Cooperative Infrastructures for Small Water Systems: A Case Study

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Abstract

This case study analyzes the opportunities and potential for a cooperative structure in rural small water systems (SWS) located in Carroll County, Virginia. It is hypothesized that, by organizing as a cooperative, SWS in Virginia can obtain operational efficiency and meet the National Primary Drinking Water Standards (NPDWS) through economies of scale. Specifically, the research involves a market analysis of the factors which influence costs, operational efficiency, revenue, the exchange of technical information, operational capacities, and, thereby, the number of NPDWS violations in those participating SWS. The results of this research reveal ways in which a cooperative structure could result in efficiency and compliance gains. Results are used to develop guidelines for a conceptual cooperative structure that can be applied to SWS across rural Virginia and perhaps may have application on a broader economic and geographic scale.

Acknowledgements

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Executive Summary

Small water systems (SWS) can serve as many as 3,300 people and as few as twenty-five people, compared to large waterworks that serve thousands of people in metropolitan areas. In Virginia, more than ninety percent of water suppliers fall into this category of public "rural" SWS. In 1996, the Safe Drinking Water Act (SDWA) was amended to protect Americans from unsafe drinking water and to prevent contamination of drinking water sources. Specifically, section 1420 of the SDWA focuses on developing the financial, managerial, and technical capacities of SWS where violation of drinking water standards are prevalent. In 1997, 304 Virginia waterworks reported violations of drinking water standards, fifty-three percent of which were rural SWS.

The SDWA authorized the United States Environmental Protection Agency (U.S. EPA) to set National Primary Drinking Water Standards (NPDWS). Large water systems, serving over 3,300 people, typically possess the financial resources and technical skills to meet the NPDWS due to economies of scale. However, a large number of small water systems do not meet SDWA standards because they lack available capital, do not retain a large volume of business, and are limited by their dispersed geographic locations. Often SWS are an auxiliary operation to another business with limited available capital, which results in the operation's inability to comply with the NPDWS.

The overall goal of this study is to analyze the opportunities and potential for a cooperative structure in rural Carroll County, Virginia. It is hypothesized that, by organizing as a cooperative, SWS in Virginia can obtain operational efficiency and meet the NPDWS through economies of scale. Specifically, the research involves a market analysis of the factors which influence costs, operational efficiency, revenue, the exchange of technical information, operational capacities, and, thereby, the number of NPDWS violations in those participating SWS.

To test this hypothesis, twelve SWS in the study area were selected, based on certain criteria including the following: number of NPDWS violations, geographic proximity, population

served, physical condition of facilities, and owner/operator interest. Personal interviews were conducted with each SWS operator using questions from a four-part survey. The survey covered the following areas: water system characteristics; operations, management, and maintenance; cooperative management; and financial management. The data from the survey were analyzed to determine where and how these SWS can improve efficiency via economies of scale and business structure.

The results of this research reveal ways in which a cooperative structure could result in efficiency and compliance gains. Results are used to develop guidelines for a conceptual cooperative structure that can be applied to SWS across rural Virginia and perhaps may have application on a broader geographic scale.

1. Introduction

In rural Virginia, small water systems face many obstacles, primarily limited resources. These small water systems are usually auxiliary businesses that lack appropriate financial, managerial, and technical resources. Drinking water violations are a real concern for system operators, owners, and customers. This cause for concern will be increasingly problematic as governmental regulations become more stringent.

2. Background

2.1 Small Water Systems

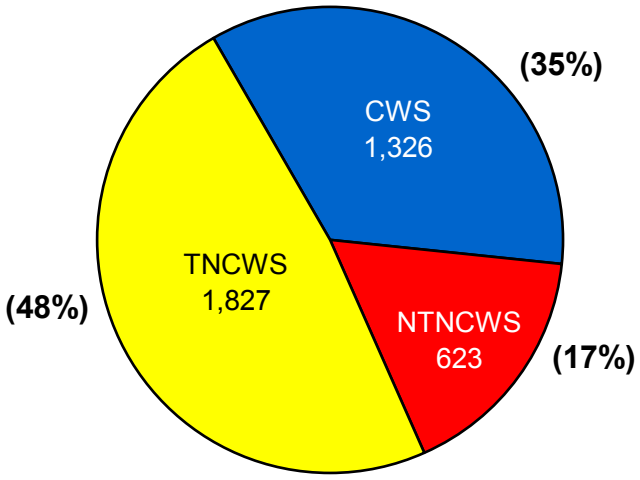
Drinking water regulations in the United States affect water systems differently based on the type and size of the system. A system that provides water via pipes or other constructed channels to at least fifteen service connections or serves at least twenty-five people per day for sixty days of the year is considered a public water system[1]. These systems may include any collection, storage, treatment, and distribution facilities under or not under the control of an operator[2].

In the United States in 2000, there were roughly 170,000 public water systems[3]. Public water systems are classified into three groups: community water systems, non-transient non-community water systems, and transient non-community water systems. Community water systems (CWS) are public water systems that serve the same residents year round. Examples of community water systems may include homes, trailer parks, condominiums, and/or apartments in cities or in small towns. Non-community water systems do not serve the same people year round. There are two types of non-community water systems: non-transient and transient. These two classifications are based on the duration of time that they serve the public. A non-transient non-community water system (NTNCWS) serves the same people for more than six

[1] Anonymous. *Understanding the Safe Drinking Water Act*. United States Environmental Protection Agency. EPA 810-F-99-008. December 1999.
[2] Anonymous. *Drinking Water Glossary: A Dictionary of Technical and Legal Terms Related to Drinking Water*. DWBKGN24. National Drinking Water Clearinghouse.
[3] Anonymous. *Factoids: Drinking Water and Ground Water Statistics for 2000*. United States Environmental Protection Agency, Office of Water. June 2001. <http://www.epa.gov/safewater/

months, but not the entire year. A good example of a NTNCWS might be a school that has its own water supply. A transient non-community water system (TNCWS) is different in that it serves different people for less than six months. A few examples are campgrounds, rest areas, service stations, visitor centers, and fire departments[4]. Figure 2.1 shows a breakdown of the three categories of public water systems in Virginia. The nationwide distribution, figure 2.2, is similar to the distribution of public water systems in Virginia. In both cases, there are a larger number of TNCWS, followed by CWS, leaving NTNCWS the smallest category. Of these three types of public water systems in Virginia, the majority (3,416) are fed via ground water. Only 360 systems are fed from a surface water source[5].

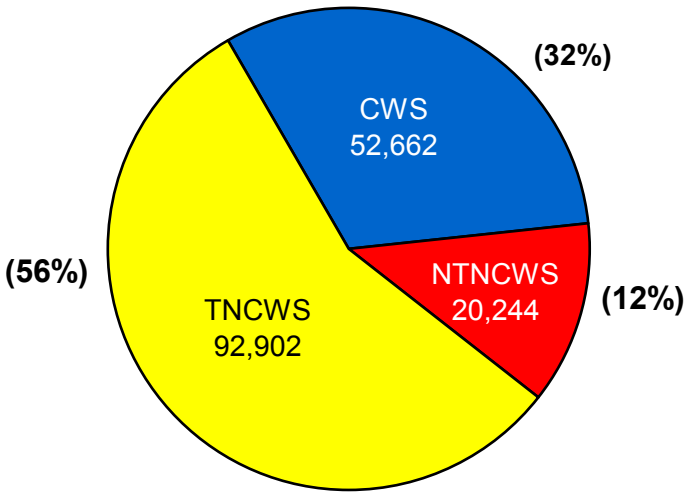
Figure 2.1. Categories and Number of Public Water Systems in Virginia



*Source: Factoid: Drinking Water and Ground Water Statistics for 2000
CWS – Community Water System
TNCWS – Transient Non-Community Water System
NTNCWS – Non-Transient Non-Community Water System

[4] Anonymous. *Understanding the Safe Drinking Water Act*. United States Environmental Protection Agency. EPA 810-F-99-008. December 1999.
[5] Anonymous. *Factoids: Drinking Water and Ground Water Statistics for 2000*. United States Environmental Protection Agency, Office of Water. June 2001. <http://www.epa.gov/safewater/>

Figure 2.2. Categories and Number of Public Water Systems in The United States



*Source: Factoid: Drinking Water and Ground Water Statistics for 2000
CWS – Community Water System
TNCWS – Transient Non-Community Water System
NTNCWS – Non-Transient Non-Community Water System

Public water systems are often given a general classification by size (the number of people they serve) as either very small, small, medium or large. Very small public water systems are defined as serving less than 500 people and small public water systems serve 501 to 3,300. Medium sized public water systems serve 3,301 to 10,000, large public water systems (LPWS) serve 10,001-100,000, and very large public water systems serve more than 100,001 people[6].

In Virginia, approximately 70% of the very small and small pubic water systems are investor-owned. The majority of medium to large size systems are publicly owned with only 7% of these

[6] Anonymous. *Factoids: Drinking Water and Ground Water Statistics for 2000*. United States Environmental Protection Agency, Office of Water. June 2001. <http://www.epa.gov/safewater/

systems investor-owned[7]. This study involves both very small and small public water systems. For simplicity, these two categories will henceforth be referred to as small public water systems (SPWS).

2.2 Safe Drinking Water Act

Americans expect clean, safe drinking water regardless of location: in a public bathroom, a five star restaurant, or at the kitchen sink. To protect Americans from unsafe drinking water, Congress passed the Safe Drinking Water Act in 1974. Originally, the Act was designed to ensure public safety by regulating the treatment of the nation's drinking water supply. In 1986 and again in 1996, the act was amended. The updated act includes various provisions to protect any drinking water source from potential contamination, to require operator training and certification, to provide a means of funding for water system improvements, and to increase the availability of public information on water systems. The motivation behind the 1996 amendments was to protect drinking water "from source to tap". The Safe Drinking Water Act regulates all public water systems in the United States; however, it does not regulate private wells or systems that serve less than twenty-five individuals. To make sure that small water systems are capable of complying with the drinking water standards set by the United States Environmental Protection Agency (EPA), the 1996 amendments to the Safe Drinking Water Act give special considerations to these small systems to ensure that they have the necessary managerial, financial, and technical support to operate[8]. Additionally, to help water systems meet requirements for implementing these rules, the EPA's Office of Water provides a timeline that outlines the rules, requirement milestones, and effective dates/deadlines from 2000 to 2004[9].

The Safe Drinking Water Act specifies that the EPA create a set of national standards for drinking water. These National Primary Drinking Water Standards must protect people from naturally occurring contaminants in drinking water, as well as man-made contaminants. The

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[7] Garcia, Kyle, Christie Thompson, and Tamim Younos. *Restructuring Strategies For Small Water Systems: Virginia Small Water Systems Co-operative*. Virginia Water Resources Research Center, Virginia Tech. Blacksburg, Virginia. Special Report SR15-1999. September 1999.

[8] Anonymous. *Understanding the Safe Drinking Water Act*. United States Environmental Protection Agency. EPA 810-F-99-008. December 1999.

[9] Rule Implementation Milestones and Requirement, http://www.epa.gov/safewater/pws/imp_milestones.pdf

standards describe ways to treat or remove contaminants from drinking water and set enforceable maximum contaminant levels to which water systems must conform. The EPA follows a three-step process when setting primary drinking water standards. First, the EPA identifies potential drinking water contaminants, studies their concentration in the water, and focuses on the contaminants that have the greatest impact on public health safety. Second, the EPA determines a maximum contaminant level for water systems. They do this while taking into consideration cost-benefit analysis and economic feasibility of detection and treatment alternatives for all sizes of water systems. Finally, the EPA formally specifies a maximum permissible level of a contaminant in drinking water. For those systems that cannot detect a specific contaminant, the EPA sets a mandatory treatment technique in order to prevent contamination in the specific water system[10].

In 2000, fourteen percent of Virginia's CWS, or 188 systems, reported health-based drinking water violations. These systems serve approximately 122,000 people. This figure is high in comparison to the entire United States, where only about eight percent (4,221 systems) reported health-based drinking water violations. Table 2.2 breaks down the number of Drinking Water Violations (DWV) by size of the system; and Table 2.3 indicates the number of actual water systems in violation. These tables illustrate that SPWS have the most drinking water violations and have the greatest number of systems in violation. Table 2.4 reveals the size of the population affected by each type of drinking water violation[11]. Even though small water systems serve a smaller population, a significant number of people are affected by drinking water violations in SPWS. The larger number of violations in SPWS, compared to the number in large community water systems, is a direct result of the obstacles and challenges these systems face on a daily basis.

[10] Anonymous. *Understanding the Safe Drinking Water Act*. United States Environmental Protection Agency. EPA 810-F-99-008. December 1999.
[11] Anonymous. *Factoids: Drinking Water and Ground Water Statistics for 2000*. United States Environmental Protection Agency, Office of Water. June 2001. <http://www.epa.gov/safewater/data/00factoids.pdf

Table 2.1. Number of Community Water System Violations Reported by System Size

	MCL[12]	TT[13]	M/R[14]	Other[15]	Total
Very Small	3,046	1,604	40,345	7,937	52,932
Small	1,122	850	7,406	1,996	11,374
Medium	318	249	2,041	447	3,055
Large	251	294	2,039	219	2,803
Very Large	16	48	182	15	261
Total	*4,753*	*3,045*	*52,013*	*10,614*	*70,425*

*Source: Environmental Protection Agency

Table 2.2. Number of Community Water Systems in Violation Reported by System Size

	MCL	TT	M/R	Other	Total
Very Small	2,001	944	10,041	14,868	27,854
Small	710	435	2,506	4,346	7,997
Medium	251	124	704	1,206	2,285
Large	186	152	487	863	1,688
Very Large	12	22	43	76	153
Total	*3,160*	*1677*	*13,781*	*21,359*	*39,977*

*Source: Environmental Protection Agency

Table 2.3. Population Affected by Drinking Water Violation Reported by System Size

	MCL	TT	M/R	Other	Total
Very Small	324,588	161,408	1,438,809	949,875	2,874,680
Small	999,776	600,020	3,293,589	2,309,815	7,203,200
Medium	1,574,032	740,753	4,037,524	2,350,790	8,703,099
Large	4,449,100	4,790,097	14,365,948	4,693,943	28,299,088
Very Large	4,599,487	9,099,186	11,058,003	3,578,340	28,335,016
Total	*11,946,983*	*15,391,464*	*34,193,873*	*13,882,763*	*75,415,083*

*Source: Environmental Protection Agency

[12] MCL – Maximum Contaminant Level (the legal limit on a contaminant in drinking water)
[13] TT – Treatment Technique (a drinking water treatment required by EPA or state rules)
[14] M/R – Monitoring/Reporting violation (water system's failure to monitor for, or report to the state, the level of a contaminant on the required schedule)
[15] Other – Other violations of EPA rules (including failure to provide public notice of another violation, or failure to prepare and/or distribute a Consumer Confidence Report)

2.3 Challenges Faced by Small Water Systems

Small public water systems face three main challenges: the structure of the industry, economies of scale, and historical nature of the industry. The structure of the drinking water industry in the United States poses a challenge because it is essentially a rising cost industry. Water systems are not providing the same product that they provided twenty or even ten years ago. The quality of drinking water in the United States has dramatically improved. Along with this improvement in water quality are increases in costs associated with tighter regulations, more personnel for facility operation and maintenance, and the need for infrastructure improvements[16].

