-Virginia Border, the valley of the Russell Fork River, which follows the easternmost terminus of the block, the Russell Fork Fault, and the valley of the Clinch River, which roughly follows the southernmost terminus, the Hunter Valley Fault. The coal measures are further delimited in Wise and Lee Counties by Little Stone and Stone Mountains, which are the northwest limbs of the Powell Valley Anticline, a broad anticline internal to the Cumberland Overthrust Block, and the highlands of the High Knob/Powell Mountain Massif. The coal measures within these limits are transacted northeast to southwest by the Middlesboro Syncline. The synclinal nature and boundary faults differentiate this region from the Logan Plateau. To the north and east of the Russell Fork Fault, a small portion of Dickenson and the whole of Buchanan Counties lie within the Logan Plateau. The Logan Plateau is highly dissected, with narrow valleys, steep slopes and narrow-crested ridges. Relief is 500-

2500 feet. Relief is similar in the Cumberland Overthrust Block, but this area also contains broad-crested ridges more typical of the classic plateau. Coal production in southwest Virginia is from strata of Pennsylvanian Age from the Pocahontas, New River, Kanawha, Lee, Norton, Wise and Harlan Formations and ranges from depths at sea level in the Pocahontas Formation to 3000+ feet above sea level in the Harlan Formation (2).

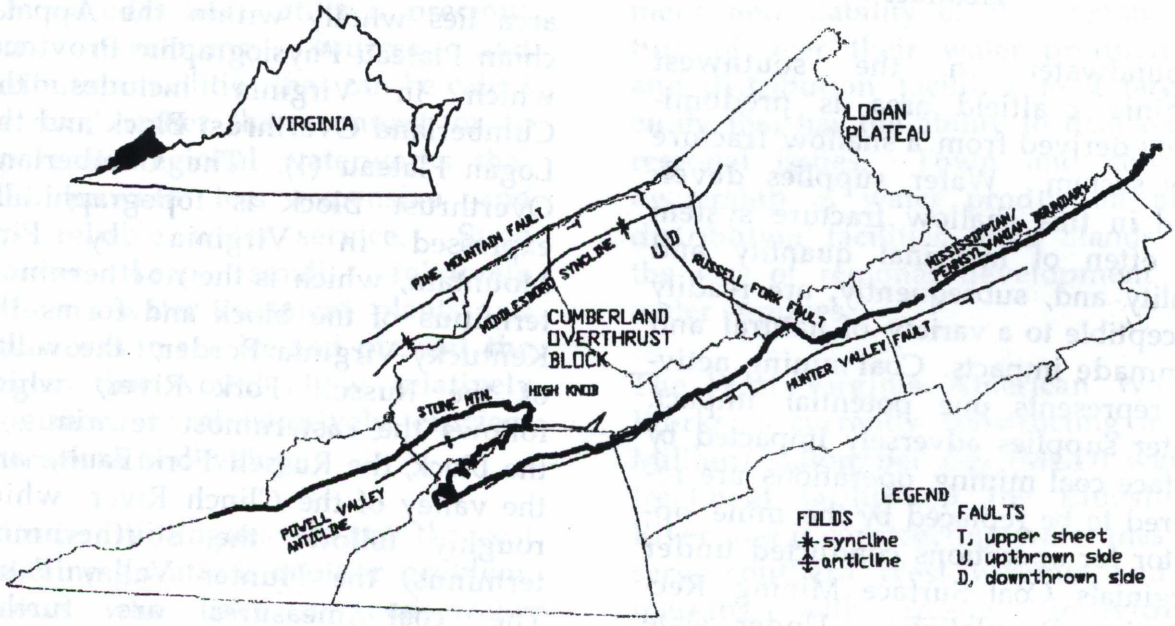

Figure 1. Coal-producing region of southwest Virginia

Ground Water Occurrence

Within the Cumberland Overthrust Block, the structural boundaries to the north (Pine Mountain) and the south (Stone, Little Stone and High Knob/Powell Mountains), cause artesian, semi-confined conditions to exist. That is, along the base of these mountains where dip is into the Middlesboro Basin, water from the highlands can be under artesian conditions as it travels down-dip. However, the bulk of both the Cumberland Overthrust Block and Logan Plateau are typified by a fracture-flow groundwater system (3, 4). In this system, groundwater occurs in, and is transmitted through, fractures in the coal bearing strata. Figure 2 illustrates movement in this system. Groundwater originates as precipitation (A), travels through soil and colluvium (B), and enters stress-relief and tectonic (where present) fractures, moving down-gradient (i.e., down-slope) in a stair-step fashion (C) to the valley floor-fracture system (D).

While transmission is not in any one rock unit, per se, coal seams themselves may act as aquifers, with cleating forming secondary porosity and underclays acting as aquitards, and may alter the predominant downslope movement to down-dip. Thus, where a coal bed intersects the shallow fracture system (E), water may move through the coal seam, emerging as contact or colluvial springs, especially near the lower half of ridges. Overall, movement is to the stream valley bottoms and underlying fractures. Consequently, the greatest quantity of groundwater is found in the valley-floor fracture system.

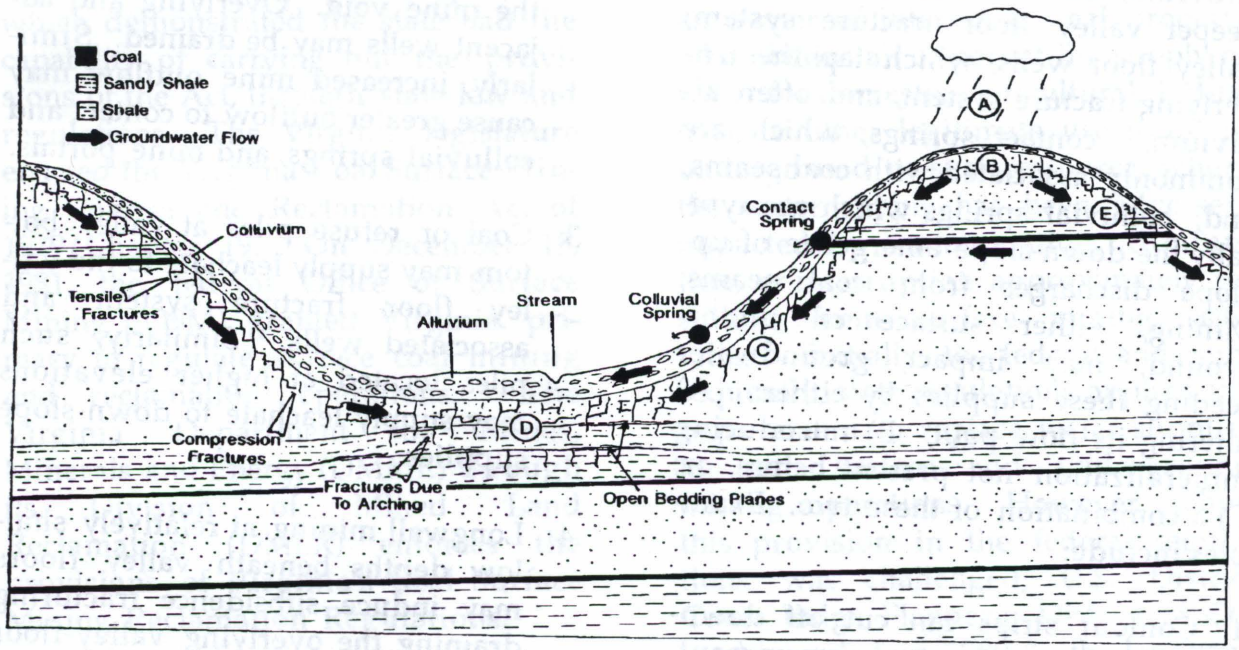

Figure 2. Fracture-flow groundwater system

Groundwater Quality

Ground water quality in the southwest Virginia coalfields is a function of where the water is in the above described flow system. Generally, groundwater encountered at higher elevations is less mineralized than groundwater at valley bottom, simply because that water has been in the flow system for a shorter period, i.e., less contact time with coal and coal-bearing strata. However, groundwater that has long residence time in a coal seam, regardless of elevation, may have higher levels of sulfates and iron, and lower pH. The poorest quality groundwater is found at valley bottoms, ironically where quantity (potential production) is greatest. Additionally, risk of non-mining pollutants is greatest at valley bottom, where most non-coal development, such as residential housing, occurs. At depths greater than 300 feet below valley bottoms, highly mineralized, saline (connate) water is often encountered (5).

Impacts Due to Mining and Regulatory Requirements

Figure 3 illustrates water supplies typically constructed in the coalfield fracture-flow system: ridgetop wells, the lowest producing wells but often of best quality; valley slope wells; alluvial wells, associated with valley floor alluvium, but not associated with the deeper valley floor fracture system; valley floor wells, which tap the underlying fracture system, and often alluvium; contact springs, which are commonly associated with coal seams, and; colluvial springs which are typically the down-slope emergence of up-slope discharges from coal seams. Mining, either surface or underground, may impact groundwater feeding these supplies by either: A) altering its flow path; B) introducing mineralization not present before, or; C) a combination of these two. Examples include:

1. Contour strips can cut off down-slope groundwater movement, limiting or stopping recharge to down-slope wells and springs. Prior to backfilling and reclamation, recharge to the coal seam horizon can be enhanced.

2. Conventional underground mining with secondary recovery in upper parts of ridges may cause subsidence fractures and enhance preexisting fractures, causing groundwater to move vertically to the mine void. Overlying and adjacent wells may be drained. Similarly, increased mine outflow may cause greater outflow to contact and colluvial springs, and mine portals.

3. Coal or refuse piles at valley bottom may supply leachate to the valley floor fracture system and associated wells. Similarly, such piles located at higher elevations may supply leachate to down-slope supplies.

4. Longwall mining at relatively shallow depths beneath valley floors may induce subsidence fracturing draining the overlying valley-floor fractures.

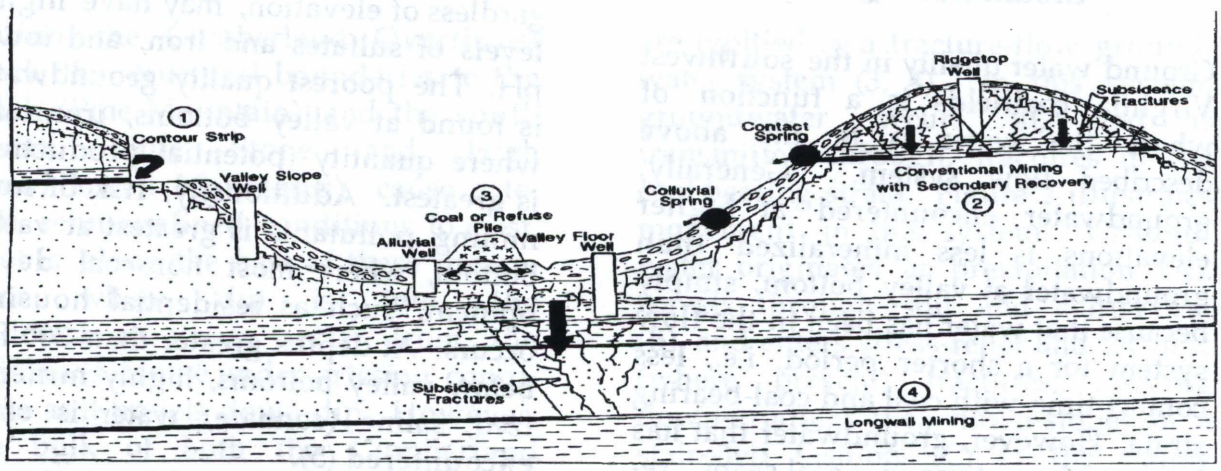

Figure 3. Potential mining impacts

On August 3, 1977, the U.S. Congress passed Public Law 95-87, the Surface Mining Control and Reclamation Act of 1977 (SMCRA). Each state, in which there were or could be coal mining operations and wanted to assume exclusive jurisdiction over the regulation of surface coal mining and reclamation operations, had the option of submitting a state program which demonstrated the state had the capability of carrying out the provisions of the Act, through state law and regulations. The Virginia legislature enacted the Virginia Coal Surface Mining Control and Reclamation Act of 1979/Chapter 19. On December 15, 1981, the federal Office of Surface Mining (OSM) granted Virginia primacy to regulate surface coal mining and reclamation operations. The Virginia Department of Mines, Minerals and Energy (DMME) through its Division of Mined Land Reclamation (DMLR) enforces the provisions of Virginia's Coal Surface Mining Reclamation Regulations.

