A SOCIOLOGICAL PERSPECTIVE OF WATER CONSUMERS IN SOUTH FLORIDA HOUSEHOLDS

Edited by

George A. Watkins

PUBLICATION NO. 18

FLORIDA WATER RESOURCES RESEARCH CENTER

RESEARCH PROJECT TECHNICAL COMPLETION REPORT

OWRR Project Number A-010-FLA

Annual Allotment Agreement Number
DI-14-01-0001-1077 (1968)

Report Submitted: September 4, 1968

The work upon which this report is based was supported in part by funds provided by the United States Department of the Interior, Office of Water Resources Research as Authorized under the Water Resources Research Act of 1964.

ACKNOWLEDGMENTS

The editor expresses his gratitude to Dr. Daniel Kubat, University of Waterloo, Ontario, and to Mrs. Lilian Tsai, Florida Atlantic University, Boca Raton, Florida, for their contributions to the original report from which this monograph was written. Dr. Kubat was the principal investigator for Project A-010-FLA "Prediction Model for Water Use by Population Structure" and provided invaluable guidance to his staff and researchers.

The Department of Sociology at the University of Florida is gratefully acknowledged for providing facilities during the project. Dr. Gerald R. Leslie and Dr. Joseph Vandiver, chairman of the department during the project, along with other faculty members, provided substantial assistance and encouragement to the researchers. Dr. Vandiver's additional assistance in the preparation of this final report is most sincerely appreciated by the editor.

Dr. Tom Huser, Publicity Director of the Central and Southern Florida Flood Control District in West Palm Beach and Dr. Olaf Pearson, City Manager of Homestead are also thanked for their cooperative attitude during the field work stages.

Finally, the editor wishes to express his sincere thanks to the Florida Water Resources Research Center in Gainesville, Florida and to the Department of Sociology at the University of Tulsa, Tulsa, Oklahoma, for encouragement and support during the editing of this report.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

Concern over water resources on a national level is a relatively recent phenomenon. There have been many local squabbles over water rights, there have been droughts in some areas while others suffered floods, and there has been considerable national concern over waterway rights for navigation. But only since the end of World War II has there evolved a nation-wide concern for water as such. Very recently in American life, rapidly intensifying concern over environmental resources has taken on the characteristics of a social movement. An indispensable part of the concern with environmental resources is the use and misuse of water resources.

One of the reasons for the increased concern of the federal government with the water crisis is the population increase in the United States since 1900. United States census figures projections show births, deaths, and in-migration indicating a population rise from 192 million in the early 1960's to 245 million by 1980, and perhaps 350 million by the year 2000 (Moss, 1967:4). Our whole society is using more water per person. This nation required only 40 billion gallons daily in 1900, but by the year 1965, it required 360 billion gallons a day. On a per capita basis this comes out to 526 gallons per person in 1900, and 1,893 gallons per person in 1965.

At the present time, industry uses the most water. Industry is currently using 160 billion gallons of water a day in its production processes, and twenty years from now will require close to 400 billion gallons a day. Irrigation now claims the second largest share of the nation's water supply.

United States agriculture uses about 141 billion gallons of water a day and it is estimated that this will increase by 1980 to about 166 billion gallons a day. Unlike the water used by industry, water used for irrigation can only be used once before most of it is lost in evaporation to begin nature's hydrological cycle again. Municipalities, the third largest users of water and the concern of this particular study, require more than 22 billion gallons a day at present, and by 1980 this need will increase to 37 billion gallons. This increase will come about not only because the population will be larger, but because of greater domestic uses. For example, it takes 3 gallons of water to wash dishes by hand, but twice this amount by machine; no water at all to put garbage in a can, but 2 gallons each day to flush refuse down a drain (Nikolaieff, 1967:16-17).

There are many programs offered at the local, state, and national level regarding water resources allocation which may simply be decided administratively and on the basis of some engineering efficiency estimate. At the same time, not all population groups are willing to accept innovations or simple administrative fiats for a number of reasons including, perhaps, a simple disaffection with community leadership. Therefore, it is quite important to assess the feelings of the population before changes in water supply and distribution practices are initiated. The need for change is always there as demonstrated by the rapidly expanding pace of population and industry. Sociologists may be able, through a detailed description of water consumer patterns and through the assessment of the attitudes of a particular population, to help bridge the gulf between the administrative solutions needed and the hesitation on the part of the water consumers to accept them.

Review of the Literature

Within the last ten years there has grown an accumulation of studies concerned with the sociological aspects of water resources. Prior to this time,

most studies of water resources were technical and administrative in nature. That is, they were concerned with engineering systems and problems connected with the allocation of and preservation of water resources. The recent trend in the social sciences to become concerned with water resources reflects their growing awareness of the problematic nature of water resources and an emphasis on an interdisciplinary approach to the solution of such problems.

Necessity of Sociological Inquiry in Water Resources Problems

There have been several articles written which concern themselves with the need for sociological inquiry, and its resulting contribution, into the problem of water resources.

Hufschmidt (1967), who noted that the interdisciplinary approach to research and education in water resources is a relatively recent phenomenon, cited the need for the social sciences to be concerned with water resources. Although some academic economists and political scientists had been working on water resources problems for a number of years, their efforts were highly individualistic, and most of them had made only sporadic contact with engineers and natural scientists. Hufschmidt felt that the situation has radically changed and that today social scientists can converse meaningfully with natural scientists about the concern and problems of water resources.

However, he further noted that today's water resources experts have had little or no formal training in water resources.

> They obtained their education in a specific discipline or professional field, perhaps civil or sanitary engineering, economics, law, public administration, geology, chemistry, biology, forestry, city and regional planning, geography, and the like. The interest in water resources probably developed some time after their academic and professional education; to a large extent, they were self-taught in the intricacies of the field. Perhaps because the limitations of this method of training for the water resources field are recognized, we are now concerned with improvements (Hufschmidt, 1967:4).

One of the recognized limitations of training with which Hufschmidt concerned himself was the "highly theoretical nature of sociology." Resources

for the Future (RFF), which has as its mission the application of social science knowledge to natural science problems, investigated the possible role that sociology might play in natural science research.

> A few leading sociologists . . . were consulted about the contribution that their field might make to water resources. Careful investigation revealed, both to the sociologists and to the RFF staff, that the kinds of research in which sociologists were interested were not easily adaptable to the kinds of natural resource problems that RFF was considering at the time (Hufschmidt, 1967:5).

This relatively early neglect of applied research by sociologists may have been part of the difficulty, but it is one which is gradually being overcome by such men as Wade H. Andrews of Utah State University.

Andrews has indicated that important contributions for the sociological study of water resources are being made by several areas of sociology.

> . . . perhaps most notable are rural sociology, as it has dealt with the structure and culture of rural people related to land resource, but also there are the fields of social change, urbanization, diffusion and adoption of technology, social psychology, social action and community development processes. In addition, . . . social theory, research methodology, industrial, communication, urban, regional and political sociology as well as population, can contribute to the problems of water resources development (Andrews, 1968:2).

Andrews cited, as did Hufschmidt, the need for an interdisciplinary approach to the water resources problem. For Andrews, this is not a mere overlapping of fields in a unidirectional approach, but rather an approach which demands the most that each field has to offer in a cooperative effort, i.e., a closure of the social aspects of geography and the applied field of urban and regional planning.

Regarding the industrial and urban uses of water, Andrews cited the need for sociology to investigate and direct its attention: (1) to the study of private industry in relation to the needs, use, and organization of industry for water, (2) to the way these factors affect other developments, including the effects on communities, (3) to the analysis of the decision-making process in both the public and private sectors, including both

noneconomic factors which affect those decisions and the effect such decisions may have on the whole developmental picture, and (4) to study present communities and regions and necessary future changes in them.

> Technical knowledge for improved use of the water resources and changing needs for water are constantly in contact with the behavioral systems man has devised of beliefs, organizations or customs to deal with this resource. To implement the adoption of useful information much more technical knowledge about man's behavior is needed (Andrews, 1968:12).

Sociology's Increasing Awareness Reflected by Studies Concerned with Socioeconomic Variables and Water Resources and Use

The numerous sociological studies of the relationship of certain socioeconomic variables to water resources and use, reflect, in part, the concern of Hufschmidt and Andrews regarding a sociological emphasis and investigation into water resources problems.

Two studies which reflect a comprehensive investigation into the relationship between socioeconomic variables and water resources and use are those of Linaweaver, Geyer, and Wolff (1964, 1967), and Spaulding (1967).

Linaweaver and his colleagues conducted a large scale study of water-use patterns which occur in residential areas. They further described the phenomenon of residential water use and analyzed and evaluated the major factors which influence the use of water in these areas. Linaweaver, *et al*. found that there is a considerable variation in water use in residential areas influenced by seasonal and hourly factors. Water demands vary over a wide range throughout the country from season to season and from area to area, and the nature of water-use patterns and the factors influencing them were determined by their analysis of residential water-use data.

For purposes of analysis, Linaweaver and his associates separated residential water use into domestic use and sprinkling use. Domestic use was defined as water used within the home for purposes including drinking,

cooking, bathing, washing, and carrying away of wastes. Sprinkling use was defined as water used for irrigation of lawns when the natural supply from precipitation failed to meet lawn requirements. Domestic and sprinkling uses were again subject to seasonal, daily, hourly and regional differences. An investigation by the researchers into the major influencing factors affecting these variations resulted in the following: (1) the principal factor influencing total annual water use in any residential area is the total number of homes, and (2) the income level of the consumer influences water use, i.e., the consumer in a higher-valued area is likely to have more water-using appliances and a larger lawn (Linaweaver, et al., 1967:28 et passim).

Spaulding (1967) conducted a study of a growing suburb in Rhode Island in an attempt to determine if quantities of water used in households were related to the social status of those households. Using selected socio-economic variables such as house value, lot size, household income, occupation of the household head, education of the household head, and equipment-status-use, he arrived at the following conclusions:

1. Among the households studied, quantities of water per household vary directly with social status; higher status households use more water than lower status households.

2. Among the indicators of status, house value and household income are more closely related to water used than are the education and occupation of the household head (Spaulding, 1967:24).

Thus, Spaulding did determine that water use is related to some socio-economic variables.

Attitudinal Studies of Water Use

The need for greatly expanded research effort should be emphasized in order to give insight into the social processes as they relate to water resources. There is the need both for research and for an organization of "social engineers" to augment civil engineers. The goal of the social

engineers, or sociologists and other social scientists, would be to eliminate some of the obstacles to the efficient operation of the programs suggested by the civil engineers. This is a goal which requires an investigation into the needs and interests of the affected populations as well as the planned programs of the engineers in regard to water resources. The efforts of several men have increased the awareness of the need for further study into the needs and interests of the populace at state and local levels.

Dasgupta (1968) conducted a study of watershed development and analyzed his data at three interrelated levels--organizational, individual, and community. It is the second, or individual level which is of present concern. At the individual level, according to Dasgupta, one is mainly interested in delineating the characteristics of the landowners which make them positively or negatively predisposed toward watershed development. Factors such as occupation, education, social participation, and level of living have been found to be related to adoption of farming practices and innovations by Rogers (1962). These findings may have some relevance in delineating factors related to attitudes toward watershed development at the individual level. For example, Photiades (1960) reported on the empirical relationship between attitudes toward watershed development programs and a number of socioeconomic factors, such as occupation, tenure status, size of farm, age and education.

Dasgupta developed a Guttman scale and selected seven socioeconomic variables in an attempt to examine their relationship to attitudes towards watershed development. His seven variables were organizational involvement, occupational status, education, level of living, age, tenure status, and number of acres operated. He found only the variables of organizational involvement, occupational status, education, and level of living to be significantly related to attitude. High organizational involvement, nonfarm occupation, high education, and high level of living were positively related to attitudes toward

watershed development (Dasgupta, 1968:7). He also found that knowledge of watershed development was highly related to attitudes. Individuals who were well informed and knowledgeable about watershed development programs were the same persons who were found to have more favorable attitudes toward the implementation of such a program in their community.