Economies of scale also pose a great challenge for SPWS. Unlike large public water utilities, SPWS lack a large customer base. Due to this lack of customers, SPWS are not able to generate enough revenue to pay additional technical staff, make infrastructure improvements, pay debts, or even meet all national drinking water standards set by the EPA[17]. Table 2.4 illustrates the composition of each type of public water system (CWS, NTNCWS, TNCWS) in the United States, a break down of the population served by the two size classifications (very small & small; medium, large & very large) of each public water system, and the sources of water for each type of water system in the United States[18]. As the table shows, the majority of water systems in the United States are very small to small in size, but serve only a small percentage of the population. With a smaller customer base, these small systems are at a great disadvantage financially compared to the few medium to large size water systems serving a large percentage of the population. According to a 1997 United States EPA Drinking Water Infrastructure Needs Survey, SPWS are less likely to be able to access outside capital to finance facility improvements because they lack the cash flow, contrary to their larger counterparts. Additionally, the 1999 Drinking Water Needs Survey conducted by the EPA reveals that, in the United States, larger water systems serving over 50,000 people account for the greatest percentage (41%) of the total reported national need for capital investment money. However, Figure 2.3 shows that the costs

[16]Anonymous. "What Are Small Systems?" United States Environmental Protection Agency, Office of Ground Water and Drinking Water. March 2001. <http://www.epa.gov/safewater/smallsys/small.html>
[17] Anonymous. "What Are Small Systems?" United States Environmental Protection Agency, Office of Ground Water and Drinking Water. March 2001. <http://www.epa.gov/safewater/smallsys/small.html>
[18] Anonymous. *Public Drinking Water Systems: Facts and Figures*. United States Environmental Protection Agency, Office of Water. July 2001. <http://www.epa.gov/safewater/pws/factoids.html

per-household of supplying water via SPWS is nearly four times the cost larger systems incur. This illustrates that small water systems do not have the luxury of spreading costs, such as infrastructure improvements, over as many customers and, thus, are at a cost disadvantage[19].

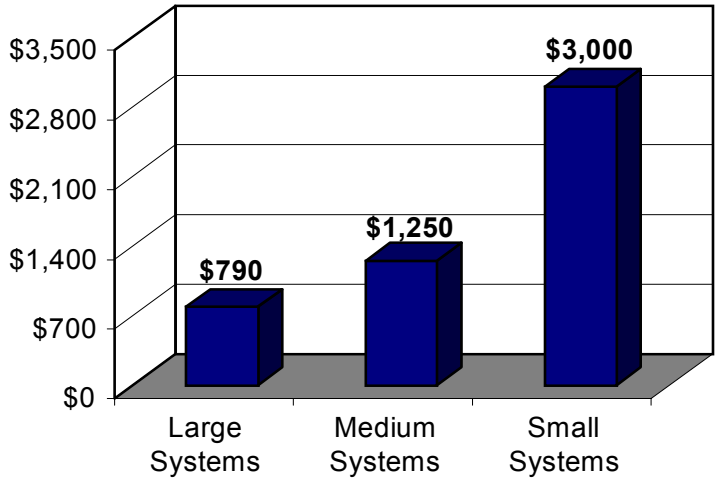
Table 2.4. Public Drinking Water Demographics

	System Size Categories (%)		Percent of Population Served (%)		Number of Systems	
	Very Small & Small	Medium, Large & Very Large	Very Small & Small	Medium, Large & Very Large	Ground Water	Surface Water
CWS	85	15	10	90	42,661	11,403
NTNCWS	99.4	0.6	76	24	19,738	821
TNCWS	99.8	0.2	78	22	91,298	1,912

The final significant challenge that SPWS face is imbedded in the history of the drinking water industry in the United States. Historically, the drinking water industry has been viewed as being under-priced, meaning the cost of providing service has been greater than the revenue generated from the sale of the service. The challenge SPWS face is providing affordable drinking water services, but not under-pricing the rates for that service. Billing rates for drinking water must be a function of two variables: the cost of providing service and the customer's ability to pay. Finding a desirable equilibrium between these two factors is a very difficult challenge that SPWS continue to face, which also threatens their continuation[20].

[19] Anonymous. *Fact Sheet: Drinking Water Infrastructure Needs Survey*. United States Environmental Protection Agency, Office of Water. EPA 816-F-01-001. February 2001.
[20] Anonymous. "What Are Small Systems?" United States Environmental Protection Agency, Office of Ground Water and Drinking Water. March 2001. <http://www.epa.gov/safewater/smallsys/small.html>

Figure 2.3. Average 20-Year Financial Need on a Per-Household Basis (in January 1999 dollars)



* Source: 1999 Drinking Water Infrastructure Needs Survey

2.4 Hypothesis

If small water systems are linked together in a cooperative organization, by pooling their collective resources, they can achieve the benefits of economics of scale and, therefore, increase their technical/financial capacities and managerial efficiency. The goal of this study is to assess the potential for a cooperative structure for rural SPWS and analyze the feasibility of this structure in Carroll County, Virginia.

3. Conceptual Options

3.1 Decision-Making Process for Small Water Systems

The businesses in this study have a clear decision making process. To gain their participation in a cooperative, the individual owners and/or operators must see the benefits and costs of a cooperative before they will be willing to join. A survey of SPWS operators revealed that there are several administrative and technical activities that operators feel could be performed more

efficiently by a cooperative of SPWS. Some administrative activities that could be executed via a cooperative include generating mandatory Consumer Confidence Reports and other EPA documents, assistance in developing budgets, and comparing costs with other SPWS. Technical services that could be arranged cooperatively include exchanging technical knowledge and information, sharing physical resources, networking with SPWS operators, sharing information on funding processes, and sharing usage figures. Even considering these benefits of a cooperative, the proposed SPWS cooperative must be economically feasible for all SPWS involved. When asked how their water customers would view a cooperative structure, all SPWS operators responded that their customers would be indifferent to the change in structure as long as service quality remains high, service reliability remains high, quality of water is good, and there is no increase in the price of the water. Forming a cooperative is a major decision for the parties involved. In the appendix section 7.1, there is a detailed synopsis of how to initiate the process of forming a cooperative.

3.2 Goals of the Cooperative

Any cooperative effort that these SPWS embark on will need very specific goals. The primary goal of this proposed cooperative would be to provide the public with safe, high quality drinking water at an affordable cost by decreasing the number of drinking water violations in all of its SPWS members. Another goal of this cooperative of SPWS would be to create a medium by which the cooperative can buy or provide products and/or services to its members that would be too costly to obtain on an individual system basis. By assuring high levels of business to vendors, the cooperative might be able to benefit from quantity purchasing discounts. A further goal for the cooperative would be to strive to lower administrative costs of each SPWS by pooling the resources and delegating responsibilities among all of the SPWS members[21]. For the SPWS in this case study, a goal of the cooperative organization could possibly be to organize an enhanced effort to get the county to extend its public water to the area.

[21] Garcia, Kyle, Christie Thompson, and Tamim Younos. *Restructuring Strategies For Small Water Systems: Virginia Small Water Systems Co-operative*. Virginia Water Resources Research Center, Virginia Tech. Blacksburg, Virginia. Special Report SR15-1999. September 1999.

3.3 Cooperative Structure

Cooperatives have been around for many years, some dating back to the ancient Egyptian era around 3100 to 1150 B.C. The modern cooperative movement is credited with beginning in 1844 by a group from England called the Rochdale Equitable Pioneers. The membership of this group included craftsman and entrepreneurs in trades ranging from flannel weavers to shoemakers. This diverse group originally came together to purchase supplies and consumer goods in bulk to save money[22].

The International Co-operative Alliance's Information Center defines cooperatives[23] as:

> *"an autonomous association of persons united voluntarily to meet their common economic, social, and cultural needs and aspirations through a jointly-owned and democratically-controlled enterprise".*

There are seven founding principles that were first established in 1844. These principles include the following[24]:

1. Voluntary and Open Membership
2. Democratic Member Control
3. Financial Obligation and Benefits Proportional to Use
4. Autonomy and Independence
5. Education, Training, and Information
6. Cooperation Among Cooperatives
7. Concern for Community

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[22] Roy, Ewell Paul. Cooperatives: Development, Principles and Management. The Interstate Printers & Publishers, Inc. Danville, Illinois. 1976. pp. 40-60.
[23] Anonymous. *What Is A Co-operative?* International Cooperative Information Centre. International Co-operative Alliance (ICA). http://www.wisc.edu/uwcc/icic/def-hist/def/what-is.html. January 1996.
[24] Anonymous. *What Is A Co-operative?* International Cooperative Information Centre. International Co-operative Alliance (ICA). http://www.wisc.edu/uwcc/icic/def-hist/def/what-is.html. January 1996.

The organizational structure suggested in this case study will be a shared-service cooperative. Furthermore it will initially be an operation at cost or non-profit cooperative[25]. Specifically, shared-service cooperatives are a way to provide high quality services competitively to rural communities and expand the welfare of its members[26]. This type of organization will allow SPWS to purchase items jointly (reducing costs and increasing purchasing options), better respond to government policy changes, share information, and provide member training, certification, and other educational opportunities. There is one characteristic of shared-service cooperatives that makes them different from other organizational structures. Shared-services cooperatives operate to provide benefits to the members as users, not as financial investors[27]. The cooperative should operate at cost or as a non-profit organization in the beginning, since the primary objective of the cooperative is not generating profits. As a non-profit cooperative, the group can focus on other goals and objectives, such as increasing their efficiency and reducing drinking water violations. Once the cooperative has had time to establish itself and the members are comfortable working together, amending the Articles of Incorporation and Bylaws so the cooperative can generate profits is an option.

Articles of Incorporation and Bylaws are two organizational/legal documents that the SPWS cooperative will have to develop. Articles of Incorporation are a statement of the scope and kind of the business the cooperative is intended to do. This statement must conform to state laws. Even if service is initially limited, Articles of Incorporation usually specify broad incorporating authority[28]. These articles usually include the name of the cooperative, principle place of business, purposes and powers of the cooperative, proposed duration of the cooperative, names

[25] Garcia, Kyle, Christie Thompson, and Tamim Younos. *Restructuring Strategies For Small Water Systems: Virginia Small Water Systems Co-operative*. Virginia Water Resources Research Center, Virginia Tech. Blacksburg, Virginia. Special Report SR15-1999. September 1999.
[26] Crooks, Anthony C., Karen J. Spatz, and Marc Warman. *Shared-Services Cooperatives*. United States Department of Agricultural Rural Development: Rural Business Cooperative Service. Washington, D.C. RBS Research Report 141. May 1997.
[27] Crooks, Anthony C., Karen J. Spatz, and Marc Warman. *Shared-Services Cooperatives*. United States Department of Agricultural Rural Development: Rural Business Cooperative Service. Washington, D.C. RBS Research Report 141. May 1997.
[28] Roy, Ewell Paul. Cooperatives: Development, Principles and Management. The Interstate Printers & Publishers, Inc. Danville, Illinois. 1976. pp. 314-316.

of the incorporators, and a provision for redemption of member equity (sometimes included in the Bylaws)[29].

Bylaws of a cooperative are basically its operational rules. The Bylaws explain in more detail the Articles of Incorporation and state the rights and obligations of the members and the board of directors[30]. The following is a list of the items that are typically included in Bylaws[31].

- Requirements for membership
- Rights and responsibilities of membership
- Grounds and procedures for member expulsion
- Voting procedures
- Procedures for calling and conducting membership meetings
- Procedures to elect or remove directors and officers
- The number, duties, terms of office, and compensation of directors and officers
- Time and place of the directors meetings
- Dates of the fiscal year
- Information on how the net earnings will be distributed
- Other rules for management of the cooperative

A committee representing the interests of the potential cooperative, together with an attorney (so that the documents will comply with state laws), traditionally prepares the Bylaws and Articles of Incorporations[32]. Attached in Appendix 7.2 is a sample outline of a cooperative's legal documents including Articles of Incorporation and Bylaws developed by The United States Department of Agriculture's Rural Business Cooperative Service[33].

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[29] Anonymous. "Rural Business & Agricultural", "Purchasing and Shared Services", "Co-op Primer". National Cooperative Business Association. Washington, D.C. October 2001. <http://www.ncba.org>

[30] Roy, Ewell Paul. Cooperatives: Development, Principles and Management. The Interstate Printers & Publishers, Inc. Danville, Illinois. 1976. pp. 314-316.

[31] Anonymous. "Rural Business & Agricultural", "Purchasing and Shared Services", "Co-op Primer". National Cooperative Business Association. Washington, D.C. October 2001. <http://www.ncba.org>

[32] Anonymous. "Rural Business & Agricultural", "Purchasing and Shared Services", "Co-op Primer". National Cooperative Business Association. Washington, D.C. October 2001. <http://www.ncba.org>

[33] Ely, Gerald and Galen Rapp. *How to Start A Cooperative*. Cooperative Information Report 7. United States Department of Agricultural Rural Development: Rural Business Cooperative Service. Washington, D.C. September 1996. <http://www.rurdev.usda.gov/rbs/pub/cir7/cir7rpt.htm>

Other important issues for cooperatives include taxation requirements and other required legal documents. The federal tax code explains the special tax considerations for cooperatives in Subchapter T. A cooperative is a flow-through entity where any profits are distributed to members as patronage refunds. Subchapter T of the tax code basically states that a cooperative is not taxed as an entity; however, each member is responsible for paying tax on any patronage dividend (refund) received. The rules are slightly different for a non-profit cooperative. Unlike regular cooperatives, the members of a non-profit cooperative have no tax liability, because all surplus is placed in a reserve fund. There are no patronage refunds distributed to members, and members do not have access to the cooperative's retained funds. Any revenue (income) generated from activities not within the principal purpose of the cooperative is subject to taxation just as in regular cooperatives[34]. However, non-profit cooperatives still have to pay all of the local, state, and federal taxes that other businesses pay[35].

3.4 Benefits of Cooperative Structure

A shared-service cooperative can provide each SPWS member with several benefits. The United States Rural Business-Cooperative Service lists five benefits of general cooperative structures, which also apply to shared-service cooperatives[36]:

1. *Access to quality supplies and services at reasonable costs*
2. *Increased clout in the marketplace*
3. *Share in the earnings*
4. *Political action*
5. *Local economy enhanced and protected*

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[34] Anonymous. "Rural Business & Agricultural", "Purchasing and Shared Services", "Co-op Primer". National Cooperative Business Association. Washington, D.C. October 2001. <http://www.ncba.org>

[35] Anonymous. *The Electric Co-op Business Model: The Cooperative Difference*. National Rural Electric Cooperative Association. Arlington, Virginia. <http://advocacy.nreca.org/html/govt_relations/gr_business.html>

[36] Frederick, Donald. *Co-ops 101: An Introduction to Cooperatives*. Cooperative Information Report 55. United States Department of Agricultural Rural Development: Rural Business Cooperative Service. June 1997. <http://www.rurdev.usda.gov/rbs/pub/cir55/cir55rpt.htm>

A shared-service cooperative will allow the SPWS to purchase chemicals, supplies, equipment, and expert services in larger volumes and at lower costs. This is a result of economies of scale. When these smaller water systems join together, they can enjoy the same efficiencies and opportunities as larger municipal water systems, which are unavailable to SPWS. By joining together, the SPWS will also benefit from increased clout in the marketplace. This benefit alone is important to members because it means that together they have improved bargaining power when dealing with other businesses or organizations. In the future, if the cooperative decides to drop the non-profit status and generate earnings, each member will have a share of those earnings based on usage of the cooperative. Along with a share in monetary earnings, the members of the cooperative will have a means to share information on technical, managerial, and operational aspects of their systems. Member control, which refers to the cooperative policy of one member, one vote, is another beneficial aspect. Increased political action is one of the most important benefits to the SPWS in this study. Carroll County has considered extending its public water system out to the town of Fancy Gap. Due to the fact that operating and maintaining a SPWS is so demanding, many operators want the county to take over their systems. By forming a shared-service cooperative, the SPWS can voice their options and concerns louder than individual systems, while maintaining their independence. One of the final benefits of a cooperative organization would be to the local economy and residents. In accordance with the goals of the cooperative, each SPWS operator could find ways to decrease the number of drinking water violations his/her system receives. By decreasing drinking water violations, the system can provide the community with a high quality drinking water. High quality drinking water has other beneficial effects on the local community such as attracting new residents or visitors, both of which stimulate the local economy[37]. Additional benefits include the following: availability of important educational services and technical training sessions, sharing of information and experience, consolidation of administrative tasks (such as Consumer Confidence Reports), and the utilization of one certified operator for all systems.