The Virginia regulations require the applicant seeking a coal mining permit to submit geologic and hydrologic information for the potential impact area of the proposed operation. Baseline quantity, quality, and usage data for surface water and groundwater resources; stratigraphic data, including geologic cross-sections and strata analyses; and surface water, groundwater, and NPDES monitoring plans are in the submitted information. The application must also include a determination of the probable hydrologic consequences (PHC) of the proposed operation upon the quality and quantity of surface and groundwater for the proposed permit and adjacent areas. Based on this information, the mine plan must be designed to minimize disturbances to the hydrologic balance within the permit area and to prevent material damage to the hydrologic balance outside the permit area.

The regulations state "Any person who conducts surface mining activities shall replace the water supply of an owner of interest in real property who obtains all or part of his supply of water for domestic, agricultural, industrial, or other legitimate use from an underground or surface source, where the water supply has been adversely impacted by contamination, diminution, or interruption approximately resulting from surface mining activities." Initially, the federal and, subsequently, state regulations applied the requirement to replace water supplies to both surface and underground mining operations. However, when this provision in the federal regulations was challenged, U.S. District Court Judge Flannery, District of Columbia, ruled in 1980 "...the language of Section 717(b) is clear; it requires water replacement only for surface coal mining operations. Hence, water replacement applies only to surface coal mining operations. There is simply no statutory basis to apply it to underground mines." Based on this ruling, the water replacement requirement was removed from the federal and state underground mining regulations.

The federal Energy Policy Act of 1992 (EPACT) included revisions to SMCRA requiring the replacement of certain water supplies impacted by underground mining. The effective date for the new SMCRA requirements was

the date of passage of the act, October 24, 1992. However, unlike the surface mining water replacement requirements, only certain water supplies are eligible for replacement under the underground mining requirements established by EPACT. The 1993 session of the Virginia general assembly passed House Bill 1687 amending Chapter 19 of Title 45.1 of the Code of Virginia governing replacement of certain water supplies adversely affected by underground mining. The bill closely tracked the changes to the federal SMCRA. Eligibility for replacement is based on several criteria. The water supply must:

1. be used for drinking, domestic, or residential uses;
2. be from a well or spring, and;
3. have been in existence prior to the date the coal operator applied for the permit to mine the area, mined on or after October 24, 1992.

Abandoned Mined Land Program Funding for Water Supplies

The purpose of the Abandoned Mined Land (AML) program, as stated in SMCRA, is to "promote the reclamation of mined areas left without adequate reclamation prior to enactment of this Act and which continue, in this unreclaimed condition, to substantially degrade the quality of the environment, prevent or damage the beneficial use of land or water resources, or endanger the health or safety of the public." The federal Abandoned Mine Reclamation Fund was established with the passage of SMCRA. The fund, from a per ton tax on coal production, provides funding to reclaim abandoned mine sites, primarily those abandoned prior to passage of the Act (August 3, 1977). Effective December 15, 1981, OSM granted Virginia primacy for the AML program, administered by the Virginia DMME. Federal funding of Virginia's AML program primarily allowed abatement of problems only on the highest priority sites (priority 1 and 2); those involving public health and safety issues. Other than environmental problems corrected incidental to the abatement of health and safety concerns, most AML environmental problems could not be addressed, including water quantity and quality issues. Recognizing the severe public health hazards associated with water supplies adversely affected by abandoned coal mine workings, Congress amended the Act. The 1990 amendment allows for possible AML funding of water projects, including facilities relating to water treatment, supply or distribution.

Virginia's AML program may fund projects where the adverse effects are due predominately to the effects of mining processes undertaken and abandoned prior to December 15, 1981. DMME may expend up to 30 percent of its annually granted AML funds for construction or repair of water supply systems which were adversely affected by past coal mining practices. The amount of funding available for water projects changes from year to year , depending on several factors, including AML fees collected, number of emergencies which may occur for any given

year, and the number and cost of other critical non-water projects. Eight AML program water projects funded to date are:

1984 Central Wise County Water System (Sandy Ridge), funded through AML by a special Congressional appropriation, served 350 households. The project included construction of a raw water intake plant and pipeline extensions from Coeburn to Norton and Coeburn to Wise, serving the Crab Orchard community southeast of Coeburn and all areas along U.S. 58A, including Riverview west of Coeburn and Tacoma. Funds for the project included $1.3 million from AML and $85,600 from the Wise County PSA for a total combined funding of $1,385,600.

1986 South Clinchfield Water Project in Russell County, funded through AML by a special congressional appropriation, provided water to about 85 homes. A central water system was installed to south Clinchfield from the Gravel Lick water tank following State Route 615 for approximately 3.8 miles. The $815,000 AML grant fully funded the project.

1990/1992 Harman water project in Buchanan County, funded by AML in two phases, served about 300 households. The 1990 fiscal year funds were used to provide water to about 150 households in the lower section of the Harman community and several smaller communities along Bull Creek and northwest of Grundy. The 1992 funds were used to extend the water line to about 150 residences along State Route 609 and tributaries including Big Branch, Jess Fork, Deel Fork and Belcher Branch. AML provided $1.3 million of the approximately $3 million total project cost.

1993 Nealy Ridge water project in Dickenson County extended the Big Caney water system from Carve Beech Gap for 6 miles to and along State Route 663. Sixty households were in the project area. Of the estimated $872,000 project cost, $750,000 of AML funds were allocated. The project was completed in the summer of 1994.

1994 The estimated $820,000 Horton Ridge project in Russell County received about $750,000 from AML to extend the Swords Creek water system along Routes 67 and 645. The project, completed the summer of 1996, provided water to about 50 households.

1994 The ongoing Johnson Hollow project in Tazewell County will provide water to over 40 households in the Raven and Doran communities along U. S. Route 460 and State Route 617. The estimated $720,000 project received $666,430 from AML. Tazewell County has rebid part of the project since bids received exceeded the total funding.

1995 The estimated $1.3 million Poplar Creek-Hoot Owl water project in Buchanan County will provide water to about 120 homes by extending the Buchanan County PSA System along Routes 615 and 604, across Hoot Owl Gap, and into the Poplar Creek community. AML provided about $750,000 for the project. Construction started the summer of 1996.

1996 The estimated $2.8 million Brushy Ridge water project in Dickenson County received $750,000 from AML. The project has not been bid yet but, when completed, will provide water to about 150 homes by extending the Big Caney water system along Routes 650, 651 and 627 from Nora into the Brushy Ridge community.

Communities that have experienced water loss can apply for AML funding of water systems. Local governments submit applications for project funding through either the LENOWISCO or Cumberland Plateau Planning District offices for DMME evaluation. In 1994, the "AML Water Project Review Manual" was developed to assist the applicants in the preparation of their submittal and to outline the evaluation criteria used in the selection process. This year, the DMME expects to receive two requests for AML water project funding. The expected applications are for (1) the Bold Camp area near Pound in Wise County (LENOWISCO) and (2) for the Lynn Springs area near the Swords Creek community of Russell County (Cumberland Plateau). The applications from the PDCs are due at DMME's Big Stone Gap office on or before October 1, 1996. The funding level to be received from OSM for AML water projects is expected to be approximately $750,000. Due to anticipated project costs and level of available funding, only one of the two proposed projects may be selected for AML funding. If a county has an ongoing AML funded project, another project cannot be funded until the current project is substantially completed (75% of the funds expended).

Acknowledgments

Figures 2 and 3, and portions of the text, previously appeared in *The Professional Geologist*,, a monthly publication of the American Institute of Professional Geologists (Reference 4). Used with permission.

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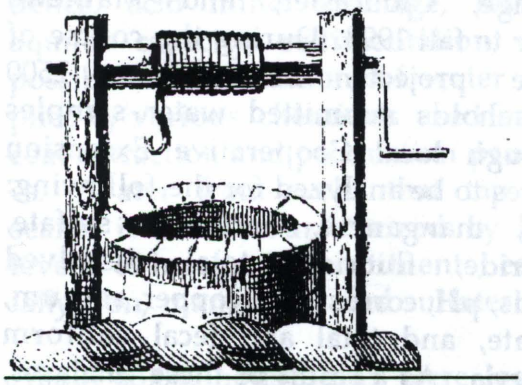

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HOUSEHOLD WATER QUALITY IN THE COAL-PRODUCING COUNTIES OF SOUTHWEST VIRGINIA

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Introduction

In Virginia, nearly all farmsteads and rural homesites are served by individual water systems, most of which are groundwater supplied (1). While the users of many of these rural water systems have historically experienced poor water quality due to natural conditions, public concern about groundwater pollution and protection is at an all-time high in Virginia. In recent years, local governments have been faced with the need for extensive, reliable data on the quality of rural water supplies to aid in decision making for groundwater protection and landuse planning. Although state and federal agencies have conducted numerous studies of both surface and groundwater resource quality, research-based information on the quality of household water from private sources in Virginia is limited.

To address the needs faced by individuals and local governments regarding rural water supply and quality, Virginia Cooperative Extension (2) initiated a pilot program of household water quality education in Warren County, which included water sampling, testing, and diagnosis. Based on requests and support from local interests, subsequent programs were conducted in the counties of Page, Rappahannock, Clarke, Culpeper, Madison, Montgomery, Greene, Orange, Gloucester, and Mathews prior to fall 1993. During the course of these projects, more than 2500 households submitted water samples through local Cooperative Extension offices to be analyzed for the following: iron, manganese, hardness, sulfate, chloride, fluoride, total dissolved solids, pH, corrosivity, copper, sodium, nitrate, and total and fecal coliform bacteria. As a result of these analyses, the major household water quality problems identified were determined to be iron/manganese, hardness, corrosivity, sodium, and bacteria.

Background

Residents of the coal mining region of Virginia, generally considered to be comprised of the seven coal-producing counties of Buchanan, Dickenson, Lee, Russell, Scott, Tazewell, and Wise (including the City of Norton), are not immune to such contamination. Household water users in far southwestern Virginia have historically encountered water of poor quality because of natural conditions (3). Shallow wells or springs in the region may naturally dry up during the summer months and be easily contaminated by landuse practices. The karst terrain, common in the

Ridge and Valley physiographic province, primarily covering Lee, Scott, Russell, and Tazewell Counties, is characterized by numerous sinkholes and solution channels which may accelerate the movement of contaminants into deep wells. The coal mining activity in the Appalachian Plateau physiographic province, predominant throughout Buchanan, Dickenson, and Wise Counties, can lead to such water-related problems as land subsidence, acid mine drainage, loss of aquifer capacity, sedimentation, and possible contamination of water supplies by various chemicals used in the coal extraction and production processes. Water from wells that tap coal seams is often characterized by high levels of inorganic constituents; especially iron, manganese and sulfates (14).

About 88,000 households were located within the seven-county region in 1990, and of these, more than 50% used sources other than public/private water systems (5). A relatively large portion (16%) of all households obtain water from "other" sources, suggesting that residents are relying on springs, using cisterns, or hauling water from another location. There is also evidence that most individual water supply systems are inadequately constructed. It has been estimated that, in the seven counties comprising the Virginia coal region, 95-100% of the dug wells and 40-90% of the drilled wells are improperly constructed (1).

Objectives

The primary goal of this project was to extend Virginia Cooperative Extension's Household Water Quality Education Program that was started in Warren County (2) to the seven coal producing counties of Buchanan, Dickenson, Lee, Russell, Scott, Tazewell, and Wise over a two-year period. The program was intended to result in an improved quality of life for rural household residents in these counties by increasing awareness and understanding of water quality problems, protection strategies, and treatment alternatives, as well as to provide an assessment of the overall quality of available water resources for household use.

Specific objectives of this project were:

1. For up to 2800 of the private household water supplies in Buchanan, Dickenson, Lee, Russell, Scott, Tazewell, and Wise Counties to be tested, and for users of these supplies and others to understand the causes and implications of high levels of nitrates, bacteria, and other contaminants, and to implement corrective and protective measures where needed.

2. To assist local government decision making for land use and groundwater management planning by providing an extensive database, documenting the status of existing water quality and areal trends as affected by physiographic properties and landuse activities.

The intent of this report is to highlight some of the major findings of the Coal County Household Water Testing and Information Program. A more complete review is available (6) and additional information specific to each county program may be found in

earlier reports prepared for the individual counties (7-13).

