AN ANALYSIS OF INDIVIDUALS' ATTITUDES AND ADAPTATIONS TO CHRONIC HOUSEHOLD WATER SUPPLY PROBLEMS IN A RURAL NEIGHBORHOOD

by

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(ABSTRACT)

Reliable household water supply remains a problem for many small rural neighborhoods. Safe drinking water is increasingly becoming a national issue, and many small rural systems do not have the governmental supports, both financial and technical, that assure them an adequate and safe household water supply.

This study focused on describing the attitudes and practices of 43 householders in a low-income rural neighborhood that owned their own water system. They had experienced chronic water problems for eight years, and were trying to get the county to take over the system.

Data were collected through a self-administered questionnaire that was developed by the researcher. An 82 percent return was achieved. Dependent variables used for analysis were: age, sex, educational level, income, and tenure status. Findings showed that most residents took minimal action to prepare for water shortages: storing only two-five gallons in plastic jugs, females taking this action more often than males. No one had developed a larger

storage system. Most residents relied on family and friends for emergency water, as well as alternative bathing and toilet facilities. Forty-five percent also used a privy or the woods for alternative toilet facilities. Older residents were more likely to use sponge baths as alternative bathing. The worst problems with the situation were not having water and carrying alternative supplies. Though the majority of residents were not satisfied with the water system, they felt the cost of water was about right.

A majority of residents were satisfied with their housing and the location in which they lived.

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CHAPTER I

Introduction

Purpose

The purpose of this study was to examine the attitudes and adaptations of individuals with a household water supply that was periodically inadequate. The neighborhood had experienced sporadic breakdowns in its water-delivery system over the past approximately eight years. The rural neighborhood of 67 families was serviced by a water system that they jointly owned.

Issues surveyed and analyzed related to what people did as they managed their water supply inside their homes. Did they store water in preparation for times when their water system was not working? Did they conserve water? How much time and effort did it take to prepare for times when their system was not working? The study also looked at attitudes regarding the water situation. General housing satisfaction was also measured in order to determine the impact of a negative water situation on overall housing satisfaction.

Background of Rural Water Situation and Importance of Study

General Concerns

When evaluating rural housing, water issues are a primary concern. In areas of scattered single-family homes, water is an individual family responsibility. When housing is clustered, many small neighborhood water systems have

evolved. Today the majority of the population of the United States is served by municipal systems. However, many neighborhood systems serve the remainder of the population. Data from the National Statistical Assessment of Rural Water Conditions (Francis et al., 1983) indicated that in 1983 there were over 39,000 small, year-round, neighborhood water systems in the United States, and each served a population of less than 500.

Administration of Water Systems

Many of these small neighborhood systems are owned and administered by some level of governmental or quasi-governmental body. As Cox & Patrizi (1984) note, state laws allow for a variety of institutional frameworks for these systems. Municipal and county governments, special county water and sewer districts, metropolitan districts, sanitary districts, water and sewer authorities, private companies, and cooperative associations are the main organizations with responsibility for residential water supplies. Many of these organizations receive assistance in financing through state or federal agencies. State and federal regulations, such as the Safe Drinking Water Act of 1974, also are enforced through these systems.

Many of the neighborhood and small community systems in rural areas are the least supported. Often they are served by private companies and cooperatives. Because they are

private, there are no provisions for state or federal financial support. Any system that services a population of less than 25 or has less than 15 hookups is not subject to state and federal safety regulations.

Rural Water in Virginia

Virginia Health Department records indicate that in Virginia there are over 1,000 water systems serving communities of 25-200 people (Massie, July, 1991). Water systems serving fewer then 25 people are not counted or monitored in any way. The 1980 census counted 100,530 homes, about 5% of total state household units, without complete plumbing for the homes' exclusive use (Virginia Water Project, 1988). This lack of plumbing often indicates a lack of a source of water. Other counts by the Virginia Water Project show 353,657 households with individual drilled wells, almost 50% of which are of inadequate construction and therefore prone to failure or pollution.

Funding Sources in Virginia

Funding channels have changed over the years. In 1958, the Environmental Protection Agency began to fund waste water construction programs whose primary role was to protect surface water. During the 60s, the Farmers Home Administration, the Appalachian Regional Commission, and the Department of Housing and Urban Development began funding water projects for small communities and individuals. In

1981, the Federal programs for small cities were folded into block grants that could be awarded in water and sewer or other competing areas.

By the late 80s, the Virginia General Assembly began to address water issues unique to rural areas. The General Assembly funded the Virginia Water Project specifically to address rural household water issues. However, the funding was limited and the bulk of the money was used for the preparation of applications for larger block grants. Bond issues and revolving loan funds through the Virginia Resources Authority were also developed.

Finally in 1990, Virginia attempted to address some individual issues with an indoor plumbing program that offered up to $12,000 per household for indoor plumbing expenses (Department of Housing and Community Development, 1991). Included in the funded projects were wells and related improvements for the water source. Though these various programs showed an awareness of some of the problems related to rural water, they failed to offer enough resources to solve the problems.

Small neighborhood water systems that may be privately owned or owned by a very small municipality have major problems with funding. As noted by Cox & Patrizi (1984), these small systems are hampered by low per capita income and higher costs for system development. They often have a

more difficult time recruiting trained personnel to meet the testing guidelines of the Safe Drinking Water Act. Some of these systems that were funded by public or private organizations 20 or more years ago are approaching the end of their useful life span. Few options are currently available for new funding. Though surveys have been taken of some of these neighborhoods for the purposes of funding applications, little documentation has been disseminated regarding the actual day-to-day living involved with a situation like the one described in this study.

Buck Hill, the neighborhood chosen for this study, has many of the water supply problems that may be typical of rural areas. The system, described in more detail below, has problems with storage, pumping equipment, and delivery. The neighborhood is small and currently unassisted by the county government. It has been difficult to foster community involvement. Many people are unwilling or unable to help. Trained personnel are not available from within the local population. Though this is only one neighborhood with several of the problems confronted by small systems, the current study begins to address a part of the issue that has not been documented. That is, how do rural households cope with problems related to their household water system?

Objectives of Study

The objectives of this study were to determine, in

households that have chronic water problems, what planning and implementing strategies were used. Could different levels and types of planning and implementing activities be related to the variables of age, sex, income, educational level, and tenure type? The data were analyzed to determine different attitudes regarding several aspects of the water situation. Information from the Buck Hill neighborhood was analyzed:

1. to determine demographic characteristics of Buck Hill residents;

2. to identify the household water supply resources and water-using items;

3. to identify the housing characteristics including basic structure, age, number of bedrooms, and land;

4. to determine patterns of routine household water use;

5. to determine the planning and implementing activities that the respondent used during down-time in the water systems and relate them to the variables of age, sex, income, educational level, and tenure type;

6. to determine a measure of housing satisfaction of each respondent, and

7. to determine the attitudes of each respondent toward the water situation in the neighborhood.

Delimitations

This study was limited to the current residents of a single rural neighborhood in western Virginia. It did not address the attitudes and practices of those who may have moved from the area because of the water situation.

This study did not address issues of family or community dynamics.

Limitations

The study was a self-administered questionnaire subject to the limitations of such an instrument.

The findings of the study can not be generalized to describe and explain attitudes and practices in other neighborhood water systems.

Definitions

Within the context of the research, the following terms are defined:

Community Water System: A water system controlled by a governmental or public service authority agency; considered a public system.

Down-time: A time when the water system is not delivering water.

Macro-environment: ". . . surrounds the micro-environment through related societal systems . . . and the natural and structured surroundings or settings for all other ecosystem interchanges" (Deacon & Firebaugh, 1981, p.8).

Micro-environment: ". . . the surrounding elements of the living environment that other family systems share. This may include homes, yards and schools relating to kin, friends, and neighbors" (Deacon & Firebaugh, 1981, p.8).

Neighborhood Water System: A water system controlled by a private group, cooperative, or individual, and established to supply water within one residential area.

Respondent: The person answering the questionnaire. In this research, the primary homemaker in each household.

Water Problem: A problem obtaining drinkable household water because of no water, low water pressure, or bad quality water.

CHAPTER II

Review of Literature

Introduction

In developing background to study the attitudes and water practices, as well as the housing satisfaction, of the people of Buck Hill it was necessary to look at a number of different areas of background literature. 1) Studies were reviewed that helped the current writer to obtain a feel for the societal fabric of Appalachia. 2) Information and understanding of rural water systems was developed through readings about water issues in Virginia in agency publications, and information from Health Departments as well as through interviews with water development personnel. 3) An understanding of housing norms was gained through articles on the housing of families in this region, as well as interviews with agencies involved with the specific neighborhood. Texts and writings on social-science based housing issues and family resource management in America were studied to ground the theoretical framework of this thesis within the current research literature. 4) Finally, several methodology sources were consulted in the development of the interview process and questionnaire.

Appalachia

Appalachia is a mountainous region of generally rural development that sweeps southwestward from southern Quebec

to central Alabama. The mountainous terrain defines many cultural characteristics and water situations. It has been noted that, as a whole, mountain slopes occupy 90 percent of the total land area (Weller, 1965). Early studies found a region of self-sufficient farm families. The numerous mountain hollows separated families from easy access to each other, especially before the age of the automobile. An early study by the University of Virginia Rural and Urban Living Standards in Virginia (Gee & Stauffer, 1929) described the housing situation as mostly poor with little running water.

In Yesterday's People Weller (1965) described the character of the people in an area of Appalachia in which he worked as a minister for 13 years. The people he described were molded from a life of hardship and isolation. The significant traits that Weller explored were individualism, traditionalism, fatalism, action seeking, fearfulness, and person orientation. Weller also described the mountain peoples' inability to work in organizations for the long-term common good.

Stephenson (1968) in his case study Shiloh: A Mountain Community described a time in the 1960s when subsistence farming gave way to other employment opportunities. People often commuted to manufacturing jobs some distance from their homes. The mountain peoples' adaptation to the

stresses of the area and their changing nature was the concern of Stephenson's study. The beauty of the region and the difficult terrain were constant factors involved in people's choices and situations. Economic issues permeated the culture; it was often stated that, if only one could afford to, this area was the best place to live. Stephenson noted that the economic status of residents could be judged by the steepness of the land. The poorest people occupied the steepest, least accessible areas that were least likely to offer the means for an adequate living. He described not only the poorest, least successful resident, but also the "middle-class" and affluent, whom he saw as adapting in different ways. He noted the differences among sexes, at different economic levels, regarding acceptance of situations. Stephenson found that at the lower economic levels women had more goals for housing than did the men. Factors other than the immediate problem impacted on attitudes and adaptations, thus background and history were important. He also commented that even though a level of satisfaction of many life situations was expressed it was often tempered with a resigned attitude toward life and the difficulties with which they had to contend.

A U.S. Department of Health, Education and Welfare publication (Irelan & Besner, 1967) of the 1960s also looked at the rural poor. This study defined four life conditions

of the poor that impacted on many decisions and adaptations. These were: "(1) comparative simplification of the experienced world, (2) powerlessness, (3) deprivation, and (4) insecurity" (p.2). The study found that the rural poor listed better housing and neighborhoods as high on their list of desirable situations. The desire for basic services such as water was not polled. Two themes recurred in this study, as well as other literature. The first is the impact of automobiles on choices. The study noted that a family may stint on children's clothing or health matters in order to have money for a car. The other theme was the resigned approach to life. The authors suggest that the four life conditions mentioned above resulted in a fatalistic life approach to problems.

Janet Fitchen (1981), in her case study of a northern Appalachian community, addressed the issue of rural poverty and its causes. Her book Poverty in Rural America: A Case Study had as its primary focus the understanding of the causes of poverty and suggestions for overcoming rural poverty. In this context she looked at lifestyles in order to address common stereotypes and challenge them. The current writer's purpose is, in a sense, similar: to look at actual practices and attitudes in order to develop better programs to alleviate water problems. As Fitchen said, "If the underlying stereotypes are wrong, then the policies and

programs based upon them are not likely to be effective in solving the problem of long-term rural poverty" (p 62).

In regard to rural housing, Fitchen defines four goals of those in rural poverty: "to provide shelter for household members, to minimize the cash cost of housing, to be assured of a place to live in the future, and to maintain flexibility to modify living arrangements and adjust housing expenditures to meet fluctuations in family size, household needs, and availability of cash" (p.96). Several situations in Fitchen's life sketches related to water and assisted the writer in developing questions. For example, one was the concern with the time spent on household tasks when basic services are lacking. Another was the desirability to cope with problems in their own style rather than be involved with government programs. Fitchen noted the encroaching involvement of rules and regulations as housing density increases.

In Buck Hill the increased involvement of government was welcomed by many. When the existing system was built, just 20 years ago, it met very basic guidelines. Regulations required little testing, and no septic system, hydrants, or standards on the delivery system. The neighborhood was given a loan/grant for a basic system that they were to maintain themselves. A current problem that this neighborhood will face if the water system remains

privately run is finding the resources in both money and manpower to meet the many requirements demanded by new Safe Drinking Water legislation.

As regulations increase, many of the historical advantages of rural living are subjugated. Fitchen listed some of these advantages as relatively cheap land, housing, and taxes, an absence of zoning and housing codes, availability of game and wild food crops, open space, and free firewood.