Spaulding, in his Rhode Island study, also attempted to measure attitudes of his respondents in the following areas: (1) water as a necessity, (2) water as abundant in nature, (3) water as an economic commodity, (4) concern with water supply problems and shortages, and (5) relationships among ability to buy water-using equipment, social status, and amount of water used (Spaulding, 1967:26).

Wilkinson (1966) conducted a survey of rural landowners in two watershed districts and attempted to measure the attitudes of the residents toward the watershed project and toward water conservation in general. He found differences and similarities in the attitudes of the residents of the communities as follows: (1) 55 percent of the respondents in Community A and 32 percent in Community B rated the watershed project as "good" or "excellent," (2) regarding water conservation in general, a greater proportion of the respondents in Community A felt that conservation was a real local problem, that the area's future economy would depend in large part on conservation of water resources, that the federal government should be involved in water conservation, that pollution of streams is a major national problem, that the state gives up power when the federal government finances watershed projects, that landowners alone should not be required to pay for flood protection, that most local landowners would lose from watershed programs, that supplying water for industry should be a major local concern, that widespread local acceptance of watershed programs would be likely, that spending money for watershed development is a good investment, and that everyone in the county

would benefit from the watershed project, and (3) 72 percent of the respondents in Community B and 38 percent in Community A agreed with the statement, "Landowners have little opportunity to express their opinion in planning watershed programs" (Wilkinson, 1966:14-15).

Wilkinson found that an examination of demographic and socioeconomic characteristics of the two groupings did not reveal a pattern of differences which would account for the differences in attitudes noted above.

For Wilkinson and Cole (1967), attitude

> is basically a field-theory concept having to do with the qualitative relationship between an individual's inner life and some object in his psychological environment, i.e., with some object of which he is aware. Two attitude objects appear to be of great significance in the study of water resources problems. One is the attitude of the individual toward water resources as such. The other is his attitude toward programs of water management (Wilkinson, Cole, 1967:9).

The second effort of this study is directed at Wilkinson and Cole's first attitudinal object--the attitude of the individual toward water resources as such. An attempt will be made to develop an attitudinal scale to measure the attitudes of a particular population of respondents toward water resources. Of concern are the attitudes of the respondents regarding: (1) water resources as an economic commodity, (2) their willingness to do something about the water resources problems, (3) their awareness of water resources problems, and (4) their knowledge of certain socioeconomic relationships and availability of water. Once the scale has been developed, the scale score of each respondent will be compared with certain socioeconomic variables.

However, the purpose of this study is first to determine what relationships there are between water consumption in residential areas as compared with certain socioeconomic variables of the population. It is believed that the quantities of water used in households are positively related to: (1) the socioeconomic status of the household, (2) the demographic composition of the

household, and (3) the number and kinds of household appliances present which use water.

In essence, the first part of this study is a replication of research already done by Spaulding, Linaweaver and others with the intent of verification. The second part of this study is exploratory in nature. It will be concerned with the development of a scale to measure attitudes towards water conservation as developed by Watkins (1968).

CHAPTER II

RESEARCH DESIGN

In July, 1967, the Department of Sociology at the University of Florida was awarded a grant from the Office of Water Resources Research at the University of Florida under the Water Resources Research Act of 1964, Public Law 88-379. The purpose of the grant was to determine the possibility of a prediction model for water use by different population structures.

In an effort to establish a prediction model for water use by population structures, data collected for this study were obtained from a sample survey of households in two urban places in South Florida--Homestead and the contiguous areas of northern West Palm Beach.[1] In order to minimize expense in sampling, the universe from which the sample was drawn was defined so as to contain a minimum of business establishments, large-scale apartment complexes and trailer parks. It was felt by the investigators that the latter complexes would not offer sufficient data for analysis since the flat rate for dwelling units eliminated information on the variation of water use by individual households.

---

[1]To conduct a survey on water consumption in individual households is quite similar to any other survey work. There are some specific traits of such a survey, however. In the first place, when the survey questionnaire contains items regarding attitudes towards water consumption, conservation, and waste, the respondents are not as ready to provide accurate and considered answers inasmuch as such questions still pertain to the realm of the "irrelavant." In the second place, there arise specific problems of identifying households with water meters, households with own wells, and households with both without violating the principle of probability sampling. In the third place, information about the actual water consumption and water-using appliances and plumbing fixtures itemization runs into the problem of incomplete answers.

Field work, consisting of four stages, was necessary for the collection of data. After a pretest of the interview schedule (Appendix A) in Gainesville, Florida in September, 1967, the first stage was started and completed in February, 1968 in the target areas. The second stage was started and completed in June, 1968.

Sampling Procedures

The first stage of the field-work consisted of sampling residential units in the two target areas--West Palm Beach and Homestead, Florida. The technique of area probability sampling was used (Monroe and Finkner, 1959). First of all, large areas which were presumed to have an equal number of dwellings were selected from aerial photographs. These selected areas were then mapped for sampling frames and segmented. Segments were then randomly selected to represent the sample. By using segments of approximately four adjacent units and then interviewing the whole segment, it was possible to keep interviewing costs at a minimum and to spot respondents who were possibly "unique" in their life style and water consumption patterns.

The target area covered forty-five traffic zones in Palm Beach County, Florida. A systematic sampling procedure was then used on these traffic zones in an attempt to simplify sampling procedures and to produce a manageable universe from which a two-stage area probability sample, without replacement, was drawn. The method of random selection, used to draw a starting point from the first three zones, consisted of simply "reaching in and drawing out (N=1) different items." From the zone selected, every third zone on the list was drawn. As a one-third probability of forty-five traffic zones, fifteen traffic zones were thus selected, from which the two-stage area probability sample was drawn.

The first stage of the area probability sample consisted of dividing

the fifteen zones into 116 smaller ones. These smaller areas were presumed to have equal numbers of dwellings in each, based upon the previous study of aerial photographs and upon on-the-spot inspections. Using a table of random digits, about one-fifth (N=22) of the smaller areas could be identified on the aerial photographs and thus were selected.

In the second stage of the area probability sample, the twenty-two selected areas were mapped and divided into 736 segments. Each segment contained approximately four adjacent dwelling units. Using random-sampling techniques, about 15 percent of these segments (N=111) were selected. Thus, for the target area of West Palm Beach, the sample consisted of 425 residential dwelling units.

The third stage of the field-work consisted of an area probability sample of Homestead, Florida. This was carried out in the same manner as the first stage in Palm Beach County yielding a sample of 137 residential dwelling units.

The fourth stage of the field-work represented a "purposive sample" (Selltiz, et al., 1965) in the sense that selected for inclusion in the sample were only those households for which there were completed interview schedules from the first field-work stage. The final number of such units was 313, of which 189 were accounted for after checking on vacant dwellings and those who had moved to new locations. No effort was made to trace the addresses as the interviews were anonymous and the investigators had only street addresses with which to work.

Data Collection Techniques

To facilitate interviewing and to limit the number of refusals, the occupants in the sampled households were notified by letter of the impending interview. The letter explained the purpose of the interview and asked for

the occupant's cooperation. This was done for both stages of interviewing.

In the first stage of data collection, an interview schedule (Appendix A) was designed to collect the necessary demographic information on the households. This interview schedule also provided information for the socioeconomic profile of the respondents in the households, their water consumption patterns and patterns of water use, and the number of water-using items in the households. In the second stage of data collection, the aforementioned was again collected with the addition of responses to a set of questions designed to elicit the respondents' attitudes toward water resources problems.

In the West Palm Beach area, of the 425 residential units selected, only 257 (about 55 percent) met the following requirements: (1) the household was occupied, (2) the household had an individual water meter, and (3) there was a completed interview schedule for the household.

As stated, of the 425 residential units selected for inclusion in the sample, only 257 met the requirements. However, there were 56 dwelling units for which only one criterion was missing. These units were selected for inclusion in the second data-collection stage (N=313). However, the final "N" was 189 for the target area in the second data-collection stage. Of the 313 residential dwelling units originally selected for inclusion in this second sample, 59 units were vacant, 47 householders were different residents, and 18 householders refused to be interviewed.[1] This concluded the data-collection stages.

Data Processing

Data-processing techniques involved the coding of some items from each of the interview schedules. After the schedules for the two data-collection stages were corrected, edited, and coded, the data were transferred to

---

[1]The refusal rate for the first data-collection stage was 13.4 percent (N=425) and for the second, 5.8 percent (N=313).

eighty-column IBM cards.

Data Analysis

Absolute frequencies and percentage distributions were computed for the necessary household information needed for this study. Used in testing relationships among the variables being examined were: (1) Chi Square (Mueller and Schuessler, 1961), (2) Factor Analysis (Fruchter, 1954), (3) Guttman Scalogram Analysis (Edwards, 1957), (4) the Kruskal-Wallis One-Way Analysis of Variance (Siegel, 1956), and (5) the Spearman Rank Order Correlation Coefficient (Siegel, 1956).

CHAPTER III

CHARACTERISTICS OF THE POPULATION

This chapter is devoted to the presentation of a profile of the characteristics of the respondents in the total sample. In attempting to construct a prediction model for water use by a given population structure, it is imperative that an accurate and descriptive profile of the sample be given. Data are presented for each subsample separately on the following demographic and socioeconomic variables: (1) size of households, (2) number of children, (3) average age of children, (4) education of head of household, (5) occupational classification of head of household, (6) income of head of household, and (7) age of husband. These data should prove very valuable in the subsequent chapters.

Size of Households

Regarding the size of the households, that is, the number of persons in each household, the Homestead sample had a greater proportion of single person households than did the West Palm Beach sample. Contrary to what one might anticipate, given current sociological data on family size and fertility differentials, the West Palm Beach sample seems to have proportionately more larger families. While 84.6 percent of the Homestead households have families of one to four, only 76.6 percent of the West Palm Beach sample fell into this same category (Table 1). On the other hand, 23.3 percent of the West Palm Beach sample had families of five or more while only 15.4 percent of the Homestead families fell into this same category.

TABLE 1

NUMBER AND PERCENTAGE DISTRIBUTION OF SIZE OF HOUSEHOLDS, HOMESTEAD AND WEST PALM BEACH, FLORIDA

Number of Persons in the Household	Homestead		West Palm Beach	
	Number	Percent	Number	Percent
1	12	8.6	20	7.8
2	46	33.6	78	30.4
3	32	23.4	53	20.6
4	26	19.0	46	17.9
5	17	12.5	34	13.2
6 or More	4	2.9	26	10.1
Total	137	100.0	257	100.0

Number of Children

Consistent with the data presented on the size of the households, the data on the number of children in the households seem contrary to other studies on the same data. West Palm Beach seemed to have a larger proportion of its families with a greater number of children. That is, while 86.2 percent of the Homestead sample had between no children and two children, only 76.6 percent of the West Palm Beach sample had the same number (Table 2). But, 23.4 percent of the West Palm Beach sample had three or more children while only 13.8 percent of the Homestead sample fell into this same category.[1]

[1]It should be noted that there is a large United States Air Force installation located in the Homestead area which may account for the apparent "discrepancies" on size of household and number of children data.

TABLE 2

NUMBER AND PERCENTAGE DISTRIBUTION OF CHILDREN IN HOUSEHOLDS, HOMESTEAD AND WEST PALM BEACH, FLORIDA

Number of Children in the Household	Homestead		West Palm Beach	
	Number	Percent	Number	Percent
0	65	47.4	110	42.8
1	29	21.3	51	19.8
2	24	17.5	36	14.0
3	13	9.5	36	14.0
4	5	3.6	11	4.3
5 or More	1	.7	13	5.1
Total	137	100.0	257	100.0

Average Age of Children

Regarding the average of the children in the households, West Palm Beach would seem to have slightly older children, that is, proportionately more West Palm Beach families have older children than do Homestead families. While 78.8 percent of the Homestead sample have children between the ages of 0 (the first year) and 9, only 76.7 percent of the West Palm Beach sample have children of the same ages. Of those families with children 10 to 19 years of age, West Palm Beach had 23.3 percent in this category and Homestead had 21.2 percent (Table 3).