Methods

In fall 1993, a regional household water quality testing and information program was initiated in the seven coal counties of southwest Virginia. This effort was modeled after the program conducted in Warren County (2) and ten other counties prior to fall 1993. The foundation of the water quality education program was a diagnostic water testing and interpretation program offered to interested participants from the seven targeted counties (Dickenson County during fall 1993, Scott and Wise Counties during spring 1994, Russell and Tazewell Counties during fall 1994, and Lee and Buchanan Counties during spring 1995). The programs were conducted through the Virginia Cooperative Extension offices in each county.

The educational programming effort consisted of two series of public meetings sandwiched around the testing program, as well as news articles, radio programming, and printed materials. Prior to any water testing, the first series of meetings provided participants' information about the hydrogeology of the area, likely sources of contamination, health significance of household water quality, and basic water sampling and testing procedures, and provided an opportunity to sign up for the testing program.

For a small fee, participation in the testing program was open to any resident of these counties who relied on an individual, privately owned household water system (well, spring, cistern, etc.), on a first come, first serve basis. The analyses, conducted by the Biological Systems Engineering Water Quality Laboratory at Virginia Tech, included iron, manganese, hardness, sulfate, chloride, fluoride, total dissolved solids (TDS), pH, saturation index, copper, sodium, nitrate, and total and fecal coliform/E. coli bacteria.

Participants were provided with sampling kits and instructions for taking their own samples. Procedures called for sampling at a cold, drinking water tap after the system had been run for several minutes and the plumbing flushed. Upon submitting water samples, participants were required to complete a sample information form and questionnaire providing such information as location, type, and characteristics of water supply, treatment devices in use, proximity of water supply to potential pollutant sources, such as a septic system drainfield, and perceptions of their household water quality.

The second series of meetings was directed to those persons having had their water tested. These meetings were held to disseminate and explain the test results and to discuss sound management practices to eliminate, reduce, or prevent water contamination. In some cases, recommendations included further diagnostic testing by a private water testing laboratory, and/or site surveys conducted by environmental health specialists from local offices of the Virginia Department of Health.

At the conclusion of the testing and information dissemination portion of the program, all participants were surveyed by mail through an evaluation form completed and returned anonymously to assess their improved level of understanding, as well as their motives for participating in the testing program. Information was also obtained regarding participants' follow-through with specific recommendations to the extent that the limited project time-frame allowed. In addition, limited socio-economic information was collected to provide a profile of the participant audience.

Throughout the course of the program, local government and public officials were kept apprised of the water quality test results. All water quality test results, along with pertinent water supply characteristics, were coded and entered into a computer database. (To assure confidentiality of test results, all references to individual's names, addresses, and telephone numbers were purged from this listing.) The database was developed in such a manner to readily allow modification for further analysis, mapping, etc. for use by county or district level planners.

Findings

During the course of the project, provisions were made to analyze up to 400 household water supplies in each of the 7 counties. Despite consistent and concerted efforts to publicize the program and facilitate availability in each county, participation in this voluntary program varied widely by county. Although slightly more samples were originally received from each county, the sample totals representing bona fide and unique household water supplies for each county are presented in Table 1. The percentages of participant households utilizing wells, springs, and cisterns in each county are also listed in Table 1.

Table 1. Participant Household Water Sources

County	Samples (#)	Wells (%)	Springs (%)	Cisterns (%)	Other (%)
Dickenson	410	77.3	14.4	7.3	1.0
Scott	142	78.9	21.1	0.0	0.0
Wise	128	77.3	21.1	0.8	0.8
Russell	57	87.7	10.5	1.8	0.0
Tazewell	74	64.9	35.1	0.0	0.0
Lee	127	68.5	29.9	0.8	0.8
Buchanan	26	96.2	3.8	0.0	0.0
ALL	964	76.6	19.4	3.4	0.6

In order to assess housing density, which may have an impact on water quality with respect to proximity to potential sources of contamination, such as septic systems, participants were asked to classify their housing environs as one of the following four categories, ranging from low to high density: (1) on a farm, (2) in a remote, rural area, (3) in a rural community, (4) in a housing development/trailer lot. As shown in Table 2, rural community was the most common and housing development/trailer lot the least common across the seven counties.

Table 2. Housing Environs of Participant Households

County	Farm (%)	Rural Lot (%)	Rural Community (%)	Housing Development (%)
Dickenson	13.8	19.2	62.8	4.1
Scott	56.7	8.6	34.0	0.7
Wise	9.5	21.3	61.4	7.9
Russell	27.6	3.9	41.3	25.6
Tazewell	33.2	8.7	50.5	7.3
Lee	58.9	11.4	29.4	0.0
Buchanan	3.8	15.4	61.5	19.2
ALL	27.4	15.2	51.9	5.4

Participants were asked if their household water systems had water treatment devices presently installed to deal with water quality problems, and if so, the type of device. Nearly one-fourth of all participants reported at least one treatment device installed, with the most common types of treatment devices in use being water softeners and sediment filters (Table 3).

Participants were asked about problems they were currently experiencing with their household water systems. Information about the reliability of water sources was sought. Eleven percent of the participants reported that their water supply was regularly interrupted for a variety of reasons.

Twenty percent of the participant households indicated that, instead of their primary household water source, they used another source of water for drinking/cooking purposes. Fifty percent of these reported that they relied on bottled water for such uses. Other cited sources of alternative drinking/cooking water were a community spring, private, individual source belonging to a friend or relative, or a private/public water system source not connected to the participant household.

Table 3. Household Water Treatment Devices Installed

County	Treatment Equip. (%)	Water Softener (%)	Iron Filter (%)	Auto. Chlorinator (%)	Acid Neutralizer (%)	Sediment Filter (%)	Carbon Filter (%)	Other (%)
Dick.	38.5	23.2	14.1	2.4	1.2	7.1	5.9	1.2
Scott	16.2	4.9	1.4	2.8	0.0	8.5	1.4	0.7
Wise	43.0	28.9	19.5	5.5	3.9	12.5	94	1.6
Russ.	19.3	14.0	1.8	0.0	0.0	3.5	1.8	0.0
Taze.	21.6	5.4	0.0	0.0	0.0	14.9	2.7	2.7
Lee	20.5	6.3	2.4	0.8	0.0	9.4	2.4	5.5
Buch.	57.7	11.5	3.8	0.0	0.0	38.5	0.0	3.8
ALL	31.5	16.8	9.3	2.3	1.0	9.5	4.6	1.9

Participants were asked about their perceptions of their household water quality in terms of aesthetic properties. Participants were asked whether or not they presently (in both the cases of treated and untreated water) experienced one or more of the following conditions: (1) corrosion of pipes or plumbing fixtures; (2) unpleasant taste; (3) objectionable odor; (4) unnatural color or appearance; (5) staining of plumbing fixtures, cooking appliances/utensils, or laundry; and (6) floating, suspended, or settled particles in the water. These results are summarized in Table 4 for each county.

Table 4. Participants' Perceptions of Household Water Aesthetic Problems

Co.	Corrosion (%)	Taste (%)	Odor (%)	Appearance (%)	Staining (%)	Particles (%)
Dick.	22.4	37.8	35.6	30.5	52.2	31.2
Scott	14.1	9.9	10.6	16.9	31.7	16.2
Wise	23.4	39.1	44.5	26.6	50.8	25.0
Russ.	15.8	17.5	10.5	7.0	24.6	19.3
Taze.	20.3	13.5	17.6	10.8	25.7	25.7
Lee	15.0	21.3	19.7	11.8	23.6	17.3
Buch.	38.5	38.5	26.9	34.6	61.5	26.9
ALL	20.2	28.6	27.9	22.7	41.8	25.1

As mentioned above, water supplies in each county were analyzed for various inorganic and microbiological contaminants. These results are presented in Table 5. It should be noted that the sample set summarized includes both untreated and treated water and, therefore, tended to represent the available water quality to household residents as being somewhat better than may be the case with raw water only. What is presented, however, can give insight into the "tap water" (or point-of-use) conditions experienced by rural residents in the coal counties and the implications of water quality with regard to household quality of life.

Table 5. Samples Exceeding Established Standards/Guidelines for Various Constituents

Test	Standard or Guideline (mg/L)	County							
		Dick (%)	Scot (%)	Wise (%)	Russ. (%)	Taze. (%)	Lee (%)	Buch. (%)	ALL (%)
Iron	0.30	10.7	1.4	3.1	3.5	4.1	3.1	0.0	6.1
Manganese	0.05	26.1	6.3	26.6	3.5	4.1	5.5	26.9	17.5
Total Hardness	180.00	9.8	44.4	6.3	66.7	33.1	18.1	7.7	20.7
Sulfate	250.00	2.9	0.7	7.0	0.0	1.4	2.4	3.8	2.8
Chloride	250.00	3.2	0.7	0.0	1.8	0.0	1.6	0.0	1.8
Fluoride	2.00	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.1
TDS	500.00	4.4	2.8	9.4	12.3	2.7	5.5	3.8	5.3
pH	6.5	20.2	3.5	20.3	0.0	0.0	3.9	3.8	12.4
Saturation Index	-1.0	89.8	19.0	82.0	10.5	13.5	27.6	61.5	58.8
Copper	1.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Sodium	20.0	47.1	12.0	51.6	22.8	6.8	18.9	46.2	34.2
Nitrate	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total coliform	ABSENT	63.4	56.3	45.3	63.2	73.0	71.7	57.7	61.6
Fecal col/E.coli	ABSENT	16.3	28.2	7.8	26.3	21.6	36.2	15.4	20.5

Notes: units of mg/L apply for all constituents except pH, saturation index, and bacteria; all standards represent maximum recommended levels with the exception of pH and saturation index for which standard given is minimum recommended level; fecal coliform bacteria replaced by E. coli bacteria analysis as of Russell and following county programs.

The tests included in the water analysis offered to participants are listed in Table 5. Also presented are the water quality standards or guidelines for each constituent and the percentages of values exceeding these levels. From the information provided in Table 5, it can be observed that the major household water quality problems encountered by coal county participant households were iron/manganese, hardness, corrosivity, sodium, and bacteria. These major contaminants encountered are further discussed below.

Iron and manganese often occur together in groundwater supplies and result in similar objectionable taste and staining problems. The results obtained were not considered unusual because of natural conditions in the coal counties and the prevalence of iron and manganese in the soil. Levels were substantially greater, particularly in the case of manganese alone, for the Appalachian Plateau physiographic province counties of Buchanan, Dickenson, and Wise. The results would likely indicate greater incidence of iron and manganese in household water, were it not for the generally widespread use of iron removal filters and water softeners (see Table 3), the latter of which can remove small amounts of both iron and manganese.

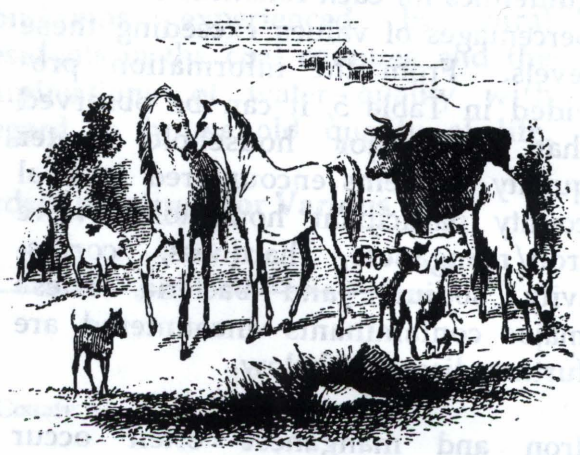
The same was true of total hardness with respect to the presence of calcium and magnesium that determine the level of hardness. As expected, incidence of excessive water hardness was particularly more noticeable in the predominantly Ridge and Valley physiographic province counties of Lee, Russell, Scott, and Tazewell. The widespread use of water softeners (see Table 3) has likely corrected many of the worst case hard water situations. It should be noted that water with total hardness between 60 mg/L and 180 mg/L is classified as moderately hard to hard and may warrant the installation of a commercial water softener in the view of some household water users. An additional 41% of water samples were in the range of 60 mg/L to 180 mg/L total hardness, indicating that nearly two-thirds of all water samples could be classified as moderately hard or harder, even when considering both treated and non-treated water.