Rural Water

Source and Quality

In Virginia, the water supply of almost all small systems is from groundwater. Surface water facilities require more expensive building projects that need careful long range planning (Weigmann & Kroehler, 1988). Additionally much of Virginia does not have natural reservoirs for surface water.

The publication Threats to Virginia's Groundwater (Weigmann & Kroehler, 1988) described the current situation with groundwater in Virginia. The authors noted that until quite recently groundwater was thought to be protected from human contamination because it is hidden beneath the surface. Unfortunately, widespread contamination of groundwater is being discovered. Once contaminated, groundwater is very difficult and costly to clean up. In

the Valley and Ridge area (the Blue Ridge area of which Buck Hill is a part) pollution potential is quite high. The numerous streams lead directly to the underground aquifers that recharge the groundwater. Though groundwater contamination seems relatively low in Virginia, complaints have increased continually since 1979. The intent of information such as the Weigmann & Kroehler publication is to educate citizens so that good quality groundwater is not threatened.

Small Systems in Virginia

In order to understand how typical the Buck Hill situation was several sources were consulted. A database printout from the State Health Department (Massie, July, 1991) was reviewed. Analysis showed that in Virginia there were approximately 1,194 water systems that serve populations between 25 and 200. These systems are often located within mobile home parks, older existing neighborhoods, and newer subdivisions. Information on the condition of specific systems was not available.

However, a picture of the general state of water systems was presented in the publication Water for Tomorrow (Virginia Water Project, 1988). The intent of this study was to provide accurate data from which to set goals and measure progress. The study used data from the 1980 census, a 1987 survey conducted by the Virginia Department of

Health, the Tayloe-Murphy Institute Population Estimates for 1981-1985, and the Environmental Protection Agency's 1986 Wastewater Needs Survey. Local sanitarians also collected new data. This comprehensive survey of Virginia water and wastewater needs showed that the small rural areas have the greatest needs and the fewest resources.

The study made a strong case for the role of government programs in the remediation of inadequate water and wastewater systems in rural Virginia. The authors of Water for Tomorrow (Virginia Water Project, 1988) concluded that "new programs and services must be designed in a manner that makes best use of resources and provides assistance to communities and individuals according to their needs" (p.29).

A study by the Virginia Water Resources Research Center detailed the various administrative options existing in the delivery of water statewide. In Institutional Framework for Rural Water Supply in North Carolina, South Carolina, and Virginia, Cox and Partizi (1984) described the rural situation, and noted that of the 61,500 community water systems in the United States, 63.5% serve fewer than 500 households. Cox and Partizi also stated that rural systems experienced a disproportionate share of water supply problems, and although an EPA study published in 1983 reported that few systems have quantity problems, when they

did it was usually due to the deterioration or inadequate construction of the physical facilities rather than a less than adequate source. The major difficulties for small rural systems were the low per-capita income of the residents and the relatively higher costs for system development.

Cox and Partizi also commented on the differences between small corporations that were for profit or nonprofit. In the case of the nonprofit, substantial citizen support is needed. If this exists, it can be a very positive force; if it does not, it can be a major difficulty. These nonprofit systems may qualify for some federal and state assistance or other funds available for nonprofits. However, if a company is a profit-making venture it does not qualify for federal or state assistance. Often it is not in the primary business of water supply; the water company is a necessary adjunct business to its mobile home park or small development. As a result, the interest to maintain high standards in the system is limited.

Household and Individual Water Practices and Attitudes

Few studies have been reported that relate directly to individual household practices with water and attitudes toward water. However several studies, conducted over the past 25 years, highlight very different approaches research has taken toward measuring domestic water use. A Study of

Residential Water Use by Linaweaver, Geyer, & Wolff (1967) was a report based on data from a study conducted from 1961-1966 in a typical subdivision. The purpose of the study was to gather updated information on residential water use in order to better design modern central distribution centers. It was based on a growth policy with no mention of conservation measures. However, it did point out that domestic use was significantly lower in metered areas using individual septic systems than in municipal systems. Data were collected for whole house use and also compared outside and inside water use. It reported 1966 residential water use at 80 gallons per capita per day. Suburban water use often depended on the economic level of the household and the area of their lawn.

A later study published by the Environmental Protection Agency, Resource Use and Residuals Generation in Households (Kuhner, Luecke, & Shapiro, 1979) focused on major household functions and their relative importance. Its emphasis was on reducing water use and residual generation. The report organized data into nine household functions. The six water-using functions were: water heating, kitchen, washing and cleaning, bathroom, outdoors, and maintenance. Data were from individual estimates of amount used, using categories of enough, not enough, more, or less. These categories were used to indicate the importance in

perception of each function, observe variations, and make comparisons. Usage figures were established by asking about the number of appliances and number of times used. The authors found water was used in greatest quantities in the bathroom. They also noted that over half of the water used by a household may be for outdoor use.

A study published in 1984 by the Department of Housing and Urban Development, Residential Water Conservation Projects (Maddaus, 1984) analyzed a number of demonstration projects in order to document water savings in residential settings. The areas focused on were around large metropolitan districts in California, Colorado, Georgia, Washington, DC, and New Jersey. The goal was to develop models for efficient water utility systems. The study reported that the average water usage in non-conserving homes was 77 gallons per capita per day, but in homes with a variety of water saving devices, such as low-flush toilets and water saving shower heads, the per capita usage was 60 gallons per day. The study reported, as others had, that metered homes used less water than non-metered and most savings were on outside usage. Though the previous studies are important for general guidelines regarding household water usage, they were based on urban or suburban water situations and do not report on individuals' attitudes or practices in rural areas.

A study by Dellenbarger and Dellenbarger (1987), People and Prices, Rural Water Systems in Oklahoma, looked at water conservation attitudes and practices of individuals in rural Oklahoma. Residents using rural water systems (population under 10,000) were surveyed. The authors of the study found that most rural water system users felt that they could use as much water as they wanted. However, over 30% indicated that an alternative source of water was available for non-household use. Since a goal of the study was to analyze price elasticity, the authors were interested in how these alternatives were used when the price of water was raised. The researchers found that during high price periods water was not saved since rural users had options for alternatives. Also, current pricing of systems was based on equipment and maintenance and not the resource, e.g. water.

In Attitudinal and Behavioral Responses to Drought-Induced Water Rationing Flannery, Morris, Carey, and Eichner (1983) looked at attitudes toward water, knowledge of water-use practices and attitude toward government action in a university town. Unlike the Buck Hill area, Flannery et al. surveyed households in a crisis situation of drought. One of the study's goals was to suggest whether attitudinal changes would result in behavioral changes. Interestingly, the study found a very low level of knowledge about water-use practices. Attitudes about the seriousness of the

situation played a small role in determining conservation practices. However, householders' characteristics did appear to be related to conservation. Households of middle-aged persons had more reductions than older ones. Greater reduction was also positively associated with household size (up to four persons) and higher education.

Housing Wants and Needs

In studies reviewed that looked specifically at housing wants and needs, most were concerned with levels above the need for basic services. It would seem a truism that today's families would want the basic services of water, sewer, and electricity for housing satisfaction. However, this question has not been directly addressed.

A study by Hanna and Lindamood (1979) looked at lower income rural families in order to access various aspects that determined housing satisfaction. In this study 20% of the sample lacked complete plumbing but individual analysis of this variable was unavailable. However, in the analysis of the full sample the strongest correlation with overall satisfaction was with number of rooms.

A study by Goss and Day (1984) Housing Aspirations: A Case Study of Appalachian Miners noted that miners' housing aspirations were typical of many Americans. Goss and Day found that the five most desired characteristics were: a laundry room, family room, dining room, garage, and brick

exterior. They found that family income was positively related to aspirations, however other variables tested--length of time in dwelling, form of tenure, location of dwelling, age of household head, education of household head, race, housing deprivation, and housing satisfaction--did not correlate with aspirations. Goss and Day found that this population put a limit on the cost of a house. This amount of $40,000 was below the median priced house in the area and thus would tend to limit opportunities for housing.

Other studies of low and moderate income rural people examined housing satisfaction. Brink and Johnston (1979) attempted to clarify what housing satisfaction is, and to test the concept within the context of home purchases. In their literature review, Brink and Johnston noted that housing satisfaction involved many separate parts. One might be satisfied with one aspect and not with others, or one might be influenced by aspirations and expectations. They also pointed out that housing satisfaction could change over time. In their conclusion Brink and Johnston noted that "housing satisfaction is a subjective response to housing need gratification, which the consumer gauges by the degree of fulfillment of his housing expectations and aspirations and by housing improvement achieved over his previous dwelling" (p. 344).

Summary

In summary, the literature reported that most rural water is groundwater (Weigmann & Kroehler, 1988; Virginia Water Project, 1988). The administrative framework for these systems was often varied, and in the smaller systems the administrative structure was often private, thus limiting access to funding (Cox & Partizi, 1984). Through state records it was estimated that, at the time of the study, there were over 1,194 water systems serving populations of 25-200 in Virginia (Massie, July, 1991). These water systems often had more problems and cost more per capita than larger, municipal systems (Cox & Patrizi, 1984).

Literature on the region of Appalachia suggested that there was a fatalism about life in general, and a strong concern with economic problems (Fitchen, 1981; Stephenson, 1968; Weller, 1965). Fitchen also found a reluctance to get involved with government to solve problems. Job opportunities had changed over the years bringing the population more in touch with the outside world (Stephenson, 1968), and dependence on cars was prevalent (Irelan & Besner, 1967).

In looking at water consumption it was found that an average per capita usage in suburban areas could range from 60-77 gallons per day (Maddaus, 1984). Those with water

saving items used the smaller amounts. Half of the usage was often found to be for outdoor watering (Kuhner et al., 1979). Research also pointed out that metered areas used less water (Linaweaver et al., 1966; Maddaus, 1984; Kuhner et al., 1979). One study noted that rural areas often had alternative sources and therefore did not limit the amount of water used (Dellenbarger & Dellenbarger, 1987).

In the area of housing satisfaction, the literature noted that rural aspirations were similar to those of many Americans (Goss & Day, 1984). However several studies pointed out that rural housing was seen more as shelter than as an investment and there was a low limit placed on how much a family was willing to spend (Goss & Day, 1984; Fitchen, 1981). Moreover, Brink and Johnston (1979) reported that housing satisfaction was not a static response, but could be based on the history of the housing situation and expectations as well as existing physical attributes.

The literature was limited regarding the focus of this thesis: What are the attitudes and practices related to water and housing of rural individuals in a small neighborhood system with water problems? No research data were found on attitudes or practices of individuals who lived in housing without basic services such as water.

CHAPTER III

Background for Study

Buck Hill

Sociological studies on Appalachia have noted that a struggle for a decent life was all consuming for a majority of people (Fitchen, 1981; Irelan & Besner, 1967). Limited income led to a need for a family to make hard choices. The natural isolation of the area also led to an independent spirit. Buck Hill is a small segment of yet another emerging type of community in Appalachia. It is an example of the non-farm, less isolated, rural neighborhoods that have grown more prevalent as rural job opportunities have continued to change.

The Neighborhood

Buck Hill, Rockbridge County, Virginia, the neighborhood of this study, is an area of rural non-farm housing consisting of 67 homes. The homes are sited along two paved secondary roads that meet at a corner where a church, veterinary clinic, and general store are located. Within a few miles is the center of Natural Bridge Station, were the high school, primary school, bank, hardware store, and family restaurant used by the Buck Hill neighborhood are located. The neighborhood is also within five or six miles of the new industrial park in the county. The boundaries of the neighborhood are defined by the water system as well as

the topology and major roads.

The neighborhood population is about 150 persons. According to the Community Improvement Grant survey conducted in 1991 in preparation for a water grant, low and moderate income families make up 68% of the population. Of the 67 homes in the neighborhood, 6 lack complete indoor plumbing, and four are not on the existing system (Dewberry & Davis, 1991). The remaining 57 homes are connected to the water system described in detail below.

Before the current system was built in 1972, the source of water for most households was a contaminated spring. In an interview with J. C. Reynolds, a community organizer from the Southeast Rural Community Assistance Project, the author learned that the initial concern of the residents was for the convenience of a piped-in neighborhood system. They had lived with the existing source for quite a while and were not concerned with, or wanting to admit to, having "bad" water (J. C. Reynolds, personal communication, April 11, 1991).

The Rockbridge Rural Water Agency Incorporated

At the time of the study, the Buck Hill water system was owned and operated by the neighborhood residents, under the name of Rockbridge Rural Water Agency Incorporated. The funding for the current system was a combination loan/grant from Farmers Home Administration in 1972 (J. C. Reynolds,

personal communication, April 11, 1991). The system was built over a period of 18 months in 1972-73 as part of a demonstration project with the assistance of the Southeast Rural Community Assistance Project. During the time of planning a number of neighborhood meetings were held. Eventually about seven persons were trained to do the bulk of the daily maintenance and record keeping work. This group of neighborhood residents tested the water; maintained the system, including repair of the storage tank, pump, and lateral lines; read the meters, and did all record keeping connected to billing the residents (J. C. Reynolds, personal communication, April 11, 1991).