[37] Frederick, Donald. *Co-ops 101: An Introduction to Cooperatives*. Cooperative Information Report 55. United States Department of Agricultural Rural Development: Rural Business Cooperative Service. June 1997. <http://www.rurdev.usda.gov/rbs/pub/cir55/cir55rpt.htm>

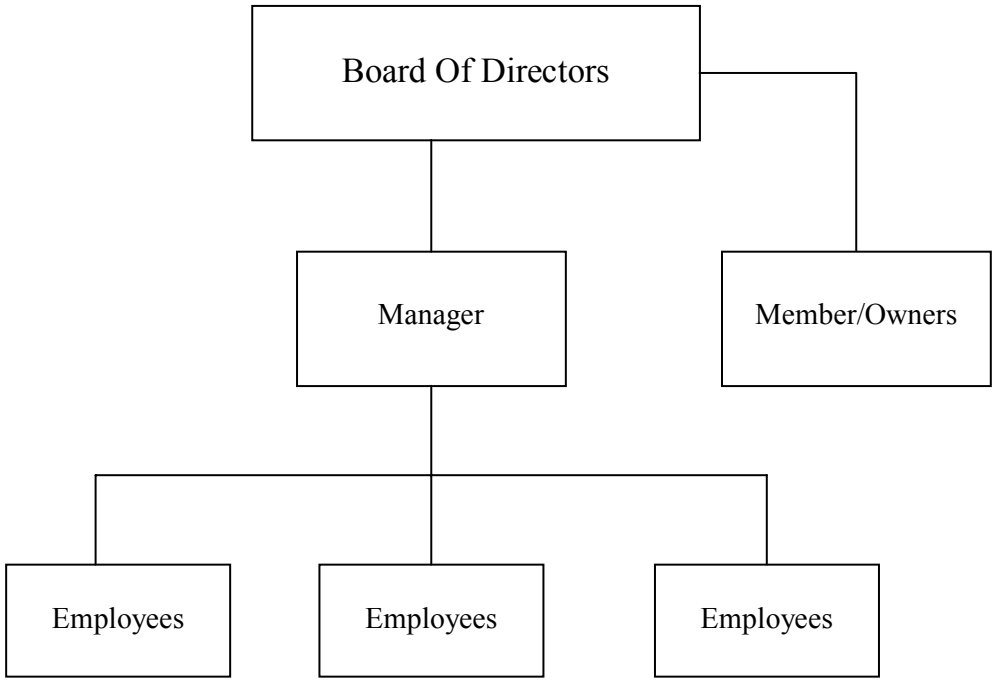
3.5 Proposed Cooperative

For this case study, Figure 3.1 illustrates the proposed organizational structure of a SPWS cooperative in Virginia[38]. Each person or group in this organizational chart (member/owners, board of directors, general manager, and employees) has specific roles and responsibilities. The most important part of the cooperative is the representation of the members/owners of each SPWS. In this small water system cooperative, each customer receiving water from a SPWS is not a member of the cooperative. The cooperative's membership is comprised of representatives from the individual SPWS. The articles of incorporation and bylaws establish the legal rights of each cooperative member. The Cooperative Information Reports distributed by the United States Department of Agriculture's Rural Development Service list these rights as normally included for each member[39]:

- Adopt and amend the articles of incorporation and bylaws
- Elect and, if necessary, remove directors of the business
- Dissolve, merge, or consolidate the cooperative or form a joint venture with others
- Require officers, directors, and other agents to comply with the law under which the business was set up, and which its articles of incorporation, bylaws, and membership contracts
- Hold directors and officers liable for damage injurious to members
- Examine the annual reports

[38] Garcia, Kyle, Christie Thompson, and Tamim Younos. *Restructuring Strategies For Small Water Systems: Virginia Small Water Systems Co-operative*. Virginia Water Resources Research Center, Virginia Tech. Blacksburg, Virginia. Special Report SR15-1999. September 1999.
[39] Meyer, Tammy M. *Understanding Cooperatives: Who Runs The Cooperative Business?* USDA Rural Development Administration, Cooperative Services. Cooperative Information Report 45, Sections 4-6. October 1994.

Figure 3.1. Organizational Structure for a SPWS Cooperative



Additionally, each individual SPWS has one vote in this democratically governed cooperative. Along with these rights come responsibilities of cooperative membership, which requires that individuals maintain a long-term commitment to the cooperative. Members must stay informed and up-to-date regarding the cooperative's present situation and future operations. It is also the responsibility of the member/owners to provide the necessary capital to finance the cooperative and understand, adopt, and amend cooperative legal documents. To make sure the cooperative is and continues to meet the needs of the member/owners, it is the responsibility of each member to inspect and evaluate the cooperative's annual reports[40].

The board of directors for the cooperative should be representative of all members/owners (each individual SPWS). The size of the board should be determined by incorporation law and in general should be an odd number of people. Often the board will elect board officers, the most

[40] Meyer, Tammy M. *Understanding Cooperatives: Who Runs The Cooperative Business?* USDA Rural Development Administration, Cooperative Services. Cooperative Information Report 45, Sections 4-6. October 1994.

common being president, vice-president, secretary, and treasurer. Members of the board are nominated and elected by the members of the cooperative. The board members must be members of the cooperative[41].

The board of directors play an important role in the cooperative because they act as the link between the members and any hired management or employees. Some of the duties of board members are to familiarize themselves with the articles of incorporation and bylaws of the cooperative. The board will use the provisions in these documents to conduct business. The board will also have to conduct regular (and occasionally special) meetings, understand the state law under which the cooperative was incorporated, understand all legal contacts or agreements the cooperative enters into, participate in training programs on topics relating to cooperative operations, and investigate new ideas or changes that will benefit members of the cooperative. In addition to all these duties, being a member of the board comes with a set of responsibilities. These responsibilities vary by organization but generally include the following: hiring a manager; adopting policies to guide the manager regarding how the board wants its policies implemented; developing long range business strategies; producing periodic financial reports and operating statements; assisting the manager in preparing an operating budget for the next year; using a qualified auditor for an independent audit at least one a year; and using (if necessary) a competent legal counsel. Along with all these responsibilities, the board of directors is also responsible for planning board meetings, keeping a complete record of the board's actions, and keeping the membership informed about the status of the cooperative[42].

Once the cooperative has formed a board of directors, it is the board's responsibility to hire and set the salary for a general manager, who in turn, will hire additional employees. Generally, the manager is not a member of the board, but does actively participate in board meetings as a non-voting party. The general manager is primarily responsible for the day-to-day operations of the cooperative. Specifically, the general manager is responsible for overseeing and coordinating the

[41] Meyer, Tammy M. *Understanding Cooperatives: Who Runs The Cooperative Business?* USDA Rural Development Administration, Cooperative Services. Cooperative Information Report 45, Sections 4-6. October 1994.
[42] Meyer, Tammy M. *Understanding Cooperatives: Who Runs The Cooperative Business?* USDA Rural Development Administration, Cooperative Services. Cooperative Information Report 45, Sections 4-6. October 1994.

business activities and operation of the cooperative; implementing the policies established by the board; handling various accounting, bookkeeping, and budgeting duties as set by the board of directors; providing board member with information needed for long term planning; and presenting a positive image to members of the cooperative and the community. If the manager sees that additional employees are needed, it is his/her responsibility to supervise all aspects of hiring, training, and managing these new employees. Employees of the cooperative have four basic responsibilities. These responsibilities include understanding the purpose and objectives of the cooperative; fully performing their duties (determined by general manager); understanding that member/owners own the cooperative where providing a service is the primary objective; and appreciating that they, as employees, are representing the cooperative[43].

The board, when necessary, could also receive advice from outside organizations such as the Virginia Department of Health, local Health Departments, Public Service Authority, United States Environmental Protection Agency, and American Water Works Association. However, representatives from these organizations cannot hold a seat on the board of directors, unless they are members of the cooperative.

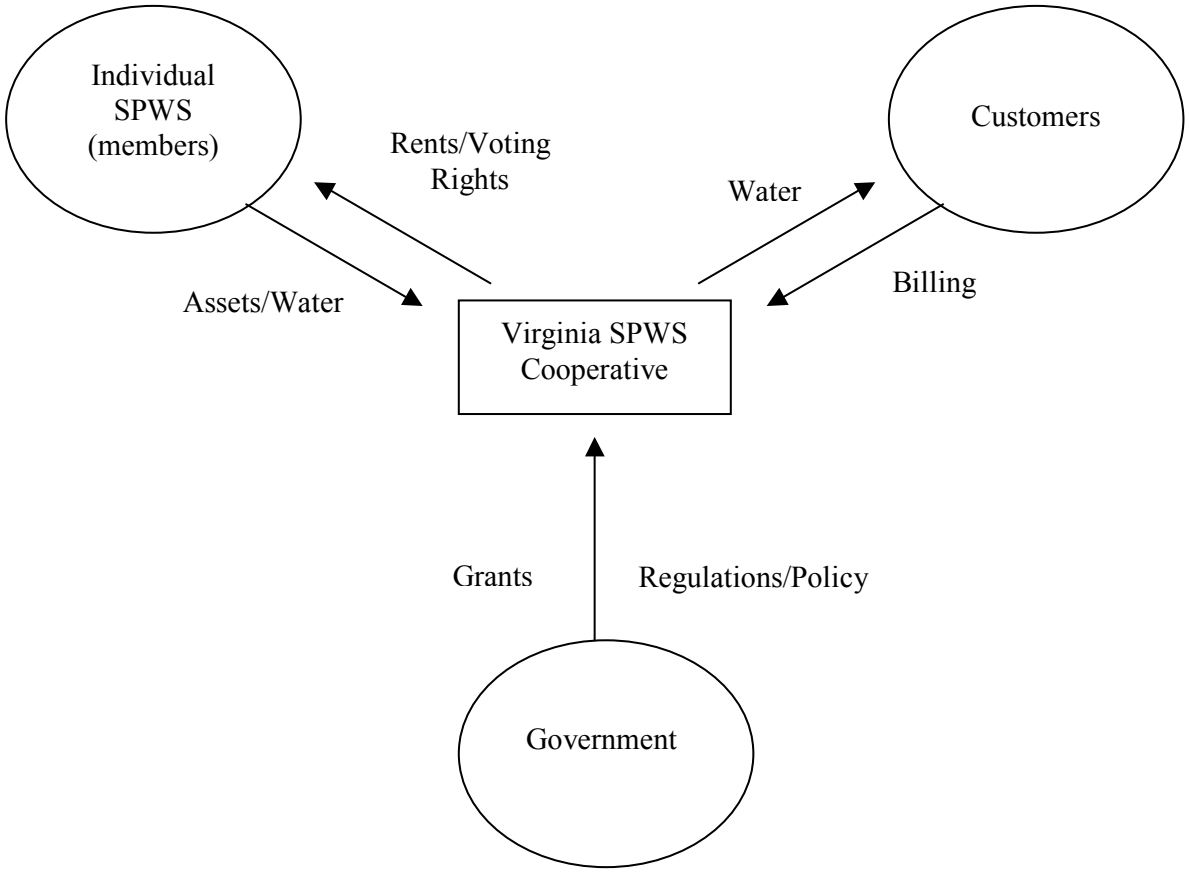
The interaction of the cooperative with its members (individual SPWS), water system customers, and the government can vary; but Figure 3.2 is one way to illustrate this interaction[44]. Each individual SPWS in the cooperative will use its own assets and facilities to supply its customers with water. Water from these individual SPWS will be sold to their customers. In turn, the money customers pay for the water will be paid, through the cooperative, to the individual SPWS as rent based on usage to pay for facility depreciation, water provided, and other operational expenses. It is important to note here that no profits will be made on the sale of the water. Money from the billing process will be used to cover all costs associated with operating the cooperative in addition to the costs of supplying water to the customers. The SPWS cooperative will have to abide by regulations and policies set by the government. It will also be the

[43] Meyer, Tammy M. *Understanding Cooperatives: Who Runs The Cooperative Business?* USDA Rural Development Administration, Cooperative Services. Cooperative Information Report 45, Sections 4-6. October 1994.

[44] Garcia, Kyle, Christie Thompson, and Tamim Younos. *Restructuring Strategies For Small Water Systems: Virginia Small Water Systems Co-operative*. Virginia Water Resources Research Center, Virginia Tech. Blacksburg, Virginia. Special Report SR15-1999. September 1999.

cooperative's responsibility to ensure that the individual SPWS comply with government regulations and policies that apply to them. Through government sponsored programs, such as Water Assistance Supply Grant Fund[45] and the Drinking Water State Revolving Fund[46], the cooperative will be able to apply for grants or other sources of funding for capital improvement projects, educational and technical training programs, etcetera.

Figure 3.2. Interaction of SPWS Cooperative with Other Groups



[45] The Water Supply Assistance Grant (WSAG) Fund in Section 32.1-171.2 of the Code of Virginia was created by the 1999 General Assembly to make grant funds available to localities and owners of waterworks to assist in the provision of drinking water.

[46] The State Drinking Water Revolving Fund (SDWRF) provides funding for various technical assistance activities and construction projects through both federal and state funding.

3.6 Challenges Faced by New Cooperatives

In the process of forming a cooperative, all interested SPWS representatives will need to consider the effect of internal and external challenges. In addition to these two types of challenges, the interested SPWS will need to consider the source of capital to establish and maintain the cooperative or legal entity, without the option of bringing on investors who would a seat on the board. Any legal limits to membership or daily operation of the cooperative should be understood. Perhaps the greatest challenge for a cooperative of this nature involves the individual SPWS members. In a democratic organization, like a cooperative, the organization itself ought to invest time and money into educating its members, which can be expensive and time consuming. In order for members to contribute, they need to be aware of how the cooperative operates, key issues facing the cooperative, holding meetings, and how the cooperative will respond to their concerns. Educating and keeping members abreast of cooperative issues is essential. As soon as members lose interest and stop investing time and energy into the cooperative, the cooperative will no longer be able to provide all the benefits to the members[47]

3.6.1. Internal Challenges

A newly formed cooperative will face many challenges, some internal and some external. One major internal challenge that the cooperative will have to deal with is the problem of "free-riders." Free-riders are those members who do not participate in a program but reap the benefits of it. They will also take advantage of the benefits provided by other cooperative members' investments of time and, or, money. Another internal challenge that threatens the longevity and success of the cooperative organization involves cooperation among its members. For example, getting all SPWS to adopt good management practices and conform to various standards and regulations may inevitably cause conflict among members. Traditional thinking and methods of operation are a key challenge that the cooperative members must address immediately. The need

[47] Anonymous. *Starting A Cooperative*. Cooperative Life and the Cooperative Development Institute. Greenfield, Massachusetts. May 2001. http://cooplife.com/startcoop.htm.

to adopt new operational technologies is an example of one more internal challenge that the cooperative members must address[48]. Other internal challenges include the following:

- Source of capital to initiate and support the cooperative as a legal entity
- Time and cost of educating members of their roles and responsibilities as cooperative members
- Developing operations and management protocols within the cooperative and assigning responsibilities
- Equitable responsibilities

3.6.2. External Challenges

External challenges are caused by forces outside the cooperative and outside the control of its members. In this study, some SPWS are operated as separate profit/loss entities with the core business, which is in the tourism industry (i.e. resorts). The differences between for-profit and non-profit objectives has the potential to create conflict within the cooperative. This might reduce communication and important information sharing among members. Changes in technology and drinking water standards are other major external challenges for the cooperative. Cooperative members must stay aware of technological changes in the industry in order to continue to provide the highest quality drinking water at the lowest cost possible[49]. Cooperatives will face further external challenges, some of which include the following:

- The structure of individual member businesses, specifically the differences in the objectives between those who are for-profit and those who are non-profit
- Different perspectives on responsibilities from the representatives who receive a salary verses volunteers

3.6.3. Educational Challenges

One of the most important aspects of developing a functional cooperative structure is the role of education. Cooperatives can be organized in many different ways. Potential members need to

[48] Crooks, Anthony C., Karen J. Spatz, and Marc Warman. *Shared-Services Cooperatives*. United States Department of Agricultural Rural Development: Rural Business Cooperative Service. Washington, D.C. RBS Research Report 141. May 1997.
[49] Crooks, Anthony C., Karen J. Spatz, and Marc Warman. *Shared-Services Cooperatives*. United States Department of Agricultural Rural Development: Rural Business Cooperative Service. Washington, D.C. RBS Research Report 141. May 1997.

be educated on various activities and issues involving cooperatives and their organization. Such topics include the following: the legalizing and chartering process, membership requirements, ownership and operation of the cooperative, investment requirements, implications of profit or non-profit status, and taxation of the cooperative.