The pH reading and saturation index combine to indicate the corrosive potential of the water. While pH determines whether the water is acidic or alkaline, the saturation index is calculated to estimate the inclination of the water to deposit a protective scale (calcium carbonate) on pipe walls, metal fixtures, etc. Therefore, if acidic water is encountered, this scale can help to insulate metals from the corrosive action of acidic water. The greatest risk of corrosion, therefore, would be a household water situation in which pH is below 6.5 and saturation index is below -0.1. As is evident from Table 5 for all counties, with 12% of the pH values below 6.5 and 59% of the saturation indices below -0.1, a number of households may be subject to serious corrosion problems. Those households in Appalachian Plateau, as opposed to Ridge and Valley, counties were noticeably more at risk to corrosion (Table 5).

Sodium may be a health hazard to people suffering from high blood pressure or cardiovascular or kidney diseases. For those on low-sodium diets, 20 mg/L is suggested as a maximum level for sodium in drinking water, although a physician should be consulted in individual cases. More than one-third of the water samples exceeded this guideline for sodium, in part due to the widespread use of water softeners. It should be reemphasized, however, that the suggested threshold is relatively low and should not apply to individuals who are otherwise not experiencing the above health problems. To evaluate the presence of sodium in the context of these latter users, a threshold value of 100 mg/L was used which was exceeded by only 10% of all samples.

As was the case in all of the Virginia counties in which this program has been conducted, the most widespread indicator of contamination was the presence of coliform bacteria. Microbiological contamination of drinking water can cause short term gastrointestinal disorders, resulting in cramps and diarrhea that can be mild to very severe. Of the non-gastrointestinal disorders that may result, one particularly important disease, transmissible through drinking water, is Viral Hepatitis A. Other diseases include salmonella infections, dysentery, typhoid fever, and cholera.

Coliform bacteria detection is simply an indication of the possible presence of pathogenic organisms. Furthermore, coliform bacteria are harmless to humans. They are very prevalent, being found in the air, soil and plant material, as well as the digestive systems of all warm-blooded animals.



While a water sample can be inadvertently contaminated during sampling, other possibilities include contamination of the household water plumbing, groundwater contamination, or poor well construction allowing ready entry of contaminated surface water into the well. Detection of coliform bacteria is confirmed by a total coliform bacteria analysis result above zero (present). To determine whether or not the bacteria were from human and/or animal waste, positive total coliform tests were followed up by analysis for fecal coliform or E. coli bacteria.

Of the 964 household water samples analyzed for total coliform bacteria, 62% tested positive. Subsequent fecal coliform/E. coli analysis for these total coliform positive samples resulted in 33% positive results, or 21% of all household water samples. Therefore, in the case of positive fecal coliform/E. coli, the likelihood is greater that a source of human or animal waste is migrating toward, and ultimately

contaminating, the water source. Although positive results should be viewed with concern, they are not a cause for panic. Individuals have probably been drinking this water for some time with no ill effects and could possibly continue to do so. Nevertheless, program participants whose water tested positive were given information regarding emergency disinfection, well improvements, septic system maintenance, and other steps to identify and correct the source of contamination. After taking initial corrective measures, they were advised to have the water retested for total coliform, followed by fecal coliform or E. coli tests, if warranted.

Post-testing evaluation surveys generally indicated a readiness to take various measures to improve and/or protect the quality of their water supply. For example, of those reporting that they had one or more identified water quality problems as a result of the testing program, 63% indicated that they already had taken, or planned to take, at least one measure to improve the quality of their household water, such as shock chlorinate, conduct additional follow-up analysis, or seek state agency assistance. These responses are not surprising in light of the fact that 85% of all coal county respondents for safety reasons and 28% because of objectionable, "nuisance" symptoms, were motivated to participate in the water testing program.

Conclusions

The Coal County Household Water Testing and Information Program was considered to be successful and very well received by those who chose to participate. Despite being a voluntary program, and resulting in fewer participant samples than anticipated, a geographically distributed sample representing diverse household and water supply characteristics was obtained. While the project was designed to involve voluntary participation, and quality control in sampling was not assured, the type of information gathered and summarized was nevertheless deemed useful for water quality assessment and planning at the county and regional levels.

Considering the results of the analysis, major household water quality problems were, from a nuisance standpoint, iron/manganese, hardness, and corrosivity. The major health-related concerns were corrosivity (because of the potential to raise dissolved copper and lead levels in water), sodium, and bacteria. Sixty-two percent of the samples tested positive for total coliform and 21% for fecal coliform/E. coli bacteria. Water quality analysis, for many constituents, supported the participants' descriptions of their water supplies regarding such problems as staining, taste and odor, and appearance. The severity of these symptoms is confirmed by the high incidence of water treatment devices installed — 32% of all households participating had one or more water treatment devices installed.

Post-program survey results indicated that participants were interested in the water testing program primarily because of health concerns. Respon-

dents to the program evaluation reported that they increased their understanding about water quality. The average increase in understanding was greater for those respondents who attended one or both of the public (pre-testing and post-testing) meetings.

Sixty-three percent of the households that reported having at least one water quality problem also reported that they had taken, or planned to take, at least one measure to improve the quality of their water supply. Twelve percent or more of all respondents had taken, or planned to take, one or more of the following measures: use bottled water for drinking/cooking, shock chlorinate the water system, determine the source of the undesirable condition, and improve existing water treatment equipment.

Acknowledgments

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COMMISSION ON THE FUTURE OF SOUTHWEST VIRGINIA

Donna Stanley
Mountain Empire Community College

There are two study commissions currently assessing water needs in southwest Virginia. The first study commission, HJR 104, is a state study commission created through legislation patroned by Delegate Clarence E. "Bud" Phillips. This 10-member joint legislative subcommittee, which began its work in August 1996, is charged with evaluating drinking water needs in southwest Virginia and proposing funding mechanisms to address these needs. Legislators serving on this joint legislative subcommittee include: Delegate Phillips (Chairman), Senator William Wampler, Jr. (Vice-Chairman), Senators Jack Reasor, Jr., and Madison Marye, and Delegates John Tate, Jackie Stump, and Terry Kilgore. This study commission will complete its report prior to the January 1997 Virginia General Assembly session.

The second study commission, which I will be reporting on today, is a part of Congressman Boucher's Commission on the Future of Southwest Virginia. The Commission includes over 100 regional leaders who are volunteering their time to recommend strategies for economic development and the improvement of the quality of life in the Ninth Congressional District. There are eight subcommittees which comprise this commission. I chair the subcommittee on Water, Wastewater, and Other Utilities.

The Water, Wastewater and Other Utilities subcommittee has already gained approval of four recommendations which are a part of the Commission's interim report. A number of other issues are being considered by the subcommittee and these will be included as recommendations for the Commission's final report. It is my pleasure to report to you the four recommendations in the Commission's interim report, as well as the six other recommendations which I anticipate will be contained in the Commission's final report.

Interim Report Recommendations from the Commission on the Future of Southwest Virginia

1. *The U. S. Congress is encouraged to provide full funding for the "Water 2000" project announced in 1994, with the goal of assuring an adequate supply of clean drinking water in every American home by the year 2000.*

This initiative to provide safe and affordable water to all rural homes by the year 2000 was announced by the U.S. Department of Agriculture, but no new funding has been received from Congress to allow its implementation.

The Department of Agriculture has attempted to bring financial resources to communities which have inadequate water supplies by proposing regulatory changes to increase the use

of the private lenders for infrastructure development, by partnering with other federal agencies to leverage funding for water system development, and by shifting priorities within the agency.

While these efforts are laudable, these activities will not bring sufficient resources to rural communities which need major investments in drinking water supplies. The Commission recommends that the U. S. Congress appropriate new funding to allow this Department of Agriculture initiative to proceed.

2. *A Coalfield Water Development Fund capitalized in the approximate amount of $10 million should be created in order to assist local governments in the coal-producing region to leverage more effectively for federal, state and local funds and to fill in gaps in grant financing for high-cost water projects. The fund would make annual grants for water system development in the coal-producing counties.*

The Coalfield Water Development Fund, Inc. (CWDF), a regional endowment providing grants for water system development, has already been established and is capitalized with $294,000 in EPA funds. Earnings from the fund are allocated annually to local governments, public service authorities, and non-profit organizations developing new water projects. The project grants are designed to expedite water system construction in the coal-producing counties.

The CWDF is designed to provide "gap financing." When a locality has applied for every available grant dollar for a project, and there is still a grant gap, the community can submit an application to this fund for additional grant assistance. The organization recently announced its first $10,000 grant to gap finance a water project in the Dante community.

The CWDF will seek $10 million in additional endowment funds through a long-term, 0% interest rate loan from the Virginia Safe Drinking Water Revolving Loan Fund. The Safe Drinking Water Act included a provision which authorized the use of a portion of Virginia's new safe drinking water revolving loan fund for capitalizing a regional endowment serving the same localities as the CWDF. As the funds are received from the state revolving loan fund, and the endowment is increased, larger gap financing grants will be awarded to communities in the coal-producing counties.

3. *The Virginia Public Finance Act and the Commonwealth's constitution should be amended to extend to counties the same rights and privileges now given to cities and towns for water and wastewater projects.*

The Virginia Public Finance Act specifies the authority of local governments to obtain debt financing through bonding. Currently in Virginia, cities and towns have the authority to pledge 10% of their bonding capacity (or tax base) toward financing infrastructure without going to a public referendum. These local-

ities use general obligation bonds for financing infrastructure because they have a lower interest rate. General obligation bonds are more marketable because they pledge future tax revenues as security for the bonds.

Counties do not have the same authority in Virginia. Counties must go to a referendum if they seek to borrow using general obligation bonds. Because counties are not allowed to use general obligation bonds without voter approval, separate Public Service Authorities or non-profit organizations are established and they obtain financing through revenue bonds. Because revenue bonds only pledge future revenues from the utility and do not pledge future tax revenues, they are less marketable than general obligation bonds.

Two local governments in Southwest Virginia have successfully gone to a public referendum to obtain permission from voters to have city status for purposes of bonding. Wythe and Smyth Counties, as a result of obtaining city status for bonding, can now use general obligation bonds without referendums on individual projects. No other southwest Virginia localities have gained this authority.

If counties could use general obligation bonds without the requirement of a public referendum, the cost of capital improvements would be reduced. There is approximately 1% difference in the interest rate on general obligation bonds and revenue bonds. If elected representatives from towns and county governments can be trusted to pledge future taxes as security for bonds, the Commission believes the same trust should be given to governing boards of counties.

The implementation of this recommendation would not be in conflict with the Dillon rule, which specifies the taxing powers of local governments. If this recommendation is implemented, legislative action will be needed by the Virginia general assembly.

4. *Federal regulations should be amended to permit the Rural Utilities Service (RUS) within the USDA to guarantee loans to local governments when the interest on the loan is tax exempt for the lender. At the present time, guarantees may only be made by this agency in instances in which the interest is taxable to the lender. Loan guarantees for tax exempt debt financing would enable local governments to obtain loans at lower interest rates and enhance their ability to build water and wastewater projects.*

Formerly the Farmers Home Administration, RUS is the largest

infrastructure financing agency for projects in rural areas. To achieve the Water 2000 goal, the agency is encouraging the use of bond markets and commercial banks to meet some of the credit needs of rural communities.

The RUS currently offers a loan guarantee program for commercial loans for water and wastewater systems. This program is not being utilized by communities seeking infrastructure improvements because banks are only interested in providing guaranteed loans with fifteen-year terms, with a call in five years. Local governments are not interested in loans with a five-year call because the cost of money could go up two or more times over the period of the loan.

If the interest on these loans could be tax exempt, banks would extend the term of loans from twenty to twenty-five years. The loan guarantee and the tax exemption for loan interest would make the provision of long-term financing attractive to commercial lenders.

Currently, the Internal Revenue Service prohibits the use of loan guarantees to assist in financing projects in which the interest is tax exempt. This long-standing regulation was promulgated to prevent the provision of "double subsidies." Policy makers have felt that it is unreasonable for the government to provide a subsidy both to the issuing entity in the form of reduced interest cost, and to the purchaser in the form of exemption from taxes.

A re-evaluation of this policy is needed. Unless there is a dramatic increase in the RUS direct lending program, it will be unable to meet the increased lending demands of rural communities. Not every rural community has a favorable bond rating that will allow it to use tax-exempt bond issues. If sufficient funds are not available to the RUS to allow it to make direct loans, then additional credit enhancements such as the ones proposed are needed to allow rural communities to access financing from commercial lenders.