The system consisted of a well, rated Class I, with a rated capacity of 28 gallons per minute. Because of the rated draw-down capacity, the well could only be pumped 60% of the time, which was adequate for 56 homes. A storage well of 4,500 gallons was present. The distribution system consisted of 6-inch plastic mains and service laterals installed above the freeze line. Neither placement nor size meets current standards of the Rockbridge County Public Service Authority. The system did not contain shut-off valves or hydrants, but all dwellings on the system were metered. The water had been tested and met current safety standards. The only treatment was chlorination at the well (Dewberry & Davis, 1991).

Newspaper reports indicated that problems with the Buck Hill system go back at least 10 years. For the past eight years residents have been working to educate the county officials about their problems and convince them to apply for state and federal money for a new system. The motor for the well often breaks down, storage tanks are rusting and full of holes, and in winter, the small and thinly covered lateral supply lines often freeze. Volunteer help is worn out (Jarvis, January 9, 1991).

In February of 1991 the county, with the assistance of a regional planning district commission, applied for Community Development Block Grant funding. The request for $700,000 was to be met with matching funds from the county of about $80,000. After completion of the system the county planned to assume the existing debt of $20,000 still held by Buck Hill and also take over the control of the new system (Jarvis, June 12, 1991).

In June of 1991 the Community Development Block Grant proposal was denied. The county voted to reapply for a grant, and did so in March 1992. The county supervisors addressed problems with the original grant in that they increased the proposed storage capacity of the tank and also increased the matching grant from the county to $120,000. Residents were hopeful this would make the difference. It would still be over a year before any new system would be in

place. The current mainstay of the system said, "It's gradually getting worse and worse" (Jarvis, July 10, 1991). At the time of this writing, the revised grant has been submitted and the neighborhood again waits for news.

CHAPTER IV

Theoretical Background and Empirical Model

Theoretical Background

In attempting to ground this study in a model concerned with individual action, the researcher looked to family resource management theory. The work of Deacon and Firebaugh was used. Deacon & Firebaugh (1981) note that "managerial activities and processes aim to meet desired goals and purposes by using resources"(p.3). Their resource management theory uses systems analysis classifications of input, throughput, and output to further define management. In this study their theory is adapted to the individual.

The input parameter includes demands and resources. Within demands are goals and events. Goals are expected demands related to daily life. Events are unexpected occurrences that have a low probability of happening. Resources may be material or human, including fixed personal attributes.

Deacon and Firebaugh (1981) subdivide the throughput parameter into the personal and managerial areas. The managerial subsystem includes planning and implementing. Planning includes standard setting and sequencing. Within implementing are actuating, controlling, adjusting, and facilitating (Figure 1).

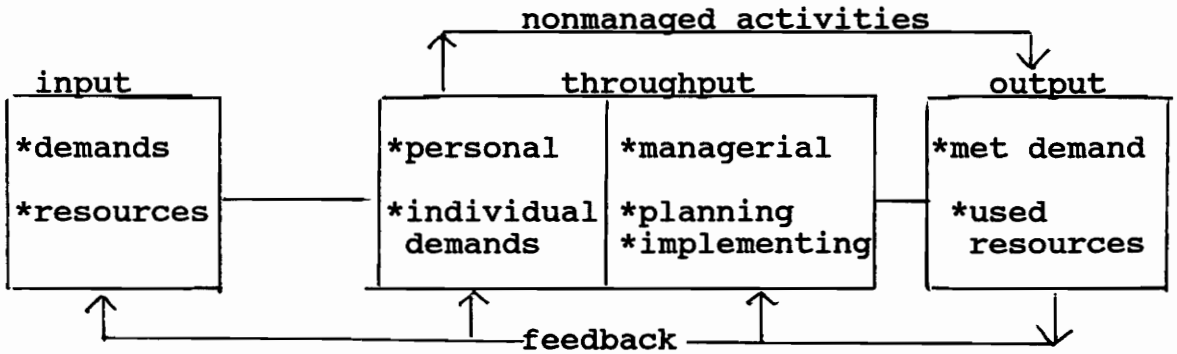

Figure 1. Theoretical Model of Family Resource Management. The Deacon and Firebaugh model (1981) adapted to the individual.

Output involves met demand and used resources. These are a result of "transformations inside the boundaries of the managerial system in response to demands and resource inputs" (Deacon & Firebaugh, 1981, p.35). Used resources are changes in the basic resources of the input side, and along with met demand, lead full circle back to the input through a feedback loop.

Tangential to these three basic areas and affecting them in various ways are feedback and nonmanaged actions. Feedback of met demands or used resources may impact the input parameters of demand and resources (Figure 1). According to the Deacon and Firebaugh (1981) model, feedback also may channel directly back to throughput or may cycle within the throughput area between planning and implementing. Nonmanaged actions may circumvent the planning activities and implementing activities in throughput and go directly to the output, perhaps resulting in a number of unplanned adaptations in values and needs before resulting in a met demand. The Deacon and Firebaugh model is dynamic, attempting to define a moment in time in an action, or resource management decision. This theoretical model seems appropriate in attempting to identify the attitudes and practices in a household water management situation.

Empirical Model

The structure of the empirical model draws on the theoretical structure using input, throughput, and output to analyze the coping behavior of individuals who have chronic water supply problems in their homes. However, the empirical model for this research is limited to the one aspect, coping behavior, within what Deacon and Firebaugh call the micro-environment. It does not attempt to analyze the family and community subsystems.

In the empirical model, the input resources is the existing water system and the individual resources of each household. These include material resources such as money to buy bottled water, or personal resources such as near-by family or a car in which to transport water, and individual attributes such as sex, education, and age (Figure 2).

The throughput personal area consists of individuals' current demands and the practices that they implement to meet these demands. These demands and practices are influenced by the resources and attributes of the individuals. For instance an elderly, retired person may take a sponge bath for a few days. However, a laborer who comes home quite dirty each evening may demand a hot shower and therefore plan to visit his parents on the way home in order to use their shower.

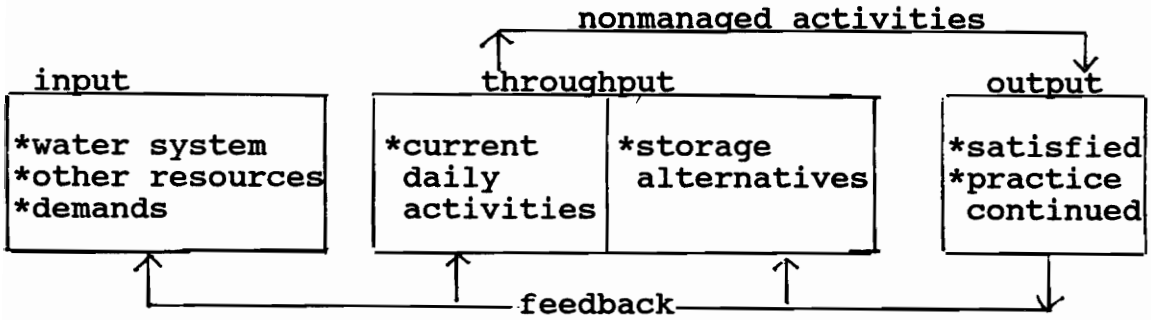

Figure 2. Empirical model of coping behavior.

The output area of met demands may be acceptance of the current system or satisfaction with a found alternative. It is recognized by the researcher that many aspects of the macro-environment and a person's attitudes toward it may also affect acceptance.

Feedback is related to the problems associated with using someone else's water system, not having enough water, or perhaps the criticism of other family members. Nonmanaged action may result in some of the same feedback. The area of nonmanagement is difficult to analyze objectively. What may appear to an outsider to be nonmanaged activity may well be the level of planning that is accepted in a particular person's subculture.

CHAPTER V

Methods and Procedures

The Sample

The sample was composed of one adult member of each household in the neighborhood known as Buck Hill. The adult responsible for the major portion of the household tasks was asked to respond. Names and addresses of all those in the neighborhood were obtained from the person responsible for the water system. Of the 67 households in the area, 59 accepted questionnaires. None of those declining were on the water system: 2 had individual wells and 6 did not have plumbing. Two of those accepting the questionnaire currently used individual wells, but were interested in joining the new water system.

Instrument Development

The instrument (Appendix A-2) for this survey was developed by the researcher using guidelines of the Total Design Method (TDM) by Dillman (1978). The instrument was designed to elicit information regarding water usage practices in rural non-farm households that had experienced long-term problems with household water supply. Questions regarding attitudes toward the household water situation as well as housing satisfaction were also asked. The several sections of the questionnaire were home water supply and system, home characteristics, water practices, attitudes

toward water situation and housing, and household data.

There were 49 questions asked, primarily multiple choice, with most questions also including an "other" choice. Respondents were encouraged to explain further if the "other" choice was selected. Eight of the questions allowed for more than one answer. There were three open-ended questions that related to defining the worst aspect of the water situation and the best and worst characteristics of the housing. A statement at the end of the questionnaire encouraged respondents to note any additional concerns. Precoding allowed for easy tracking of returns.

Pretest

A pretest was carried out in November of 1991 at a mobile home park situated in the same county as the full study. The park was experiencing water supply problems. All respondents reported periods of no water supply. Four also indicated problems with water pressure and water quality.

Residents of five of the eight homes in the park received questionnaires and all five completed and returned the questionnaires. The sample consisted of those that were home the day the questionnaire was delivered by the researcher accompanied by an informal leader in the park. The questionnaire was briefly explained by the researcher and an explanatory letter and a self-addressed stamped

envelope were left. Respondents were encouraged to call the researcher if they had any questions. They were asked to return the questionnaire within one week.

The intent of the pilot survey was to test the content and structure of the questionnaire. The readability level of the pilot was deemed appropriate by the respondents. Several questions were unanswered and on further questioning, by telephone, were said to be confusing in intent, but not reading level. Revisions were made to the questionnaire to correct these problems. As a result of feedback from the pilot test, several questions were added regarding use of household water and the worst problems associated with the water situation.

Data Gathering for the Buck Hill Study

The questionnaire was personally delivered to each of the homes in the sample on one Saturday in January of 1992. The researcher was accompanied by the neighborhood resident who maintained the water system. As noted above, 59 of the 67 homes in the areas accepted delivery. Of the 59 deliveries, all but 16 were delivered personally. A packet containing a copy of the questionnaire and the return envelope was left in the door at each of the remaining 16 homes. It was explained to all recipients that this was part of a study being conducted through Virginia Tech that would assist researchers and officials in understanding

rural water problems. It was also noted that pertinent information would be passed on to the county supervisors in a summary way, with no individuals identified. They were told that it would take less than one-half hour. They were encouraged to call the researcher if they had any questions. An explanatory letter and a self-addressed, stamped envelope were left. Residents were encouraged in the letter, and verbally, to return the questionnaire within a week. If a questionnaire was not returned within a week, a follow-up reminder contact was made by telephone or postcard.

Twenty-six questionnaires were returned within the week while seven respondents were telephoned and 10 postcards were mailed. Two people were reminded in person by the volunteer helper. The community helper reported that of those not returned, four were situations in which the person had moved, either permanently or temporarily because of a long-term illness.

Within three weeks a total of 45 questionnaires were returned. Two of these were eliminated from the sample because the majority of the questions were left unanswered. The survey population then consisted of 43 households. After subtracting the four unavailable households, the response rate of 45 out of 55 was about 82 percent.

Data Analysis

Upon completion of data collection the information was coded and entered into the Number Cruncher Statistical System (Hintze, 1990), version 5.03. Data were analyzed through use of descriptive and comparative procedures using the NCSS system.

CHAPTER VI

Report of Findings

Demographics: Objectives 1-3

The first three objectives of the study were: 1) to determine demographic characteristics of Buck Hill residents, 2) to determine the household water supply resources and water using items, and 3) to identify the housing characteristics related to basic structure, age, number of bedrooms, and land. These three objectives set the basis for analyzing actions and attitudes and are reported below. All percentages in the narrative are rounded off to the nearest whole number.

Buck Hill Residents

Similar to the entire county, the population was almost equally divided between male and females. By 1980 census data, Rockbridge County had a population of 9,156 males and 9,184 females (Rockbridge County Economic Development Office, personal communication, March 12, 1992). The questionnaire was answered by 21 females and 22 males who had identified themselves as the primary adult responsible for homemaking (Table 1).

The age of the respondents ranged from 28 to 84 years old. The largest category of about 33 percent was in the age range of 36 to 45 years of age.