There are many other factors that make cooperatives unique. Some of the unique features of cooperatives relative to other business structures were compared in a 1985 publication (Groves). Table 3.1 is an excerpt from that paper. The Table 3.1 compares the purpose, decision-making process, director selection process, general structure, policy-making procedures, and contribution to owners' equity and distributions of net margins of cooperatives to other non-cooperative entities[50]. The key to success with a cooperative structure is to take advantage of its unique features and not imitate other business structures.

Table 3.1. Unique Features of Cooperative Management

Feature	Cooperative	Non-Cooperative	Implication for Cooperative
Purpose	Maximize member benefits (increase operational efficiency)	Maximize returns to stockholders	Profit maximizing decisions, not always the best for the member
Decision Making Process	Democratic one member one vote	One vote/share of common stock	Members need education for decision making
Director Selection	From members	Inside/outside or both	Directors often need training
Structure	Those who own, use, and control are the same people	Those who own, use, and control may be different people	Members need education for decision making
Policy Making Procedure	Quasi public	Often private	Members need education for decision making
Contribution to Owners Equity and Distribution of Net Margins	Proportional to use by current member-owners	Money available to invest and proportional return on investment	Members need to be educated to understand responsibilities

*Source: Groves, Frank. *What Is Cooperation?: The Philosophy of Cooperation and It's Relationship to Cooperative Structure and Operations*.

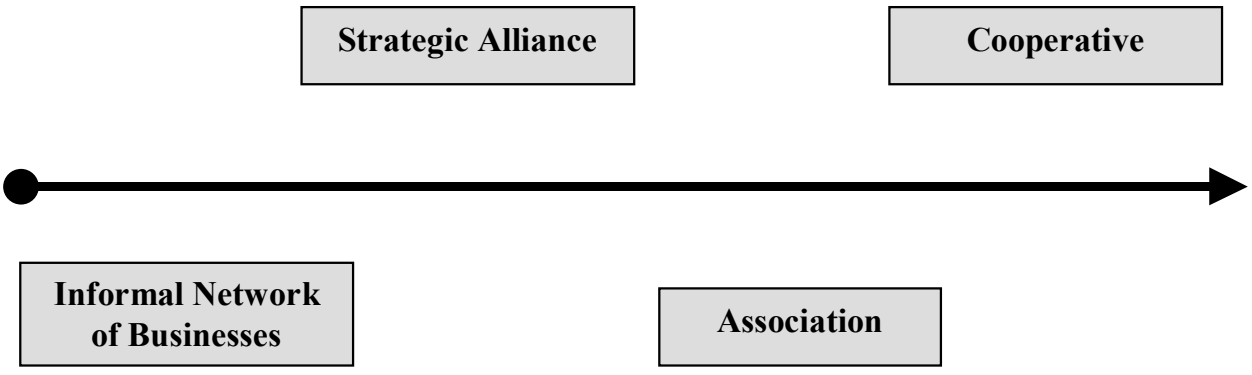
[50] Groves, Frank. *What Is Cooperation?: The Philosophy of Cooperation and It's Relationship to Cooperative Structure and Operations*. University of Wisconsin Center for Cooperatives. UCC Occasional Paper No. 6. October 1985. http://www.wisc.edu/uwcc/info/ocpap/groves.html.

The characteristics that make a cooperative unique also result in several implications, most of which deal with education. In order to make sound business decisions at all levels, directors, managers, employees, and members of the cooperative all require continuous educational programs[51].

3.7 Alternative Structures

There may be some initial hesitation to entering into a more formal legal business structure, however, short term, informal alternatives exist that could eventually lead to the formation of a more formal business structure, such as a shared-service cooperative. Progression from an initial simple, less organized, informal business structure to a more organized and legally incorporated business structure is illustrated in figure 3.3. Initially, interested parties have the option to come together as an informal network of businesses. Thus, SPWS that are facing similar problems to come together to network, share advice, and swap information. These informal networks are not incorporated, but the discussion and joint activities can prove useful to all involved. The downside to this type of structure is instability. Parties are not required to commit and may choose to disengage from the group at any time[52].

Figure 3.3. Progression of Business Organizational Structures



[51] Groves, Frank. *What Is Cooperation?: The Philosophy of Cooperation and It's Relationship to Cooperative Structure and Operations*. University of Wisconsin Center for Cooperatives. UCC Occasional Paper No. 6. October 1985. http://www.wisc.edu/uwcc/info/ocpap/groves.html

[52] Crooks, Anthony C., Karen J. Spatz, and Marc Warman. *Shared-Services Cooperatives*. United States Department of Agricultural Rural Development: Rural Business Cooperative Service. Washington, D.C. RBS Research Report 141. May 1997.

3.7.1. Strategic Alliance

If successful, the informal business network can lead to the formation of a strategic alliance. The Strategic Alliance Center at the Canadian Consulate General of Chicago defines a strategic alliance "as formal and mutually agreed-upon commercial collaboration between companies[53]." In this context, individual SPWS would work in collaboration with other SPWS while remaining separate, independent businesses. There are many benefits to a strategic alliance structure. Strategic alliances allow individual SPWS to set mutually beneficial goals and objectives that they could not have otherwise achieved alone, while sharing risks and resources[54]. Another important benefit of a strategic alliance is information exchange. By sharing information, SPWS could learn ways to improve their current management practices, thereby making the individual SPWS more efficient. With these benefits also comes a high level of commitment by SPWS. In order to build and maintain strong, lasting, and beneficial relationships, SPWS must invest considerable time and dedication to the alliance. Maintaining high levels of communication among all alliance members is essential for the alliance to sustain strength and longevity[55]. In fact, a survey of 445 CEO's revealed poor communication as the second most common reason that alliances failed[56]. One option for parties interested in forming an alliance is to develop a "Document of Understanding." Since a strategic alliance is not a legally binding business structure, drafting a "Document of Understanding" will address some of the underlying expectations of an alliance. The document should cover topics such as the scope of the alliance, major goals and objectives, and any expected benefits of the collaboration. Most importantly the document should outline the amount and type of commitment each party is expected to give, how the alliance will be managed; and, if necessary, how problems will be resolved[57].

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[53] Anonymous. *Strategic Alliances*. Strategic Alliance Center. Canadian Consulate General of Chicago. Department of Foreign Affairs. August 2000. http://www.canadachicago.net/sac-e.html

[54] Anonymous. *Strategic Alliances*. Strategic Alliance Center. Canadian Consulate General of Chicago. Department of Foreign Affairs. August 2000. http://www.canadachicago.net/sac-e.html.

[55] Ward, Clement E and Tanya L Estrada. *Beef Industry Alliances: Motivation and Characteristics*. Oklahoma Cooperative Extension Service: OSU Extension Facts WF-563. August 2000. http://www.agweb.okstate.edu/pearl/agecon/marketing/wf-563.

[56] Ball, Mary Alice and Shirley C. Payne. *Strategic Alliances: Building Strong Ones and Making Them Last*. Papers Presented at CAUSE conference (CNC9818). 1998. http://cause-www.colorado.edu/ir/library/html/cnc9818/cnc9818.html.

[57] Ball, Mary Alice and Shirley C. Payne. *Strategic Alliances: Building Strong Ones and Making Them Last*. Papers Presented at CAUSE conference (CNC9818). 1998. http://cause-www.colorado.edu/ir/library/html/cnc9818/cnc9818.html.

3.7.2. Associations

The next step to a more formal business structure is forming an association. In many ways, this process is very similar to forming a strategic alliance. There are many different types of alliances and associations, all with varying degrees of formality and organization. What makes alliances and associations different from a basic informal network of business is that there is an increased opportunity to enter into contractual arrangements. Even though a strategic alliance and an association are not formal legal business structures, they can provide the platform for individual SPWS to enter into contracts with other SPWS for one-time purchases of goods or services. These contractual arrangements allow each party to become comfortable working with a group of other SPWS in a combined effort. This is an excellent way for all parties to learn about the long-term benefits that a cooperative would provide on an initial short-term basis. The shortfall with contracts, strategic alliances, and associations is their volatility. Unlike a cooperative, commitment on a long-term basis by all parties involved is not required. Once a contract expires, parties are not legally committed to each other and may part ways, which is a potential problem if additional or continued services are needed[58].

3.8 Other Water Cooperative Models

The idea of forming a water cooperative to increase efficiency is not a new concept. Water cooperatives can be found in the United States and all over the world. In the United States, there are many water cooperatives, especially in the mid-western states. One such water cooperative is Avra Water Cooperative in Tucson, Arizona. This water cooperative is a non-profit organization and serves approximately 2,400 connections and 6,500 people. This water cooperative was formed in order to buy out the real estate developer who owned the system. It is common practice for a developer to build a water system to service properties being built and, upon the eventual sale of the properties, to offer the water system for sale.

[58] Crooks, Anthony C., Karen J. Spatz, and Marc Warman. *Shared-Services Cooperatives*. United States Department of Agricultural Rural Development: Rural Business Cooperative Service. Washington, D.C. RBS Research Report 141. May 1997.

The mission statement of the Avra Water Cooperative is the following[59]:

> *"to provide for the community water supply needs of its members and customers at the most reasonable cost. Specifically, the Cooperative will (1) provide a continuous and adequate supply of high quality drinking water, (2) provide superior service to its members and customers, (3) provide for future water supply needs, (4) provide excellence in governance that is responsive to its members, (5) cultivate the trust, confidence and support of its members and other stakeholders".*

The Avra Water Cooperative has a nine member board of directors, all of whom are volunteer members of the cooperative and also receive drinking water from it, and one hired general manager. A certified operator is contracted for all the small water systems in the cooperative.

There are about a dozen other cooperative public service corporations (as defined by the Arizona Corporations Commission) that are community water systems in Arizona. One of these systems, Rancho De Canjo, is a water cooperative in the same area of Tucson which serves about 200 people[60].

In Minnesota, a different rural water cooperatives concept has been introduced. The new water cooperative is called a water quality cooperative. The idea is to provide rural citizens with the perks of urban life at wholesale prices (and the option of tax exempt financing), such as water supply, wastewater treatment, fire protection water, and storm-water runoff management. This type of water cooperative is defined as "an association of persons organized (under Minnesota Statute Chapter 308A) to install, own, manage, and control individual sewage treatment systems or alternative discharging sewage systems and provide water-quality treatment and management services within a defined geographic area" (from Minnesota Stat. § 115.58)[61]. The concept for water quality cooperatives was developed in 1996 at the College of Architecture and Landscape

[59] Information involving Avra Water Cooperative provided by an interview with Michael J. Lytle, General Manger of Avra Water Cooperative (phone: 520-720-4467, e-mail: mlytle@avuawater.com).
[60] Information involving Avra Water Cooperative provided by an interview with Michael J. Lytle, General Manger of Avra Water Cooperative (phone: 520-720-4467, e-mail: mlytle@avuawater.com).
[61] Minnesota Statues 2001. http://www.revisor.leg.state.mn.us/stats/.

Architecture at the University of Minnesota. Currently a water quality cooperatives pilot project is being conducted in rural Minnesota[62].

Finland has a long history of rural cooperative ventures in such areas as agriculture, telephone, electricity, and even lake drainage associations. A study by Katko in 1992 looked at the evolution of consumer-managed water cooperatives in Finland and the implications of these structures for implementation in developing countries. Katko conducted a survey of 122 sector professionals, in which participates were asked to give their perspective on the advantages and disadvantages of water cooperatives. Many of the responses in Katko's study are similar to concerns expressed by respondents in this case study. Table 3.2 summarizes the advantages and disadvantages that Katko's survey respondents gave to that open-ended question. [63]

Table 3.2. Summary of Advantages and Disadvantages of Water Cooperatives in Finland

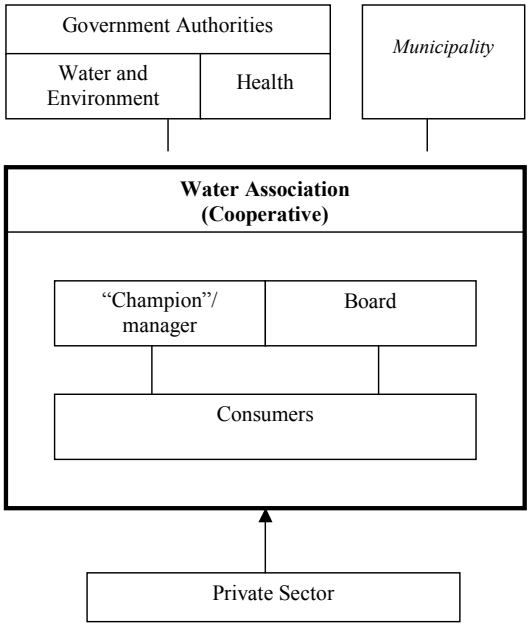
Advantages	Disadvantages
– Long tradition and experience – Consumer commitment to management, operation, and maintenance – Flexibility of decision making – Democratic and equitable system – Good for homogenous body of customers – Applicability to small systems – Members' property not at risk	– Possible reluctance to expand the service area – Possible lack of technical know-how – Possible lack of coordination with sewerage – Limited possibilities for accumulating investment capital – Tendency to minimize charges and risk financing – Risk of management problems after takeover – Decision making of large customers limited – Possible problem of "generation gap"

*Source: Katko, T. *Evolution of consumer-managed Water Cooperatives in Finland, with Implications for Developing Countries*. Water International. Vol. 17, No. 1. p.15. 1992.

[62] Skyes, Robert D. *Minnesota Water Quality Cooperatives Pilot Project*. Center for Rural Technology and Cooperative Development. University of Minnesota Extension Service. http://extension.umn.edu/water/coop1.html
[63] Katko, T. *Evolution of consumer-managed Water Cooperatives in Finland, with Implications for Developing Countries*. Water International. Vol. 17, No. 1. p.15. 1992.

Currently in Finland water cooperatives serving less than 1,000 people and partnerships serving less than 100 people are the most prevalent organizational structures. Much like in America, water cooperatives in Finland are managed by an annually elected board of administrators (directors). The duties of the board are very similar to that in American water cooperatives. Figure 3.4 is Katko's illustration of the parties involved in the development of consumer managed water cooperatives in Finland. Katko's work also reinforced the finding that economies of scale (discussed in chapter 2, section 2.3) do not apply to water cooperative systems in Finland, serving 1,000 people or less. Additionally, in Finland, large public municipalities and the private sector have more association, influence, and involvement in the development of rural water cooperatives than in America. [64].

Figure 3.4. Major Parties in the Development of Water Cooperatives in Finland



Source: Katko, T. *Evolution of consumer-managed Water Cooperatives in Finland, with Implications for Developing Countries*. Water International. Vol. 17, No. 1. p.17. 1992.

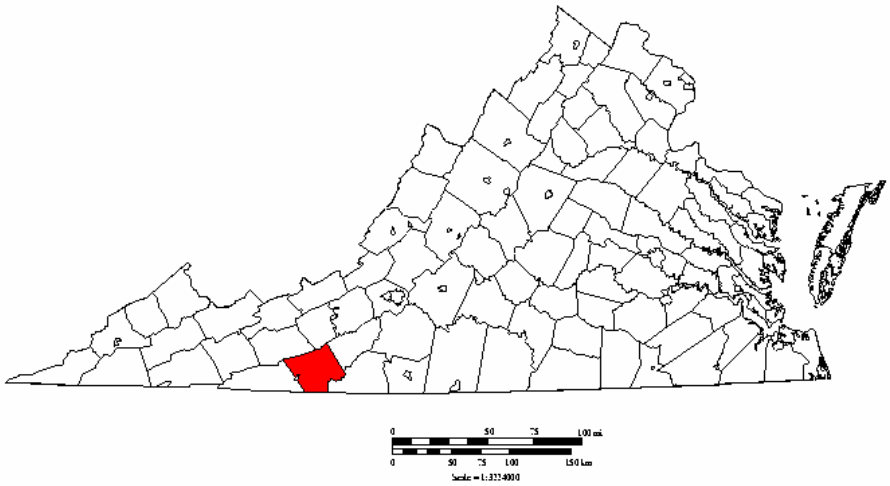
[64] Katko, T. *Evolution of consumer-managed Water Cooperatives in Finland, with Implications for Developing Countries*. Water International. Vol. 17, No. 1. p.15. 1992.