Additional recommendations to be proposed for inclusion in the final report by the Commission on the Future of Southwest Virgina

5. *Encourage localities which have not developed a county-wide water and wastewater plan to apply for EPA 604B grants to support comprehensive planning. The localities must provide the 25% matching funds in order to secure federal grants to cover 75% of the project cost. EPA 604B grants support engineering analysis to determine preferred service options for community water and wastewater service and to assess costs.*

Projects have already been completed for some southwest Virginia counties, but many have not completed countywide water and wastewater plans. The completion of comprehensive county plans would assist all localities in making informed decisions regarding the design and phasing of infrastructure development. These plans will also support the development of regional systems which may

be more cost-effective than stand-alone community systems.

6. *Currently, Virginia's coal producers are paying more into the Abandoned Mine Land Fund than is being returned to the state. If the "surplus" funds (the difference between what is being paid in and what is being returned to Virginia's AML program) could be made available for projects rather than being used to increase the federal AML Trust Fund, more money would become available for traditional AML projects and also for water projects in Virginia. Virginia is authorized to use up to 30% of its AML funds annually to restore water to previously mined areas as authorized by federal regulations. An increase in the amount of money available to Virginia for AML projects would also allow more money to be made available for water service development.*

This strategy will need to be undertaken with caution. Any effort to change the AML program risks concerted action by the western states to terminate AML assessments. Western states have reclaimed eligible AML sites and producers would like to have the assessment discontinued. Any effort to return the "surplus" to Virginia must be weighed against the risk of eliminating the program.

7. *Some of the regional public service authorities in the coal counties have acquired equipment to extend water lines. Incentives should be created to encourage more public service authorities to adopt regional management and to develop internal capacity to extend water service and to maintain existing water lines. While the public sector should not compete with the private sector for large projects which have sufficient funding for construction, there are many small line extensions that will not be cost-feasible if they must be undertaken by private contractors. This is especially true when there are many regional projects under construction and private contract bids are higher.*

The Buchanan County Public Service Authority has acquired the equipment needed to complete many line extension projects. These projects have been undertaken with a 35-50% reduction in cost. Funding from the county government has allowed the Buchanan County Public Service Authority to acquire the equipment needed for construction activities. Financial incentives should be created to encourage other localities to develop this local public service authority capacity. Not only would the availability of this equipment reduce construction cost, but would assist the authorities in replacing aging lines and repairing leaks.

8. *The Safe Drinking Water Act included authorization for the establishment of five or more small public water system technology assistance centers at institutions of higher learning. A number of Virginia colleges and universities are collaborating to attract one of these centers to Virginia. The centers will receive as much as $2 million annually for*

project activities. Technical and political support should be provided to assist these institutions to secure a center in Virginia.

As a part of a consortium of institutions which are developing demonstrations for different regions of the sate, Virginia Tech and Mountain Empire Community College are focusing attention on the coal-producing region. With federal assistance to create a center, resources will become available to assess and encourage improved rural and small community water treatment and supply technology, commercialization, small water system economics, and water supply system management, training, and operation. Center demonstrations could benefit the region by helping to fund demonstrations in communities without an adequate water supply, and by helping to test alternative technologies for providing safe drinking water in areas which cannot be feasibly served by water line extensions.

9. *Water is a finite resource which must be protected to provide not only current and future drinking water supplies, but to support wildlife, recreation, and quality of life. Groundwater protection projects and public education on the protection of groundwater supplies are especially important in the coal-producing region where groundwater supplies are limited and there have been negative impacts from land use.*

Public education projects, such as the Clinch-Powell Karst Groundwater Project, need to reach broad audiences throughout the region. All citizens need to gain a better understanding of how land use, as well as household consumption and disposal practices, can contaminate water for current and future use. Citizen involvement in conservation activities should be encouraged to heighten awareness of the importance of water conservation.

10. *As federal Safe Drinking Water Act monies capitalize the Virginia Water Supply Revolving Fund (VWSRF), provisions should be made for the issuance of small loans with low closing costs. Currently, most financing sources have excessive overhead costs for small loans. These high closing costs and high interest rates hamper communities from obtaining loan financing for small-scale facility improvements.*

There are many communities which need loans in the $50,000 to $70,000 range. In 1995, the members of the State Water Commission introduced SB 1019 (1995) in recognition of the need for a small loan program for waterworks. The bill was referred back to the Commission.

The capitalization of the Virginia Water Supply Revolving Fund using the Safe Drinking Water Act grants will provide the Virginia Department of Health (VDH) the opportunity to develop strategies for meeting the needs of communities needing small loans. The VDH has already devised two strategies which might be used to provide small loans to communities.

One strategy would be to use the grant power of the Board of Health (already

contained in the VWSRF) to transfer funds to a locality after completing a Letter of Intent to Repay (LIR). An LIR loan carries no obligation to repay, but documents the borrower's intent to repay. Negligible costs would be incurred to close this good faith loan and less time would be required for closing. This method would be helpful when immediate funding is needed.

A second strategy would be a modification of the existing VWSRF loan program for issuance of either a local anticipation note and/or a long term marketable bond. This strategy carries the full weight of an obligation to repay. The process would be streamlined by 1) using a county or city attorney as bond counsel by the VRA's general counsel, or 2) allowing VRA counsel to act as both general and bond counsel if this arrangement is acceptable to the locality.

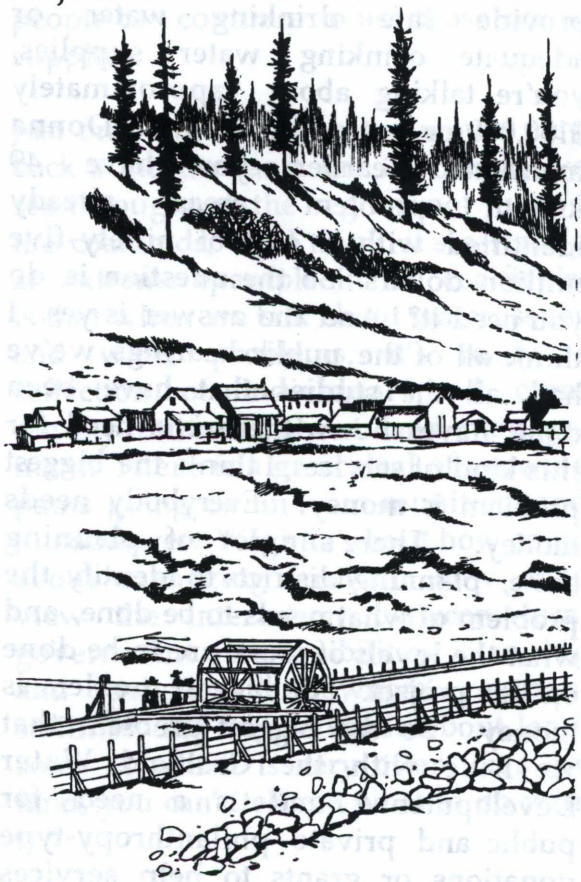
PANEL PRESENTATIONS
MORNING SESSION
Moderator: Carl Zipper

I think the way we will begin is to introduce each member of the panel and tell who they are, what they represent, and have a brief statement by each member of the panel.

We have three panelists. We will start with David Wampler. David Wampler is President of the United Coal Company. He's a member of the Joint Subcommittee for Safe Drinking Water chaired by Delegate Phillips and a member of the Board of Directors. Our second panelist is Jason Gray. Jason Gray is the Manager of Environmental Programs for the Virginia Water Project. Our third panelist is Delegate Clarence "Bud" Phillips. Delegate Phillips will present his comments as the luncheon speaker.

David Wampler

I was just listening to a lot of things being presented today and I've heard a lot of these things presented in the format of the Coalfield Water Development Fund and of the Joint Subcommittee on Safe Drinking Water. First, I am part of the big bad coal companies that we've been talking about today. I would like to remind you though that a lot of things, because of what the coal industry has done in the past, and I'm talking about primarily 1978, those days have past. Because we were bad, because we did bad things, or because we didn't protect the environment, there were a lot of laws instituted to make us do it. And I think a lot of those laws exist now to make us do a better job. It's un-fortunate that it happened, but it did. I think you will find, though, that now there is coal industry participation in these issues that are community related. I think you will find that there are several coal companies on the Coalfield Water Development Fund. There are several coal com-panies on the Powell River Project supporting its effort both financially and as participants, and trying to get us some sort of input on the joint subcommittee here as well.



Coal mining has impacted water supplies in the past. I think what you get a feel for here is that we have a

major problem. We have fifteen to eighteen thousand households in southwest Virginia alone that are using either cisterns, hand-dug wells, or springs, or whatever because mining or microbiological activity have contaminated the water, and there isn't really adequate or safe drinking water supplies for those people. And you've heard today just some of the examples of what may have caused the pro-blems that you're looking at. I was trying to knock some of these things out earlier, but if you save ten thousand dollars a household, which is not unreasonable, then you're talking about fifteen to eighteen thousand households, to try to provide safe drinking water or adequate drinking water supplies, you're talking about approximately $150,000 or more dollars. As Donna mentioned earlier, you have 49 known problem areas already identified with a cost of ninety-five million dollars. So the question is, do you need it? And the answer is yes. I think all of the public hearings we've had, all the studies that have been done, have shown there is a need for this kind of service. I think the biggest problem is money. Everybody needs money. There's a lot of planning done, planning districts to identify the problem of what needs to be done, and what the levels of work are to be done on this project. The biggest problem is money. So the biggest problem that we have with the Coalfield Water Development Fund is a need for public and private philanthropy-type donations or grants to help services give us additional money and from state and federal, as well as legislation. From the coal industry side, I think that we all do not want to impact mining or water supplies but we do. And I think to the extent on safe drinking water that we can do something to advance public water supplies for these people, not just the supply but the quality of drinking water as well. As to the extent we can do that, we're all in favor. I'm talking about whether it's on a participant basis like this, or whether it's financial.

Jason Gray

I grew up in a military family and the two things I learned in a military family was how to say "yes, sir" and how to shout to make yourself heard. I think the quality of the presentations we've had this morning have been excellent. I always learn a great deal from the folks who presented this morning. The little list of comments that I'm going to make is just to react to some of what I've heard. I'm going to start off by doing an opinionated and crotchety imitation of Andy Rooney from 60 Minutes and just get something off my chest. So what I want to say is this. We very often define water problems as if it's not a direct health threat. We define them as an aesthetic problem. I just hate that. I wish we could do away with that term because when you have, as we have, many households in southwest Virginia, not just in the coal field but throughout southwest Virginia, that have serious iron, manganese, and sulfur problems in their water and they're spending fifty, sixty, and sometimes more dollars a month to deal with the problem, they don't have an aesthetic problem. They've got a financial problem because this has a serious impact on many households, many of whom are

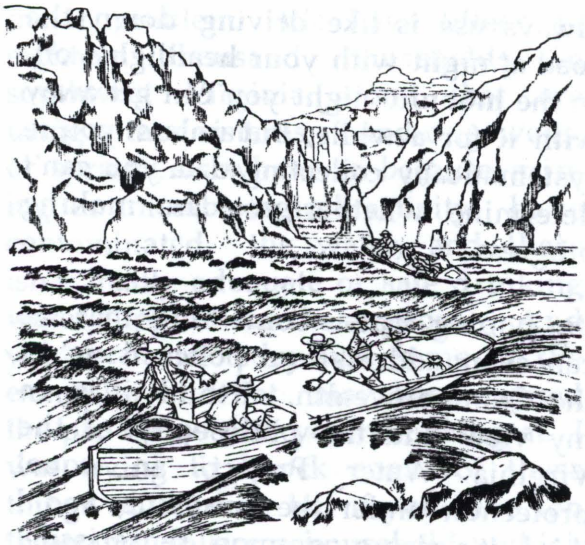
on fixed incomes or very limited incomes. I know the notion of defining a water problem as an aesthetic problem has a technical application, but I wish we could just broaden the issue out a little bit to really define it for what it is, and it has a tremendous financial impact even if it does not have a direct acute health impact.

Okay, I feel better. No doubt drinking water is an enormous part of the wider issue of the quality of life. We simply cannot have healthy sustainable economic development in the absence of good water supplies. I think we see it throughout the United States, but I know Virginia's situation best so I can speak about that.