TABLE 3

NUMBER AND PERCENTAGE DISTRIBUTION OF AVERAGE AGE OF CHILDREN IN HOUSEHOLDS, HOMESTEAD AND WEST PALM BEACH, FLORIDA

Average Age of Children in the Household	Homestead		West Palm Beach	
	Number	Percent	Number	Percent
0-4	95	69.3	156	60.7
5-9	13	9.5	41	16.0
10-14	21	15.4	37	14.4
15-19	8	5.8	23	8.9
Total	137	100.0	257	100.0

Education of Head of Household

From Table 4 one can determine that the West Palm Beach sample was slightly more educated than the Homestead sample.

TABLE 4

NUMBER AND PERCENTAGE DISTRIBUTION OF HEAD OF HOUSEHOLD'S EDUCATION, HOMESTEAD AND WEST PALM BEACH, FLORIDA

Head of Household's Education	Homestead		West Palm Beach	
	Number	Percent	Number	Percent
Less than High School	32	23.3	44	17.4
High School Complete	51	37.2	104	40.9
Less than Bachelor's Degree	38	27.8	50	19.7
Bachelor's Degree	9	6.6	32	12.6
Work beyond Bachelor's Degree	7	5.1	24	9.4
Total	137	100.0	254	100.0

Twenty-two percent of the West Palm Beach sample had completed at least a Bachelor's degree, while only about half this number, or 11.7 percent, of the Homestead sample had done so. This difference holds for any category. For example, 82.6 percent of the West Palm Beach sample and 76.7 percent of the Homestead sample had completed at least high school (Table 4).

Occupational Classification of Head of Household

Nationally, in 1965, 51.1 percent of the total United States population was classified as Blue Collar, 22.1 percent as White Collar, and 26.8 percent as Professional (Petersen, 1967:459). As revealed in Table 5, there are some small differences between the sample used in this study and the national population as regards occupational classification. For example, Homestead was very close to the national figure in the Blue Collar category, 50.7 and 51.1 percent respectively. West Palm Beach, on the other hand, had only 45.1 percent of its constituents in this occupational category. While 22.1 percent of the national population was classified as White Collar, only 18.8 percent of the Homestead sample and 18.6 percent of the West Palm Beach sample was so classified. And finally, where 26.8 percent of the national population was classified as Professional, 30.5 percent of the Homestead sample and 36.3 percent of the West Palm Beach sample was so classified. It would appear that in both samples used in this study, there is a significant over-representation in the Professional category and a slight under-representation in the Blue Collar category.

TABLE 5

NUMBER AND PERCENTAGE DISTRIBUTION OF OCCUPATIONAL CLASSIFICATION OF HEAD OF HOUSEHOLDS, HOMESTEAD AND WEST PALM BEACH, FLORIDA

Occupational Classification[a]	United States	Homestead		West Palm Beach	
	Percent[b]	Number	Percent	Number	Percent
Laborers and Service Workers	7.2	3	4.3	22	10.2
Operatives and Kindred Workers	31.5	10	14.5	14	6.5
Craftsmen, Foremen, and Kindred Workers	12.4	22	31.9	61	28.4
Sales Workers	6.5	10	14.5	18	8.4
Clerical and Kindred	15.6	3	4.3	22	10.2
Managers, Officials, and Proprietors	13.9	8	11.6	24	11.2
Professional, Technical, and Kindred Workers	12.9	13	18.9	54	25.1
Total	100.0	69	100.0	215	100.0

[a]Blue Collar includes laborers and service workers, operatives and kindred workers, and craftsmen, foremen and kindred workers. White Collar includes sales workers and clerical and kindred workers. Professional includes managers, officials and proprietors, professional, technical and kindred workers.

[b]Actual numbers not available so percentages only can be presented.

Income of Head of Household

It would appear from Table 6, that West Palm Beach has a higher average income per head of household than does the Homestead sample. Sixty-five percent of the West Palm Beach sample earned between $6,000 and $14,999 per year while only 42.8 percent of the Homestead sample earned this much. The mode for the Homestead sample would appear to have been between $4,500 and

$5,999, while for the West Palm Beach sample it was between $10,000 and $14,999. As has been earlier demonstrated (Dasgupta, 1968), and as will be shown later in this study, income tends to explain a good deal of the variation found in water consumption.

TABLE 6

NUMBER AND PERCENTAGE DISTRIBUTION OF HEAD OF HOUSEHOLD'S INCOME, HOMESTEAD AND WEST PALM BEACH, FLORIDA

Income of Head of Household	Homestead		West Palm Beach	
	Number	Percent	Number	Percent
$ -0- - $ 2,999	20	15.3	12	5.1
3,000 - 4,499	24	18.3	20	8.5
4,500 - 5,999	28	21.4	26	11.1
6,000 - 7,999	25	19.1	48	20.4
8,000 - 9,999	17	13.0	45	19.1
10,000 - 14,999	14	10.7	61	26.0
15,000 - 19,999	3	2.2	11	4.7
20,000 or more	0	0.0	12	5.1
Total	131	100.0	235	100.0

Age of Husband

Table 7 reveals that the West Palm Beach population is somewhat older than the Homestead population. When one divides the population into under forty and over forty years of age, the Homestead population had 55.4 percent of its husbands under forty and the West Palm Beach sample had only 43.2 percent of its husbands under forty. In the middle ages of 40 years to 59 years, the West Palm Beach sample was greater with 41 percent of its husbands in this

age category while Homestead had 27.7 percent. It is only in the age category of 60 years of age or older that Homestead exceeded West Palm Beach, 17.3 percent and 15.8 percent respectively. The modal age group in Homestead was the 20-29 years of age range (N=33.9%), while the modal age range in Palm Beach County was twenty years older (26% in the 40-49 years of age range). The analysis of the data on age enables one to see that the income differences and family size differences previously noted are largely explained by the differential age distribution in the two areas.

TABLE 7

NUMBER AND PERCENTAGE DISTRIBUTION OF AGES OF HUSBAND IN HOUSEHOLDS, HOMESTEAD AND WEST PALM BEACH, FLORIDA

Average Age of Husband	Homestead		West Palm Beach	
	Number	Percent	Number	Percent
20-29	41	33.9	48	21.2
30-39	26	21.5	50	22.0
40-49	15	12.8	59	26.0
50-59	18	14.9	34	15.0
60-69	11	9.1	25	11.0
70 or more	10	8.2	11	4.8
Total	121	100.0	227	100.0

Summary

In general, when one compares the West Palm Beach sample with the Homestead sample, the following appears: (1) West Palm Beach has proportionately more larger families, (2) West Palm Beach had a larger proportion of its families with a greater number of children, and (3) West Palm Beach had a

larger proportion of its families with older children. Additionally, the head of the household in West Palm Beach, when compared to the head of the household in Homestead, was: (1) more likely to have completed a high school education and a college education, (2) more likely to be a professional worker and less likely to be a blue collar worker, (3) more likely to earn more, and (4) was slightly older.

CHAPTER IV

WATER CONSUMPTION BY HOUSEHOLD CHARACTERISTICS

In this chapter an attempt will be made to focus on the relationship between the amount of water consumed in households and the demographic and socioeconomic characteristics of these households. Contingency tables will be presented which represent cross-tabulation of the consumption of water with information on family size, number of children, average age of children, education of the head of household, occupation of the head of household, income of the head of household, number of water appliances and fixtures, description of water-using appliances and fixtures, and determinants of water consumption.

For purposes of analysis, four categories of water consumption were established. The first group of households had a fairly low consumption of water, under 3,000 gallons per month, or about 100 gallons per day. The second group, which proved to be a modal for Homestead but not for West Palm Beach, had a maximum daily use of about 200 gallons per day. The third group had a maximum use of about 300 gallons per day per household, and the fourth group had a minimum daily consumption of over 300 gallons.

Water Consumption by Size of Household

In an effort to determine differential water consumption in the sampled households, analysis was first made on the size of households and water consumption. In Homestead, in a small household of four persons or less (85 percent fell into this category), 40 percent of the households used between

4,000 and 6,000 gallons a month. The remainder of the households is fairly evenly distributed over the other categories (Table 8). This pattern repeats itself for the families of five or more with the exception of the 1,000 to 3,000 gallons per month category, where only 14.3 percent used this little water. Thus, at least in the Homestead sample, the size of the household did not seem to contribute much to differential consumption since the percentages in Table 8 were fairly evenly distributed.

In West Palm Beach however, both the small and the large families were heavy users. The small households constituted about three-fourths of the West Palm Beach sample and the large households about one-fourth. Among the large households, two-thirds showed high water consumption as compared with one-third of the small households. With no large households using less than 4,000 gallons per month in the West Palm Beach area, one could speculate that there is a positive relationship between the number of persons in the household and differential water consumption in West Palm Beach.

Water Consumption by Number of Children

To get at the relationship between number of persons in the household and differential water consumption further, the number of children in the household was tabulated with water consumption. The number of children was dichotomized into two or fewer and three or more children in the household. With no major changes, Table 9 revealed the pattern described above with size of household. It would seem reasonable, then, to state that the number of children and, consequently, the size of the household does influence water consumption, at least for the West Palm Beach area.

TABLE 8

NUMBER AND PERCENTAGE DISTRIBUTION OF SIZE OF HOUSEHOLD AND WATER CONSUMPTION, HOMESTEAD AND WEST PALM BEACH, FLORIDA

Size of Household	Monthly Water Consumption in Thousands of Gallons									
	1 - 3		4 - 6		7 - 9		10 or More		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Homestead (a)										
1 - 4	26	22.4	45	38.8	23	19.8	22	19.0	116	100.0 (84.7)
5 or more	3	14.3	9	42.9	4	19.0	5	23.8	21	100.0 (15.3)
								Total	137	(100.0)
West Palm Beach (b)										
1 - 4	33	16.7	56	28.4	44	22.4	64	32.5	197	100.0 (76.6)
5 or more	0	0.0	11	18.3	13	21.7	36	60.0	60	100.0 (23.4)
								Total	257	(100.0)

(a) Chi square equals 0.843--p. $<$.90
(b) Chi square equals 20.787--p. $<$.001

TABLE 9

NUMBER AND PERCENTAGE DISTRIBUTION OF NUMBER OF CHILDREN IN HOUSEHOLD AND WATER CONSUMPTION, HOMESTEAD AND WEST PALM BEACH, FLORIDA

Number of Children in Household	Monthly Water Consumption in Thousands of Gallons									
	1 - 3		4 - 6		7 - 9		10 or More		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Homestead (a)										
2 or less	26	22.0	46	39.0	23	19.5	23	19.5	118	100.0 (86.3)
3 or more	3	15.9	8	42.1	4	21.0	4	21.0	19	100.0 (13.7)
								Total	137	(100.0)
West Palm Beach (b)										
2 or less	33	16.8	56	28.4	43	21.8	65	33.0	197	100.0 (76.6)
3 or more	0	0.0	11	18.3	14	23.3	35	58.4	60	100.0 (23.4)
								Total	257	(100.0)

(a) Chi square equals 0.380--p. $<$ 0.95
(b) Chi square equals 19.466--p. $<$ .001

Water Consumption by Average Age of Children

Does age composition affect water consumption in the household? It may be that having younger children necessitates more water than having teenagers in the household. To determine this, the data were dichotomized into families with children nine years and younger and children ten years and older, the latter representing the threshold of the teens. Table 10 reveals that the data for the Homestead area are inconclusive; about the same proportion of families with young children consumed as much water as those families with older children. In the West Palm Beach area, however, there does appear to be some relationship, only in the opposite direction. That is, proportionately more families with older children use more water than those with younger children.

The data would tend to support the notion that the number of people in the household affects water consumption directly. However, it was earlier stated that the major factor in water consumption is the socioeconomic status of the family and not family size. To test for this relationship, data on education, occupation, and income of the head of the household was cross-tabulated with water consumption.