Census data for 1990 show the typical family size in

Table 1
Demographic Characteristics of Respondents: Household Summaries

Description	n	%
Sex		
Male	22	51.2
Female	21	48.8
Age		
28-35	7	16.3
36-45	14	32.6
46-55	7	16.3
56-65	5	11.6
66-75	7	16.3
76-84	2	4.6
no answer	1	2.3
	43	100.0
Household Size		
one	11	25.6
two	11	25.6
three	10	23.3
four	10	23.3
five	--	----
six	1	2.3
	43	100.1
Homes with Children	22	51.1
Mean Number of Children	2.5	
Standard Deviation	.722	
Single Parents	5	11.6
Mean Years in Home	13.0	
Standard Deviation	12.16	
Household Yearly Income		
less than $5000	5	11.6
$5,000-10,000	10	23.3
> $10,000 but < $15,000	5	11.6
$15,000-$22,000	11	25.6
over $22,000	11	25.6
no answer	1	2.3
	43	100.0

(continued on next page)

Table 1-continued
Demographic Characteristics of Respondents: Household Summaries

Description	Respond-ent	%	Other Adult	%
Educational Level				
some grade school	4	9.3	2	7.7
completed grade school	4	9.3	3	11.5
some high school	12	27.9	5	19.2
completed high school	11	25.6	8	30.8
some college or adv. training	9	20.9	6	23.1
completed college	2	4.7	2	7.7
no answer	1	2.3	-	-
	43	100.0	26	100.0
Employment Status				
full time	25	58.1	14	60.9
part time, occasional	2	4.6	1	4.3
part time, regular	3	7.0	2	8.7
retired	9	20.9	-	-
unemployed	3	7.0	4	17.4
no answer	1	2.3	2	8.7
	43	99.9	23	100.0
Occupational Category				
laborer/fast food	12	40.0	9	52.9
trade/office wk.	9	30.0	4	23.5
professional	7	23.3	3	17.6
other	2	6.7	1	5.9
	30	100.0	17	99.9

Note: Percentages may not equal 100 due to rounding.

the county to be 2.92 (Center for Public Service, databaserun, 1990) and, similarly, in Buck Hill the average household had between two and three persons. Most households had two adults and half the households had one to two children. Five households were single parent families.

Demographic data showed that the community was primarily a low to moderate income neighborhood by county standards: 46 percent have an annual income of less than $15,000 and another 26 percent have an annual income between $15,000 and $22,000, which was also the median income range.

Data on the educational level, employment status and occupational category of respondents, and also the other primary adult in the family, were collected to give a more complete picture of the community. Unfortunately Rockbridge County data regarding these categories was not available. The education level represented in the community clustered about the categories of "some high school" and "completed high school" and "some college or advanced training". In the total community the largest group, about 28 percent, reported completing high school. About 25 percent said they had some high school, while approximately 22 percent said they had some college or advanced training.

In Buck Hill, 58 percent of adults worked full-time. Retired persons represented almost 14 percent of the adults, and about 11 percent were unemployed. Of the approximately

71 percent of adults in the community who said they were employed, about 44 percent indicated that they worked as a laborer or in the fast food industry.

Home Water Resources

In order to determine water-using resources, questions were asked about the current water system and water facilities within and outside of the home (Table 2). Over 95 percent of the participants were connected to the Buck Hill Water System, while two received water from their own individual wells.

About 88 percent of all respondents had complete plumbing, defined as a kitchen with piped-in water, a bathroom with flush toilet, sink, and tub or shower. Eighty-six percent of homes also had an outdoor faucet.

Standard water-using items--flush toilet, tub or shower, clothes washer, kitchen sink, and water heater--were reported in use by 84 to 95 percent. Only 14 percent of households reported having a dishwasher, two of these also had food waste disposers and one a hot tub. Water conserving items were low-flow shower heads (35%), and low-flush toilets (30%).

Seven households indicated that they had a privy. Only two respondents (5%) indicated that they had a secondary source of drinking water on their land.

Table 2
Household Water Using Items and Water Resources

	N	%
Drinking Water Source		
Buck Hill system	41	95.3
private well	2	4.7
	43	100.0
Complete Plumbing		
yes	38	88.4
no	5	11.6
	43	100.0
Selected Sanitary Fixtures*		
flush toilet	37	86.0
kitchen sink	41	95.3
tub or shower	37	86.0
water heater	41	95.3
clothes washer	36	83.7
dishwasher	6	14.0
garbage disposal	2	4.7
low-flow shower head	15	34.9
low-flush toilet	13	30.2
privy	7	16.3
hot tub	1	2.3
Secondary Source Drinking Water		
yes	2	4.7
no	41	95.3
	43	100.0
Secondary Source-Non-Drinking		
yes	5	11.6
no	37	86.0
	42	97.6
Outside Faucets		
yes	37	86.0
no	6	14.0
	43	100.0

Note: Figures in asterisked categories are not additive because more than one answer is possible.

Five respondents (12%) noted a secondary source of non-drinking water on their land.

In summary, household water-using facilities were limited to standard items. The only water-saving items in use were low-flow shower heads and low-flush toilets.

Reported Water Problems

Several questions were asked about the perceived problems with the current water system (Table 3). These questions were not answered by the two respondents who had their own wells so the number in this sample was 41.

Low water pressure was the most common complaint with about 70 percent identifying this as a problem. Periods of no water were reported by about 68 percent of the respondents and bad water quality was reported by almost 37 percent. The "other" category was chosen by about 7 percent: their problems related to the extreme hardness of the water, and air in the water lines.

Of those on the Buck Hill system, almost all indicated some problem. Only three persons said they had no problems while about 63 percent indicated that they had at least two problems.

House Characteristics

Basic house characteristics were tabulated for the entire sample and also compared between renters and owners (Table 4). On observation, most of the homes appeared to be

Table 3
Reported Water Problems

	n	%
Number of Problems Reported		
no problems	3	7.3
one	12	29.3
two	18	43.9
three	8	19.5
	41	100.0
Water Problems*		
low water pressure	29	70.3
no water	28	68.3
bad water quality	15	36.6
other(air,hardness)	3	7.3

Note: Two households with individual wells not included in total. Percentages and numbers are not additive in asterisked categories as there were several choices per respondent.

Table 4
House Characteristics: Renters and Owners

	Renters		Owners		Total	
Structure	n	%	n	%	n	%
Site built	8	18.6	28	65.1	36	83.7
Mobile home	-	--	7	16.3	7	16.3
Complete Plumbing						
yes	4	57.1	34	94.4	38	88.4
no	3	42.9	2	5.6	5	11.6
Home Age						
Mean	40		29.2		30.9	
Range	15-75		<1-80		<1-80	
Number of Bedrooms						
Mean	1.7		2.5		2.3	
Range	0-3		0-4		0-5	
Acreage						
Mean	7.8		5.1		5.5	
Range	<1-30		<1-45		<1-45	
Median	3		2		2	
Years in Home						
Mean	7.1		14.2		13.0	
Range	<1-21		<1-44		<1-44	

one story, two bedroom size homes. There was a mix of brick and wooden structures. Eighty-one percent of residents owned their home, while renters accounted for about 19 percent.

The most common house structure was the site-built home (84%). Renters were found exclusively in site-built homes. Mobile homes accounted for 16 percent of the total. Complete plumbing was in 88 percent of the homes, with over 94 percent of owners having complete plumbing compared to only 57 percent of renters.

The average age of all homes was about 31 years, but the range was from less than a year old to 80 years old. Renters tended to live in older homes, with the average age of the home at 40 years for renters and only about 30 years for owners.

The average number of bedrooms in the total sample was 2.3. Renters showed a lower average of 1.7 bedrooms, while the owner average was 2.5 bedrooms.

Acreage ranged from less than 1 acre to 45 acres. The median amount of land for renters was three acres as compared to two acres for owners.

The average number of years in the homes varied from less than one year to 44 years. On average, owners had lived in their homes for 14.2 years and renters for 7.1 years.

In summary, the data show a stable community of older, site-built homes with complete plumbing. Most homes were on lots of 2-3 acres, with a few homes on larger tracts. Owners more often had complete plumbing, newer and larger homes, and had resided twice as long in their home as renters.

Planning and Implementing: Objectives 4-5

The objectives related to planning and implementing were: 4) to determine the normal household use of water, and 5) to determine the planning and implementing activities that the respondents used during down-times of the water system and relate these activities to the variables of age, sex, income, educational level, and tenure.

Routine Water Use

Questions were asked regarding the use of drinking water and various appliances (Table 5). Household water was used as the primary drinking water source by 88 percent. The standard water-using fixtures of flush toilet, kitchen sink, tub or shower, water heater, and clothes washer were in use in almost all homes. The range was from 84 percent for clothes washer to 98 percent for water heater. Only 14 percent of the households had dishwashers.

Drinking water was used for several major outdoor tasks. Car washing was indicated by 47 percent, while 20 percent used drinking water for garden maintenance, and 12

Table 5
Household Water Use

	N	%
Drink Household Water		
yes	38	88.4
no	5	11.6
	43	100.0
Water Appliances Used*		
flush toilet	37	86.0
kitchen sink	41	95.3
tub or shower	37	86.0
clothes washer	36	83.7
dishwasher	6	14.0
garbage disposal unit	2	4.7
hot tub	1	2.3
hot water heater	42	97.7
Household Tasks Using Drinking Water		
car washing	20	46.5
lawn maintenance	5	11.6
garden maintenance	9	20.9
washing mobile home	-	--
no major outside use	9	20.9
	43	99.9
Water Saving Items Present		
low-flow shower head	18	41.9
low-flush toilet	13	30.2
toilet adapted for low usage	4	9.3
none	8	18.6
	43	100.0
Water Conserving Practices Followed*		
water saving cycle	24	55.8
small wash cycle	27	61.4
intermittent sink flow	32	74.4
bathe young children together	5	11.6
reuse water for garden/lawn	3	7.0
limit overall use	24	55.8

Note: Figures in asterisked categories are not additive because more than one answer was possible.

percent for lawn maintenance.

In regard to water conservation, the use of a low-flow shower head was reported by about 42 percent, and nearly 40 percent reported using either a low-flush toilet or a toilet adapted for less water usage. When asked about water conserving practices during times of regular water supply over 50 percent indicated that they limited overall use, and almost 75 percent indicated that they were careful not to let the sink run when washing dishes (i.e. used intermittent sink flow). Use of the water saving cycle or small wash cycle on the clothes washer was indicated by over half the respondents (56%; 61%).

In summary, the data related to regular water usage practices show that most residents depended on their household water for drinking and other major household tasks, but relatively few used drinking water for lawn and garden maintenance. About half the sample reported that they generally limited overall use and a smaller number used low-flow shower heads or low-flush toilets to conserve water.

Water Costs

The meters in the Buck Hill water system were read by a volunteer and bills were sent out on a bimonthly basis. The cost of water per month was $13.00 for the first 4,000 gallons and $2.34 for each additional thousand gallons.

Costs reported ranged from the $13.00 to $26.00 monthly (Table 6). The highest income group (>$22,000) also had the highest median cost of water at $17.68. The household with the highest bill of $26.00 used 9,500 gallons per month. However, 56 percent of households were billed at the minimum. Records were not available that would indicate the actual usage under the minimum level. The lack of controls within the system, even though it was metered, made comparisons with usage figures from other studies unsuitable.

Planning

In order to determine what planning action residents took, they were asked if they stored water, how much water they stored, and what type of system for storage they had. Again, these questions were not answered by the respondents with individual wells so the sample number is 41 (Table 7).

Just over 51 percent of respondents reported that they stored water in preparation for water problems. Of those that stored water, almost 48 percent reported keeping two to five gallons on hand. Five households, almost 24 percent, reported keeping one to two gallons in storage and six households, about 29 percent, reported keeping from 6 to 20 gallons.

Virtually all respondents that stored water chose to store it in plastic jugs or similar small containers, such

Table 6
Cost of Water and Water Usage Reported by 41 Households in Buck Hill

	n	%	Gallons
Cost			
$13.00	23	56.1	up to 4,000
15.34	2	4.9	5,000
17.00	4	9.8	5,800
18.00	1	2.4	6,100
20.00	4	9.8	7,000
24.00	1	2.4	8,700
25.00	1	2.4	9,120
26.00	1	2.4	9,550
no answer	4	9.8	unknown

Table 7
Planning For Water Problems

	n	%
Store drinking Water	21	51.2
Amount of drinking water stored		
one to two gallons	5	23.8
two to five gallons	10	47.6
other(6 to 20 gallons)	6	28.6
	21	100.0
Type of alternative water storage *		
plastic jugs	19	90.5
other(small containers)	4	19.1
No storage of water	20	48.8

Note: Percentages are out of 21, the number of respondents that stored water. Figures in asterisked categories are not additive because more than one answer was possible.

as pails or glass bottles. Respondents were asked about more permanent measures of storage such as cisterns but no one reported using this method.

Planning by Variables

Planning activities were further analyzed by the variables of age, sex, income, educational level, and tenure status. When analyzed by the various demographic variables some interesting trends were noted (Table 8).

More females (71%) than males (30%) reported storing water. In looking at the variable of age, there was not a clear trend, except that the youngest age group, 25-35, stored much less often than any other age range (14% compared to the next lowest of 40%).

Analysis by income levels showed that some would more typically store water than others but this was mixed among the levels. Education levels showed that those with some high school were most likely to store water (75%). In the variable of tenure, about 40 percent of owners stored water, while 57 percent of renters stored water.

Implementing

Objective 5 looked at how persons coped with the water problems. Respondents were asked about alternatives that they used for drinking water, bathing, and toilet facilities when they were experiencing water problems (Table 9). Thirty-eight respondents chose to answer these questions.