4. Situation Analysis

4.1 Case Study Location

The target site for this case study was Fancy Gap, located in Carroll County, Virginia. This small community has a population of approximately 260 people and is located adjacent to the Blue Ridge Parkway and Interstate 77. There are a total of 156 households in Fancy Gap, Virginia[65]. Many of the SPWS are located along sections of the Blue Ridge Parkway. Figure 4.1 highlights Carroll County, where the case study is focused.

Figure 4.1. Carroll County, Virginia



*Source: University of Virginia Geographic Information Center

The twelve SPWS selected for the case study were chosen based on several variables: water system size (number of connections), geographic location, number of drinking water violations, and type of system (similar number and type of customer). Three of the water systems are not

[65] Anonymous. *Profile of General Demographic Characteristics: 2000*. Fancy Gap, Virginia. Census 2000. American Fact Finder Quick Tables.
http://factfi…/_lang=en_vt_name=DEC_2000_SF1_U_DP1_geo_id=16000US5127296.htm

considered SPWS by the Virginia Department of Health because they have fewer than fifteen connections. However, these water systems are geographically close to the other water systems; have similar customer demographics; have similar technical, financial, and managerial concerns; and have the potential to increase their number of connections to more than twenty-five in the foreseeable future. Therefore, they were included in this case study analysis.

4.2 System Profiles

Of the twelve small water systems in the study area, six (A-1, A-2, A-3, A-4, A-5, A-6) are under the jurisdiction of the Office of Water Programs in Abington, Virginia, are classified as SPWS, and there is extensive data available on each. To retain confidentially, all SPWS who participated in this case study will be referred to by a two-digit code. Three systems (B-1, B-2, B-3) are under the jurisdiction of the county health department, but there is limited data available. The last three systems fall into the category of very small water systems, (C-1, C-2, C-3). These systems are too small to be considered SPWS and are, thus, not regulated by the Virginia Department of Health. Since these systems are not subject to government reporting requirements or regulations, no system data are collected.

System A-1 consists of a drilled well, a 100,000-gallon steel storage tank, and a distribution system. The source of the water system is ground water. The system currently has thirteen connections and serves anywhere from sixty to 125 people. The number of people on the system varies due to the seasonality of the golf course and turnover of people staying at the hotel-style facilities. It has a design capacity of pumping 12,000 gallons per day, but has an average daily usage of approximately 3,772 gallons per day. This results in an average of 314 gallons per day pumped per connection on the system[66]. This SPWS has had three safe drinking water violations since 1990. In June and July of 1995, the water system had a maximum contaminant level (MCL) and monthly Total Coliform Rule (TCR) violation. These violations can mean one of

[66] Crooks, Anthony C., Karen J. Spatz, and Marc Warman. *Shared-Services Cooperatives*. United States Department of Agricultural Rural Development: Rural Business Cooperative Service. Washington, D.C. RBS Research Report 141. May 1997.
Ely, Gerald and Galen Rapp. *How to Start A Cooperative*. Cooperative Information Report 7. United States Department of Agricultural Rural Development: Rural Business Cooperative Service. Washington, D.C. September 1996. <http://www.rurdev.usda.gov/rbs/pub/cir7/cir7rpt.htm>

two things: more than five percent of the time, this system tested positive for Coliform when testing more than forty samples, or this system had more than one sample testing positive for Coliform when testing fewer than forty samples. These testing standards are set by the EPA. The EPA, in both cases, requests a public notification as a follow-up action. In August 1996, the system had a monitoring and reporting violation. The violation was the result of a failure to collect an appropriate number of samples for the period under the TCR[67].

System A-2 consists of three drilled wells, a 50,000-gallon atmospheric tank, 5,000-gallon hydropneumatic tank, and 1,000-gallon flood tank. Corrosion is controlled by an orthophosphate passivation, and the system has chlorination facilities. The source of the water system is ground water. The system currently has 134 connections and serves anywhere from seventy permanent residents to 180 transient people. The number of people on the system varies due to the seasonality of the business, but the number of residents in the A-2 community does not fluctuate as much. It has an existing flow capacity of pumping 100,000 gallons per day with an average daily usage of 3,772 gallons per day. This results in an average of 109 gallons per day pumped per connection on the system[68]. This SPWS has had ten safe drinking water violations since 1990. The system had eight monitoring TCR violations from 1992 to 1999. In April of 1999, the system had a violation of the lead and copper rule; and in February of 2000, the system had a consumer confidence report reporting violation[69].

System A-3 consists of five drilled wells, five twenty gallon bladder-type surge tanks, four (75,000; 60,000; 50,000; 40,000 gallon) atmospheric tanks, two booster pumps and stations, two 120 gallon bladder-type tanks, one forty gallon bladder-type tank, and a "jet type" booster pump.

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[67] Anonymous. *Safe Drinking Water Violation Reports*. United States Environmental Protection Agency, Office of Ground Water and Drinking Water. July 2001. <http://navigation.helper.realnames.com/framer/1/112/default.asp?realname=EPA&url=http%3A%2F%2Fwww%2Eepa%2Egov%2F&frameid=1&providerid=112&uid=30006037>

[68] Crooks, Anthony C., Karen J. Spatz, and Marc Warman. *Shared-Services Cooperatives*. United States Department of Agricultural Rural Development: Rural Business Cooperative Service. Washington, D.C. RBS Research Report 141. May 1997.
Ely, Gerald and Galen Rapp. *How to Start A Cooperative*. Cooperative Information Report 7. United States Department of Agricultural Rural Development: Rural Business Cooperative Service. Washington, D.C. September 1996. <http://www.rurdev.usda.gov/rbs/pub/cir7/cir7rpt.htm>

[69] Anonymous. *Safe Drinking Water Violation Reports*. United States Environmental Protection Agency, Office of Ground Water and Drinking Water. July 2001. <http://navigation.helper.realnames.com/framer/1/112/default.asp?realname=EPA&url=http%3A%2F%2Fwww%2Eepa%2Egov%2F&frameid=1&providerid=112&uid=30006037>

The source of the water system is ground water. The system currently has eighty connections and serves a population of 125 people. It has an existing design capacity of pumping 92,800 gallons per day with an average daily usage of 11,941 gallons per day. This results in an average of 149 gallons per day pumped per connection on the system[70]. This SPWS has had fifteen safe drinking water violations since 1990. The system had fourteen monitoring TCR violations from 1992 to 2001. In 1994, the system had a violation of the lead and copper rule[71].

System A-4 consists of three drilled wells, two 10,000-gallon hydropneumatic tanks, one 6,000-gallon hydropneumatic tank, one booster pump, and two separate soda ash treatment systems for corrosion control. The system currently has 104 connections and serves a population of approximately 150 people. It has an existing design capacity of 112 connections, pumping 10,528 gallons per day. This results in an average of 149 gallons per day pumped per connection on the system[72]. This SPWS has had sixteen safe drinking water violations since 1990. The system had twelve monitoring TCR violations and three violations of the lead and copper rule since 1991. In 2000, the system had a consumer confidence report reporting violation[73].

System A-5 consists of one drilled well, two 120-gallon hydropneumatic tanks, and one 10,000-gallon hydropneumatic tank. The source of the water system is ground water. The system currently has thirty-two connections and serves a population of ten to forty-five people. It has an

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[70] Crooks, Anthony C., Karen J. Spatz, and Marc Warman. *Shared-Services Cooperatives*. United States Department of Agricultural Rural Development: Rural Business Cooperative Service. Washington, D.C. RBS Research Report 141. May 1997.
Ely, Gerald and Galen Rapp. *How to Start A Cooperative*. Cooperative Information Report 7. United States Department of Agricultural Rural Development: Rural Business Cooperative Service. Washington, D.C. September 1996. <http://www.rurdev.usda.gov/rbs/pub/cir7/cir7rpt.htm>

[71] Anonymous. *Safe Drinking Water Violation Reports*. United States Environmental Protection Agency, Office of Ground Water and Drinking Water. July 2001.
<http://navigation.helper.realnames.com/framer/1/112/default.asp?realname=EPA&url=http%3A%2F%2Fwww%2Eepa%2Egov%2F&frameid=1&providerid=112&uid=30006037>

[72] Crooks, Anthony C., Karen J. Spatz, and Marc Warman. *Shared-Services Cooperatives*. United States Department of Agricultural Rural Development: Rural Business Cooperative Service. Washington, D.C. RBS Research Report 141. May 1997.
Ely, Gerald and Galen Rapp. *How to Start A Cooperative*. Cooperative Information Report 7. United States Department of Agricultural Rural Development: Rural Business Cooperative Service. Washington, D.C. September 1996. <http://www.rurdev.usda.gov/rbs/pub/cir7/cir7rpt.htm>

[73] Anonymous. *Safe Drinking Water Violation Reports*. United States Environmental Protection Agency, Office of Ground Water and Drinking Water. July 2001.
<http://navigation.helper.realnames.com/framer/1/112/default.asp?realname=EPA&url=http%3A%2F%2Fwww%2Eepa%2Egov%2F&frameid=1&providerid=112&uid=30006037>

existing design capacity of pumping 7,000 gallons per day with an average daily usage of 1,810 gallons per day. This results in an average of fifty-six gallons per day pumped per connection on the system[74]. This SPWS has had two safe drinking water violations since 1990. Both violations were monitoring TCR violations[75].

System A-6 consists of one drilled well, two hydropneumatic tanks, and a chlorination system. The source of the water system is ground water. The system currently has thirty-three connections and serves a population of seven to forty people. It has an existing design capacity of thirty-three connections, pumping 13,600 gallons per day, with an average daily usage of 2,012 gallons per day. This results in an average of sixty-one gallons per day pumped per connection on the system[76]. This SPWS has had eleven safe drinking water violations since 1990. The system had ten monitoring TCR violations and one violation of the lead and copper rule[77].

System B-1 consists of one drilled well and a 1,000-gallon steel storage tank. This system has ninety to 100 connections and serves a population of approximately fifty on a seasonal basis.

System B-2 consists of one drilled well and a small 100-gallon storage tank. The current well is drilled to a depth of 465 feet and is approximately five years old. The system has a chlorinator

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[74] Crooks, Anthony C., Karen J. Spatz, and Marc Warman. *Shared-Services Cooperatives*. United States Department of Agricultural Rural Development: Rural Business Cooperative Service. Washington, D.C. RBS Research Report 141. May 1997.
Ely, Gerald and Galen Rapp. *How to Start A Cooperative*. Cooperative Information Report 7. United States Department of Agricultural Rural Development: Rural Business Cooperative Service. Washington, D.C. September 1996. <http://www.rurdev.usda.gov/rbs/pub/cir7/cir7rpt.htm>

[75] Anonymous. *Safe Drinking Water Violation Reports*. United States Environmental Protection Agency, Office of Ground Water and Drinking Water. July 2001.
<http://navigation.helper.realnames.com/framer/1/112/default.asp?realname=EPA&url=http%3A%2F%2Fwww%2Eepa%2Egov%2F&frameid=1&providerid=112&uid=30006037>

[76] Crooks, Anthony C., Karen J. Spatz, and Marc Warman. *Shared-Services Cooperatives*. United States Department of Agricultural Rural Development: Rural Business Cooperative Service. Washington, D.C. RBS Research Report 141. May 1997.
Ely, Gerald and Galen Rapp. *How to Start A Cooperative*. Cooperative Information Report 7. United States Department of Agricultural Rural Development: Rural Business Cooperative Service. Washington, D.C. September 1996. <http://www.rurdev.usda.gov/rbs/pub/cir7/cir7rpt.htm>

[77] Anonymous. *Safe Drinking Water Violation Reports*. United States Environmental Protection Agency, Office of Ground Water and Drinking Water. July 2001.
<http://navigation.helper.realnames.com/framer/1/112/default.asp?realname=EPA&url=http%3A%2F%2Fwww%2Eepa%2Egov%2F&frameid=1&providerid=112&uid=30006037>

and a charcoal filtering system. System B-2 serves two separate enterprises with a total of twenty-three connections and a population of approximately 175.

System B-3 consists of one drilled well, a 7,500-gallon bulk storage tank, four booster bumps, four pneumatic tanks, and some water lines. The well is drilled to a depth of ninety-five feet and has a design capacity of 15,800 gallons per day. The system has seventy-nine connections and can serve a population of 150 on a seasonal basis.

Systems C-1, C-2, and C-3 all use private wells. The well at system C-1, including a fifty-gallon storage tank, is three years old. Systems C-2 and C-3 both use a drilled well. System C-2 is five years old and relies on storage within the well itself. System C-3 was installed in 1993 and includes a 150-gallon storage tank on site.

4.3 Analytical Approach

The objective of this study is to consider the feasibility of gaining efficiencies in management and operation of SPWS by forming a cooperative entity. To analyze the feasibility of the cooperative concept for SPWS in Fancy Gap, Virginia, a four-part survey was developed. The goal of this survey was to determine the potential for forming a Small Water System Cooperative. The survey tool was designed to collect quantitative and qualitative data in four segments of a SPWS's operation: water system characteristics; management, operations, and maintenance; cooperative management; and financial management. A copy of the survey is attached in the appendix section 7.3.

The survey was administered to all twelve system operators in the form of a one-on-one, on-site personal interview. There are several advantages of using a one-on-one personal interview scenario. An interviewer can more effectively use open-ended, probing, and perhaps complex questions. In this study, sampling strategies was a minimal concern because the intended survey population was covered completely, response rate was one hundred percent, and ample background research was conducted on each site prior to the interview. The actual survey

instrument used structured questions, in which all respondents were asked the same questions in the same order. This standardization of the survey and interviews facilitated data analysis.[78]

The first section of the survey, water system characteristics, contained twenty-seven questions. These questions were designed to assess the physical characteristics of the water system, such as the number and type of connections, gallons of water pumped, age of the system, and other general information on the actual physical water system. Data from this section were also used to estimate current and potential future demand on the individual water systems.

The second section of the survey was comprised of twenty questions relating to the management, operations, and maintenance of the water system. Respondents were asked questions pertaining to the daily operations on the system. Questions in this section covered topics such as operator certification, preventative maintenance plans, leak and repair programs, and the ability to upgrade the system.

The third section of the survey was designed to assess the operator's knowledge of cooperatives. Operators were asked thirteen qualitative questions. The purpose of this section was to determine the needs of the SPWS and to identify ways that the SPWS could benefit from a cooperative structure.

The fourth section of the survey was designed to analyze the financial situation of each water system. However, many of the water system operators that were interviewed did not have any financial data on their system. While, all of the water systems had a budget, in all of the systems but one it was incorporated in overall maintenance budgets. Therefore, it was virtually impossible for most operators to answer the eleven questions in the financial section of the survey with any accuracy.

[78] Sudman, Seymour and Edward Blair. Marketing Research: A Problem Solving Approach. Irwin/McGraw-Hill Company, Inc. 1998. pp. 84, 165.

4.4 Statistical Analysis and Results

The data collected from the survey were coded, quantitative data were entered into an Excel spreadsheet, and qualitative responses were recorded in an Access database. Data was coded by a system presented by Sudman and Edward[79]. A list and explanation of the variables and their respective coding is documented following the survey tool in Appendix 7.4. Since there were only twelve data points, any further statistical analysis and inference has limited extension beyond the sample. Nevertheless, the data were analyzed using SAS (Statistical Analysis System).

4.4.1 Section One: Water System Characteristics

Section one of the survey revealed many similarities and differences among the twelve SPWS. All surveyed systems use groundwater as the primary source of water.