Water Consumption by Education of Head of Household

The variable of education of the head of household was trichotomized, using graduation from high school and from college as the cutting points (Table 11). In comparing the two areas it can be determined that only about 11 percent of the Homestead sample had a college education as compared with 21 percent of the West Palm Beach sample. Among the big water consumers, the more educated were slightly over-represented in both samples, with the pattern being more pronounced in the West Palm Beach area. Since only about one-fifth

TABLE 10

NUMBER AND PERCENTAGE DISTRIBUTION OF AVERAGE AGE OF CHILDREN IN HOUSEHOLD AND WATER CONSUMPTION, HOMESTEAD AND WEST PALM BEACH, FLORIDA

Average Age of Children	Monthly Water Consumption in Thousands of Gallons									
	1 - 3		4 - 6		7 - 9		10 or More		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Homestead (a)										
9 or less	26	24.1	42	38.9	19	17.6	21	19.4	108	100.0 (78.8)
10 or more	3	10.3	12	41.4	8	27.6	6	20.7	29	100.0 (21.1)
								Total	137	(100.0)
West Palm Beach (b)										
9 or less	33	16.8	57	28.9	36	18.3	71	36.0	197	100.0 (76.6)
10 or more	0	0.0	10	16.7	21	35.0	29	48.3	60	100.0 (23.4)
								Total	257	(100.0)

(a) Chi square equals 3.20-p. $<$.50
(b) Chi square equals 20.11--p. $<$.001

TABLE 11

NUMBER AND PERCENTAGE DISTRIBUTION OF YEARS OF EDUCATION COMPLETED BY HEAD OF HOUSEHOLD, AND WATER CONSUMPTION, HOMESTEAD AND WEST PALM BEACH, FLORIDA

Years of Education Completed by Head of Household	Monthly Water Consumption in Thousands of Gallons									
	1 - 3		4 - 6		7 - 9		10 or More		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Homestead (a)										
11 or less	8	25.0	13	40.6	6	18.8	5	15.6	32	100.0 (23.4)
12 - 15	17	19.1	35	39.3	19	21.4	18	20.2	89	100.0 (64.9)
16 or more	4	19.1	6	37.5	2	12.5	4	25.0	16	100.0 (11.7)
								Total	137	(100.0)
West Palm Beach (b)										
11 or less	4	9.1	13	29.5	14	31.0	13	19.6	44	100.0 (17.4)
12 - 15	26	16.9	41	26.6	30	19.5	57	37.0	154	100.0 (61.3)
16 or more	3	5.4	12	21.4	12	21.4	29	51.8	56	100.0 (21.3)
								Total	251	(100.0)

(a) Chi square equals 1.55--p. $<$.98
(b) Chi square equals 12.79--p. $<$.05

of the population had less than a high school education, education would seem not to be a discriminating variable, unless one considers the second category of twelve to fifteen years of education as the breaking point. One could, of course, assume that the older population had less education proportionately and lived in smaller households and thus consumed less water. The age distribution of the husband attests to this fact when the age is fifty or older. However, one should keep in mind that the variables discussed described as head of household need not describe the husband of the household. In some cases where the families were not complete, the head of the household was not the husband, so that education, income, and occupation portray a central tendency.

Water Consumption by Occupation of Head of Household

The second indicator of socioeconomic status is occupation. Using seven occupational categories, the two samples were dichotomized into two occupational categories: manual and nonmanual (Table 12). It appeared from the data that nonmanual occupations are more clearly associated with high water consumption than are manual occupations. This pattern holds somewhat more strongly for the West Palm Beach area than for the Homestead area.

Water Consumption by Income of Head of Household

Income was the third indicator of socioeconomic status. Using income of the head of the household, an even stronger relationship was revealed between the consumption of water and income than was revealed with occupation (Table 13). Again, Homestead had only one-sixth of the low income households among high water consumers as opposed to two-fifths of the high income

TABLE 12

NUMBER AND PERCENTAGE DISTRIBUTION OF OCCUPATION OF HOUSEHOLD HEAD AND WATER CONSUMPTION, HOMESTEAD AND WEST PALM BEACH, FLORIDA

Occupation of Head of Household	Monthly Water Consumption in Thousands of Gallons									
	1 - 3		4 - 6		7 - 9		10 or More		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Homestead (a)										
Manual (b)	6	17.1	15	42.9	10	28.6	4	11.4	35	100.0 (50.7)
Nonmanual (c)	5	14.7	14	41.2	6	17.6	9	26.5	34	100.0 (49.3)
								Total	69	(100.0)
West Palm Beach (d)										
Manual (b)	14	14.4	25	25.8	27	27.8	31	32.0	97	100.0 (45.1)
Nonmanual (c)	12	10.2	27	22.9	23	19.5	56	47.4	118	100.0 (54.9)
								Total	215	(100.0)

(a) Chi square equals 3.00--p. $<$.50
(b) Manual includes laborers and service workers, operatives and kindred workers, craftsmen, foremen, and kindred workers.
(c) Nonmanual includes sales workers, clerical and kindred workers, managers, officials proprietors, professional, technical and kindred workers.
(d) Chi square equals 5.71--p. $<$.2.0

TABLE 13

NUMBER AND PERCENTAGE DISTRIBUTION OF INCOME OF HOUSEHOLD HEAD AND WATER CONSUMPTION, HOMESTEAD AND WEST PALM BEACH, FLORIDA

Income of Household Head	Monthly Water Consumption in Thousands of Gallons									
	1 - 3		4 - 6		7 - 9		10 or More		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Homestead (a)										
$0 - $4,999	16	36.4	14	31.8	7	15.9	7	15.9	44	100.0 (33.6)
$5,000 - $9,999	8	11.7	33	47.1	17	24.3	12	17.2	70	100.0 (53.5)
$10,000 or more	3	17.6	5	29.1	2	11.8	7	41.2	17	100.0 (12.9)
								Total	131	(100.0)
West Palm Beach (b)										
$0 - $4,999	5	15.6	12	37.5	9	28.1	6	18.8	32	100.0 (13.6)
$5,000 - $9,999	16	13.5	35	29.4	30	25.2	38	31.9	119	100.0 (50.6)
$10,000 or more	8	8.5	13	15.5	15	17.9	45	57.1	84	100.0 (35.8)
								Total	235	(100.0)

(a) Chi square equals 16.451--p. $<$.02
(b) Chi square equals 20.289--p. $<$.001

households. Income also discriminated water consumption in West Palm Beach as about three times as many high income households and high water consumers appeared when compared to low income water consumers. Income, as shown in other studies (i.e., Spaulding, 1967), proved to be the most discriminating of the socioeconomic variables used in this study.

Water Consumption by Number of Water Appliances

There seems little doubt that socioeconomic status, especially as indicated by income, is important in discriminating how much water a household consumes. Since the consumption of water is more or less dependent on the facilities through which the use is possible, the relationship between the number of water-using appliances and water fixtures and the amount of water consumed was explored (Table 14). Dichotomizing the appliances into ten or less and eleven or more, it was revealed that three-fourths of the households in Homestead were "appliance-poor" when compared to West Palm Beach. It would seem additionally, that appliances and fixtures prove to be weak predictors of water consumption in Homestead but relatively good predictors in West Palm Beach.

The data have shown two things to this point. One, a fairly accurate profile of the two samples of households has been shown. Second, the circumstances surrounding high or low water consumption are being revealed.

It should be noted that Homestead charges very low rates for metered water. The rate is low enough to be considered a flat rate. From other studies evidence has appeared which indicates that a flat rate tends to encourage water consumption, not as much in actual household use, but rather in external use, like the watering of lawns. On the other hand, West Palm Beach has a graduated water rate which is much more expensive than Homestead

TABLE 14

NUMBER AND PERCENTAGE DISTRIBUTION OF WATER APPLIANCES AND FIXTURES AND WATER CONSUMPTION, HOMESTEAD AND WEST PALM BEACH, FLORIDA

Water Appliances and Fixtures	Monthly Water Consumption in Thousands of Gallons									
	1 - 3		4 - 6		7 - 9		10 or More		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Homestead (a)										
10 or less	26	25.5	40	39.2	17	16.7	19	18.6	102	100.0 (74.4)
11 or more	3	8.6	14	40.0	10	28.6	8	22.8	35	100.0 (25.5)
								Total	137	(100.0)
West Palm Beach (b)										
10 or less	24	26.1	34	37.0	21	22.8	13	14.1	92	100.0 (35.7)
11 or more	9	54.5	33	20.0	36	21.8	87	52.7	165	100.0 (64.3)
								Total	257	(100.0)

(a) Chi square equals 5.631--p. $<.20$
(b) Chi square equals 48.756--p. $<.001$

rates. Even so, Homesteaders seem to use about half as much water as households in the West Palm Beach area. This may be explained in that the West Palm Beach area has been shown to have better educated, higher occupationally rated, and "wealthier" residents. Since income has been demonstrated to be positively related to water consumption, the higher water consumption in West Palm Beach is not surprising. Income helps in purchases of appliances and installment of additional water fixtures, and so, the mechanisms of water consumption are greatly improved.

This circumstance may, perhaps, explain the lower water consumption in Homestead. Homestead households seem not to be as well equipped with water dependent appliances as does West Palm Beach, and thus even practically free water finds little utilization. Additionally, one might speculate that the suburbanism of West Palm Beach with its stress on green lawns is not as visible to the casual observer in Homestead. Thus, combined with the life styles of lower middle class and slightly less money, the Homestead area offsets a relatively free water supply by "under-utilizing" it. On the other hand, the more suburban nature of the sampled area in West Palm Beach, with its population geared more to the stereotypical image of the "American Dream," and the resulting increase in number of water-using appliances and fixtures, by necessity, is an area of heavier water consumption than Homestead.

In any event, inspecting the various relationships between the amount of water consumed by individual households and selected socioeconomic characteristics of those households, some relationships were established. The data, however, lend themselves to further analysis in an attempt to verify the previous explored relationships.

Determinants of Water Consumption: A Factor Analysis

A useful descriptive measure to identify salient components of any complex set of variables is factor analysis.[1] This technique was used in an attempt to confirm the relationship between the selected socioeconomic variables and water consumption. Twelve variables were selected to be factor analyzed: family size, number of children, age of children, husband's education, wife's education, husband's age, occupation of head of household, income of head of household, income of entire family, number of appliances, and the metered amount of water consumed in one month by each household.

Using this technique, Table 15 revealed that two factors appeared to account for eight of the twelve variables used. Factor I will hereafter be referred to as the "Economic Factor" because of the high factor loadings on the two income variables (income of head of household and income of entire family), the two appliance variables (number of appliances and appliances weighted score), and the water consumption variable. Factor II will hereafter be referred to as the "Family Factor" because of the high loading on family size, number of children, and age of children.

The important finding of the factor analysis is the clear separation between the Economic Factor and the Family Factor, especially when most of the variance in the income variables is accounted for, while the overlap between the income and the socioeconomic variables obtains, by necessity again, on the part of the demographic factor. In other words whereas one can explain water consumption by income and assume that members of the household are the consumers, the number of people in a given household does not have much to do with the amount of water consumed. This seemingly curious

---

[1]For a more complete description of the technique of Factor Analysis, see Fruchter, p. 196.

TABLE 15

ROTATED FACTOR MATRIX ON SELECTED SOCIOECONOMIC VARIABLES AND WATER CONSUMPTION

Selected Socioeconomic Variables	Factor Loadings		Communalities
	I Economic Factor	II Family Factor	
Size of family	.271	.655	.502
Monthly water consumption	.455	.016	.207
Age of husband	.064	- .359	.133
Education of husband	.156	- .211	.069
Education of wife	.094	- .247	.069
Number of children	.239	.671	.508
Age of children	.327	.497	.354
Occupation of head of household	- .361	.054	.133
Income of head of household	.624	.097	.399
Income of family	.608	.098	.380
Number of appliances	.696	- .014	.485
Appliances weighted score	.695	.006	.483

fact is easy to explain when one considers that high income households may be using water for purposes unrelated to the physical needs of the household members. Additionally, such households are more likely to entertain which may function as numerically enlarged households without ever showing in the demographic indicators.

An inspection of the zero order correlation matrix which served as the basis for the factor analysis program will help one further explain and explore the relationship between consumption and the socioeconomic variables. The incipient clustering which one observes in the two factors identified (Table 15) was already noticeable in the correlation matrix (Table 16). Although a number of the coefficients is significant at the .01 level,[1] significance which explains reasonable amount of the variance is not as frequent. For example, income of the head of the household explained 16 percent of the variance when related to the number of appliances, whereas water consumption correlated to the number of appliances explained 20 percent of the variance. These are the strongest relationships observed, if one disregards the naturally high correlations between variables like the size of the family and the number of children. Factored out, the number of appliances, which had the highest loading on the Economic Factor, represents close to 50 percent of the total variance and close to unity in explained variance. In other words, the more water dependent appliances and fixtures in a household, the more likely are these going to be used and consume water.