Table 8
Storage of Water According to the Variables of Sex, Age, Income, Education Level, Tenure
n=21

Sex	Female	Male
n	15	6
%	71.4	30.0

Ages	25-35	36-45	46-55	56-65	66-75	76-85
n	1	9	3	2	5	1
%	14.3	69.2	42.8	40.0	71.4	50.0

Income	<5,000	5-10,000	>10-<15,000	15,-22,000	>22,000
n	4	6	1	7	3
%	80.0	60.0	20.0	63.6	27.3

Education	<Gm.	Gm.	<H.S.	H.S.	<C	COL+
n	2	2	9	3	4	1
%	50.0	50.0	75.0	30.0	44.4	50.0

Tenure	Owner	Renter
n	17	4
%	39.5	57.1

Note. Numbers equal the total respondents within each subcategory. In the categories of age, education and income one respondent did not answer. Percentages indicate those within that specific subcategory who stored water.

Table 9
Alternative Actions for Drinking Water, Bathing and Toilet Facilities When System is Down

	N	%
Action to get drinking water*		
from family/friends	31	81.6
buy bottled water	7	18.4
from spring	15	39.5
Time spent getting alternative potable water		
<15 minutes per day	13	31.7
about 1/2 hour per day	23	56.1
other	2	4.9
no answer	3	7.3
	41	100.0
Physical effort to get water*		
carry jugs < 50 feet	7	18.4
carry jugs 51 ft. to 1/4 mile	4	10.5
carry jugs > 1/4 mile	3	7.9
transport water by car	30	78.9
other(little effort)	2	5.3
Daily Activities *		
do less cleaning	33	80.5
take more time	19	46.3
need help	12	29.3
more energy needed	18	43.9
other	7	17.1
Bathing when system is down		
use friend's/family's	26	63.4
use public facilities	-	----
use work facilities	2	4.9
other bathing	10	24.4
no answer	3	7.3
	41	100.0
Toilet when system is down		
use friend's/family's	17	41.5
use public facilities	2	4.9
use work facilities	3	7.3
use outdoor facilities	10	24.4
other	8	19.5
no answer	1	2.4
	41	100.0

Note: Figures in asterisked categories are not additive because more than one choice was possible. These responses do not include the two individuals who had their own wells.

Thirty-one households (82%) got alternative drinking water from family or friends. Fifteen (40%) reported getting water from a spring and 7 (18%) bought bottled water.

The daily time spent getting drinking water was reported as about one-half hour by 56 percent, though 32 percent reported spending less than 15 minutes. Only 5 percent reported spending more than 1/2 hour daily to obtain replacement water.

Questions about the physical effort required to get water allowed the respondents to choose more than one answer. Transport by car was chosen by almost 79 percent. Carrying jugs for short distances was chosen by 18 percent and two respondents used the "other" category to point out that it took less effort than indicated in the choices.

When asked what daily activities were most impacted by lack of water over 80 percent said that they did less cleaning. About half indicated that daily activities took more time or needed more energy.

The two most prevalent practices for alternative bathing were using friends' or families' facilities (63%) or "other" (24%). Those indicating "other" said they took some sort of sponge bath using stored water or bathed less often.

For alternative toilet facilities about 42 percent indicated the use of families' or friends' facilities. However, almost 25 percent reported that they used outdoor facilities. In the "other" category, four persons indicated that they used their indoor toilet but flushed with stored water; three indicated that they simply went to the woods.

In summary, most respondents depended on getting water from family or friends, used their cars to get the water, and spent about one-half hour per day in this activity. Cleaning activities were most changed by lack of water.

Implementing by Variables

Analysis of the major variables of the study showed that the implementing actions within subgroups were similar to the total sample. However, some interesting variations were indicated by percentages.

Within the gender variable alternative actions were similar between sexes except that in obtaining drinking water many more men (32%) than women (8%) found their alternative drinking water in a spring (Table 10).

In looking at the age variable (Table 11) and the various actions, the data showed that the oldest age group (76-85) did not depend on their car to get water. Those over 55 more typically chose "outdoors" or "other" as their alternative toilet facilities. The older three age groups (56-85) also more took sponge baths as an alternative

Table 10
Alternative Actions for Drinking Water, Bathing and Toilet Facilities When System Down: Totals and by Sex

n=41

	Female	Male	Total
	%	%	%
Action to get drinking water*			
from family/friends	42.1	39.5	81.6
buy bottled water	7.9	10.5	18.4
from spring	7.9	31.6	39.5
Time spent getting alternative potable water			
<15 minutes per day	13.2	21.1	34.2
about 1/2 hour per day	31.6	28.9	60.5
other	5.3	---	5.3
Physical effort to get water			
carry jugs < 50 feet	13.2	5.3	18.4
carry jugs 51 ft.-1/4 mile	5.3	5.3	10.5
carry jugs > 1/4 mile	2.6	5.3	7.9
transport water by car	31.6	47.4	78.9
other	5.3	---	5.3
Bathing when system is down			
use friend's/family's	36.8	31.6	68.4
use public facilities	--	---	---
use work facilities	2.6	2.6	5.2
other bathing	10.5	15.8	26.3
Toilet when system is down			
use friend's/family's	17.5	25.0	42.5
use public facilities	-	5.0	5.0
use work facilities	7.5	---	7.5
use outdoor facilities	25.0	25.0	25.0
other	25.0	15.0	25.0
Daily activities *			
do less cleaning	36.5	43.9	80.5
take more time	19.5	26.8	46.3
need help	12.2	17.1	29.3
more energy needed	22.0	22.0	43.9
other	9.8	7.3	17.1

Note: Percentages in asterisked categories are not additive because more than one answer was possible. These responses do not include the two individuals who had their own wells.

Table 11
Alternative Actions for Drinking Water, Bathing and Toilet Facilities When System Down: Age Categories

Age Categories	25-35	36-45	46-55	56-65	66-75	76-85
Number	7	13	7	5	7	2
Action to get drinking water						
family/friends	71.0	92.3	66.0	60.0	100.0	100.0
buy water	28.6	23.1	--	20.0	20.0	--
from spring	28.6	46.2	33.0	60.0	40.0	--
Time spent getting alternative potable water						
1/2 hour/ day	71.4	69.2	50.0	20.0	60.0	100.0
Physical effort to get water.						
carry < 50 ft.	14.3	7.7	16.7	20.0	20.0	100.0
by car	71.4	92.3	71.4	60.0	100.0	-
Bathing when your system is down						
friend/family	100.0	61.5	83.0	50.0	50.0	50.0
other bathing	--	30.8	--	50.0	50.0	50.0
Toilet when water down						
friend/family	85.7	35.7	66.7	20.0	16.0	--
outdoor	--	21.4	16.7	40.0	42.8	50.0
other	14.2	28.6	16.7	20.0	--	50.0

Note: Percents relate to persons within each subgroup of the age category. Percentages in asterisked categories are not additive because more than one answer was possible.

bathing choice. The younger age range was more apt to use the bathing facilities of families or friends.

The income variable generally followed the trends of the full sample as most households acquired alternative drinking water from family or friends, spent one-half hour getting water, and used their cars to get water (Table 12). Bathing and toilet options were also most often found with family and friends, however, a large percentage of those in the two lowest income levels, (<$5,000; $5,000 to $10,000), reported using sponge baths for bathing (40%) and outdoor facilities or the woods for alternative toilet (33%).

Education levels (Table 13) seemed to follow the full sample trend with respect to getting water from family, spending about 1/2 hour to get water, and depending on the car to obtain the water. In looking at bathing and toilet alternatives, the lowest education level turned exclusively to the use of sponge baths or outdoor toilet. This may be related to the use of a car in this group. Though they all reported that they used a car to get drinking water, something they can plan ahead for, they also all reported that they did not have daily access to a car. Perhaps without constant availability of a car, bathing and toilet activities were more easily accomplished at home.

The percentages in the tenure variable followed those of the overall sample.

Table 12
Alternative Actions for Drinking Water, Bathing and Toilet Facilities When System Down: Income Variable

Income Categories	1 %	2 %	3 %	4 %	5 %*
Action to get drinking water*					
family/friends	75.0	100.0	60.0	90.0	70.0
buy bottled water	--	12.5	20.0	20.0	30.0
from spring	25.0	37.5	30.0	30.0	60.0
Time spent getting alternative potable water					
<15 minutes/ day	25.0	25.0	30.0	50.0	20.0
about 1/2 hour/day	50.0	75.0	60.0	50.0	70.0
Physical effort to get water*					
carry < 50 feet	--	50.0	--	10.0	20.0
transport by car	75.0	62.5	80.0	80.0	100.0
Bathing when your system is down					
friend's/family's	25.0	75.0	60.0	70.0	80.0
other bathing	75.0	37.5	--	20.0	20.0
Toilet when water down					
friend's/family's	--	11.1	80.0	40.0	63.6
outdoor facilities	50.0	33.1	20.0	30.0	9.1
other	50.0	33.1	---	20.0	9.1

Note: Annual household income categories are: 1=<$5,000; 2=$5,000-$10,000; 3=>$10,000 but <$15,000; 4= $15,000 to $22,000; and 5= over $22,000. Percentages relate to persons within each income subgroup. Figures in asterisked percents are not additive because more than one answer was possible.

Table 13
Alternative Actions for Drinking Water, Bathing and Toilet Facilities When System Down: Education Level Variable

Educational Levels	1	2	3	4	5	6
number	4	4	13	9	9	2
	%	%	%	%	%	%
Action to get drinking water*						
family/friend	50	100	83	90	100	100
buy bottled water	-	-	-	30	33	100
from spring	50	100	33	10	50	100
Time spent getting alternative potable water						
<15 minutes/day	25	50	33	40	25	100
1/2 hour/ day	50	50	58	60	75	100
Physical effort to get water*						
carry < 50 ft.	--	50	16	10	38	--
transport by car	100	100	66	70	100	100
Bathing when your system is down						
friend's/family's	--	100	75	80	75	100
other bathing	100	--	16	20	25	100
Toilet when water down						
friend's/family's	--	--	50	70	33	100
outdoor facilities	75	66	8	10	33	--
other	25	--	25	20	22	--

Note: Educational levels are: 1=some grade school; 2=completed grade school; 3=some high school; 4=completed high school; 5=some college or advanced training; and 6=completed college or above. Percentages relate to persons within each subcategory of educational level. Figures in asterisked percentages are not additive.

Difference in Daily Activities by Variables

In looking at the individual variables, it was noted that the older ages, from 56 and up, chose more items as being impacted by the water situation (Table 14). They typically chose 3 or more of the items compared to 1.3 to 2.2 items for the younger ages. Cleaning was, as in the full sample, most often chosen as being impacted by water problems. The oldest respondents also chose time and energy as impacted.

The variables of sex, income, education level, and housing tenure showed very small differences in the impact on daily activities.

Housing Satisfaction: Objective 6

The study looked at housing satisfaction measures in order to relate concerns regarding a major household resource (i.e., water) to overall satisfaction. Respondents were asked to rate home size, number of bedrooms, amount of land, home location in the county, and the water system by choosing one of six ratings from very dissatisfied to very satisfied (Table 15). In the total sample, the majority of respondents were either satisfied or very satisfied with all the housing aspects except water. The water system was given an overall rating of dissatisfied or very dissatisfied by 44 percent, while 16 percent indicated that they were satisfied or very satisfied with the water system.

Table 14
Daily Activities by Age

Daily Activities	# of Choices	Cleaning	Time	Energy
Age				
25-35	2	57.1	57.1	28.6
36-45	2.2	84.6	35.7	53.8
46-55	1.3	100.0	33.3	-
56-65	3.2	80.0	80.0	80.0
66-75	3	100.0	40.0	60.0
76-85	3.5	50.0	100.0	100.0

Note: Figures are not additive; more than one answer was possible.

Table 15
Housing Satisfaction

	Total	
	N	%
General Satisfaction with Housing		
very satisfied	11	25.6
satisfied	15	34.9
somewhat satisfied	13	30.2
somewhat dissatisfied	2	4.7
dissatisfied	1	2.3
very dissatisfied	1	2.3
	43	100.0
Satisfaction with Size		
very satisfied	10	23.3
satisfied	21	48.7
somewhat satisfied	6	14.0
somewhat dissatisfied	2	4.7
dissatisfied	2	4.7
very dissatisfied	1	2.3
no answer	1	2.3
	43	100.0
Satisfaction with # Bedrooms		
very satisfied	9	20.8
satisfied	16	37.2
somewhat satisfied	10	23.3
somewhat dissatisfied	2	4.7
dissatisfied	2	4.7
very dissatisfied	1	2.3
no answer	3	7.0
	43	100.0
Satisfaction with Amount Land		
very satisfied	12	27.9
satisfied	19	44.2
somewhat satisfied	5	11.6
somewhat dissatisfied	2	4.7
dissatisfied	-	
very dissatisfied	-	
no answer	5	11.6
	43	100.0

(continued on next page)

Table 15-continued
Housing Satisfaction

	Total	
	N	%
Satisfaction with Location		
very satisfied	17	39.5
satisfied	19	44.2
somewhat satisfied	4	9.3
somewhat dissatisfied	-	--
dissatisfied	-	--
very dissatisfied	1	2.3
no answer	2	4.7
	43	100.0
Satisfaction with Water System		
very satisfied	1	2.3
satisfied	6	14.0
somewhat satisfied	5	11.6
somewhat dissatisfied	9	20.9
dissatisfied	7	16.3
very dissatisfied	12	27.9
no answer	3	7.0
	43	100.0

In an open-ended format, the researcher also asked about the best and worst aspects of housing. Respondents were asked to list the two best and two worst aspects of their housing (Table 16).