If you are a rural household in Virginia and you are relying on a well or not on a public water system, I think we have a real problem in that the resources available from the state, for the most part, treat those who need domestic water supplies as second-class citizens. The well is tested when it is built, and after that you are on your own. This is why I think the program offered in Cooperative Extension and the well-testing program is so important because the state has no other systematic data collection of domestic water quality. It's just not there, and actually though we tend to do a little bit more of it in the coalfield region because of the activities of the coal industry, but nonetheless statewide and even within the region, we're not collecting the baseline data to really be able to map out whether the situation is improving or deteriorating.
This is something I've been on a soap box about for years and the analogy I always use is like driving down the road at night with your headlights off. In the moonlit night you can get away with it for a while, but unless you're systematically collecting data you can't determine whether you are making progress.

I'm hoping that is something that we can even address as a policy issue in the Commonwealth. I think it is, in my view and the philosophy of the Virginia Water Project, an equal protection under the law issue, and I think it's also a common sense issue. If you have a region of a county that has good groundwater supplies, it's in everybody's interest to see that those people can continue to use those water supplies.

Just one other comment. I would step back a minute and say that what we see throughout the region, not just in the coalfields, but I think it's certainly an extreme example in the coalfields, is that when we talk about water issues and water problems, it's really a reflection of individual and community attitudes about land management. There is a great deal of growing pains going on in com-munities and in southwest Virginia about how to go about managing growth, how they view the interaction between local government responsibilities, planning and private landowners' responsibilities, and their attitude about land, some of which is very often, "it's my land, you can't tell me what to do with it."



We need to think about water management as being tied up with overall attitudes about land management. I would also add that this has a significant role in how we encourage intergovernmental cooperation for water management. I'm a child of the late 60s and early 70s, and I was raised with the philosophy that small is beautiful, that small communities are great which I think they are, and that small scale things in and of themselves are better than big scale things. Reality therapy has set in in my middle-age years, and I would now agree with many others that the water supply needs for southwest Virginia, particularly far southwest Virginia, is going to have to be in very large regional water supply projects. Small is beautiful but bigger is better. We've got some real challenges in how we get different local governments to sit down and start mapping out their futures together. I'm hoping that in the future we'll have situations that we'll have not only as many folks as we have here today, but have meetings that consist chiefly of directors of public service authorities, county supervisors, and start thinking about how we deal with many of those issues. I'll conclude with a brief comment about the coal industry. I had the great pleasure, interest, and sometimes enormous frustration of working on a mediation over an 18-month period between service owners who felt that their water supplies had been impacted by the coal industry and most of the representatives of the Virginia Coal Association. I must say it was very interesting because at least I tend to think, and I think everyone else here tends to think, the coal industry as being this monolithic sort of entity. It was interesting looking at the different members of the coal association and seeing how different they were in many respects in their own interests, in how they went about responding to issues, and that there was a great deal of variability out there. I was pleased to see that there are some coal companies, not all but some, that are taking very pro-active, positive steps. I think, as we move into the future, we need to tap that goodwill not being anything other than up front and recognizing that the coal industry has had a tremendous impact on water resources in the region when looking to the future.

Delegate Clarence "Bud" Phillips
Luncheon Speaker

I have the opportunity and good fortune of addressing you again. This morning I had the opportunity to talk to you about the scope of the problems that exists with water in southwest Virginia. As you can see from the research that is going on and from the studies that are being conducted, we

are getting now what we consider a good handle on the scope of the problem that exists in southwest Virginia. Anytime that you have problems, you have to be able to define those problems, to identify them, and to know exactly what those problems are before you can solve them. We have made several attempts in our small way prior to the last couple of years to define the problem, but we never really completed a definitive study of the scope of water problems that exist in southwest Virginia. The first attempt to do that was the Powell River Project, and I think they've done an excellent job of doing that in terms of finding the scope of the problem. The study that we have going on at the state level now goes a little bit farther than that, and we'll use a lot of their baseline research and data and expand on that to not only identify each community in southwest Virginia that needs water and have problems but also identify funding resources, as well as potential resources that may be there for us to use. So we'll have that scope defined. We'll have some of the most definitive studies that have been done heretofore on that issue.

This afternoon, what I would like to very briefly touch on is trying to look prospectively to the future as to what we need to do to move ahead with water resource issues in southwest Virginia. As I spoke this morning, I said it's a big problem. The scope of the problem is extremely complex. A lot of the different issues, players, and considerations have to be made. The future solutions I think to water problems, without question, depends upon the ability of all the competing countervailing portions to come together to discuss these issues, to plan, and to implement their plans in a way that's acceptable and reasonable for all the parties. What are the future solutions to southwest Virginia's problems? We probably could talk all evening and debate a lot of these issues, but just from a perspective today I'm going to be talking about, as I see them, the future solutions to southwest Virginia's water problems.

The first is planning. Once we know what the problems are, we have to have in place good research and the ability to continue to do good research, i.e., the Powell River Project at VPI or other institutions. I think it is vitally important that we go after one of those grants that you talked about, Donna, to put into place at Virginia Tech and with Mountain Empire, a water research station if you will, a water research institute that will continue to research and monitor water quality issues in southwest Virginia. Planning, yes, we have to have planning. We can never do too much planning to insure that we balance out all these issues. The ability to deal with these problems that exist will depend on how well we plan. As someone reminded me, we'll either plan to fail or plan to succeed. I hope that we plan to succeed in the future of southwest Virginia's water problems and that means we have to get every county in southwest Virginia planning water and wastewater issues. They have to be planning, and I think that's one of the first criterias that we have to get involved in for standards and goals.

Secondly, we've got to have the state involved in helping us plan to use these resources and monitoring to

insure that these resources are either getting better or worse but we have some baseline data to do that. As one of the speakers noted earlier, the state is not doing a very good job at this point and time of monitoring water, monitoring the quality of water whether it be groundwater or surface water, so the state has to have that role as well in planning.

The third thing we must do, and you heard a great deal about that, is we have to work as much as we can on a regional basis to use scarce dollars and scarce resources. Regionalism is competitive in many instances between jurisdictions and the ideas that many of us hold at the local level interferes with this ability sometimes to cooperate on a local level. But we don't have any options but to cooperate on a regional basis because of the scarce resources and we're talking about money as well as water. So regionalism we think is going to have a big part to play in this. One of the things I would like to see us do, in cooperation with Virginia Tech, the Powell River Project, and Mountain Empire, is get together with the planning commissions and study the problems in the next year and a half as to how we implement regional water systems. How do we do this? How do we go about it? What are the obstacles? What are the problems? What are the resources that we need? And where can these authorities come together and plan and put together these resources to serve the region?

The fourth thing that we need to do is to protect the water resources that we've been talking about today. If we fail to protect the water resources, we blow all the planning in the world. We can put all of the authorities together for regional cooperation but if we don't protect these water resources that I mentioned a while ago, the major water resources for most of us in southwest Virginia, there won't be any water to plan for, there won't be any water to distribute, there won't be any water to turn on and take a shower, or to get a clean glass of water from the tap. It just will not be there. We have to plan to protect. These are the big watersheds we're talking about — the Clinch, Powell, John Flanagan, Russell Fork, and the Holston areas. This is a multidiscipline issue. Farming is an issue, timbering is an issue, mining is an issue, as well as draw down, are issues.

The next one is we must look at multiple solutions to multiple problems. I think there are models available that we can use to solve some of the major problems, but in those areas where there are not ready solutions we must be able to adapt and to plan and to go back to these small communities that we're talking about that may not be close to a major water resource and decide how do we solve their problems?

The next one is funding. We said money is going to be an issue because money makes the world go round, money will put water in counties that do not have it. As I look at funding issues, I know that a lot of the localities in southwest Virginia have not done their part, or the supervisors in these counties have not done their part in planning for the development. They have not done what they should have done in planning to bring about

the dollars necessary to put water into communities. They have been too used to relying on "let's go to a community block grant, or let's go to the Appalachian Regional Commission, or let's go to TVA, or let's go to somebody else" to solve the problem. I'm a firm believer that if you solve the problem, you start at home to solve that problem, and I think the county is going to have to be made to understand that if they are going to solve this huge problem they are going to have to put substantial dollars into it as well. One of the things standing in the way is an attitude that the county is not responsible for water, it's a state or federal issue, and that's just not correct. I think localities have the major responsibility for water. Up to this point and time, they have gotten off easy in terms of relying on federal grants or loans from the federal government. They're going to have to provide support. They are going to have to put into place a plan in which they will be able to generate revenues to not only put in water but maintain water systems. If you go and look at water systems today in southwest Virginia, there is very little money being put aside for depreciation and upkeep and maintenance of that system. They're just not doing it. Citizens are going to have to realize that, as my good friend Delva Joe Johnson in Abingdon always says, "There are no free lunches, people." If you get something, somebody pays for it. The citizens, as well in the coalfield counties, have got to realize that they are going to have to pay for those resources and those services that they get. Up to this point and time, I'm not sure that they have been paying their fair share. We've got a lot of issues about low and moderate income but we've got to look at that as well. The counties must look at major resources whether they be bonding or whatever it happens to be. We've got this attitude that when you have major projects, you try to do it nickel and dime. But, if you look at the way corporations deal with problems, if they have investments that they want to make and it's long term investments, they go out and get either the money, or the bonds, or the loans to do it — capital construction. Capital construction you cannot nickel and dime it. You have to have a plan to make capital construction prove it and go out and get the resources to do it.

Next is the state. We have been relying on the federal government for most of the resources that we have been receiving over the last several years and we talked about that today in terms of the Clean Water Act and community block grants. The state must step up. They have a major role to play in determining the quality of life for southwest Virginia. Virginia must take a look at those federal funds that they are pulling in and channel them right down to southwest Virginia to these various entities that will be using them to put water in. But the state needs to step up and put substantial new resources into either the Department of Health or to other agencies to put into place either grants or loan programs for water systems in Virginia and southwest Virginia. The state must play a larger role whether it is in bonding or changing of legislation to allow counties to bond without referendum. They've got to

realize that they have a responsibility as well.

Other funding is the federal government. They have carried the load for so long I'm not sure they are going to be able to carry a substantial amount in the future. It's going to be left up to the state and local governments to do it. But they do have a significant role to play in our planning. In fact, the Department of Environmental Quality has been very instrumental in helping Donna with her program in getting the grant in place to allow her initiative to move forward.

The last issue is regional funding under funding packages. We have an opportunity to put in place a model for funding in terms of the gapped funding proposal Donna's family has talked to you about today. If we move forward with that and give it funding and allow it to operate along with the Virginia Water Authority, I think that we will have in place an opportunity to put more money into water funding. So these are some of the issues that I think are important in solving the problems that exist in southwest Virginia and Virginia on water issues. They are very complex but in ending my remarks today we have come a long way in just a few years in water issues. We have a long way to go on water issues and there are some very positive things happening at the state level, local level, and regional levels that I can say optimistically, we are planning for the 21st century. We just need to do it better. We need to do it in a more comprehensive fashion, and we need to be able to put money where we think is important. If we don't act to protect our water resources and our communities, then our communities will not survive and we will not survive. At the lunch table today—and I thought about this before— we talk about water issues, but we have been spoiled. We have been used to just going out and drilling a well, and getting water where we want it and using it without many restrictions but that won't be the future of Virginia. You can look out west and see what has happened on water issues. Water issues have been worse. Water riots are still major issues in the west, particularly in California where the problem exists. Those problems are coming to Virginia. There will be competition for water in Virginia. Who utilizes it, who gets it, and who doesn't get it. And we must plan for the 21st century to insure that southwest Virginia has adequate water supplies that are safe and that individuals have adequate water. It won't happen unless we all work together as a team. In my concluding remarks, I've been very very pleased with what I've heard today. We've had some excellent presentations and overviews about where we are in Virginia and these are the types of things that we need to continue to do to mount support for clean and safe water in Virginia. You've been a kind audience today and I do apologize for you having to hear me twice today. I want to thank you for your attention and your remarks that you had today.

TVA PROGRAMS IN SOUTHWEST VIRGINIA AND FUTURE DIRECTION

Jack Tuberville
Tennessee Valley Authority

Introduction

In the late 1980s, TVA established the Clean Water Initiative within its water management organization with the purpose of taking a more integrated approach to water resource protection and restoration. TVA's vested interest in protecting the quality of water in the Tennessee Valley makes it imperative that a regionally based, interdisciplinary approach be taken. Twelve subwatersheds were identified within the Valley, the plan being to establish River Action Teams (RATs) within each one. As of September 1996 six teams were established, with the remainder to be staffed during fiscal year 1997.