To this point, enough real differences between the two samples have been revealed to deserve even further analysis. The factor analysis dealt with the two areas combined, rather than separately as was done with the socioeconomic variables. The justification for doing so was that there should

---

[1]By convention in the social sciences, the .05 level of significance is used.

TABLE 16

CORRELATION MATRIX ON SELECTED SOCIOECONOMIC VARIABLES

	Selected Socioeconomic Variables	Selected Socioeconomic Variables											
		1	2	3	4	5	6	7	8	9	10	11	12
1	Size of Family	---	.16	-.25	-.08	-.08	.90	.56	-.04	.21	.21	.18	.21
2	Water Consumed			.07	.06	-.01	.13	.14	-.11	.24	.23	.45	.43
3	Age of Husband				-.01	.11	-.31	-.06	-.19	-.12	-.15	.13	.13
4	Education of Husband					.52	-.04	-.05	-.06	.11	.11	.06	.04
5	Education of Wife						-.08	-.08	-.02	.02	.02	.03	.03
6	Number of Children							.60	-.08	.17	.15	.15	.17
7	Age of Children								-.14	.24	.23	.24	.26
8	Occupation of Head of Household									-.28	-.24	-.26	-.24
9	Income of Head of Household										.93	.39	.40
10	Income of Family											.38	.38
11	Number of Appliances												.96
12	Weighted Score of Appliances												---

be some underlying factors which influence the various relationships between household water consumption and the socioeconomic variables considered, such factors should still be revealed. Whatever the shortcomings of the data may have been, the variables connected to the fluctuation in water consumption in the two samples are being more clearly explained.

Income as the Major Determinant of Water Consumption

In order to see what type of household environment acts as a restrictive or encouraging force on water consumption, another set of variables were cross-tabulated separately for Homestead and for West Palm Beach. The nine variables used were: size of family, number of children, age of children, age of husband, education of head of household, occupation of head of household, income of head of household, number of appliances, and the amount of water consumed in one month.

Table 17 revealed that for Homestead, the trinity of education, occupation and income showed some relationship with water consumption. It showed additionally that water consumption is significantly related to all of the other variables used. The possession of appliances is related to income ($r=.36$) and occupation of the head of the household ($r=.30$), but neither coefficient is very strong given the size of the sample.

Looking at the results for the West Palm Beach sample, a stronger relationship between income and the number of appliances ($r=.49$) and between appliances and water consumption ($r=.45$) was observed. The link between education, occupation, and income is stronger in West Palm Beach than in Homestead.

Table 18 revealed that the mean number of appliances and fixtures in the Homestead households ($\overline{X}=9.49$) is on the lower end of the scale. After the normal number of bathroom fixtures, kitchen sinks, and a few odd faucets,

TABLE 17

CORRELATION MATRIX ON SELECTED SOCIOECONOMIC VARIABLES AND WATER CONSUMPTION: HOMESTEAD AND WEST PALM BEACH

	Selected Socioeconomic Variables	Selected Socioeconomic Variables								
		Homestead								
	Selected Socioeconomic Variables	1	2	3	4	5	6	7	8	9
1	Size of Family	---	.14	-.27	-.07	-.01	.92	.61	.25	.15
2	Water Consumed			-.08	.11	.13	.10	.09	.16	.10
3	Age of Husband				-.29	.07	-.31	-.09	.00	.20
4	Education of Head of Household					.39	.00	-.04	.27	.02
5	Occupation of Head of Household						.05	.04	.44	.30
6	Number of Children							.66	.22	.11
7	Age of Children								.27	.17
8	Income of Head of Household									.36
9	Number of Appliances									---

	Selected Socioeconomic Variables	Selected Socioeconomic Variables								
		West Palm Beach								
	Selected Socioeconomic Variables	1	2	3	4	5	6	7	8	9
1	Size of Family	---	.16	-.32	.00	-.08	.95	.58	.06	.15
2	Water Consumed			.13	.17	.14	.11	.14	.35	.45
3	Age of Husband				-.26	-.06	-.34	-.07	-.06	.12
4	Education of Head of Household					.61	.00	.00	.45	.25
5	Occupation of Head of Household						-.09	-.03	.43	.25
6	Number of Children							.57	.01	.12
7	Age of Children								.13	.24
8	Income of Head of Household									.49
9	Number of Appliances									---

TABLE 18

ARITHMETIC AVERAGES ($\bar{X}$) AND STANDARD DEVIATIONS (S.D.) OF SELECTED SOCIOECONOMIC VARIABLES

Selected Socioeconomic Variables	Homestead[a]		West Palm Beach[a]	
	$\bar{X}$	S.D.	$\bar{X}$	S.D.
Size of Family	3.03	1.35	3.36	1.64
Water Consumed	6.83	5.26	11.30	10.46
Age of Husband	41.33	17.06	43.48	14.07
Education of Head of Household	12.18	2.69	12.93	2.66
Occupation of Head of Household[b]	4.10	1.86	4.35	2.03
Number of Children	1.04	1.27	1.35	1.64
Age of Children	3.90	5.30	4.90	5.78
Income of Head of Household[c]	3.37	1.64	4.62	1.73
Number of Appliances	9.49	2.13	12.14	3.61

[a]The number of subjects averaged for each variable differs according to available data.

[b]Rated from Low Manual (1) to Professional (7).

[c]Range from No Income (0) to $20,000 or more (8).

Homestead households did not seem to be equipped with much more. The average age of husbands in Homestead is 41 years, which would probably be modal for such a population since only residential one-family units were sampled. It is felt, however, that the suburban one-family residential dwellings are the main water consumers among the total population. This is due, probably, to the equipment of the households and the need for water connected with maintenance of homes on any side of the lot. The mean age for the whole population in the sample is about 31 years of age, the population in Homestead being somewhat younger than the population in West Palm Beach.

Summary

Evaluating the findings so far, there is increasing evidence of a definite relationship between household water consumption and the income standing of the household. The income standing, however, is tied more closely to the earning power of the head of the household than to the earning power of the family as a whole unit. To interpret this minor difference, it can be assumed that the social standing of the head of the household is related more directly to the earning of the head of the household than to the aggregate dollars a family can bring together. Probably, the additional income is not concentrated on the needs of the household as such.

The difference between the West Palm Beach and the Homestead households is striking, but explainable. To the casual observer, the areas sampled in West Palm Beach carry more of an image of rapid expanding suburbanization than the two sampled census tracts in Homestead. The "spirit" of the eastern coast of Florida, with all of its stress on appearance and on status competition, apparently imposes a style of life which becomes more demanding of water consumption. Water consumption in West Palm Beach does not appear to be deterred by pricing which, compared to Homestead, is noticeably more

expensive.

Another difference encountered between the residents of West Palm Beach and Homestead is that the modern urban, or rather suburban, features of the system are more pronounced in West Palm Beach than in Homestead. The modern urban features referred to are those revealed in the strong relationships between income, education, and occupation, a standard relationship featured in many sociological studies. If the relationships hold more for the West Palm Beach area than for Homestead, and it appears to do so, this may suggest that in terms of growth and in terms of expectation of a forward movement by the residents, West Palm Beach is more "typical" of the modern suburban areas than is Homestead. So, if the American residential household is a high water consumer, estimating the future needs of these households would require one to concentrate on projection of the types of households encountered in West Palm Beach rather than those in Homestead.

CHAPTER V

AN ATTITUDINAL PROFILE OF WATER CONSUMERS TOWARDS WATER CONSERVATION

The effort of this chapter was directed at determining the attitude of the respondent toward water resources as such. An attempt was made to develop an attitudinal scale to measure the attitudes of a particular population of respondents toward water resources. Of concern were the attitudes of the respondents regarding: (1) water resources as an economic commodity, (2) their willingness to do something about the water resources problems, (3) their awareness of water resources problems, and (4) their knowledge of certain socioeconomic relationships and availability of water. Once the scale had been developed, the scale score of each respondent was compared with certain socioeconomic variables. The variables considered were family size, water consumption, age of husband, number of children, income of the head of household, education of the head of household, and the occupation of the head of household.

From the interview schedule administered during the second stage of the field work, nineteen attitudinal statements were administered to the respondents. They were asked to respond with the five categories of "Strongly Agree," "Agree," "Undecided," "Disagree," and "Strongly Disagree." The Guttman scalogram analysis technique was used for analysis.[1]

---

[1]The Guttman cumulative scaling technique of scalogram analysis was employed. The use of a Guttman scalogram permits one to rank an individual as higher or lower than another according to their responses to a set of statements. An individual with a higher rank than another individual on the same set of statements must also rank as high or higher on every statement in the set as the other individual. " . . . this means that a person

The Rationale for the Variables in the Set

Each variable, or statement, in the set can be placed in one of four "subuniverses":

1) Statements assigned to subuniverse 1 were intended to discriminate between those respondents who felt water is an economic commodity which should be controlled by the government and those respondents who felt otherwise.

2) Statements assigned to subuniverse 2 were intended to discriminate between those respondents who would be willing to make a sacrifice in time and/or effort to provide for the proper use and distribution of water and those who felt the opposite.

3) Statements assigned to subuniverse 3 were intended to discriminate between those respondents who were aware of a water resources problem and those who seem to take the existence of water for granted.

4) Statements assigned to subuniverse 4 were intended to discriminate between those respondents who were knowledgeable and those who were not knowledgeable about: (a) the relationship between socioeconomic status, water consumption, and number of water-using appliances, and (b) the presumed availability of water and water resources in general, as indicated by the amount of thought which they had given the water resources problem.

The percentage of favorable responses to each variable in the set was established through a cutting point for each variable. The Cornell technique (Edwards, 1957:178-184) was then employed, assigning 1 to indicate favorable

---

must also be just as favorable or more favorable in his response to every statement in the set than the other person" (Edwards, 1957:172). The score is an indication of the rank-order position of individuals with respect to the underlying variable. Unidimensionality is reflected when a single score is derived which is the measure of one factor only. If a single, quantitative score is to represent, without ambiguity, the behavior of an individual on the set of items in the interview schedule, then it must be possible, knowing each respondent's score, to know his behavior on each and every statement in the set. Guttman calls this the principle of reproducibility (Remmers, 1954:99).

responses and 0 to indicate unfavorable responses to the dichotomous categories (Table 19).

TABLE 19

ITEM SET WITH ASSIGNED SUBUNIVERSES AND PERCENTAGE FAVORABLE RESPONSES

	Statements	Subuniverse	Favorable
*1.	Problems of water supply are only temporary.	3	.43
2.	If there were a shortage of water, we would cut our use of water.	2	.49
*3.	The amount of water people use depends on how much water is available.	4	.36
*4.	Nature has a way to solve water supply problems before they get serious.	3	.63
5.	We would cut our water consumption if necessary.	2	.09
*6.	The government should control the price of water.	1	.37
7.	Water reclaimed from waste is as good as any other water.	4	.31
8.	During water shortages, there should be a restriction of the watering of lawns.	2	.18
9.	The water-using appliances a family has identifies their position in society.	4	.53
10.	We would cut down our use of water if we had to.	2	.09
*11.	Mankind has a right to free and unlimited use of water.	3	.52
*12.	Water is the most abundant natural resource.	3	.44
13.	The amount of water people use depends on the number of water-using appliances they have.	4	.78

TABLE 19 (continued)

Statements	Subuniverse	Favorable
14. It's the people who should do something about the water problem.	4	.70
*15. We really haven't thought about cutting down our use of water.	4	.23
*16. The water we draw on in this area is already polluted.	3	.38
*17. It's the government who should do something about the water problem.	1	.29
*18. The water cycle is beyond human control.	4	.40
19. I would be willing to do something about the water problem.	2	.10

*The coding was reversed on these statements as a response of "Disagree" was a favorable response.