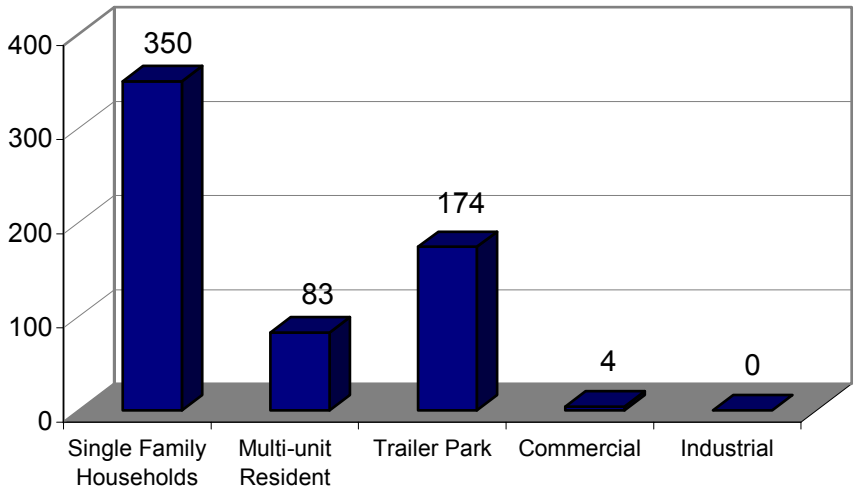
- The ages of the systems ranged from three years to thirty years, with a median age of sixteen years.
- The type of connections on the water systems in the study included single-family households, multi-unit residences, trailer parks/campgrounds, and commercial. Figure 4.3 shows the cumulative totals of each type of connection for all of the systems. As Figure 4.3 illustrates, the majority of the connections in the SPWS in this study were single-family households and trailer parks/campgrounds. There were no industrial connections.
- Fifty-eight percent of operators think that the overall demand (number of people) on their systems is stable, while forty-two percent think that the overall demand is growing.
- Seventy-five percent (nine operators) said that they will be able to meet an increased water demand with their current system over the next ten years.
- Of the three systems that thought they would not be able to meet the water demands, two systems have a written plan to increase their capacity.

[79] Sudman, Seymour and Edward Blair. Marketing Research: A Problem Solving Approach. Irwin/McGraw-Hill Company, Inc. 1998. pp. 84, 165.

- Fifty percent of the systems expect new single-family household connections in the next ten years.
- Only two systems expect new multi-unit residence connections.
- No other types of connections were expected for the next ten years.
- Of the nine SPWS that are monitored by the Virginia Department of Health (VDH) in Abington, Virginia, all have had drinking water violations within the past ten years.

These figures provide a small glimpse into the characteristics of the systems in the study, their current water demand, and the potential future change in demand that operators expect.

Figure 4.2. Total Number and Type of Connections



4.4.2 Section Two: Management, Operations, and Maintenance

This section focused on how the water systems are managed. The following points summarize some key results.

- The Safe Drinking Water Act requires that all SPWS have a certified operator. Only two of the nine systems have a certified operator, all of the systems have at least one uncertified operator, and some have up to five uncertified operators.
- With all of these uncertified operators, only fifty-eight percent receive regular outside technical assistance. However, all of the operators responded that they knew where to get technical assistance if needed.
- All of the systems have a policy for handling consumer complaints.
- In the event of using new technologies to increase efficiency or to meet new governmental requirements, nine operators said that their systems are designed to be easily upgraded.
- Of the three systems that had computers, two had Internet access.
- Of the nine SPWS that are required to keep records by the VDH, Table 4.1 lists the types of records kept and number of systems that actually keep each type of record. Note that the only type of record that all nine systems keep involves water quality testing. Due to time constrains and other reasons, not all operators keep the other important records.

Table 4.1. Number and Type of Records Kept by SPWS

Type of Record Kept	**Number of Systems That Keep the Record (out of 12 total systems)**
Water Quality Testing	9
Water Consumption Rates	5
Customer Complaints	3
Existing Equipment and Supplies	1
Chemicals Used in System	2

4.4.3 Section Three: Knowledge of Cooperatives

In section three of the survey, operators were asked to identify the barriers, advantages, and disadvantages to forming a cooperative. Table 4.2 summarizes their responses, with the most frequent responses listed first. Many of the system operators had valid concerns and reservations about the effectiveness of a cooperative. However, many of the advantages that operators want are exactly what a cooperative structure would provide. For example, the cooperative could pool resources to reduce administrative duties such as producing consumer confidence reports and other documents required by the VDH. Two of the twelve systems have volunteer operators. The average time an operator spent on the water system was approximately five hours per week; however, three operators reported that the time they spend was closer to eight to eleven hours per week. In general, all the operators expressed a desire to reduce the time spent on the water system, especially the two volunteers. Also, members of the cooperative could share one or more certified operators, another requirement of the Safe Drinking Water Act. Many operators mention their desire for the county to extend its public water system to their area. A cooperative of these local SPWS could focus an effort to get this service, even though it could eventually result in the diffusion of the cooperative.

Table 4.2. Summary of Operator-Reported Important Factors in Forming a SPWS Cooperative

Factor	Responses
Advantages of forming a Co-op	– Exchange of information (technical and political) – Increased, focused effort to get public water to the area – Help with administrative activities – Access to a certified operator – Local resource for problems or questions – Reducing administrative burden of one person – Getting help with routine testing – Access to more educational opportunities – Availability of another SPWS's water for emergencies
Disadvantages of forming a Co-op	– Improper management resulting in drinking water violations – Geographic limitations – Time limitations of individuals involved – Right-of-way issues – New regulations on chemicals – Economic and monetary feasibility – Liability (legal) issues
Barriers to forming a Co-op	– Conflicting personalities – Money issues (expenses) – Internal politics – Size of operation – Distance between SPWS – Resistance from homeowners – Time limitations of operators – Competition between businesses – Problem due to the sale of an operation – No government regulation of Co-op – Right-of-way issues – New regulations on chemicals – Liability (legal) issues

4.4.4 Statistical Analysis

To determine if there was any correlation among the variables, a statistical test for seventeen hypotheses was performed using SAS software. The following is a list of the original seventeen pairs of variables compared.

1. The number of drinking water violations (DWV) and the presence or absence of certified operators
2. The number of DWV and the size of the water system
3. The number of DWV and the age of the water system
4. The number of DWV and if the system has a list of federal, state, or other regulations/standards
5. The frequency of leaks in the system and the age of the water system
6. The number of connections on the system and the amount of time spent working on the system
7. The overall demand and the presence or absence of alternative water sources
8. The ability to meet the future (next ten years) demand on the system and the system's capability to be easily upgraded
9. The ability to meet the future (next ten years) demand on the system and the presence of a plan to increase capacity
10. The ability to meet the future (next ten years) demand on the system and the increase in future staff needs
11. The number of wells and the number of connections
12. The number of systems with uncertified operators and whether or not the SPWS provides annual training for operators
13. The number of systems with uncertified operators and the availability of regular outside technical assistance
14. The presence or absence of a preventative maintenance plan and the frequency of leaks in the system
15. The number of connections and whether or not the SPWS provide annual training for operators
16. The number of connections and what records are kept
17. The number of connections and whether or not the SPWS use a computer

A GENMOD (Generalized Linear Models Approach to Dependent Count Data) procedure was applied to several selected variables. The GENMOD procedure is unique because it fits a generalized linear model to the data by maximizing the likelihood estimation of the parameter

vector[80]. Frequency Distribution of Categorical Variables procedure (FREQ), Means procedure, Fisher's Exact Test, Correlation procedure (CORR), and a T-test procedure were also used. Of the seventeen preliminary statistical hypotheses comparing a dependent and independent variable, results of ten (Table 4.3) were chosen to be reported. This procedure found slight significance in only four, as illustrated in Table 4.3. It is important to note that there were only twelve data points available for these statistical analyses. More data points would likely generate more reliable comparisons and correlations. Many of the statistical programs performed did not generate correlations or significance, because they are designed to analyze larger data sets.

Table 4.3. Summary of Data Analysis in SAS

Hypothesis	Method of Analysis	Dependent Variable	Independent Variable	Degrees of Freedom	Significance (Yes/No)
1	GENMOD*	Number of DWV	Presence of certified operator	7	No
2	GENMOD	Number of DWV	Presence of uncertified operator	7	No
3	GENMOD	Number of DWV	Age of system	7	Yes
5	GENMOD	Frequency of leaks	Age of system	10	No
6	GENMOD	Time spent working on the system	Number of connections	8	Yes
7	FREQ**	Demand on system	Availability of alternative water source	n/a	No
8	FREQ	Meeting future demand	Easily upgradeable system	n/a	No
9	FREQ	Meeting future demand	Presence of plan to increase capacity	n/a	No
11	CORR***	Number of wells	Number of connections	n/a	Yes
14	GENMOD	Frequency of leaks	Presence of preventative maintenance plan	10	Yes

*GENMOD = Generalized Linear Models Approach to Dependent Count Data procedure
**FREQ = Frequency Distribution of Categorical Variables procedure
***CORR = Correlation procedure

[80] SAS release 8.2 Users manual. 2001 SAS Institute Inc., SAS Campus Drive, Cary, North Carolina 27513, USA.

The results of the GENMOD analysis have several implications for the management structure of any type of cooperative venture. Analysis revealed that, in general, as the age of the system (independent variable) increased, the number of drinking water violations (dependent variable) also increased. This logical statistic could be the result of a number of factors including degeneration of facilities and equipment of the water systems. Therefore, as these individual water systems age, operators should increase the frequency and depth of their inspections of facilities and equipment. After a number of years, operators should look into replacing some of the oldest infrastructure to avoid costly leaks. As a cooperative, these SPWS could buy repair material and supplies in bulk, buy and share expensive repair equipment, and apply for grant money for major infrastructure improvements and renovations.

Another result from this analysis was that the greater the number of connections on a system, the greater amount of time spent working on the system. This result was expected and suggests that larger systems may need more than one operator. In systems with more connections, there will inevitably be more potential for leaks and general maintenance problems. Especially in the systems where the operators were volunteers, it is critical not to over-burden one person. A cooperative of these SPWS could hire employees or certified operators, who could help reduce the workload on the systems.

Another way that management can potentially reduce the number of leaks in the system is to have a preventative maintenance plan in place. The GENMOD analysis found that these two variables were inversely correlated, in that systems with fewer leaks had a preventative maintenance plan; and those with more leaks did not. A preventative maintenance plan will help organize routine inspections of the systems' infrastructure and, with a system of checks and measures in place, will help detect small problems before they escalate and become major ones. Instead of just a few systems having this preventative maintenance plan, cooperative members could share information so that all SPWS in the cooperative implement a preventative maintenance plan. This would benefit all cooperative members by reducing the number of leaks in each individual SPWS.

From the analysis of all the data from the survey of the SPWS operators, several points stand out.

- Systems are committing drinking water violations
- As systems age, the number of drinking water violations increases
- Many systems do not have the required certified operator
- Operators want a means to exchange information
- Operators are spending more time on the water systems than they desire

Many of these problems and concerns could be corrected or even eliminated if the SPWS coordinated their efforts and formed a cooperative. A critical aspect of this study is to determine the specific type of cooperative that would maximize the benefits to all water systems involved.

4.5 Follow-up Focus Group Summary

A focus group meeting of the participants in the drinking water operator survey was conducted. Of the twelve operators surveyed, two were in attendance at the focus group meeting. Weather was a factor leading to a poor turn out for the meeting. The agenda of the meeting began with a light lunch, presentation of the survey results, a summary of the study, recommendations for the participants, and ended with a discussion session. At the meeting, the survey results were presented with a focus on tying the results to alternative cooperative structures that could meet the needs of the SPWS operators.

Several interesting points came up from the focus group meeting. The operators had many misconceptions about alternative cooperative structures, management, organization, and operation. Operators were familiar with the structure of electric cooperatives, in which all users of the service are members. A prototype structure for the SPWS cooperative was presented to the operators. Under this structure, the individual SPWS would be the only members of the cooperative. Operators agreed that restricting membership to individual SPWS would be a good structure for the cooperative. The fact that there were some misconceptions about cooperatives and how they can be structured is supported by the fact that survey results indicated only twenty-five percent of the SPWS operators surveyed said they knew of a cooperative in their community, where, in fact, one does exist. One of the operators in attendance brought up a potential challenge that had not previously been considered. The owner of the property (homes

and resort) for whom he works also owns the SPWS that serves the property. The owner's income is tied to the sale of water to customers. The operator said that this owner might be reluctant to join a non-profit cooperative if it decreases his income from the sale of water. However, a cooperative doesn't necessarily reduce income, its purpose is to reduce costs and to share information.

After discussing the alternative structures that could lead to a cooperative organization, all operators were interested in the benefits that could result from an informal network of businesses, a strategic alliance, or an association. At this initial focus group meeting, the operators exchanged information on several meter suppliers and companies that provide repair and maintenance services. One of the operators had received his certification since the initial survey interviews. The operators in attendance discussed the possibility of contracting his services for several SPWS who do not have a certified operator. Additionally, his knowledge of the certification process might be useful for other operators trying to get their certification.

Other advantages of forming an association were discussed, primarily the possibility of outside funding for projects. Currently, most of the SPWS find it difficult to get grant money because they are "resorts." Operators felt that they were unlikely to receive state or federal funding because "resorts" are perceived to be associated with a higher income bracket and capable of funding their own water supply systems. However, if several SPWS formed an association such as "Southwest Virginia Small Water System Association" the stigma of the individual SPWS name would no longer be a problem. Operators also felt that an association would have more influence on political leaders than individual SPWS. Also, consolidating the administrative activities involved with producing and mailing Consumer Confidence Reports was discussed as another possible advantage.

5. Recommendations

This research indicates that the SPWS in this study would benefit by forming a shared-service, non-profit cooperative organization. However, indications from the personal interviews with the water system operators suggest that the individuals involved are not immediately willing to legally organize as a cooperative. The shared-service cooperative concept is unfamiliar to most operators, which presents a problem. Only twenty-five percent of operators interviewed said they knew of a cooperative in their community. In actuality, there is a cooperative in a nearby town. This supports the idea that the majority of operators are not familiar with any type of cooperative, its organization, or its purpose. Thus, all parties considering potential involvement need to be educated on all aspects of the cooperative concept. To solve this problem, a two-phase plan is suggested. Phase one involves an initial alternative, which would first organize the SPWS into an informal network of businesses. This alternative would allow the systems to start discussing problems and potential solutions right away. This informal network is not incorporated like a formal cooperative, but it will give the members a chance to experience the benefits and challenges of a cooperative environment. During this phase, the potential members must be educated on the benefits that a cooperative structure would provide to their individual operations, how the cooperative would be managed and operated, and the expectations of each SPWS member. Cooperative Information Reports, published by the United States Department of Agriculture's Rural Development Service, can be used to help educate interested SPWS on cooperative organization, operation and management, and benefits (http://www.rurdev.usda.gov/rbs/pub/cooprpts.htm). An informal network of businesses is a stepping-stone to phase two, the legal formation of a shared-service, non-profit cooperative. Through this two-phase process of linking SPWS together in a cooperative organization, the benefits of economies of scale can be achieved, thereby increasing the technical/financial capacities and managerial efficiencies of the SPWS.

This case study was based on SPWS in Fancy Gap, Virginia. From this case study analysis, it can be assumed that SPWS across the state face similar problems and have similar concerns. This two-phase cooperative plan can be implemented in other localities across the state, which

exhibit similar system characteristics. It is understood that certain modifications will be necessary, but the general idea could apply to numerous cases in the state of Virginia. In addition to small water systems, the methods suggested in this study can also apply to all kinds of cooperative entities because the concerns, structure, progression, and economic reasoning is the same. The responses given by operators when asked the advantages, disadvantages, and barriers to forming a cooperative, indicated that the concerns would apply across many economic sectors (see Table 4.2). Raising awareness, through education and extension, on where cooperatives could be used and where efficiencies could be gained is an important aspect of this case study. Other groups such as farmers, artisans, recreational outfitters, residents in housing developments, and day care providers could benefit from sharing experiences and issues that could be addressed a cooperative or similar structure.