The goals of the teams are:

1. Improve beneficial uses of water resources.

2. Turn the responsibility for maintaining these watersheds over to the public by the year 2015.

Two teams currently operate in southwest Virginia. The Holston team was established in 1992, and the Clinch-Powell team in the fall of 1993. The Holston watershed covers nearly 4000 square miles in Virginia and East Tennessee, while the Clinch-Powell covers about 3000 square miles from Norris Dam in Tennessee to the headwaters in Tazewell County, Virginia.

Approach

The basic approach in all the watersheds includes the following steps:

- Assess: Determine the ecological condition of the subwatersheds and hydrologic units in the watershed.

- Prioritize: Based on ecological condition and public interest, rank each hydrologic unit.

- Coalitions: Work with existing coalitions to create new ones to identify and prioritize source causes of problems and threats to the watershed.

- Solutions: Jointly develop and implement solutions.

Much of the first year is spent investigating the condition of the water resources in question, and generally learning about the watershed and contacting agencies and key groups. This includes reviewing reports and data collected by others, and where data are lacking, TVA will provide field collection. Although many sources and types of information are considered, the status of the fish communities is one of the primary measures of the ecological condition. In the meantime, estimates of public interest are developed based

on surveys, interviews, public meetings, and other sources.

Priority Watersheds

Once biological assessments are made, they are grouped according to hydrologic unit and combined with estimates of local interest. Those hydrologic units with high resource need and high public interest become targets for closer scrutiny. Where resource need is low, i.e., where water resources are in good condition, and public interest is high, an effort is made to sustain this high interest.

When priority watersheds are established, a business plan is developed identifying activities and projects to be undertaken over the course of the coming year. The plan specifies the goals, general timeline and performance indicators as measurable indicators of team progress.

Clinch-Powell Priority Watersheds

Guest River: Based on biological sampling, the Guest River is in the worst condition of all the major tributaries to the Clinch River. This 100 square mile watershed, located mostly in Wise County, poses a threat to the waters of the Clinch River and to the diverse biota that live there. Impacts include mining (active and abandoned mined land), untreated sewage, urbanization, erosion and sedimentation. Recent evidence suggests sediment toxicity is also present. The lower part of the watershed is included in the Jefferson National Forest. Known as the Guest River Gorge, the area has been improved with a Rails-to-Trails project which established a scenic trail along the river in this area. Because of this and other activities, public interest was rated as "High."

Several studies are underway to determine the severity and areal extent of the impacts. Meanwhile, an education and communications committee has developed several tools to alert the public to the value and condition of the watershed. The results of the studies and the public's interest will guide any restoration projects that are developed.

Big Cedar Creek: This 80 square mile watershed in Russell County has been rated by the state as the worst agricultural nonpoint source (NPS) watershed in southwest Virginia. Most biological sampling in the watershed indicates it is in generally poor condition. Additionally, there is considerable support for improving water quality in the watershed. The Big Cedar Creek Water Quality Committee guides the efforts of TVA and other cooperating agencies in working on these mostly agricultural problems. The committee recently received an EPA grant to continue their work on NPS problems. In most cases, this involves Best Management

Practice (BMP) demonstration projects that are cost-shared by the landowners. Numerous farmers and landowners have participated. The Soil and Water Conservation District, Natural Resources Conservation Service (NRCS), and The Nature Conservancy are very active in supporting these projects.

North Fork Powell River: This 90 square mile watershed in Lee County is similar to the Guest River in that it is heavily influenced by mining activities and has very little agriculture. Because the level of local interest was unknown, the North Fork Powell River received a somewhat lower priority. One goal of the Clinch-Powell River Action Team (RAT) is to learn more about public interest here. Cooperative educational efforts, such as "Kids-in-the-Creek", have been implemented in cooperation with the Daniel Boone Soil and Water Conservation District and the local office of the NRCS. Environmental projects such as dump cleanups and streambank protection projects are also being planned.

Holston Priority Watersheds

Upper North Fork Holston River: The Upper North Fork Holston River and its tributaries are located above Saltville, Virginia and cover an area of approximately 221 square miles. A 1995 study by the Virginia Department of Environmental Quality (DEQ) indicated that there is a significant problem of high bacterial counts in most tributaries to the Upper North Fork Holston River due to agricultural runoff and animal access to the creeks. The study also indicated a problem with residential sewage pipes running directly into a creek. TVA biological sampling in the tributaries indicates that they are in generally poor condition. A local coalition of farmers, concerned citizens, educators, TVA, and USDA are working now to control animal access to some of the streams by providing animal exclusion fencing and alternative watering sources for livestock. TVA is in the process of finalizing the interpretation of Color Infrared Photography (CIR) of this area to use as a planning tool for further water quality projects. This CIR interpretation will also be used to develop a presentation to focus attention on the water quality problems and hopefully expand the diversity of the local coalition's membership.

Middle Fork Holston River: The TVA has been involved in the southwest Virginia region since 1985, and the Holston RAT since 1993. Since that time, TVA has assisted the Middle Fork and Friends of the North Fork committees in implementing an Adopt-A-Watershed program in seven schools, done extensive aerial inventories, developed the master plan for the riverwalk in Marion, conducted comprehensive biological sampling in the Middle Fork and its tributaries, provided cost-share money and technical expertise to over thirty farmers to implement more than 100 best management practices (BMPs), and most recently, demonstrated five natural techniques for restoring eroding streambanks on Hutton Creek. TVA's main partners in these projects include but are limited to the Natural Resource Conservation Service, the Holston and Evergreen Soil and Water Conservation Districts, the New River

Highlands Resource Conservation and Development, the U. S. Fish and Wildlife Service, the Virginia Department of Environmental Quality, and the Virginia Department of Conservation and Recreation.

Future Direction

The Clean Water Initiative puts heavy emphasis on working with the public and within coalitions to improve the quality of water resources. Ideally, self-sustaining local coalitions will determine future direction for their own water resources, at least within the limits of regulation. TVA can play an important role as catalyst to the development of such coalitions by providing planning and organizational support, and technical expertise where needed. As each local group becomes self-sustaining, TVA will become less involved. Ultimately, the goal is to help establish self-sustaining groups and become a resource to be called on as needed.

THE NATURE CONSERVANCY'S CLINCH VALLEY BIORESERVE

Don W. Gowan
The Nature Conservancy

Background

The Nature Conservancy has targeted the watersheds of the Clinch and Powell Rivers as part of an ambitious ecosystem conservation program called "Last Great Places: An Alliance for People and the Environment." More than 20 federally endangered species are found in the 4 ecosystems that comprise the watershed, which the Conservancy calls the Clinch Valley Bioreserve. From the freshwater mussels in the gravel shoals of the Clinch and Powell Rivers, to the rare invertebrates nestled within a huge underground cave system, the Clinch Valley is a haven for unique animal species. Additionally, the unusual habitats found on the limestone cliffs that tower above the Clinch and Powell Rivers harbor several globally rare plant species.

Consider:

- Though encompassing only 7% of Virginia's land mass, the Clinch Valley Bioreserve contains 24% of the state's globally rare species — more than 400 rare plants and animals.
- The Clinch and Powell Rivers are the only ecologically intact headwaters of the Tennessee River system. Among the last free-flowing sections of this once expansive system, these rivers are the sole remaining sanctuary for a group of freshwater mussels living nowhere else on earth. The rivers once sheltered nearly 60 species of mussels. That number has dwindled to around 40, of which 26 species are globally rare and 13 are listed as federally endangered.
- A labyrinth of caves and underground streams support 2 kinds of endangered bats, some 50 globally rare cave organisms, and several natural communities found only here.
- The "karst" regions — broad areas of limestone characterized by sinking streams, sinkholes, springs and caves — are home to plants and animals specially adapted to such unusual and demanding conditions. The largest intact cedar glade communities in Virginia are found in Lee County, as well as such endangered birds as the peregrine falcon and loggerhead shrike.

Conservancy Action

In 1990, the Virginia Chapter of The Nature Conservancy opened a field office in Abingdon to bring hands-on protection to the Clinch Valley. Four staff members are now enacting a comprehensive conservation strategy for the region that includes land

acquisition, research, economic development, and community needs. In the last two years, the Conservancy has launched several innovative conservation programs, including:

- Riparian Restoration Program: Teaming up with the U.S. Fish and Wildlife Service, the Tennessee Valley Authority, and local residents, the Conservancy is working with farmers to build fences to exclude cattle from waterways, implement alternative sources of water for cattle, and restore native vegetation along the stream banks.

- Karst Conservation Program: Working with the Virginia Department of Conservation and Recreation, Virginia Cave Board, Cave Conservancy of the Virginias, and Natural Resources Conservation Service, the Conservancy has registered for protection 20 biologically significant caves, installed best management practices at 2 significant caves, and initiated clean out and protection of several sinkholes and sinking streams.

- Scientific Research: The Virginia Chapter is working with several universities to determine the habitat needs of the Clinch Valley's endangered plants and animals. Some of the research seeks to understand the complex life histories of these organisms and develop methods to aid in the recovery of these species. Other research aims to quantify threats to the health of rivers and caves and find ways to reduce these threats without hurting the region's economy.

- Compatible Economic Development: A central tenet of the "Last Great Places" initiative is the need to protect nature while allowing human communities to grow and prosper. The Conservancy is working with local planners, government agencies, and private industry to find environmentally sound approaches to such issues as sewage treatment, timber harvesting, and reclamation of abandoned minelands.

Natural Areas Protection

The Conservancy has acquired eight sites in the Clinch Valley that represent some of Virginia's finest natural areas, including:

- Pendleton Island Preserve: As the Clinch River winds through Scott County, it passes by three wooded islands collectively called Pendleton Island. The river channels here support some 40 mussel species and some of the richest mussel diversity in North America. Acquired by the Conservancy in 1985, Pendleton Island's protection may have global significance on the survival of several mollusk species, as many of the species it harbors occur in fewer than ten sites worldwide; one is found only at Pendleton Island.

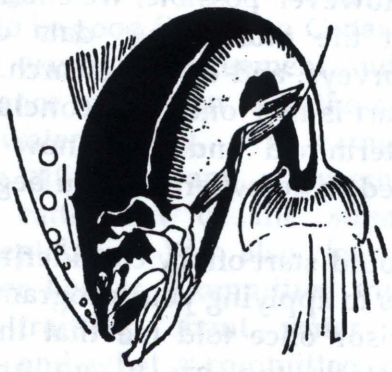
- The Pinnacle: This rugged 68-acre tract, located at the confluence of Big Cedar Creek and the Clinch River, harbors 12 rare plants,

including glade spurge, Canby's mountain lover, and Carey saxifrage, and 11 rare mollusks, including one of the last 2 refuges for the birdwing pearly mussel. Upon learning in 1989 of the Pinnacle's ecological significance, Russell County deeded the property to the Conservancy, which in turn transferred it to the Commonwealth for designation as a State Natural Area. The Conser-vancy is cooperating with local legislators and leaders on the Pinnacle Preserve Committee for future management of the site. The Pinnacle is a place where scientific research and public recreation will coexist.

- Grays Island Preserve: The Conservancy's newest preserve is a 425-acre property on the Clinch River near Dungannon in Scott County, that includes one of the Clinch's most important sites for freshwater mussels. Five federally endangered species of mussels have been found on the river bottom here. The property also contains the Rikemo Lodge built by CSX Corporation in 1969 as a hunting lodge. The lodge has recently been renovated and is now leased from the Conservancy by the Dunngannon Development Commission and is managed as a conference center and rural retreat. Additionally, the preserve contains 300 acres of farmland along the river which will be sold (with some restrictions to ensure protection of the river) to a conservation-minded farmer, ensuring that the land remains economically productive.

The Future

The Conservancy's tradition of efficient and effective conservation action based on sound scientific data will continue to drive real-world, practical conservation strategies for the Clinch Valley. By working in partnerships and building community support, together we can succeed in protecting one of the world's "Last Great Places."



EDUCATION, TRAINING, TECHNOLOGY TRANSFER NEEDS FOR WATERSHED MANAGEMENT

Joseph Wentz
Natural Resources Conservation Service

I will rephrase this fancy title and call it "ideas concerning getting your program applied." In my case, it involves getting conservation projects on the ground. I hope that there is some useful information in this for you. However possible, we should all support the monitoring, data collection, surveys, and other research. The hard part is that once the conclusions are determined and you know what you need to do, where do you begin.