Test for Scalability

If the subuniverses of content which were sampled comprise the true scale rank-order, or closely approximate it, then the scalogram should have the regular pattern which appears in the perfect Guttman scalogram. A perfect coefficient of reproducibility (1.00) would indicate that, given any respondent's score on the scale, one would be able to indicate how the respondent answered each of the items on the scale. In attempting to approximate this perfect coefficient of reproducibility, four trial scalograms were constructed. The first trial scalogram included fourteen items and had a coefficient of reproducibility of .797, the second included ten items and had a coefficient of reproducibility of .811, the third included eight items and had a coefficient of reproducibility of .858, and the fourth scalogram included six items and had a coefficient of reproducibility of .884. The elimination of one item

from the fourth trial scalogram provided the final scalogram of five items with a coefficient of reproducibility of .895, thus virtually fulfilling Guttman's own requirement of an " . . . arbitrary . . . 90 per cent . . . so as to prevent misreading as a G-scale a finding that might actually be generated by statistically independent items" (Riley, 1963:476) (Table 20).

The final five items which make up the scale are: (1) We really haven't thought about cutting down our water consumption. (2) Water reclaimed from waste is as good as any other water. (3) Mankind has a right to free and unlimited use of water. (4) Nature has a way to solve water supply problems before they get serious. (5) It's the people who should do something about the water problem (Table 21).

A Test for Validity

An attempt was made to validate the subuniverses of content as initially conceived. From a factor analysis, initially employed with all nineteen items in the set, six factors were isolated (Table 22). Seventeen of the nineteen original items had loadings of .50 or higher on one of the factors. Only the variables concerning the temporariness of water problems and water pollution had loadings of less than .50 (Table 23). The six factors were given descriptive names which, with two exceptions, correspond directly with the four subuniverses. One exception is Factor VI (Rationality) which contains two items originally assigned to two other subuniverses. The other exception is Factor V (Knowledgeability II) which contains items originally assigned to the subuniverse of "knowledgeability." The original subuniverse of "knowledgeability" was found to be made up of two factors rather than only one, as had originally been anticipated.

The six attitudinal factors, which were labeled Willingness, Awareness, Knowledgeability I, Economic Commodity, Knowledgeability II, and Rationality

TABLE 20

SCALOGRAM FOR FINAL FIVE ITEMS

Variables[a]						Guttman Scores	
1	2	3	4	5	Frequency	Score	Total Error
Responses[b]							
1	1	1	1	1	6	5	0
1	1	0	1	1	4	5	4
1	1	1	1	0	1	5	1
1	1	1	0	1	1	5	1
1	1	1	0	0	1	5	2
0	1	1	1	1	20	4	0
0	1	0	1	1	5	4	5
0	1	1	0	1	7	4	7
0	1	1	1	0	1	4	1
0	1	0	1	0	1	4	2
0	0	1	1	1	28	3	0
1	0	1	1	1	8	3	8
1	0	1	1	0	2	3	4
0	0	1	1	0	12[c]	3	12[c]
0	0	1	0	1	7	3	7
0	0	0	1	1	19	2	0
1	0	0	1	1	3	2	3
1	0	0	1	0	2	2	4
0	0	0	1	0	8	2	8

TABLE 20 (continued)

Variables					Guttman Scores		
1	2	3	4	5	Frequency	Score	Total Error
0	0	0	0	1	13	1	0
1	1	0	0	1	2	1	4
0	1	0	0	1	5	1	5
1	0	0	0	1	5	1	5
0	0	0	0	0	14	0	0
1	0	1	0	0	1	0	2
1	1	0	0	0	1	0	2
1	0	0	0	0	6	0	6
0	1	0	0	0	3	0	3
0	0	1	0	0	3	0	3
Total Frequency of "1" Response:							
43	58	98	120	133	189		99

[a]The variables coincide with the items in the interview schedule in the following manner: variable 1 equals item 15, variable 2 equals item 7, variable 3 equals item 11, variable 4 equals item 4, and variable 5 equals item 14.

[b]Favorable response equals 1, unfavorable response equals 0.

[c]This scale-type exceeds the .05 percent error for any scale-type. Investigation into the twelve respondents of this scale type revealed that nine have fourteen years or more of education, three have twelve years of education. This was the only variable that was discovered to be "common" among the scale type. For the entire sample, 30 percent were found to have fourteen years or more of education and 42 percent were found to have twelve years of education. The "common denominator" of education for this particular scale-type may or may not explain the high occurrence of the scale type.

TABLE 21

FINAL FIVE STATEMENTS FOR GUTTMAN SCALE

Variable	Statement	Statement	Favorable Responses
*1	15	We really haven't thought about cutting down our use of water.	.23
2	7	Water reclaimed from waste is as good as any other water.	.31
*3	11	Mankind has a right to free and unlimited use of water.	.52
*4	4	Nature has a way to solve water supply problems before they get serious.	.63
5	14	It's the people who should do something about the water problem.	.70

*Statements have been reverse coded.

TABLE 22

FACTOR MATRIX OF ATTITUDES TOWARD WATER CONSERVATION

VARIABLES		FACTORS					
No.	Description	I	II	III	IV	V	VI
5	Cut water consumption if necessary	0.77155					
10	Cut water use if had to	0.73554					
2	If shortage, cut use	0.71484					
19	I'd do something about water problem	0.60213					
11	Man's right to free water		0.71548				
12	Water most abundant resource		0.66522				
4	Nature solves own problems		0.54321				
14	People do something			0.62379			
9	Appliances identifies position			-0.62293			
7	Water reclaimed is good			0.51246			
6	Government control price				0.78317		
17	Government do something				0.75615		
15	We haven't thought about cutting use					0.59271	
13	Water use depends on appliances					-0.51862	
18	Water cycle beyond control					0.50614	
3	Amount water used depends on amount available						-0.66340
8	Restriction of watering lawns						0.56616

TABLE 23

FACTORS UNDERLYING ATTITUDES TOWARDS WATER CONSERVATION
(Selected loadings of .500 or higher)[a]

Statements	Factor	Loadings[b]	Label
	I		Willingness
5	We would cut our water consumption if necessary.	.771	
10	We would cut down our use of water if we had to.	.735	
2	If there were a shortage of water, we would cut our use of water.	.714	
19	I would be willing to do something about the water problem.	.602	
	II		Awareness
11	Mankind has a right to free and unlimited use of water.	-.715	
12	Water is the most abundant natural resource.	-.665	
4	Nature has a way to solve water supply problems before they get serious.	.543	
	III		Knowledgeability I
14	It's the people who should do something about the water problem.	.623	
9	The water-using appliances a family has identifies their position in society.	.622	
7	Water reclaimed from waste is as good as any other water.	.512	

TABLE 23 (continued)

Statements	Factor	Loadings[b]	Label
	IV		Economic Commodity
6	The government should control the price of water.	-.783	
17	It's the government who should do something about the water problem.	-.756	
	V		Knowledgeability II
15	We really haven't thought about cutting down our use of water.	-.592	
13	The amount of water people use depends on the number of water-using appliances they have.	-.518	
18	The water cycle is beyond human control.	-.506	
	VI		Rationality
3	The amount of water people use depends on how much water is available.	.663	
8	During water shortages, there should be a restriction on the watering of lawns.	.566	

[a]Selected value from the factor matrix, Table 22.

[b]Signs on loadings on all factors corrected for unidirectionality.

were ranked by the strength of their mean loadings. The ranking developed as follows: Economic Commodity, Willingness, Awareness, Rationality, Knowledgeability I, and Knowledgeability II (Table 24).

TABLE 24

RANK-ORDER OF FACTORS BY MEAN LOADINGS OF ATTITUDES TOWARDS WATER CONSERVATION[a]

Factor	Name	Mean Loading[b]
IV	Economic Commodity	.769
I	Willingness	.705
II	Awareness	.641
VI	Rationality	.614
III	Knowledgeability I	.586
V	Knowledgeability II	.539

[a]Derived from Table 22.

[b]Signs disregarded.

When the Guttman scale ranks were compared with the corresponding factor analysis (Table 25), the results fully support the original subuniverses as initially conceived.

Naming the Guttman Scale

The way in which the final Guttman scale should be read is as follows: for those respondents who had given considerable thought to the water problem, it is acceptable to treat water reclaimed from waste as being as good as any other water, to accept the necessity of control over water exploitation and misuse, to believe that nature cannot solve supply problems before they become serious, and finally to acknowledge that the solution of water

TABLE 25

COMPARISON BETWEEN THE GUTTMAN SCALE RANKINGS AND FACTOR MATRIX RANKINGS OF VARIABLES REFLECTING ATTITUDES TOWARDS WATER CONSERVATION

Guttman Scale Score	Statement	Description	Rank	Factor Description	Original Subuniverse
1	15	Haven't thought about cutting water consumption.	5	Knowledgeability II	Knowledgeability
2	7	Reclaimed water is good.	3	Knowledgeability I	Knowledgeability
3	11	Man has a right to free water.	2	Awareness	Awareness
4	4	Nature solves water problems.	2	Awareness	Awareness
5	14	People should do something about the water problem.	3	Knowledgeability I	Knowledgeability

resources problems is a matter with which they must personally concern themselves. The underlying dimension which this scale seems to measure is a concern for and about the water resources problem. The scale was thus named the "Water Concern Scale" and the resulting scalogram is found in Table 26.

Potential Uses of the Water Concern Scale

The Water Concern Scale may be a feasible instrument to be used by civil engineers and community officials in the planning and initiation of water projects in local areas. The scale could provide the planners with some measure of the concern and involvement of the residents of the particular community in the water resources and conservation problem, and more specifically, in the suggested local project. Such a measure would enable water project planners to decide how much more and what kind of information needs to be disseminated to the residents in order to gain acceptance for the suggested project.

TABLE 26

WATER CONCERN SCALOGRAM[a]

SCALE TYPE OF SUBJECT	SCALE PATTERN (1 = favorable response and concern; 0 = unfavorable response and concern): Thought about water consumption	Water reclaimed is as good	Right to free water	Nature solves own problems	People should do something	DISTRIBUTION OF THE RESPONDENTS: Nonscale	Perfect Scale	Total
Most Concerned	1	1	1	1	1	7	6	13
	0	1	1	1	1	14	20	34
	0	0	1	1	1	29	28	57
	0	0	0	1	1	13	19	32
	0	0	0	0	1	12	13	25
Least Concerned	0	0	0	0	0	14	14	28
Total Subjects						89	100	189

[a]Compare with Table 3 for further details of the scale.

CHAPTER VI

AN APPLICATION OF THE SCALE

In an effort to reveal any relationship or association between the scale types of the sampled population and the respondent's "actual" participation or concern with the water resources problem, the Guttman scores were compared with certain socioeconomic variables. For the variables of family size, water consumption, age of husband, number of children, income of the household head, number of water-using appliances, and education of the household head, the Spearman rank correlation coefficient[1] was used (Siegel, 1956:202-213).

For the variable of occupation of the household head, the Kruskal-Wallis one-way analysis of variance[2] was used (Siegel, 1956:184-194).

Statements of Relationships

The following variables were subjected to a statement of relationship, using in each instance the form of the null hypothesis, and tested.

FAMILY SIZE: The null hypothesis may be stated: There is no relationship between the size of the respondent's family and the respondent's

---

[1] Spearman rank correlation coefficient is a "measure of association which requires that both variables be measured in at least an ordinal scale so that the objects or individuals under study may be ranked in two ordered series" (Siegel, 1956:202). The two sets of scores are ranked in two series. Because of the large proportion of observations tied for certain ranks, a correction factor was incorporated in the computation of r_s. The correction factor prevents an inflation of the value of r_s.

[2] The Kruskal-Wallis one-way analysis of variance by ranks assumes that the variable under study has an underlying continuous distribution. "It requires at least ordinal measurement of the variable" (Siegel, 1956:185).

Guttman score.

For family size, $r_s = 0.066$ indicating only a very low correlation between family size and the Guttman score. This relationship is not significant at the .05 level of significance and, therefore, the null hypothesis cannot be rejected. On the basis of the evidence, then, it does not appear that one may assume that the size of the family as such operates as a major determinant of attitudes toward issues related to concern about water problems.

WATER CONSUMPTION: The null hypothesis is: There is no relationship between a respondent's household water consumption and his Guttman score.