The responses for best aspects were grouped by the researcher as follows: ownership, location in neighborhood, country life, the home itself, and the size of the home.

Location, which included convenience to church, stores, and post office, was chosen by 32 percent as the best aspect. The quality of country life was the next most frequent choice at 25 percent. In this category respondents mentioned such aspects as quiet, solitude, and beauty of the land. Items that related to the home itself (e.g. construction, condition) and the fact that the person owned the home were mentioned almost an equal number of times, at 16 percent and 15 percent.

When interpreting the responses for the worst aspects it is important to note the number that did not choose to answer. Approximately 67 percent of respondents offered information about the worst aspects, while 88 percent volunteered information on the best aspects of their homes. Several respondents went beyond not answering to note that they had no complaints. Answers for the worst aspects were grouped by the researcher as follows: site problems, upkeep, water system, size of home, and other.

Table 16
Best and Worst Aspects of Housing: Open Ended Questions

	% of 73 responses
Best Aspects	
___Location	31.5
___County Life	24.7
___House Itself	16.4
___Ownership	15.1
___Size of Home	12.3
	% of 53 responses
Worst Aspects	
_ Upkeep	34.0
_ Water System	26.4
_ Site Problems	15.1
_ Size of Home	15.1
_ Other	9.4

Note: Each respondent was asked to respond with two items to each question.

Of the 29 respondents who did comment on the worst aspects of their home, upkeep issues such as problems with the roof, insulation needs, the driveway, general construction, and yard work were mentioned most often (34%). The water system was mentioned by only 26 percent. Location issues related to noisy neighbors and being too close to the road, and space issues were mentioned by 15 percent.

In summary, the questionnaire data on housing satisfaction would seem to support the findings of other studies of rural, low-income housing. Respondents were very dissatisfied with the water situation but still found their homes to be very satisfactory. It is interesting to note that where their home was (e.g., convenient location, county setting) seemed more important than the home itself.

Attitudes: Objective 7

The last objective was to determine attitudes toward the water situation and relate these to the dependent variables. A single question about preferred responsibility for a new water system was asked. Data were also collected regarding opinions on the worst aspect of the water situation and the worst difficulties with obtaining alternative drinking water.

Preferred System

Sixty-seven percent said that they preferred county control of the water system (Table 17). This figure was

Table 17
Attitudes Toward Water Situation: Summary Table

	N	%
Preferred Water System		
county run system	29	67.0
neighborhood run system	5	12.0
individual well	8	19.0
no answer	1	2.0
	43	100.0
Worst Aspect of Water Situation		
Problem Itself	13	31.7
Hygiene/cleaning	5	12.2
Quality of Water	6	14.6
Cost of Water	2	4.9
Getting alternative water	1	2.4
No answer	14	34.2
	41	100.0
Worst Difficulty in Obtaining Drinking Water		
carrying water	18	43.9
finding	6	14.6
spending time	11	26.8
cost of buying	2	4.9
no answer	4	9.8
	41	100.0

validated by the participants at all the public hearings regarding the grant process. The researcher attended three of the four public hearings and only once did a resident of Buck Hill question the need for the county to take over the system. His views were loudly contradicted by the other residents at the meeting.

Worst Problem With Water Situation

When asked about the worst problem with the water situation in an open ended question, 32 percent chose the problem itself as the worst part, however 34 percent chose not to answer (Table 17). Those answering listed such items as not having water, lack of consistent water supply, or length of time the water was off. The quality of water was brought up by about 15 percent. This low level of concern for quality was also found by community organizers at the time the original system was being developed (J. C. Reynolds, personal communication, April 11, 1991). Those that did bring up the issue of quality most often discussed the limestone rather than a safety issue, such as fear of nitrates or bacteria in their water.

Problems related to personal hygiene and cleaning were chosen by 12 percent. The other concerns brought up by the respondents were cost (5%) and finding water (2%).

Worst Difficulty in Obtaining Drinking Water

The choices offered for the worst problem in obtaining

drinking water were carrying, finding, time spent, and cost. Respondents were asked to make only one choice (Table 17). In the overall sample, 44 percent chose carrying while spending time was chosen by 27 percent. Problems finding was chosen by 15 percent and the cost by only 5 percent.

Worst Problem with Water Situation Analyzed by Variables

When the worst problem with the water situation was analyzed by the dependent variables of the study, the problem itself, which was the major concern in the total sample, was again the major concern within variables (Table 18). However, quality showed up as a greater concern than the problem itself for the youngest group, those making >$10,000 but <$15,000, those who had just reached the level of high school graduate, and renters.

Another interesting trend showed 15 percent of males indicated concern for cost while none of the females noted cost as a concern. Also, seven percent of females showed a concern for finding alternative water while no males indictated this concern.

Worst Difficulty in Obtaining Drinking Water

In analyzing this area by the dependent variables, as with the full sample, most chose carrying, then time, finding, and cost, for the worst difficulty in obtaining drinking water (Table 19). Those older than 55 years of age showed the most concern about carrying while the younger

Table 18
Worst Aspect of Water Situation Analyzed by Age, Sex, Income, Education Level, and Tenure

Worst Aspect	Problem	Hygiene	Quality	Cost	Finding
	%	%	%	%	%
Age					
25-35	33.3	--	66.6	-	-
36-45	40.0	30.0	20.0	-	10.0
46-55	75.0	--	25.0	-	-
56-65	25.0	50.0	-	25.0	-
66-75	75.0	--	--	25.0	-
76-85	50.0	--	50.0	-	-
Sex					
Male	38.4	23.1	23.1	15.4	-
Female	57.1	14.3	21.4	-	7.2
Household Annual Income					
< $5000	50.0	-	-	50.0	-
$5-10,00	50.0	-	33.3	-	16.6
>$10,<$15000	33.3	-	66.6	-	-
$15-$22,000	42.9	42.9	-	14.2	-
> $22,000	55.5	22.2	22.2	-	-
Educational Level					
<grade sch.	33.3	33.3	-	33.3	-
grade sch.	66.6	-	33.3	-	-
< high sch.	50.0	-	25.0	12.5	12.5
high school	20.0	40.0	40.0	-	-
< college	66.6	33.3	-	-	-
college+	50.0	-	50.0	-	-
Tenure					
Owner	47.8	21.7	13.0	8.7	4.3
Renter	25.0	-	75.0	-	-

Table 19
Obtaining Alternative Drinking Water Analyzed by Age, Sex, Income, Education Level, and Tenure

Difficulties in Obtaining Drinking Water	% carry	% find	% time	% cost
Age n= 37				
25-35	--	60.0	40.0	-
36-45	42.9	14.2	42.9	-
46-55	66.6	-	33.3	-
56-65	60.0	20.0	-	20.0
66-75	66.6	-	16.7	16.7
76-85	100.0	-	-	-
Sex n=37				
Male	55.5	11.1	33.3	-
Female	42.1	21.1	26.3	10.5
Annual Household Income n=37				
less than $5000	50.0	25.0	25.0	-
$5,000-10,000	75.0	25.0	-	-
> $10-< $15,000	40.0	20.0	20.0	20.0
$15,000-$22,000	40.0	20.0	30.0	10.0
over $22,000	40.0	-	60.0	-
Educational Level n=37				
some grade school	75.0	-	25.0	-
grade school	100.0	-	-	-
some high school	58.3	16.7	25.0	-
high school	22.2	22.2	33.3	22.2
some college/ training	44.4	22.2	33.3	-
college	-	-	100.0	-
Tenure n=35				
Owner	50.0	13.3	30.0	6.7
Renter	20.0	40.0	40.0	-

ages (28-35) showed more concern for finding water and the time involved: 60 percent chose finding and 40 percent chose time. Cost was an important issue for those between 56 and 75 years of age (37%) but not for any other age groups.

Renters also showed some different trends from the full sample. For these respondents, finding drinking water was equally as important as time spent (each at 40%).

Within the remaining variables cost also showed up as somewhat important for those making >$10,000 to $22,000, but not for other income groups at all. Over 10 percent of women also indicated that cost was a problem, but no men. This finding was just the opposite of a similar question asking about the worst problem related to the system (see Table 18).

CHAPTER VII

Summary, Conclusions and Implications

Summary and Conclusions

A reliable household water supply remains a problem for many small rural neighborhoods. In Virginia, it is estimated that over 1,000 small clusters of housing, serving from 25-200 people, depend on small water systems. Many, as in the case of Buck Hill, are owned and operated privately. This private standing, as well as the small size of the systems, means that per capita costs are higher than average and the systems are not eligible for funding for operation, maintenance and upgrading.

The purpose of this study was to examine the attitudes and adaptations of individuals with a household water supply that was periodically inadequate. The major objectives of the study were: 1) to develop a demographic picture of the neighborhood; 2) to identify basic characteristics of the housing and the water system; 3) to determine the planning and implementing activities residents used to cope with the water supply problem within their own homes and compare these actions by the variables of age, sex, income, educational level, and tenure status, and 4) to determine attitudes toward the water situation and general satisfaction with their housing situation.

A questionnaire was developed by the researcher and

pretested in a mobile home park that had water supply problems. The final questionnaire was hand delivered by the researcher, with the assistance of a community leader.

The study surveyed 43 households within a neighborhood where there had been water supply problems for over eight years. A 82 percent response rate was achieved. The residents of Buck Hill have been trying for many years to get the county to take over the water system. Findings showed that sixty-seven percent of the repondents preferred county control (Figure 3).

Demographics

As noted in the findings, the demographics of Buck Hill are fairly representative of Rockbridge County. This is an area of mostly low to moderate income familes. A typical family was composed of two adults and one to two children. Most adults had a high school education and worked full time.

Housing and Water Resources

The majority of residents owned their home. Housing stock was mostly site-built, with only seven mobile homes. All homes were sited on individual lots with an average lot size of two to three acres. Within the homes, water-using facilities were basic but adequate. Items such as dishwashers and food waste disposers were uncommon, but 84 percent of homes had a clothes washers. The only

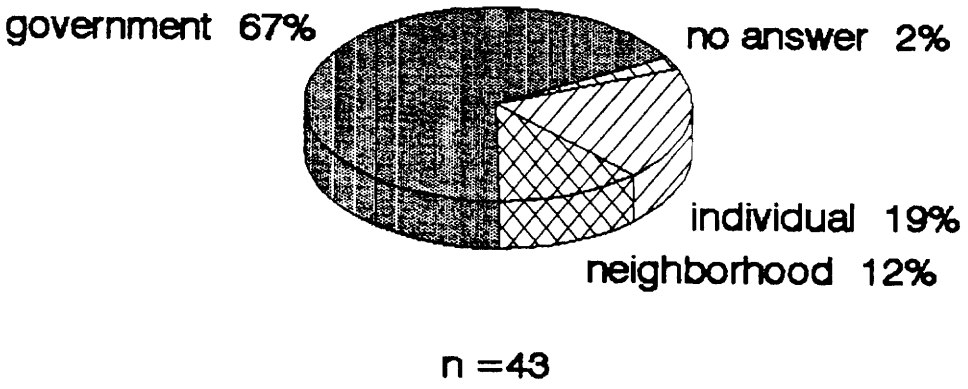

Figure 3. Preferences for water system control.

water-saving devices in common use were low-flow shower heads in 42 percent of the homes and low-flush toilets in about 40 percent of homes. The figure on low-flush toilets may be inflated. In answering this question some respondents may have been unclear in the difference between a toilet designed with a low-flush feature and one that had been adapted to use less water by putting something in the tank.

Planning and Implementing

The objectives that related to planning and implementing actions were central to the study. As noted in the findings, little planning action was found. Only 51 percent stored water. However, findings did indicate that family and friends were heavily used as resources for alternative toilet (Figure 4) and bathing facilities (Figure 5). In relating this finding to the Deacon and Firebaugh model it must be questioned whether this action is unmanaged or managed activity. Since the researcher did not ask about the dynamics of this reliance on families and friends it is difficult to answer this question. Questions asked in a future study might relate to the family's reaction to being an alternative source, and how convenient the alternative is in terms of time, distance, and other factors.