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7. Appendices

7.1 How to Start A Cooperative

The Rural Business and Cooperative Development Service has outlined ten steps in organizing a cooperative. Before this ten step process can begin, interested parties need to get together with other potential users of the cooperative to discuss topics such as a need that forming a cooperative might meet, advantages and disadvantages of cooperative business structure, any education on cooperatives that will be needed, cooperative operational practices, financial requirements, and general membership interest and commitment. Many of these topic areas may be unfamiliar to some, if not all, of the individuals involved. A very useful source for information on cooperatives is on the United States Department of Agricultural Rural Business and Cooperative Development website (http://www.rurdev.usda.gov/rbs/pub/cooprpts.htm). This site has Cooperative Information Reports that discuss many aspects of cooperatives. Outside advisors can also be utilized for technical advice and service on cooperative development, tax, legal, and financing issues. Several sources exist that can provide useful assistance including the Rural Business and Cooperative Development Service (at the state, regional, and national levels), state extension services, land-grant universities, state cooperative councils, and cooperative banks. Once this initial phase has been completed and there is significant interest, the group can proceed in the development process.

Step 1: Select a Steering Committee

This first step to starting a cooperative organization is to select a steering committee. The steering committee should be composed of four to eight (depending on the size of the project) interested individuals. This group will have no legal authority so the individuals should be selected on the basis of certain skills. They need to have good leadership, communication, and decision-making skills. The purpose of the steering committee is to gather information, voice the interests and concerns of the group to other people or factions, and make contacts with resource people and outside advisors. The steering committee will need to meet on a regular basis and report their findings and progress to the larger group. The group will need to vote on whether to continue, based on the findings of the steering committee.

Step 2: Conduct a Survey

The next step in the process is to conduct a survey of the potential cooperative members to determine feasibility of the cooperative concept. The steering committee should be in charge of this step, with guidance from outside advisors and resource people. Members should be asked questions relating to what services they need or would expect, their expected individual usage of the cooperative's services, their familiarity with cooperative businesses in general, and their willingness to join, finance, and use the cooperative. The group should hold a general meeting to discuss the results of the survey and whether they should proceed.

Step 3: Analyze the Market

The third step involves conducting an analysis of the market, including identifying sources of supplies, available services from competitors, any government regulations (local, state, federal,

international), and cost analysis. From this analysis, the committee should determine if the cooperative would yield a positive economic advantage. The group must then vote to proceed.

Step 4: Develop a Business Plan

Once the marketing analysis is complete and the group decides to proceed, a business plan needs to be developed. The business plan should focus on an in-depth financial analysis including on the amount of capital supplied by members or loans, descriptions and values of facilities and equipment, and financial projections (fixed costs, variable operating costs, sources of income, pro forma statements). The business plan should be evaluated at a general group meeting to determine if the proposed cooperative is financially feasible and sound. It is also a good idea to have an outside advisor or professional that is knowledgeable in finance to review the business plan.

Step 5: Reconfirm Commitment

At the same general meeting, all the potential members must vote to continue after hearing the business plan and financial analysis. If the vote is to continue, members should conduct a vote on whether the steering committee should remain intact or whether any changes need to be made.

Step 6: Develop Legal Documents

The sixth step is to draw up the appropriate legal documents. This step will most likely require the assistance of a legal professional. Examples of documents that will need to be drafted, such as articles of incorporation and bylaws, are located in the appendix section 7.4. After the documents have been drafted, in a meeting of all prospective charter members, they must be approved.

Step 7: Approve Documents and Elect a Board

Once the cooperative documents have all been approved, the group should elect a board of directors. The board of directors should be composed of members of the cooperative. The number and length of term for board members should be specified in the legal documents.

Step 8: Implement the Business Plan

After the board of directors is selected, the board should hold a meeting to elect officers and assign duties. A schedule should be developed that assigns committees and/or individuals tasks to implement the business plan. Also in this step of the process a membership drive could be conducted. Additionally, if capital needs to be acquired, a loan application package should be developed.

Step 9: Hire a Manager

The board of directors has the responsibility of hiring a manager to oversee the day-to-day operation of the cooperative. The manager will also be responsible for implementing any

policies that are set by the board. The selection process for a manager should be a very thought out and rigorous process in order to select a competent, hard working, and effective manager.

Step 10: Acquire Facilities and Begin Operation

Once the facilities are acquired and the manager has hired the necessary employees, the cooperative is ready for operation.

Source: Rural Business and Cooperative Development Service. *What Are Cooperatives?* *http://www.rurdev.usda.gov/rbs/pub/cooprpts.htm*

7.2 Sample Legal Document Outlines

The following sample documents came from a United States Department of Agricultural Rural Development Cooperative Information Report #7, "How to Start A Cooperative," and were designed with an agricultural cooperative example in mind. The documents for a small water system cooperative would be similar. Legal documents for any cooperative venture should be drafted by a lawyer and should reflect the goals and objectives of the members of the cooperative.

Pre-membership Agreement

1. Statement of purposes for which new cooperative is to be formed.
2. Description of steering organization committee and its powers.
3. Statement of what new cooperative's bylaws will provide when formed.
4. Notice that steering committee may call meeting of prospective members.
5. Duties of steering committee to keep records and make accounting to cooperative when formed.
6. Subscription agreement for membership certificate or stock.
7. Agreement to sign marketing agreement if cooperative is to have one.

Articles of Incorporation

of _____Association

We, the undersigned, all of whom are residents and citizens of the State of _____, engaged in the production of agricultural products, do hereby voluntarily associate ourselves for the purpose of forming a cooperative association, (with/without) capital stock, under the provisions of the _____ Cooperative Marketing Act of the State of _____.

Article I- Name

Article II- Purposes

Article III- Powers; Limitations
Section 1. Powers
Section 2. Limitations

Article IV- Place of Business

Article V- Period of Duration

Article Vl- Directors

Article Vll- Membership (for non-stock cooperative) or

Article Vll- Capital Stock (for stock cooperative)
Section 1. Authorized Amounts; Classes.
Section 2. Common Stock.
Section 3. Preferred Stock.

In testimony whereof, we have hereunto set our hands this_____day of_____, 20__.

State of _____ County of _____.

Before me, a notary public, within and for said county and State, on this ____day of ____, 20__, personally appeared ____, known to me to be one of the identical persons who executed the within and foregoing instrument, and acknowledged to me that he/she had executed the same as a free and voluntary act and deed for the uses and purposes therein set forth.

Witness my hand and official seal the day, and year, set forth.

Notary Public _____

In and for the County of _____ , State of_____.

My Commission expires _____

Bylaws

Section 2. Employment of Manager.
Section 3. Bonds and Insurance.
Section 4. Accounting System and Audit.

Article V - Duties of Officers and Manager
Section 1. Duties of President.
Section 2. Duties of Vice President.
Section 3. Duties of Secretary.
Section 4. Duties of Treasurer.
Section 5. Duties of Manager.

Article VI - Executive Committee and Other Committees
Section 1. Powers and Duties.
Section 2. Other Committees.

Article VII - Membership Certificates

If the association is organized with capital stock, the outline might read:

Article VII - Stock Certificates
Section 1. Common Stock.
Section 2. Other Committees.

Article VIII - Operation at Cost and Patrons' Capital
Section 1. Service at Cost.
Section 2. Refunds and Patrons' Capital.
Section 3. Revolving Capital.
Section 4. Transfer.
Section 5. Consent.
Section 6. Consent Notification to Members and Prospective Members.

Article IX - Dissolution and Property Interest of Members

Article X - Unclaimed Money

Article XI - Fiscal Year

Article XII - Miscellaneous Provisions
Section 1. Waiver of Notice.
Section 2. Bylaws Printed.
Section 3. Seal.

Article XIII - Amendments

We, the undersigned, being all of the incorporators and members of the_____ association, do hereby assent to the foregoing bylaws and do adopt the same as the bylaws of said association; and in witness whereof, we have hereunto subscribed our names, this _____day of _____20___ .

Source: Ely, Gerald and Galen Rapp. *How to Start A Cooperative*. Cooperative Information Report 7. United States Department of Agricultural Rural Development: Rural Business Cooperative Service. Washington, D.C. September 1996. <http://www.rurdev.usda.gov/rbs/pub/cir7/cir7rpt.htm>

7.3 Small Water Systems Operator Survey

The goal of this survey is to determine the potential for forming a Small Water Systems Cooperative. A cooperative is expected to reduce costs and keep the water system in compliance with VDH/EPA drinking water standards.

Water System Characteristics

1. What is the water source (stream or river, lake, groundwater, spring)?
2. What is the approximate age of the water system?
3. How many service connections are there in the water system (in each of the following categories)?
    a. Single family household
    b. Multi-unit residence (apartments, etc.)
    c. Commercial
    d. Industrial
4. If any in C or D above, are you familiar with the future (10 year) needs of your commercial and/or industrial customers?
5. On average, how many gallons per day (GPD) do you pump?
6. On a peak day, how many gallons per day (GPD) do you pump?
7. Would you say that the overall demand (# of people) on the water system:
    a. Growing
    b. Declining
    c. Is stable
8. Would you say that the overall demand (per person) on the water system:
    a. Growing
    b. Declining
    c. Is stable
9. What type and how many new service connections do you expect for the water system in the next 10 years?
    a. Single family household
    b. Multi-unit residence (apartments, etc.)
    c. Commercial
    d. Industrial
10. Can you meet future (10 year) water demand needs with your current system?
11. Do you have a written plan for increasing capacity?
12. Is the water supply source metered?
13. Are all water system customers metered?
14. At what frequency (on average) do leaks occur in the water system (up to the point where the water is metered into buildings)?
    a. Daily
    b. Couple times a week
    c. Couple times a month
    d. Couple times a year

15. What percent of your time do you spend working on this water system on average per week?
16. Are backflow protection devices used in the water system? If yes, describe.
17. How deep are mains and piping buried?
18. Within the last five years, have there been any problems in the system infrastructure with freezing or damage from heavy floods?
19. What materials are the mains made of?
20. What is the history of the infrastructure of this water system?
21. Is there written records of this history?
22. Is there an alternative water source if the current water source for this water system fails?
23. Is your water supply located within 100 feet to any of the following:
    a. Septic system drain field
    b. Pit privy or outhouse
    c. Cemetery
    d. Home heating oil storage tank (above or below ground)
    e. Stream, pond, or lake
    f. Compost/trash pile
24. Is your water supply is located within ½ mile to any of the following:
    a. Landfill
    b. Illegal dump
    c. Active quarry
    d. Abandoned quarry, industry, etc.
    e. Golf course
    f. Fruit orchard
    g. Farm animal operation
    h. Manufacturing/processing operation
    i. Commercial underground storage tank or supply lines (gasoline service station, heating oil supplier, etc)
25. Do you have a list of all federal, state, and other standards your system must meet?
26. Does the water system have a water tank? If yes, describe.
27. How often is it …
    a. Checked
    b. Cleaned
    c. Repaired (maintained)

Management, Operations, and Maintenance

1. How many certified operators are employed by the water system?
2. How many uncertified operators are employed by the water system?
3. Do all operators receive training at least annually to update their knowledge? If not, how often?
4. In projecting future demand, have you determined the future staff needs? If so, what increase in staff do you foresee in the next 10 years?

5. Do water system staff receive regular outside technical assistance? If yes, from what sources?
6. Do you know where you can get technical assistance if needed?
7. Do you have documented operation procedures and manuals for:
    a. System modifications
    b. New hook ups
    c. Meeting construction codes
    d. Backflow prevention
    e. Cross-connections
    f. Customer rights/responsibilities
    g. Monitoring requirements
8. Does the water system have a preventative maintenance program in place? If yes, describe?
9. Are all water system valves exercised periodically? If yes, how often?
10. Does the water system have a routine leak and repair program?
11. Are all meters routinely calibrated and tested? If yes, how often?
12. Are parts readily available to repair the water system? Where do the parts come from?
13. Does a qualified pump or well contractor inspect pumps and pump motors? If yes, how often (quarterly, annually, etc…)?
14. (If yes to #13) Do you have a regular system for inspecting pumps and pump motors in between inspections from qualified people as in question 13?
15. Does the water system have a workplace safety procedure in place? If yes, describe.
16. Does the water system have a policy for handling customer complaints? If yes, describe.
17. Is the water system designed to be easily upgraded in the event of new requirements or technologies? If yes, how?
18. Which of the following records are kept?
    a. Water quality testing
    b. Water consumption rates
    c. Customer complaints
    d. Existing equipment and supplies
    e. List of chemicals used by system
19. Is the water system information stored in a computer?
20. Does the water system have access to the Internet?

Cooperative Management

1. Are you aware of any examples of your community cooperating with other communities to accomplish something at a lower cost, to operate more efficiently, or to provide better services to citizens (such as fire or rescue squads, little league ball parks, counties buying supplies in bulk)?
    a. If so, what communities or counties were involved?
2. With respect to your operation, what types of administrative (accounting or budgeting) activities do you think could be accomplished cooperatively with one or more SWS?

3. What types of technical services do you think could be accomplished cooperatively with one or more SWS?
4. What types of supply or equipment purchases do you think could be accomplished cooperatively with one or more SWS?
5. What do you foresee as the possible barriers to forming a cooperative effort with other SWS in the county?
6. Would you expect resistance from anyone or any system (entity) in particular?
7. If formed, what would be the advantages of a cooperative effort?
8. What would be some of the disadvantages?
9. How would your customers view such cooperation?
10. (Limited liability)
11. Has the water system considered reducing costs by consolidating facilities/management with another water system?
12. If the water system had the option to consolidate physical facilities/resources with another system, would it be interested?
13. If it had the option to consolidate administration/management with other systems, would it be interested?

Financial Management

1. Does the water system have an annual budget?
    a. If yes, how often is budget performance tracked?
2. Does the budget include depreciation of the existing infrastructure and/or other water system facilities?
3. Are water rates regularly reviewed? If yes, how often?
4. Is a schedule in place for budget or capital improvements?
5. Does the water system have an operating cash or emergency reserve fund?
6. What is the average monthly residential water bill?
7. What is the average monthly residential water usage?
8. Who does the accounting for the water system (in-house or outsourced)?
9. Is it an accrual or cash based accounting system?
10. Is the water system (the infrastructure) paid off?
11. Annual Operating budget
    a. Revenues
        i. Water sales (user service charges)
        ii. Fees and service
        iii. Taxes/assessments
        iv. Interest earnings
        v. Other revenue
    b. Expenses
        i. Labor expenses
        ii. Administrative expenses
        iii. Operation & maintenance expenses (excluding labor costs)
        iv. Insurance expenses
        v. Building expenses (rent expenses of buildings or land)

vi. Taxes
vii. Debt payments (Principal or interest payments)
viii. Other

c. Capital sources
    i. Loan/bonds funds
    ii. Grants
    iii. Other

7.4 Survey Codebook: List of Variables

Every variable in the survey was given a separate code. This codebook consists of 102 variables covering all 61 questions in the survey. The following is a detailed explanation of the coding method used in this study.

Variable name = Each variable in the survey that is to be analyzed is given a specific variable name to differentiate that specific piece of data. The range is from V1 to V102 representing all 102 variable from the survey

Variable description = This is a description of the variable being represented. When comparing different variables, it is a way to reference the topic quickly and prevent any confusion.

Location on questionnaire = This code tells the user in which question the specific variable can be found. Often one question will have multiple variables. The number following the letters in this code refers to the number of the question in the specified section of the survey.

- **QW** – refers to a specific question in section one of the survey titled "Water System Characteristics
- **QM** – refers to a specific question in section two of the survey titled "Management, Operations, and Maintenance"
- **QC** – refers to a specific question in section three of the survey titled "Cooperative Management"
- **QF** – refers to a specific question in section four of the survey titled "Financial Management"

Data Fields = The raw data from this survey were entered into an Excel spreadsheet and an Access database. This code tells the user which column in the Excel spreadsheet the data for this variable is located or if it is located in the Access database.