For water consumption, $r_s = 0.095$ indicating a low correlation between water consumption and the Guttman score. This relationship is not significant at the .05 level of significance and would indicate that a respondent's household water consumption does not significantly affect his attitude regarding concern about water resources problems. The null hypothesis cannot be rejected.

AGE OF HUSBAND: The null hypothesis may be phrased: There is no relationship between the age of the husband in the household and the respondent's Guttman score.

For age of husband, $r_s = 0.079$ indicating that a low correlation exists between the age of the husband and the Guttman score. This relationship is not significant at the .05 level of significance, and, thus, the null hypothesis cannot be rejected. It would appear that the age of the husband is not a "cause" of the respondent's attitude concerning water resources problems.

NUMBER OF CHILDREN: The following null hypothesis is offered: There is no relationship between the number of children in the household and the respondent's Guttman score.

For the number of children, $r_s = 0.066$ indicating only a very low correlation between the number of children in the household and the respondent's

Guttman score. This relationship is not significant at the .05 level of significance, and, on this basis, the null hypothesis cannot be rejected. The number of children apparently does not affect the respondent's attitude regarding his concern about water resources problems.

INCOME OF THE HOUSEHOLD HEAD: The null hypothesis may be stated: There is no relationship between the income of the household head and the respondent's Guttman score.

For income of the household head, $r_s = 0.164$ indicating that there is a correlation between the income of the household head and the Guttman score. This relationship is significant at the .05 level of significance and, consequently, the null hypothesis can be rejected. As found by Dasgupta (1968), income is found to be a determinant of the respondent's attitudes toward water resources problems.

NUMBER OF WATER-USING APPLIANCES: The null hypothesis is: There is no relationship between the number of water-using appliances in the household and the respondent's Guttman score.

For number of water-using appliances, $r_s = 0.008$ indicating a very low correlation between the number of water-using appliances in the household and the Guttman score. This relationship is not significant at the .05 level of significance, and, therefore, the null hypothesis cannot be rejected. Although the number of water-using appliances was found to be significantly related to attitudes by Dasgupta (1968), in this sample the number of water-using appliances does not contribute to the respondent's attitudes regarding water resources problems.

EDUCATION OF THE HOUSEHOLD HEAD: The null hypothesis may be phrased: There is no relationship between the education of the household head and the respondent's Guttman score.

For the education of the household head, $r_s = 0.233$. Although a

correlation on this level does not suggest a very close relationship between the series of data, the relationship is significant at the .01 level of significance. That this null hypothesis can be rejected may offer support, in some manner, to the occurrence of the twelve-scale-types as discussed in Table 2. In Table 2 it was determined that education could be the common denominator for the appearance of twelve respondents with the same response pattern. The direction of the relationship is such that one may assume the existence of some tendency for the Guttman score to be higher as the education of the household increases.

OCCUPATION OF THE HOUSEHOLD HEAD: The null hypothesis is: There is no relationship between the occupation of the household head and the respondent's Guttman score.

For the occupation of the household head, H = 7.066, indicating that the probability associated with the occurrence under the null hypothesis of a value this large (df = 6) is not significant at the .05 level of significance. The null hypothesis cannot be rejected. One may assume, because of this quite low probability of occurrence, that the occupation of the household head is not determinant of the respondent's Guttman score.

Summary

An attempt was made to construct an attitudinal scale that might be useful to social scientists, natural scientists, and civil engineers concerned with the water resources problems in the United States. The interview schedule contained questions which provided standard socioeconomic information on the respondents. The interview schedules also contained nineteen attitudinal questions which were intended to elicit respondents' attitudes towards water resources problems. The attitudinal questions were designed to measure the subuniverses of (1) willingness on the part of the

respondent to do something about the water resources problem, (2) the consideration by the respondent that water is an economic commodity, (3) awareness on the part of the respondent, and (4) knowledgeability of the respondent regarding the water resources problem.

An attempt was then made, using the technique of Guttman scalogram analysis, to construct the attitude scale. In meeting the requirements of the Guttman scalogram analysis, that is, that the scale be reproducible, only five of the original nineteen attitudinal statements were retainable. The final scale had a coefficient of reproducibility of .895.

The original nineteen items were subjected to a factor analysis to determine if the original subuniverses were to be validated. Initially, four subuniverses were proposed: economic commodity, willingness, awareness, and knowledgeability. The factor analysis revealed that there were six subuniverses measured by the attitudinal items: economic commodity, willingness, awareness, knowledgeability I, knowledgeability II, and rationality. Only two of the original nineteen items were not sufficiently "loaded" on the factor analysis. In comparing the original subuniverses with those revealed by the factor analysis, the final scale was fully supported. That is, the final five items on the scale had loadings of .50 or higher and were initially assigned to subuniverses which were validated by the factor analysis. The nature of the final five items on the scale was such that it was named the Water Concern Scale.

The scale scores of the final Water Concern Scale were then compared with certain socioeconomic variables in order to reveal any relationship between a respondent's score and his actual concern and participation with the water resources problem. Using the Spearman rank correlation coefficient and the Kruskal-Wallis one-way analysis of variance, the following socioeconomic variables were compared with the Guttman scores of the respondents:

family size, water consumption, age of husband, number of children, income of the household head, number of water-using appliances, education of the household head, and occupation of the household head. The relationships were stated in the form of null hypotheses and the following null hypotheses could not be rejected at the .05 level of significance: family size, water consumption, age of husband, number of children, number of water-using appliances, and occupation of the household head. Only the null hypotheses concerning the socioeconomic variables of education of the household head and income of the household head could be rejected. The implication of this rejection is that income and education of the household head are determinants of the respondent's attitude score in the population samples in this research. It was finally noted that another attitudinal study had revealed these same two socioeconomic variables to be significantly related to attitudes regarding water resources problems.

CHAPTER VII

SUMMARY AND CONCLUSIONS

An effort has been made in this research to: (1) determine what relationships there are between water consumption in two residential areas compared with certain socioeconomic variables of the population, and (2) measure the attitudes of water consumers toward water conservation. The research consisted of interviewing residents of two South Florida areas--West Palm Beach and Homestead.

In an attempt to achieve the two goals of this research, data were presented and analyzed on the characteristics of the population, water consumption by household characteristics, attitudes of the respondents toward water conservation, and on the relationships of certain socioeconomic variables and the Water Concern Scale. It was determined in this analysis that the West Palm Beach sample had proportionately more larger families, had proportionately a larger number of families with a greater number of children, and had proportionately more families with older children than did the Homestead sample. The head of the household in West Palm Beach was also found to have been more likely to have completed a high school education and a college education, more likely to have been a professional worker and less likely to have been a blue collar worker, more likely to earn more, and to be slightly older than his or her Homestead counterpart.

It was also determined, as has been established in other research, that there is a definite relationship between water consumption and the income standing of the household. Additionally, differences between West

Palm Beach and Homestead in water consumption were attributed to their different "life styles," with West Palm Beach being considered more typically urban.

Finally, with the development of the Water Concern Scale, it was determined that income and education of the household head appear to be the determinants of a respondent's attitude score in the two areas sampled. The attitudinal profile proved to be consistent with other research on attitudes and water conservation, although this was the first attempt to construct a Guttman scale as such.

Conclusions

Some basic relationships between the use of water and the several socioeconomic characteristics of the households of West Palm Beach and Homestead have been established. By further observation of frequency distributions on some of the items of the interview schedule used, some major habits of the householders with regard to water use can be established.

In part of the preceding analysis, water dependent appliances and plumbing fixtures proved to be the key discriminators in water use. Table 27 compares West Palm Beach and Homestead households on the number and types of appliances and fixtures.

It is demonstrated that the West Palm Beach households are more affluent, at least judging by the number of appliances which tend to characterize the higher income households such as dishwashers, garbage disposals, and multiple bathrooms. To what use these appliances and fixtures were put can be estimated by the differential water consumption of the respective households. It has been repeatedly demonstrated that the West Palm Beach households use substantially more water than the Homestead households. For instance, when asked about their lawn watering practices, the Homestead respondents were about twice as likely (71 percent) as the West Palm Beach respondents

TABLE 27

NUMBER AND PERCENTAGE DISTRIBUTION OF WATER-USING APPLIANCES AND FIXTURES, HOMESTEAD AND WEST PALM BEACH HOUSEHOLDS

DESCRIPTION OF APPLIANCES AND FIXTURES	NUMBER OF APPLIANCES AND FIXTURES							
	One				Two or More			
	Homestead	Percent[a]	West Palm Beach	Percent[a]	Homestead	Percent[a]	West Palm Beach	Percent[a]
Washing Machine	99	72.3	196	77.1				
Dishwasher	12	8.7	76	29.9				
Garbage Disposal	4	2.9	72	28.3				
Lawn Sprinkler	15	10.9	152	59.8			3	
Swimming Pool	2		15					
Hot Water Heater	136		254					
Bathtub	122	89.0	207	81.4	13	9.5	40	15.7
Shower	106	77.4	157	61.8	20	14.6	86	33.8
Bathroom Commode	100	72.9	105	41.3	37	27.0	149	58.6
Bathroom Sink	98	71.5	112	44.0	38	27.7	142	55.9
Kitchen Sink	135		248	97.6	2		96	37.8
Outside Faucet	45	32.8	33	12.9	92	67.1	215	84.6
N	137		254		137		254	

[a]Percent based on total number of respondents in Homestead (N=137) and West Palm Beach (N=254) respectively.

(32 percent) to report that they water their lawn "seldom or never." A routine sprinkling of lawns either with a hose or through a sprinkler system was claimed by West Palm Beach respondents convincingly more often than by Homestead respondents (watering by garden hose: 25 percent for Homestead, 42 percent for West Palm Beach; watering by sprinkler system: 2 percent for Homestead and 26 percent for West Palm Beach).

However, the purpose of this research was not to give weight to minor water consumption habits, but rather to tap the attitudes and opinions of the respondents as to their understanding of the water supply distribution question. One of the difficulties in water conservation and consumption surveys when the focus is on attitudes is that water for a long time has been considered one of the free things like air, which may not be free either. In order to pinpoint some of the general and diffuse attitudes and opinions on water, an attempt was made first of all to ascertain how accurately the respondents think about their sources of water supply.

One of the questions was designed to find out whether the respondents could identify accurately the supplier of their water. This proved to be no problem in Homestead as the City of Homestead is the sole supplier of households who do not have their own wells or are out of the water district. In the West Palm Beach area, however, the many subdivisions and incorporated places have a variety of private suppliers, but only 12 of the 254 respondents identified their water suppliers as such. Apparently, most of them think the city always supplies water. On the other hand, when asked whether or not they are satisfied with their present water supply, 16 percent of the West Palm Beach respondents would prefer a different supplier. This latter refers, of course, only to the households connected to a metered supply of water.

The respondents were also asked whether they ever thought before about

cutting down their water use, whether they would be willing to do so, and how they would prefer to implement such cuts. A great majority of them (92 percent in Homestead and 82 percent in West Palm Beach) indicated that they have not given thought to cutting their water consumption and from among those who had done so, about 15 percent (mostly from West Palm Beach) did so because of the cost. This seems consistent with other observations made where the use of water is related to water rates.

When asked how they would implement a cut in water consumption, 36 percent of the Homestead respondents and 41 percent of the West Palm Beach respondents indicated they would cut down on their lawn watering, 30 percent and 14 percent respectively would check fixtures for leaks, and others mentioned yet other means. In general, the make-up of the households in the two areas is reflected in these responses. Since fewer respondents in Homestead than in West Palm Beach water their lawns in the first place, fewer of the Homestead respondents would be able to turn off their lawn irrigations. However, since the people in the Homestead sample are apparently more aware of the cost of living, the lower percentage is proportionately larger regarding lawn irrigation than the West Palm Beach sample. The economic factor also enters in checking for leaking faucets where the Homestead respondents would check their fewer faucets more thoroughly for leaks than would be the case with the West Palm Beach sample.