Attitudes

Attitudes toward the worst aspects of the water

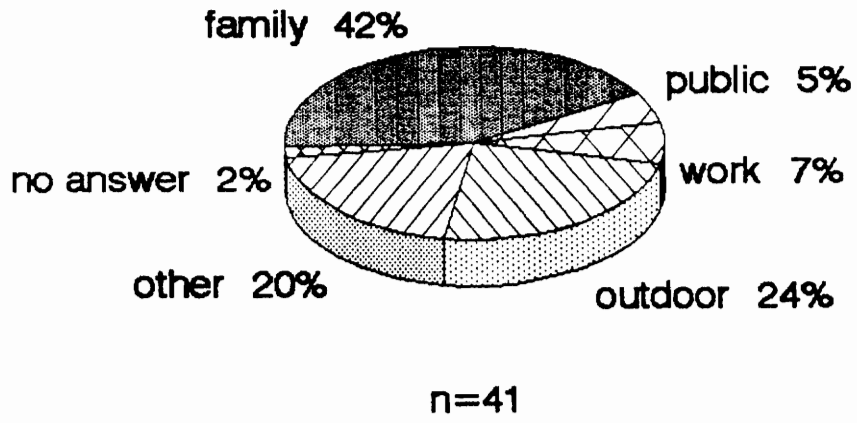

Figure 4. Sources of alternative toilet facilities

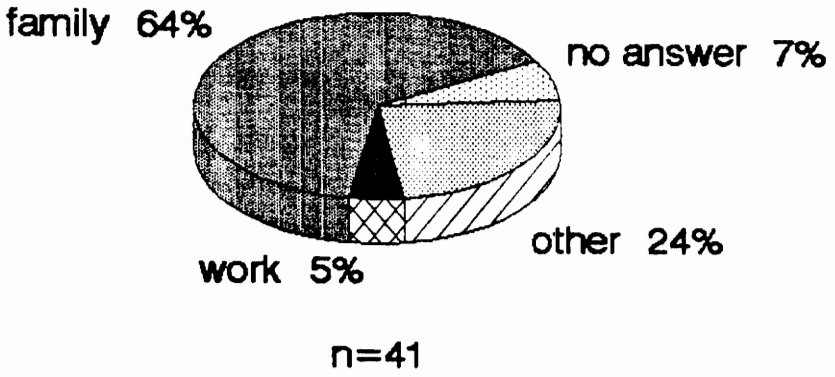

Figure 5. Sources of alternative bathing facilities.

situation (Figure 6) were asked in an open ended question, and also in a structured question that asked about the specific concerns of carrying, finding, cost, and time spent (Figure 7). It was difficult for the respondents to define the worst problem with the water situation. Thirty-two percent simply referred to the basic fact that they had water problems. Thirty-four percent did not answer.

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Only 15 percent expressed a concern for quality. This lack of concern for quality was also found when the existing system was being planned 20 years ago. It is unclear to the researcher if the question was not answered because they were satisfied or because they had difficulty putting their concerns into words. An interview situation would have helped to clarify this type of answer.

A structured question did show that about 44 percent were either dissatisfied or very dissatisfied with the water system. When asked specifically about the worst difficulty in obtaining water the majority choose carrying.

Data related to general overall housing satisfaction indicated that about 60 percent of respondents were very satisfied or satisfied with their housing in general, while only about 5 percent were very dissatisfied or dissatisfied. Comparison of this study's data on water system and housing satisfaction support information from previous studies, such as that by Brink and Johnston (1979), that noted housing satisfaction might have may separate elements.

Implications

For Community Action Workers/Housing Agencies

The data showed a community with long term problems in which residents have taken little action within their homes to remedy their water supply problems. Education about alternative actions available might assist some in making

choices for action. Examples of alternatives are bulk water storage and composting toilets. Education on water safety is also needed. Many residents of all educational levels turned to springs as an alternative source of drinking water. The dangers inherent in this choice should be addressed. Also, although there is no suspected point source of pollution for area groundwater, informal household dumps in sinkholes are often found in the county. As noted by Weigmann and Kroehler (1988) widespread contamination of groundwater is being discovered in Virginia.

For County Government

County officials need to understand that this community seems to have few internal resources for change. Even though they are very unhappy with their system they probably will not organize to take further action on their own and are not inclined to complain. This finding is partly supported by the literature and partly not supported. Previous studies of Appalachia (Stephenson, 1968; Fitchen, 1981) have noted that people of Appalachia had a reluctance to become involved with government programs and preferred to develop their own solutions to problems. In the Buck Hill situation the history of attempting to run their own system may have convinced residents that government support is needed. Weller (1965) noted that the people in his study had difficulty in working in organizations for long-term

common good. A future study could look at why the people of Buck Hill could not successfully maintain their water company. An interesting aspect of the Buck Hill organization is that almost all members of the neighborhood who went to meetings and organized were Blacks, even though the neighborhood as a whole was racially mixed. The meter reader and main organizer was also a Black person. However, specific racial data on the individuals in the study were not collected.

It would be in the financial interest of the county to maintain the neighborhood as a viable living area for low and moderate income workers. It is probable that many find employment in the nearby industrial park and major hotel. By taking over the system the county can assure such workers safe and adequate water.

For Researchers

This study is only a beginning in the effort to understand how these communities can be helped to obtain safe and adequate water supply. Much more study needs to be done related to other variables that were not tested by the researcher, or further comparisons of tested variables. Researchers may find that these variables have a bearing on willingness and ability to change the water situation.

Though the current data showed that only half the households stored water this may not be an indication of

poor planning because many residents also seemed to have nearby family to rely on.

The entire issue of community organization and comparative studies of similar communities that have succeeded in developing an adequate water system should be addressed.

More research could also be done related to awareness of the importance of conserving water. The current research indicated that large quantities of water may be being used. More detailed analysis of records and water use is needed to quantify household water usage. Attitudes toward water consumption also need to be explored.

The use of the Deacon and Firebaugh model was useful for the initial conception of the study. The model helped in understanding how the use of a resource can be impacted by planned and unplanned decisions. Because this study also was a general survey of an area with many variables and a number of individuals it was difficult to isolate the variety of moments in time needed to apply the model to many instances. The model seems more appropriate for an individual analysis. Future studies of this community would need to go beyond this model to understand community dynamics.

References

Brink, S., & Johnston, K. A. (1979). Housing satisfaction-the concept and evidence from home purchase behavior. Home Economics Research Journal, 7, 338-345.

Center for Public Service. (1990). [1990 census information]. Unpublished database printout. University of Virginia, Charlottesville.

Cox, W. E., & Patrizi, K. S. (1984) Institutional framework for rural water supply in North Carolina, South Carolina, and Virginia. (Bulletin 142). Blacksburg: Virginia Polytechnic Institute and State University, Virginia Water Resources Research Center.

Deacon, R. E., & Firebaugh, F. M. (1981). Family resource management. Boston: Allyn & Bacon.

Dellenbarger, L. A., & Dellenbarger, A. Z. (1987). People and prices: Rural water systems in Oklahoma. Housing and Society, 14, 167-173.

Department of Housing and Community Development. (1991). Virginia Housing Partnership Fund: Indoor Plumbing Program. (Program Guidelines, Application Manual). Richmond, VA:

Dewberry & Davis, Inc. (1991) Preliminary engineering report: Buck Hill water inprovements. Prepared for Rockbridge County, VA. Roanoke: Author.

Dillman, D. A. (1978). Mail and telephone surveys, the total design method. New York: Wiley.

Fitchen, J. M. (1981). Poverty in rural America: A case study. Boulder, CO: Westview Press.

Flannery, B. A., Morris, E. W., Carey, S. E., & Eichner, M. M. (1983). Attitudinal and behavioral responses to drought-induced water rationing. Housing and Society, 10, 11-24.

Francis, J., Brower, B., Graham, W., Larson III, O., McCaul, J., and Vigorita, H. (1983). National Statistical Assessment of Rural Water Conditions-Executive Summary. In E. L. Cobb and M. E. Morgan (Eds.), Drinking Water Supplies in Rural America. Washington, DC: Board of Directors of the National Demonstration Water Project.

Gee, W., & Stauffer, W. H. (1929). Rural and urban living standards in Virginia. (Monograph No. 6). Charlottesville: University of Virginia, Institute for Research in Social Service.

Goss, R. C., & Day, S. S. (1984). Housing aspirations: A case study of Appalachian miners. Housing and Society, 11, 16-27.

Hanna, S., & Lindamood, S. (1979). Components of housing satisfaction among lower income rural families. Housing and Society, Special issue: Proceedings of the annual conference, 61-64.

Hintze, J. L., (1990). Number cruncher statistical system: Version 5.03 5/90. Kaysville, UT: Author.

Irelan, L. M., & Besner, A. (1967). Low-income outlook on life. In L. M. Irelan (Ed.), Low-income lifestyles (pp.1-12). Washington, DC: U.S. Department of Health, Education and Welfare.

Jarvis, T. (1991, January 9). Buck Hill residents seek water solution. The News Gazette. p.14.

Jarvis, T. (1991, June 12). Buck Hill grant denied; supervisors concerned. The News Gazette. pp. 1-2.

Jarvis, T. (1991, July 10). Buck Hill still waiting for water improvements. The News Gazette. pp. 1-2.

Kuhner, J., Luecke, D. F., & Shapiro, M. (1979). Resource use and residuals generation in households. Washington, D.C.: U.S. Environmental Protection Agency.

Linaweaver, F. P., Geyer, J. C., & Wolff, J. B. (1967). A study of residential water use. A report prepared for the technical studies program of the Federal Housing Administration, Department of Housing and Urban Development. Baltimore: Johns Hopkins.

Maddaus, W. (1984) Residential water conservation projects, summary report. U.S. Department of Housing and Urban Development., Office of Policy Development and Research, Building Technology Division. Walnut Creek, CA: Brown and Caldwell.

Massie, E. H. (July 1991). Commonwealth of Virginia, Department of Health. Public water supplies report. Unpublished database run. Richmond.

Stephenson, J. B. (1968) Shiloh: A mountain community. Lexington: University of Kentucky Press.

Virginia Water Project, Inc. (1988). Water for tomorrow; A report on water and wastewater needs in Virginia. Roanoke: Author.

Weigmann D. L., & Kroehler, C. J. (1988) Threats to Virginia's groundwater. Blacksburg: Virginia Polytechnic Institute and State University, Virginia Water Resources Research Center.

Weller, J. E. (1965). Yesterday's people: Life in contemporary Appalachia. Lexington: University of Kentucky Press.

APPENDIX A

INFORMATION LETTER
FOLLOW-UP POSTCARD
QUESTIONNAIRE

January 18, 1992

Dear Resident of Buck Hill:

The enclosed questionnaire is part of a project being conducted at Virginia Polytechnic Institute and State University in the Department of Housing, Interior Design and Resource Management. We are conducting this survey in order to develop information about how rural residents cope with water supply problems. It is time that residents of rural areas were asked about their problems with household water. Without your help policy makers will continue to misunderstand the needs and wants of rural residents.

The survey asks questions concerning your use of household water, your attitude toward various aspects of your water situation, attitudes toward your housing and some general personal information.

It would be appreciated if the adult primarily responsible for homemaking would answer the enclosed questionnaire. It will take about one-half hour of your time. Your name will not appear on any survey, and all identifying information will be kept confidential. Please help us, yourself and your neighbors by completing this questionnaire.

If you have any questions please feel free to call me at my home: 463-2557. Please use the enclosed envelope to return the completed questionnaire by January 25, 1992. Thank you for your assistance.

Sincerely,

Pamela E. Breil
Research Assistant

Sample Postcard

Pat Hunter
Rt.1, Box 27
Natural Bridge, VA

Dear Mr. Hunter,

I look forward to receiving your completed **Household Water Use Survey.** If you have questions or need another form, please call me at 463-2557. We need <u>your</u> questionnaire to make our study useful.
Thank you, Pam Breil

HOUSEHOLD WATER USE SURVEY

General Directions

Please circle the number(s) next to your choice(s). If none of the choices seem to apply to your situation write N/A on the "other" line. If you want to add a choice, please use the "other" line and write in your answer. Please feel free to call me at 463-2557, if you have any questions. Thank you for your help.

SECTION I

HOME WATER SUPPLY AND SYSTEM

The following questions ask about your household water system.

Q-1 What phrase best describes your current drinking water source?

(please circle only one number)

1 MUNICIPAL OR COUNTY SYSTEM
2 PRIVATE MULTIUSER WELL OR CISTERN
3 INDIVIDUAL WELL
4 INDIVIDUAL CISTERN
5 SPRING
6 OTHER-EXPLAIN_____

Q-2 Do you have a secondary source of **drinking water** on your property.(circle number)

1 YES
2 NO

Q-3 Do you have a water source on your property that you use for purposes **other than** drinking water?(circle number)

1 YES
2 NO

Q-4 Do you have outside water faucets?(circle number)

1 YES
2 NO

Q-5 What type of sewage system does your home have?(circle all numbers that apply)

1 INDIVIDUAL SEPTIC
2 MULTIFAMILY PRIVATE SEPTIC
3 GREYWATER SYSTEM
4 COUNTY OR TOWN MANAGED TREATMENT FACILITY
5 OTHER-EXPLAIN_____

Q-6 Complete plumbing can be defined as a kitchen with piped in water and a bathroom with flush toilet, sink, and tub or shower. Do you have complete plumbing in your home?(circle number)

1 YES
2 NO

Q-7 Whether or not you have complete plumbing, you may have many of the following items in your home. Please put an X in the YES column to indicate that you have the item **(even if it isn't working)** and place an X in the FUNCTIONING column to indicate the item is being used **(even if it does not rely on standard plumbing to work).**

		YES	FUNCTIONS
1	FLUSH TOILET	_____	_____
2	TUB OR SHOWER	_____	_____
3	KITCHEN SINK	_____	_____
4	CLOTHES WASHER	_____	_____
5	HOT WATER HEATER	_____	_____
6	PLUMBING FOR KITCHEN	_____	_____
7	PLUMBING FOR BATHROOM	_____	_____
8	DISH WASHER	_____	_____
9	HOT TUB	_____	_____
10	SINK GARBAGE DISPOSAL	_____	_____
11	LOW FLOW SHOWER HEAD	_____	_____
12	LOW FLOW TOILET	_____	_____
13	COMPOSTING TOILET	_____	_____
14	ELECTRIC INCINERATOR TOILET	_____	_____
15	TOILET ADAPTED TO USE LESS WATER	_____	_____
16	PRIVY (OUTHOUSE)	_____	_____
17	OTHER-EXPLAIN_____		

Q-8 Which of the following water situations have your experienced in your home during the past year or at present. Put an X in the YES column to indicate you have had, or are having, the problem. In the FREQUENCY column indicate about how often, in the past year, this situation has occurred.