Codes = Each variable represents a specific piece of data. In the Excel spreadsheet, data were entered numerically. This code explains how the survey responses were represented in the spreadsheet, for example representing continuous number like variable V1, yes or no response like variable V3, or a multiple choice question such as variable V52. Asterisks represent open ended questions that were recorded in the Access database

Variable name: V1
Variable description: Number of wells
Location on questionnaire: QW1
Data Fields: Column B
Codes: # = number of wells in system

Variable name: V2
Variable description: the approximate age of the system in years
Location on questionnaire: QW2
Data Fields: Column C
Codes: # = age in years

Variable name: V3
Variable description: are there any single family household service connections
Location on questionnaire: QW3
Data Fields: Column D
Codes: 1= yes
0= no

Variable name: V4
Variable description: are there any multi-unit resident service connections
Location on questionnaire: QW3
Data Fields: Column E
Codes: 1= yes
0= no

Variable name: V5
Variable description: are there any trailer park service connections
Location on questionnaire: QW3
Data Fields: Column F
Codes: 1= yes
0= no

Variable name: V6
Variable description: are there any commercial service connections
Location on questionnaire: QW3
Data Fields: Column G
Codes: 1= yes
0= no

Variable name: V7
Variable description: are there any industrial service connections
Location on questionnaire: QW3
Data Fields: Column H
Codes: 1= yes
0= no

Variable name: V8
Variable description: how many single family household service connections
Location on questionnaire: QW3
Data Fields: Column I
Codes: #= number of units
0= none

Variable name: V9
Variable description: how many multi-unit residence service connections
Location on questionnaire: QW3
Data Fields: Column J
Codes: #= number of units
0= none

Variable name: V10
Variable description: how many trailer park service connections
Location on questionnaire: QW3
Data Fields: Column K
Codes: #= number of units
0= none

Variable name: V11
Variable description: how many commercial service connections
Location on questionnaire: QW3
Data Fields: Column L
Codes: #= number of units
0= none

Variable name: V12
Variable description: how many industrial service connections
Location on questionnaire: QW3
Data Fields: Column M
Codes: #= number of units
0= none

Variable name: V13
Variable description: are you familiar with future needs of commercial/industrial customers
Location on questionnaire: QW4
Data Fields: Column N
Codes: 1= yes
0= no

Variable name: V14
Variable description: number of gallons per day pumped on average
Location on questionnaire: QW5
Data Fields: Column O
Codes: number of gallons

Variable name: V15
Variable description: number of gallons per day pumped on peak days
Location on questionnaire: QW6
Data Fields: Column P
Codes: number of gallons

Variable name: V16
Variable description: overall demand on the water system
Location on questionnaire: QW7
Data Fields: Column Q
Codes: 1= growing
2= declining
3= stable

Variable name: V17
Variable description: per person water demand
Location on questionnaire: QW8
Data Fields: Column R
Codes: 1= growing
2= declining
3= stable

Variable name: V18
Variable description: do you expect any future single family household service connections
Location on questionnaire: QW9
Data Fields: Column S
Codes: 1= yes
0= no

Variable name: V19
Variable description: do you expect any future multi-unit resident service connections
Location on questionnaire: QW9
Data Fields: Column T
Codes: 1= yes
0= no

Variable name: V20
Variable description: do you expect any future trailer park service connections
Location on questionnaire: QW9
Data Fields: Column U
Codes: 1= yes
0= no

Variable name: V21
Variable description: do you expect any future commercial service connections
Location on questionnaire: QW9
Data Fields: Column V
Codes: 1= yes
0= no

Variable name: V22
Variable description: do you expect any future industrial service connections
Location on questionnaire: QW9
Data Fields: Column W
Codes: 1= yes
0= no

Variable name: V23
Variable description: how many single family household service connections
Location on questionnaire: QW9
Data Fields: Column X
Codes: 0= none
#= number of connections

Variable name: V24
Variable description: how many multi-unit residence service connections
Location on questionnaire: QW9
Data Fields: Column Y
Codes: 0= none
#= number of connections

Variable name: V25
Variable description: how many trailer park service connections
Location on questionnaire: QW9
Data Fields: Column Z
Codes: 0= none
#= number of connections

Variable name: V26
Variable description: how many commercial service connections
Location on questionnaire: QW9
Data Fields: Column AA
Codes: 0= none
#= number of connections

Variable name: V27
Variable description: how many industrial service connections
Location on questionnaire: QW9
Data Fields: Column AB
Codes: 0= none
#= number of connections

Variable name: V28
Variable description: can current system meet demand in next 10 years
Location on questionnaire: QW10
Data Fields: Column AC
Codes: 1= yes
0= no

Variable name: V29
Variable description: do you have a written plan for increasing capacity
Location on questionnaire: QW11
Data Fields: Column AD
Codes: 1= yes
0= no

Variable name: V30
Variable description: is the water supply metered
Location on questionnaire: QW12
Data Fields: Column AE
Codes: 1= yes
2= some
0= no

Variable name: V31
Variable description: are water customers metered
Location on questionnaire: QW13
Data Fields: Column AF
Codes: 1= yes
0= no

Variable name: V32
Variable description: do leaks occur daily in the system
Location on questionnaire: QW14
Data Fields: Column AG
Codes: 1= yes
0=no

Variable name: V33
Variable description: do leaks occur couple times a week in the system
Location on questionnaire: QW14
Data Fields: Column AH
Codes: 1= yes
0=no

Variable name: V34
Variable description: do leaks occur couple times a month in the system
Location on questionnaire: QW14
Data Fields: Column AI
Codes: 1= yes
0=no

Variable name: V35
Variable description: do leaks occur couple times a year in the system
Location on questionnaire: QW14
Data Fields: Column AJ
Codes: 1= yes
0=no

Variable name: V36
Variable description: percent of time spend working on the water system in hours per week
Location on questionnaire: QW15
Data Fields: Column AK
Codes: # of hours

Variable name: V37
Variable description: are there backflow protection devices in the system
Location on questionnaire: QW16
Data Fields: Column AL
Codes: 1= yes
0= no or not sure

Variable name: V38
Variable description: how deep are the mains and piping buried (in inches)
Location on questionnaire: QW17
Data Fields: Column AM
Codes: #= of inches

Variable name: V39
Variable description: any problems with freezing or floods damage within last 5 years
Location on questionnaire: QW18
Data Fields: Column AN
Codes: 1= yes
0= no

Variable name: V40
Variable description: what are the pipes and mains made of
Location on questionnaire: QW19
Data Fields: Access database
Codes: *****

Variable name: V41
Variable description: history of the water system
Location on questionnaire: QW20
Data Fields: Access database
Codes: *****

Variable name: V42
Variable description: are there written records of this history
Location on questionnaire: QW21
Data Fields: Column AO
Codes: 1= yes
0= no

Variable name: V43
Variable description: alternative water sources other than current source (besides digging another well)
Location on questionnaire: QW22
Data Fields: Column AP
Codes: 1= yes
0= no

Variable name: V44
Variable description: is water system within 100 feet of these
Location on questionnaire: QW23
Data Fields: Access database
Codes: 1= septic system drain field
2= pit privy or outhouse
3= cemetery
4= home heating oil storage tank (above or below ground)
5= stream, pond, or lake
6= compost/trash pile
7= none

Variable name: V45
Variable description: is water source within ½ mile to any of these
Location on questionnaire: QW24
Data Fields: Access database
Codes: 1= landfill
2= illegal dump
3= active quarry
4= inactive quarry
5= abandoned quarry, industry, etc
6= golf course
7= fruit orchard
8= farm animal operation
9= manufacturing/processing operation
10= commercial underground storage tank or supply lines
11= none

Variable name: V46
Variable description: do you have a list of federal, state, and other standards on the system
Location on questionnaire: QW25
Data Fields: Column AQ
Codes: 1= yes
0= no

Variable name: V47
Variable description: does the system have a water tank
Location on questionnaire: QW26
Data Fields: Column AR
Codes: 1= yes
0= no

Variable name: V48
Variable description: how big is the tank in gallons
Location on questionnaire: QW27
Data Fields: Column AS
Codes: #= number of gallons
0= no tank

Variable name: V49
Variable description: how often is the water tank checked
Location on questionnaire: QW27
Data Fields: Column AT
Codes: #= number of times a year
0= not checked

Variable name: V50
Variable description: how often is the water tank cleaned
Location on questionnaire: QW27
Data Fields: Column AU
Codes: #= number of times a year
0= not cleaned

Variable name: V51
Variable description: how often is the water tank repaired (maintained)
Location on questionnaire: QW27
Data Fields: Column AV
Codes: #= number of times a year
0= none

Variable name: V52
Variable description: how many certified operators are employed
Location on questionnaire: QM1
Data Fields: Column AW
Codes: 1= one
2= two
3= three
0= none

Variable name: V53
Variable description: how many uncertified operators are employed
Location on questionnaire: QM2
Data Fields: Column AX
Codes: 1= one
2= two
3= three
4= four
5= five
0= none

Variable name: V54
Variable description: do all operators receive training at least annually
Location on questionnaire: QM3
Data Fields: Column AY
Codes: 1= yes
0= no

Variable name: V55
Variable description: need for an increase in staff in the next 10 years
Location on questionnaire: QM4
Data Fields: Column AZ
Codes: 1= one
2= two
3= three
0= none

Variable name: V56
Variable description: do you receive regular outside assistance
Location on questionnaire: QM5
Data Fields: Columns BA
Codes: 1= yes
0= no

Variable name: V57
Variable description: where or who do you receive assistance from
Location on questionnaire: QM5
Data Fields: Column BB
Codes: 1= Water Center Abington, VA
2= Environmental Management Services Wytheville, VA
3= Virginia Department of Health (Carroll County) Hillsville, VA
4= other
5= none

Variable name: V58
Variable description: do you know where to go to get technical assistance
Location on questionnaire: QM6
Data Fields: Column BC
Codes: 1= yes
0= no

Variable name: V59
Variable description: is there a preventative maintenance program
Location on questionnaire: QM8
Data Fields: Column BD
Codes: 1= yes
0= no

Variable name: V60
Variable description: are system valves exercised periodically
Location on questionnaire: QM9
Data Fields: Column BE
Codes: 1= yes
0= no

Variable name: V61
Variable description: how often are the valves exercised
Location on questionnaire: QM9
Data Fields: Column BF
Codes: 1= few times a week
2= few times a month
3= whenever needed
0= none

Variable name: V62
Variable description: is there a routine leak and repair program
Location on questionnaire: QM10
Data Fields: Column BG
Codes: 1= yes
0= no

Variable name: V63
Variable description: are all meters routinely calibrated and tested
Location on questionnaire: QM11
Data Fields: Column BH
Codes: 1= yes
0= no
2= no meters

Variable name: V64
Variable description: are parts readily available for repairs
Location on questionnaire: QM12
Data Fields: Column BI
Codes: 1= yes
0= no

Variable name: V65
Variable description: where do the parts come from
Location on questionnaire: QM12
Data Fields: Access database
Codes: *****

Variable name: V66
Variable description: does a qualified pump inspector have to inspect pumps
Location on questionnaire: QM13
Data Fields: Column BJ
Codes: 1= yes
0= no

Variable name: V67
Variable description: are there workplace safety procedures in place
Location on questionnaire: QM15
Data Fields: Column BK
Codes: 1= yes
0= no

Variable name: V68
Variable description: is there a policy for handling customer complaints
Location on questionnaire: QM16
Data Fields: Column BL
Codes: 1= yes
0= no

Variable name: V69
Variable description: describe the policy for customer complaints
Location on questionnaire: QM16
Data Fields: Access database
Codes: *****

Variable name: V70
Variable description: can the system be easily upgraded
Location on questionnaire: QM17
Data Fields: Column BM
Codes: 1= yes
0= no

Variable name: V71
Variable description: do you keep records on water quality testing
Location on questionnaire: QM18
Data Fields: Column BN
Codes: 1= yes
0= no

Variable name: V72
Variable description: do you keep records on water consumption rates
Location on questionnaire: QM18
Data Fields: Column BO
Codes: 1= yes
0= no

Variable name: V73
Variable description: do you keep records on customer complaints
Location on questionnaire: QM18
Data Fields: Column BP
Codes: 1= yes
0= no

Variable name: V74
Variable description: do you keep records on existing equipment and supplies
Location on questionnaire: QM18
Data Fields: Column BQ
Codes: 1= yes
0= no

Variable name: V75
Variable description: do you keep records on a list of chemicals used by the system
Location on questionnaire: QM18
Data Fields: Column BR
Codes: 1= yes
0= no

Variable name: V76
Variable description: is information on the water system stored on a computer
Location on questionnaire: QM19
Data Fields: Column BS
Codes: 1= yes
0= no

Variable name: V77
Variable description: does the water system have Internet access
Location on questionnaire: QM20
Data Fields: Column BT
Codes: 1= yes
0= no

Variable name: V78
Variable description: are there any cooperatives in your community
Location on questionnaire: QC1
Data Fields: Column BU
Codes: 1= yes
0= no

Variable name: V79
Variable description: what are the names of the cooperatives in you area
Location on questionnaire: QC1
Data Fields: Access database
Codes: *****

Variable name: V80
Variable description: what administrative activities could be accomplished via a cooperative
Location on questionnaire: QC2
Data Fields: Access database
Codes: *****

Variable name: V81
Variable description: what technical services could be accomplished via a cooperative
Location on questionnaire: QC3
Data Fields: Access database
Codes: *****

Variable name: V82
Variable description: what supplies or equipment could you buy in bulk with a cooperative
Location on questionnaire: QC4
Data Fields: Access database
Codes: *****

Variable name: V83
Variable description: what are some barriers to forming a cooperative
Location on questionnaire: QC5
Data Fields: Access database
Codes: *****

Variable name: V84
Variable description: what would be the advantages of a cooperative
Location on questionnaire: QC7
Data Fields: Access database
Codes: *****

Variable name: V85
Variable description: what would be the disadvantages of a cooperative
Location on questionnaire: QC8
Data Fields: Access database
Codes: *****

Variable name: V86
Variable description: how would your customers view a cooperative
Location on questionnaire: QC9
Data Fields: Access database
Codes: *****

Variable name: V87
Variable description: would there be a liability concern when forming a cooperative
Location on questionnaire: QC10
Data Fields: Column BV
Codes: 1= yes
0= no

Variable name: V88
Variable description: has the water system ever considered forming a cooperative before
Location on questionnaire: QC11
Data Fields: Column BW
Codes: 1= yes
0= no

Variable name: V89
Variable description: would the system be interested in forming a cooperative
Location on questionnaire: QC12 & QC13
Data Fields: Column BX
Codes: 1= yes
0= no
2= maybe

Variable name: V90
Variable description: does the water system have an annual budget
Location on questionnaire: QF1
Data Fields: Column BY
Codes: 1= yes
0= no

Variable name: V91
Variable description: does the budget include depreciation of the existing infrastructure
Location on questionnaire: QF2
Data Fields: Column BZ
Codes: 1= yes
0= no
2= not applicable

Variable name: V92
Variable description: are water rates regularly reviewed
Location on questionnaire: QF3
Data Fields: Column CA
Codes: 1= yes
0= no
2= not applicable

Variable name: V93
Variable description: is a schedule in place for budget or capital improvements
Location on questionnaire: QF4
Data Fields: Column CB
Codes: 1= yes
0= no
2= not applicable

Variable name: V94
Variable description: does the budget include operating costs or emergency funds
Location on questionnaire: QF5
Data Fields: Column CC
Codes: 1= yes
0= no
2= not applicable

Variable name: V95
Variable description: what is the average monthly water bill
Location on questionnaire: QF6
Data Fields: Column CD
Codes: #= dollars of water bill
0= not applicable

Variable name: V96
Variable description: what is the average monthly water usage
Location on questionnaire: QF7
Data Fields: Column CE
Codes: #= gallons of water used per month
0= not applicable

Variable name: V97
Variable description: who does the accounting for the water system
Location on questionnaire: QF8
Data Fields: Column CF
Codes: 1= in-house
2= outsourced
0= don't know

Variable name: V98
Variable description: what type of accounting system
Location on questionnaire: QF9
Data Fields: Column CG
Codes: 1= cash based
2= accrual based
0= don't know

Variable name: V99
Variable description: is the water system's infrastructure paid off
Location on questionnaire: QF10
Data Fields: Column CH
Codes: 1= yes
0= no

Variable name: V100
Variable description: annual operating budget
Location on questionnaire: QF11
Data Fields: (currently unavailable)
Codes: (currently unavailable)

Variable name: V101
Variable description: total number of connections
Location on questionnaire: (other source)
Data Fields: Column CJ
Codes: # = number of connections

Variable name: V102
Variable description: total number of drinking water violations since 1990
Location on questionnaire: (other source)
Data Fields: Column CK
Codes: # = number of violations