We should start off by considering the barriers to applying your program. My supervisor once told me that there is no obstacle too big to go around. There is some truth to this. At the time it was in reference to, "if this doesn't work, then try that." It is possible that you can blow it the first time, and with a second chance, just can't get off the ground. So please don't consider this in a negative way. By knowing the barriers, we can be prepared, and an obstacle won't become a landmine. We will also be thinking of the positive ideas to overcome, or go around the barriers.

The biggest barrier is people. You, or someone working closely with you, should be a good public relations person. The targeted group may have no idea that there is a problem. There will be skeptics in the group. It is even possible that a whole community will condemn you before your first presentation. Many of these hollows in southwest Virginia were settled by a tight knit group of similar ethnic background. They kept to themselves, perhaps originally because of a language or other custom difference, and also because of geographical isolation. This kind of tradition continues. Some communities are more likely to give a cool reception to strangers, to be down right anti-government, or just think things are fine the way they are without any interference from outsiders. If you have a choice of community A, that has a tradition like this and has a history of low participation; and community B that has similar needs but is willing to go with your project, who do you want to work with? I prefer to work with people that want to work with me. We don't always have a choice. Maybe we go ahead and work with B because we will see results more quickly. Let's not forget A. Perhaps a small scale pilot or demonstration is more suitable in that community. Friends and family will share the results (we hope positive results) and the full project could be implemented later after community A realizes how good a thing is going on in community B.

Be aware of the individuals that will sabatoge your efforts. You will learn who they are along the way. In every walk of life, there is the good and the bad. Seek the good, and be careful with the less than good personality. Avoid the radical. It sure does help if

someone will point out to you who the radicals are.

This notion sort of leads us into the grassroots approach. You need to identify the individual and/or group that will help you make sure your project can get going. These people, the "movers and shakers", are already busy with community activities. You must convince everyone along the way that your idea is worthy of their interest and their time. Go to someone who knows these people. In environmental matters, a good place to start will be the local conservation office and the extension agent. Convince these individuals that you have a good project and let them help you plan a strategy and develop a list of people that are likely to be interested.

I've been involved with developing a local committee in several cases. One died because of sabatoge and dealing with people that exhibited the barriers mentioned previously. A public meeting was held before getting consultation and support from key community leaders. In the another case, it is working. I'm not willing to say we're doing everything right, but the Cedar Creek Watershed Committee is still functioning after almost three years. We've made adjustments along the way. The committee, with the help of the agency advisors, have had two mini-grants for a water quality farm tour and a watershed brouchure. We just learned that we were awarded a sizable 319 grant for education and implementation of best management practices.

We started in January 1994 by inviting seven carefully selected farmers to an informal dinner meeting. I talked with each of these folks on a one-on-one to convince them that it was worth their time to come to this meeting. At the meeting, different agency people and the Nature Conservancy took turns telling how bad the water quality in the creek was. That almost killed it because we hit them cold with the facts. Luckily, there was some good discussion about how there used to be good fishing in Cedar Creek. There was some agreement and some difference in opinion as to the cause of poor water quality. We learned of a strong attitude: any requirement to fence cattle out of the streams is unacceptable. We also learned of another barrier. Committee members need training about water quality issues and what a committee can do. Rex Greer was invited to relate some experiences of the Middle Fork Holston group. Informational material was sent by mail. We visited a demonstration farm on the Clinch River to look at various water quality practices. In the beginning, the committee expressed its frustration with "what are we going to do?" It later became apparent that there were things to do that should include the town and non-farmers. They agreed to a strategic planning session with a trained facilitator. Another motive was to diversify the committee. Thirty-one community leaders were invited with a letter that said, "You have been chosen because you are community minded, have been active in the community, or by your interest or position should be able to contribute to this planning session."

A good turnout (18) occurred probably because they were told up front what was expected and that it could be done in one evening. At the meeting, the agenda and purpose of the meeting was posted so everyone could see it. This went over well because many of the participants had no experience in strategic planning. They were divided into small groups to discuss what they liked about their watershed. Then they listed the issues or concerns, and what could be done, and voted on their importance. At the end of the meeting, I asked for volunteers to continue meeting as a committee. I promised that there would only be a meeting when there was a purpose. There were six volunteers that included three of the original committee. There were positive comments at the end. The meeting was run efficiently and everyone knew what was expected. At the next meeting of this reorganized committee, they elected their chairman and decided to invite the town manager to be part of the committee. Currently, four of the members regularly attend the meetings that have been held when needed, usually quarterly. Six or seven advisors attend and everyone participates, but decisions or concensus depend on the committee. Meetings are held at 7:30 in the morning with breakfast foods. It's an informal discussion with a good chairman that sticks to the agenda. We usually adjourn by 8:45 so that those who need to go to work, can do so.

The next most important item is that you need a purpose. We learned that the water got so bad in Marion that you could smell it. It was not so severe in Cedar Creek. In fact, the town of Lebanon has a state-of-the-art water plant. We did, however, convince community leaders that there were some water quality concerns and plenty of room for improvement, and there was a good possibility of getting cost-share funding.

Purpose ties into this next item. You need to develop an appropriate sales pitch. In my case, I want to sell water quality practices. They could be called best management practices (BMPs), and formerly referred to as conservation practices. Now it is a little easier because there are case studies that prove that conservation pays. So, my sales pitch is to apply these practices to improve the farm, herd health, production, and profitibility. I only sell water quality improvements if it's appropriate with the individual landowner. All along the way, you will need to sell your program. Keep in mind that your audience is always thinking, "what's in this for me?", or "is this worth my time?", or " what's the bottom line?"

After you have a following for your cause, a committee, you need to keep the momentum going. Maintain individual contacts and correspondence. At the meetings of your grassroots group, you must learn to bite your tongue. Allow the local folks to

discuss an item and make a decision. This takes great care. A tight relationship with a good chairperson is very important. Ideally, the chairperson has business sense. He or she will follow the agenda and keep things on track for an efficient meeting. The chairperson should respect you and call on you or other advisors for guidence when needed. The committee will lose interest if you, the advisor, run the show. Make appropriate suggestions, but let the committee make decisions. It is their community. If you have done proper preparation, it will work out.

As you build your relationship with your grassroots committee, don't forget to reflect. In your individual conversations, and hopefully your chairperson will take the lead in future meetings, discuss what went well. Positive reinforcement keeps us going. Then, look back at what could have been done differently. If there is reflection, your committee will grow. When your committee initiates new ideas, that will make you feel good.

In this discussion, several items probably stood out concerning education and training. More barriers to overcome. You may need training on dealing with individuals and groups. Take advantage of this kind of training whenever it is available. Your individual contacts will need to be educated concerning the issue. If it's about groundwater, you may have to provide information starting with basic geology, and go from there. Your local committee chairperson may need training on conducting an efficient meeting. Your committee should decide the best way to provide education to the general public. They should review news releases. In preparing a watershed brouchure for Cedar Creek, the chairman appointed one individual to review the advisors' draft. It was understood, that if this individual approved, it would be okay for the general public.

Briefly, there may be other barriers with which to deal. Keep in mind, there is no obstacle too big to go around. Here I offer no answers. There may be a lack of time, equipment, inadequate staff, or lack of funding. You may have the wrong plan. Don't be discouraged. Make adjustments. Learn as you go. Have fun. Good luck as you apply your positive programs to benefit people and our natural resources.

SURFACE WATER MONITORING PROGRAMS

Fred Kaurish
Department of Environmental Quality
Southwest Regional Office

(The following outline is a summary of the presentation given by Mr. Kaurish at the symposium.)

I. Introduction
   A. DEQ designs, operates, and maintains an Ambient Water Quality Monitoring (AWQM) network of appropriate locations, sample frequencies, and physical/chemical/biological constituents.
   B. The data collected in the AWQM network represents a water quality database that is comprehensive, accurate, representative, relevant, and statistically confident.
   C. DEQ's AWQM data is stored in EPA's STORET system.

II. Geography
   A. Our AWQM network covers 13 counties in southwest Virginia.
   B. We cover four geographic provinces: Cumberland Plateau, Valley and Ridge, Blue Ridge, and Piedmont.
   C. We monitor eight major river drainage basins.
   D. There are 75 individual water bodies (separate hydrologic sub-basins) in our region.

III. Components of DEQ's Surface Water Quality Monitoring Program
   A. Fixed stations in the AWQM network
      1. Chemistry sampling stations (n=68)
      2. Biological sampling stations (n=44)
   B. Supplemental Water Quality Monitoring (not AWQM network)
      1. Biological Eco-Region monitoring
      2. Lake monitoring
      3. Effluent compliance monitoring at permitted facilities
      4. Special studies
         a) Fecal coliform surveys
         b) Benthic surveys
         c) Dissolved oxygen profiles
         d) Intensive stream surveys

IV. Pollution Sources
   A. Point sources (n = about 500 permitted facilities)
   B. Non-point sources
      1. Agriculture
      2. Mining

3. Logging
4. Urban runoff

V. Uses of AWQM database
   A. Establish effluent limitations for permitted facilities
   B. Statistical trend analyses (seasonal, spacial, temporal)
   C. STORET — acces to researchers, agencies, general public
   D. Water Quality Assessment Report, 305(b) report by DEQ

GROUND WATER MONITORING PROGRAMS IN DEQ'S SOUTHWEST REGIONAL OFFICE

Michael R. Dovel
Department of Environmental Quality
Southwest Virginia Regional Office

(The following outline is a summary of the presentation given by Mr. Dovel at the symposium.)

I. Physiographic and hydrogeological provinces
- A. Blue Ridge/Piedmont
  - 1. Same from hydrogeological point of view
  - 2. Most precambrian igneous and metamorphics
  - 3. Limited yields
    - a) thin soil locally (exceptions)
    - b) rapid runoff (exceptions)
    - c) fractures for storage and movement
    - d) good quality
    - e) low yields (exceptions)
- B. Valley and Ridge
  - 1. Mountainous terrain ground water area
    - a) sandstones, quartzites and conglomerates
      - (1) ridge formers
      - (2) good quality
      - (3) limited yields
    - b) shales
      - (1) mountain slopes
      - (2) medium to poor quality (Fe, Mn, pH)
      - (3) limited yields
    - c) carbonates (limestones and dolomites)
      - (1) limited to slopes
      - (2) variable yield
      - (3) good quality (hardness)
  - 2. Carbonate ground water areas
    - a) lowlands
    - b) greatest yields
    - c) good quality (hardness)
    - d) most subject to contamination
- C. Cumberland Plateau Ground Water Area
  - 1. Rocks generally flat lying
  - 2. Sandstones, shales, coal seams
  - 3. Medium to poor quality
    - a) iron
    - b) manganese
    - c) pH

d) sulfates
e) hydrogen sulfide
f) methane

4. Variable yields (usually low)

II. Past Monitoring Programs

A. County ground water background monitoring

1. For county ground water reports
2. Twenty samples/month
3. Usually one sampling event
4. Mostly private wells
5. Meager well construction data
6. Data broadbased but limited
7. Program ended
   a) insufficient staff
   b) costly program
   c) replaced by ambient program

B. Ambient ground water monitoring program

1. To determine long range trends
   a) impact of weather
   b) impact of heavy use
   c) impact of various activities
2. Locate areas for special attention
   a) development of ground water resources
   b) areas of special studies
3. Careful selection of wells
   a) highly representative
   b) two wells per county (26)
   c) mostly public wells
      (1) repeated access
      (2) more construction data
      (3) past history data
4. New wells to be added to network
5. Change in monitoring schedules
6. Program ended

C. Risk assessment ground water monitoring

1. Landfills and lagoons
   a) not a regulatory requirement
   b) provide early warning for ground water impact
   c) target parameters for specific site
   d) some sampling and analysis by Virginia Water Control Board
2. Replaced by regulatory requirements

III. Present Ground Water Monitoring

A. Hazardous/solid waste monitoring sites

1. Regulatory requirements
2. Specific parameters

B. Leading underground/aboveground tank sites
1. Site characterization process
2. Risk assessment modeling
3. Use of MWs for model confirmation
4. Use of MWs for cleanup effectiveness

IV. Future Ground Water Monitoring Programs
A. Re-establishment of ambient program
B. Areas of special interest
1. Protection
2. Development of resource

V. Summary
A. Purpose of Program Clearly Defined
B. Data is Consistent
1. Written sampling protocol
2. Same testing methods used
3. Trip blanks
C. Review of data