		YES	FREQUENCY
1	LOW WATER PRESSURE	_____	_____
2	SYSTEM DELIVERS NO WATER	_____	_____
3	BAD QUALITY (TASTE, COLOR,CONTAMINATION, ETC.)	_____	_____
4	OTHER-EXPLAIN _____	_____	_____

Please answer the next question regarding your **PREVIOUS** housing.

Q-9 What was the major source of drinking water supply in your previous home? (please circle only one number).

1 MUNICIPAL OR COUNTY SYSTEM
2 PRIVATE MULTIUSER WELL OR CISTERN
3 INDIVIDUAL WELL
4 INDIVIDUAL CISTERN
5 SPRING
6 OTHER-EXPLAIN_____

SECTION II
HOME CHARACTERISTICS

The following set of questions ask about other characteristic of your home and land. Please circle the number(s) next to your choice(s).

Q-10 What choice best describes your home?(please circle only one number).

1 SINGLE FAMILY
2 MULTIFAMILY
3 MOBILE HOME
4 OTHER-EXPLAIN_____

Q-11 How old is your house?

1_____years

Q-12 How many bedrooms does your home have?(please circle only one number).

1 ONE
2 TWO
3 THREE
4 FOUR
5 OVER FOUR

Q-13 How much land is your house on?(note approximate acerage).

_____ACRE(S)

Please answer the next question regarding your **PREVIOUS** home.

Q-14 What choice best describes your previous home?(please circle only one number).

1 SINGLE FAMILY
2 MULTIFAMILY
3 MOBILE HOME
4 OTHER-EXPLAIN_____

SECTION III
WATER PRACTICES

The following questions ask about how you generally use water in the home, how you plan for times when you may not have water, or how you cope when your regular water system is not functioning. If you do not have a plumbed system at all, also answer these questions. If the situation does not apply to you, put "NA" in the "other" blank and go on.

Q-15 Do you regularly drink the water from you home water system? (circle number).

1 YES
2 NO

Q-16 Which of these water conserving practices do you follow, on a regular basis?(circle all numbers that apply)

1 USE WATER SAVING CYCLE IN CLOTHES WASHER
2 WHEN USING CLOTHES WASHER, CHOOSE SMALLER AMOUNT OF WATER FOR SMALLER WASHES
3 DON'T LET SINK WATER RUN CONSTANTLY IN WASHING DISHES
4 BATHE YOUNG CHILDREN TOGETHER
5 REUSE WASH WATER FOR PLANTS OR GARDEN
6 LIMIT OVERALL USE
7 NONE
8 OTHER-EXPLAIN_____

Q-17 Household tasks often use large amounts of water. In the following list, indicate those activities that you regularly use **DRINKING WATER** to do. (circle all numbers that apply)

1 CAR WASHING
2 LAWN MAINTENANCE
3 GARDEN MAINTENANCE
4 WASHING MOBILE HOME
5 OTHER-EXPLAIN_____

Q-18 Do you store water for use in the event that you don't have water for a period of time?(circle number).

1 YES- please answer questions 19 and 20.
2 NO- please skip to question 21.

Q-19 If you do store water for use when your system isn't working, how much do you keep on hand for each day's use?(please circle only one number).

1 ONE-TWO GALLONS
2 OVER TWO GALLONS- FIVE GALLONS
3 OTHER-please indicate amount_____

Q-20 If you do store water for use when your system is down, what kind of storage system do you have?(circle all numbers that apply).

1 PLASTIC JUGS
2 CISTERN
3 OTHER-EXPLAIN_____

The following questions refer to times <u>when your plumbed water system is not delivering drinkable water or if your water system is not a plumbed system</u>.

Q-21 What action do you take to get drinking water?(circle all numbers that apply)

1 GET WATER FROM FRIENDS OR FAMILY
2 BUY BOTTLED WATER
3 GET WATER FROM SPRING
4 OTHER-EXPLAIN_____

Q-22 On average, how much time do you spend getting drinking water, on a daily basis?(please circle <u>only one</u> number)

1 LESS THAN 15 MINUTES PER DAY
2 ABOUT 1/2 HOUR PER DAY
3 OTHER-EXPLAIN_____

Q-23 What kind of physical effort does it take to get drinking water? (circle all numbers that apply)

1 CARRY JUGS LESS THAN 50 FEET
2 CARRY JUGS FROM 51 FEET TO ONE-QUARTER MILE
3 CARRY JUGS OVER ONE-QUARTER MILE
4 TRANSPORT JUGS BY CAR
5 USE HOSE TO GET OTHER WATER SOURCE
6 OTHER-EXPLAIN_____

When your system does not deliver **any** water, either for drinking or household tasks, please answer the following questions.

Q-24 What do you generally do about bathing when your system does not deliver any water?(please circle <u>only one</u> number).

1 USE FAMILY OR FRIENDS FACILITIES
2 USE PUBLIC FACILITIES (e.g. church, school)
3 USE WORK FACILITIES
4 OTHER-EXPLAIN_____

Q-25 What do you generally do about toilet facilities when your system is not working?(please circle only one number).
1 USE FRIENDS OR FAMILIES INDOOR FACILITIES
2 USE PUBLIC FACILITIES (e.g. church, school)
3 USE WORK FACILITIES
4 USE OUTDOOR FACILITIES
5 OTHER-EXPLAIN_____

Q-26 How are your daily activities different when your water system is not working ?(circle all that apply)
1 DO LESS CLEANING
2 TAKE MORE TIME FOR HOUSEHOLD CHORES
3 NEED HELP FROM OTHERS
4 CHORES TAKE MORE ENERGY

SECTION IV

In this section I would like you to express you opinion about your water situation and about your general housing satisfaction.

Q-27 What is the worst difficulty you have in obtaining drinking water?(**PLEASE MAKE ONLY ONE CHOICE ON THIS QUESTION**)
1 CARRYING WATER
2 FINDING SOMEWHERE TO GET WATER
3 SPENDING THE TIME TO GET WATER
4 COST OF BUYING DRINKING WATER
5 OTHER_____

Q-28 Please try and think about what for you is the **worst** aspect of your water situation.

_____

Q-29 How do you feel about the cost of your water? Skip this question if you currently do not pay for water.
Is the amount:(please circle only one number)
1 ABOUT RIGHT
2 TOO MUCH
3 TOO LITTLE
4 OTHER-EXPLAIN_____

Q-30 Assuming a grant were available for any type water source installation, and only a small monthly payment would be required, what type of water system would you prefer?(please circle only one number).
1 A MUNICIPAL OR COUNTRY RUN WATER SYSTEM
2 A PRIVATE OR NEIGHBORHOOD SHARED WELL SYSTEM
3 AN INDIVIDUAL WELL
4 OTHER_____

Q-31 If you own your home and were to consider moving, do you believe that the water problems in your area have made your home:(please circle only one number).

1 LESS VALUABLE TO A BUYER
2 UNABLE TO BE SOLD
3 NO DIFFERENT IN VALUE
4 OTHER-EXPLAIN_____

Q-32 If you rent your home, what effect do you believe that the water problems have on the rental value?(please circle only one number).

1 RENT IS LOWER WITH WATER PROBLEM
2 RENT THE SAME AS IF NO PROBLEM
3 OTHER-EXPLAIN_____

Q-33 How satisfied are you with the following aspects of your home? Place an X under the word that best describes your feeling about each item.

	very satisfied	satisfied	somewhat satisfied	somewhat dissatisfied	dissatisfied	very dissatisfied
1 SIZE OF HOME						
2 NUMBER OF BEDROOMS						
3 AMOUNT OF LAND						
4 WATER SYSTEM						
5 LOCATION OF HOME (IN COUNTY)						

Q-34 List two things that you like best about your home.

1_____

2_____

Q-35 List two things that you like least about your home.

1_____

2_____

Q-36 Overall, how satisfied are you with your present home? Choose the phrase that describes how you feel.(please circle only one number).

1 VERY SATISFIED
2 SATISFIED
3 SOMEWHAT SATISFIED
4 SOMEWHAT DISSATISFIED
5 DISSATISFIED
6 VERY DISSATISFIED?

SECTION V
HOUSEHOLD DATA

This last section asks questions about yourself and the other people in your household. These questions are asked so that the survey can help planners address issues that are important to those people that are alike in some ways; by income, age, family makeup, etc. I hope that you will assist us in making this survey more useful by answering these questions.

Q-37 When did you move to your current home?
1 month_____year_____.

Q-38 If you are billed for your water, how much do you pay, per month?
1_____PER MONTH

Q-39 If you do not pay a water bill, why is that? (please circle only one number).

1 INCLUDED IN RENT
2 INDIVIDUAL WELL
3 OTHER-EXPLAIN_____

Q-40 Do you own or rent your home?(circle number)

1 OWN
2 RENT

Q-41 What is your birth date?
1 month_____year_____

Q-42 What is your sex?(circle number)

1 MALE
2 FEMALE

Q-43 How many children, under 18, live in your home?(circle number)

1 ONE
2 TWO
3 THREE
4 FOUR
5 MORE THAN FOUR_____

Q-44 How many persons live full-time in your home. Include yourself, all other adults and children.

1_____

Q-45 Do you have daily access to a vehicle?

1 YES
2 NO

Please answer the following questions for yourself and for your spouse or other major household support.

Q-46 Please indicate the highest level of schooling completed (mark an X in each appropriate column).

		SELF	OTHER ADULT
1	SOME GRADE SCHOOL	_____	_____
2	COMPLETED GRADE SCHOOL	_____	_____
3	SOME HIGH SCHOOL	_____	_____
4	COMPLETED HIGH SCHOOL	_____	_____
5	SOME COLLEGE OR ADVANCED TRAINING	_____	_____
6	COMPLETED COLLEGE	_____	_____
7	POST GRADUATE WORK	_____	_____

Q-47 Please indicate occupational status?(mark an X in each appropriate column).

		SELF	OTHER ADULT
_ 1	FULL TIME	_____	_____
2	PART TIME, OCCASIONAL	_____	_____
3	PART TIME,REGULAR	_____	_____
4	RETIRED	_____	_____
5	UNEMPLOYED	_____	_____
6	OTHER-EXPLAIN_____		

Q-48 Please indicate occupational category.(mark an X in each appropriate column).

		SELF	OTHER ADULT
1	LABORER/FAST FOOD EMPLOYEE	_____	_____
2	SKILLED TRADESPERSON OR OFFICE WORKER	_____	_____
3	PROFESSIONAL	_____	_____
4	OTHER_____	_____	_____

Q-49 What is the approximate yearly income of your household. (Include all income that supports the household)(circle number)

1 LESS THAN $5000
2 $5000-$10000
3 MORE THAN $10,000 BUT LESS THAN $15,000
4 $15,000 - $22,000
5 OVER $22,000

This is the end of the questionnaire.

If there are any additional issues and concerns regarding your water system that you feel are important, please feel free to comment about them on this page. I look forward to receiving your completed questionnaire. Thank you for your help with this project.

VITA

PAMELA E. BREIL

Personal Data: Born in Massachusetts, December 6, 1944, daughter of Kendall and Phyllis Breil; married Daniel J. Frese, Jr., January 9, 1987.

Education: graduated from Smith College, Northampton, Massachusetts in 1966 with a Bachelor of Arts in Sociology; graduated from Boston University, Boston, Massachusetts in 1971 with a M.Ed. in Elementary Education; attended the University of Massachusetts at Amherst and received certification as a remedial reading teacher in 1978; attended Virginia Polytechnic Institute and State University, 1990-1992 and completed the requirements for the M.S. in Housing in May, 1992.

Professional Experience: Executive Director of Help With Housing, Berryville, VA, 1992- present; Residential Services coordinator for Rockbridge Area Community Services Board, Lexington, VA, 1987-1990; Manager and Assistant for Conn Save home energy audit program at Northeast Utilities, Newington, CT, 1979-1983; elementary classroom and remedial reading teacher in Massachusetts and Germany, 1971-1978; library assistant at the Boston Athenaeum Library, Boston, MA, 1966-1969.

Pamela E. Breil