Were the respondents faced with a community-wide shortage of water, they would relegate the responsibility for water consumption to, in the first place, the water plant itself (20 percent in Homestead and 31 percent in West Palm Beach), second to the civic responsibility of the citizens themselves (36 and 34 percent respectively), and lastly, to some legal sanctions (41 and 37 percent respectively). The only apparent real difference between the two samples is the understanding of the role of the water plant, where only two

out of ten respondents in Homestead, but three out of ten in West Palm Beach would favor such control.

Questions concerning water shortage seem to be of only minor relevance when three-quarters of the respondents never expect this to happen in their area. Just about all of them believed that the water supply in their area was either abundant or quite satisfactory. When the respondents were asked whether they would go farther, deeper, into the ocean, or into the sewers were they in need of more water, 13 percent of the Homestead respondents and only 7 percent of the West Palm Beach respondents indicated such, even though Homestead draws all of its water supply from the ground and West Palm Beach off the surface. On the other hand, 34 percent and 44 percent of the Homestead and West Palm Beach respondents, respectively, indicated they would prefer to go deeper for the water. Almost 47 percent of the respondents in Homestead and 42 percent of the respondents in West Palm Beach indicated desalination as an alternative. Regarding the reclamation of water from the effluent, only three respondents in each area indicated such as a favorable alternative.

When, however, the respondents were presented directly with the reclaimed water questions giving reclaimed water as an economical solution to the water problem, still 51 percent and 60 percent of the respondents in Homestead and West Palm Beach, respectively, would rather pay more than have to drink reclaimed water. And, if they had to drink water reclaimed from the effluent, 62 percent of the Homestead respondents and 66 percent of the West Palm Beach respondents would be bothered by the knowledge of it. It would appear that the dislike of water reclaimed from effluent seems to cut across social class lines.

The overall profile of the two communities may increase our understanding of the social forces behind the differential water consumption. In Homestead,

where the income does not allow as much equipment in the household as in West Palm Beach, there appears correspondingly lower water consumption, mainly reflected in the low use of water for lawns and the like. Also, the overall set of attitudes and opinions toward water conservation seems to be one of a lack of real concern, some misunderstanding of what it is all about, and willingness to have somebody else take care of it.

APPENDIX

UNIVERSITY OF FLORIDA
Department of Sociology
Water Resources Research Center

Prediction Model for Water Use by Population Structure

INTERVIEW SCHEDULE

CARD 6

	COLS	CODE
ADDRESS: _____ (Zone: Segment:)	1-6	
SCHEDULE SERIAL NUMBER: _____	75-77	
INTERVIEWER: _____	7,8	
DATE OF CONTACT: 1st_____		
2nd_____		
3rd_____		
INTERVIEW COMPLETED: _____	9	1
		2
INTERVIEW INCOMPLETE: Dwelling Vacant_____	10	1
Interruption_____		2
Refusal_____		3
Different Residents_____		4

**INTERVIEWER NOTE: ASK THE FOLLOWING QUESTIONS OF EVERY RESIDENT

1. Were you interviewed last Fall by someone from this project? YES NO	11	1
		2

If NO, TERMINATE THE INTERVIEW

If YES, ASK THE FOLLOWING QUESTIONS

1a. Were you interviewed by a male or female? MALE FEMALE	12	1
		2
1b. Did you receive any literature from the interviewer? YES NO	13	1
		2
If YES, did you read it? YES NO	14	1
		2

The University of Florida is interested in some long range estimates of water needs in this area. You were most cooperative last Fall, and we once again ask your cooperation in answering a few questions on the use of water by this household. As you know, the Project is being paid for by the Federal Government but the results will be of help to the people in this community regarding the future needs for water here.

	COLS	CODE
1. Do you know how many gallons you use on an average day?	17-19	
If Yes, how many_____ No_____		999 000
Comments: _____		
2. Did you ever contemplate cutting down your water consumption?	20	
Yes_____ No_____		1 2
If Yes, what was the main reason for it?		
Water Cost _____		3
Dislike Taste _____		4
Problems of Supply _____		5
Comments: _____		9 0
3. Do you think you could cut down on your water use?	21	
Yes_____ No_____		1 2
If Yes, why:		
Water Cost _____		3
Dislike Taste _____		4
Problems of Supply _____		5
Comments: _____		9 0
4. Were you to cut down your water consumption, what would you do?	22	
Stop watering lawn_____		1
Check the faucet leakage_____		2

	COLS	CODE
Other_____		3
Don't know_____		9
Comments: _____		0
5. Were the community to experience a water shortage and cuts of consumption in each household would have to be made, which of the following ways would appeal to you most?	23	
_____Rationing plan by water works, e.g., shutting water supply off a certain time of the day.		1
_____Encouraging the citizens to cut their water consumption in general.		2
_____A ban on watering lawns and fines to enforce it.		3
_____Allowing only so many gallons per person in the household.		4
_____Decreasing the pressure.		5
Comments: _____		9 0
6. Do you think that your community will ever face a problem of an inadequate supply of water?	24	1
Yes_____ No_____ Don't Know_____		2
Comments: _____		9 0
7. Do you think the water supply in this area is:	25	1 2
Abundant_____ Sufficient_____ Inadequate____		3
Comments: _____		9 0
8. When a community like yours faces a water shortage because there is no adequate recharging of the areas the water comes from, there are several alternatives facing the community. If each of the following alternatives were to cost the same, which one would you prefer?	26	
_____Go farther to get the water.		1

	COLS	CODE
_____Go deeper to get the water.		2
_____Desalinate, using the water from the ocean.		3
_____Reclaim water from the waste.		4
Comments: _____		9 0
9. Were the cost of reclaiming water from the waste the cheapest way to keep up with the water need of the community:	27	
_____would you rather pay more for the other alternatives.		1
_____would you accept it as a reasonable solution.		2
Comments: _____		9 0
10. Would it bother you to know that the water you are drinking was reclaimed from the waste?	28	
Yes_____ No_____ Don't Know_____		1 2
Comments: _____		9 0
11. Have you heard about communities where this is the case?	29	
Yes_____ No_____		1 2
Comments: _____		9 0
12. Do you think it would be worthwhile, even though the initial cost might be high, to have a dual system of water supply; one for outside use and one for cooking and drinking?	30	
Yes_____ No_____ Don't Know_____		1 2
Comments: _____		9 0

	COLS	CODE
13. Were it necessary to install such a system, how should it be financed?	31	
_____Increased water rates.		1
_____Governmental subsidy.		2
_____Don't know.		9
Comments: _____		0
14. There is no question that this area is increasing in population and in the need for water. Do you think that there should be some governmental agency to assure that the cost of water does not increase disproportionately?	32	
Yes_____ No_____ Don't Know_____		1 2 9
Comments: _____		0
15. Do you think that water works should be subsidized so that even the poor families may have as much water as they need?	33	
Yes_____ No_____ Don't Know_____		1 2 9
If Yes, how should this subsidy be effected?		
_____A general water tax.		3
_____Property tax.		4
_____Some other tax.		5
Comments: _____		0
16. Have you ever attended a formal or informal gatherings concerned with water?	34,35	
Yes_____ No_____		1 2
If Yes, how many: _____		99 00

	COLS	CODE
17. With whom have you talked most about the water problem?	36	
_____Family		1
_____Close personal friends		2
_____Other neighbors		3
_____Other friends at work		4
_____Other (specify)		5
Comments: _____		9 0
18. Have any of the following indicated concern about conserving water?	37	
_____Family		1
_____Close personal friends		2
_____Other neighbors		3
_____Other friends at work		4
_____Other (specify)		5
Comments: _____		9 0
19. Do any of the following exercise exceptional or noticeable practice with respect to water conservation?	38	
_____Family		1
_____Close personal friends		2
_____Other neighbors		3
_____Other friends at work		4
_____Other (specify)		5
Comments: _____		9 0

	COLS	CODE
20. Would you be willing to pay more for the water you need?	39	
Yes_____ No_____		1
Comments: _____		2
		9
		0
21. Would you use desalinated water?	40	
Yes_____ No_____		1
Comments: _____		2
		9
		0
22. Do you think your community will face a water shortage soon?	41	
Yes_____ No_____		1
Comments: _____		2
		9
		0
23. Do you water your lawn often?	42	
Yes_____ No_____		1
Comments: _____		2
		9
		0
24. Do you think your monthly water bill is fair?	43	
Yes_____ No_____		1
Comments: _____		2
		9
		0

**INTERVIEWER NOTE:

That concludes that part of this questionnaire. Now I will read to you a series of statements concerning your attitudes on water. Consider how strongly you personally agree or disagree with the following statements. Tell me if you STRONGLY AGREE with the statement, only AGREE with the statement, if you STRONGLY DISAGREE with the statement, only DISAGREE with the statement, or if you are UNDECIDED about the statement.

**INTERVIEWER GIVES THE RESPONDENT THE CARD WITH THE RESPONSES ON IT.

		COLS	CODE
1.	Problems of water supply are only temporary. SA A U D SD	45	1 2 3 4 5
2.	If there were a shortage of water, we would cut our water use. SA A U D SD	46	1 2 3 4 5
3.	The amount of water people use depends on how much water is available. SA A U D SD	47	1 2 3 4 5
4.	Nature has a way to solve water supply problems before they get serious. SA A U D SD	48	1 2 3 4 5
5.	We would cut our water consumption if necessary. SA A U D SD	49	1 2 3 4 5
6.	The government should control the price of water. SA A U D SD	50	1 2 3 4 5
7.	Water reclaimed from waste is as good as any other water. SA A U D SD	51	1 2 3 4 5
8.	During water shortages, there should be a restriction on the watering of lawns. SA A U D SD	52	1 2 3 4 5
9.	The water-using appliances a family has identifies their position in society. SA A U D SD	53	1 2 3 4 5

		COLS	CODE
10.	We would cut down our use of water if we had to. SA A U D SD	54	1 2 3 4 5
11.	Mankind has a right to free and unlimited use of water. SA A U D SD	55	1 2 3 4 5
12.	Water is the most abundant natural resource. SA A U D SD	56	1 2 3 4 5
13.	The amount of water people use depends on the number of water-using appliances they have. SA A U D SD	57	1 2 3 4 5
14.	It's the people who should do something about the water problem. SA A U D SD	58	1 2 3 4 5
15.	We really haven't thought about cutting down our use of water. SA A U D SD	59	1 2 3 4 5
16.	The water we draw on in this area is already polluted. SA A U D SD	60	1 2 3 4 5
17.	It's the government who should do something about the water problem. SA A U D SD	61	1 2 3 4 5
18.	The water cycle is beyond human control. SA A U D SD	62	1 2 3 4 5

	COLS	CODE
19. I would be willing to do something about the water problem.	63	1 2 3 4 5
SA A U D SD		

THAT CONCLUDES THE INTERVIEW. I THANK YOU VERY MUCH FOR YOUR COOPERATION. IT WAS MOST SINCERELY APPRECIATED.

**INTERVIEWER NOTE

1. Degree of Interview Cooperation	65	
_____Good		1
_____Fair		2
_____Poor		3

Comments: _____

_____

BIBLIOGRAPHY

"A Directory of Information Resources in the United States - Water," U.S. Library of Congressional Natural Referral Center for Science and Technology (September, 1966).

Ackerman, Edward A., "Questions for Designers of Future Water Policy," Journal of Farm Economics, Vol. 38 (November, 1956), pp. 971-980.

Andrews, Wade H., "Sociological Analysis and Water Resources Problems," Prepared for presentation at a Workshop for Sociological Aspects of Water Resources Research in Logan, Utah State University, April 18, 1968 (Mimeographed).

_____, and Gillings, James L., "Some Factors Affecting Social Change in Water Resources." Unpublished Paper. San Francisco: Rural Sociological Society Meeting, 1967.

Arrow, Kenneth J., "Criteria for Social Investment," Water Resources Research, Vol. I (First Quarter, 1965), pp. 1-8.

Backstrum, Charles H., and Hursh, Gerald D., Survey Research. Evanston: Northwestern University Press, 1963.

Baur, E. Jackson, "Opinion Change in a Public Controversy," Public Opinion Quarterly, Vol. 26 (Spring, 1962), pp. 210-226.

_____, "Public Opinion and the Primary Group," American Sociological Review, Vol. 25, (April, 1960), pp. 208-219.

Brock, Dan A., "Multiple Regression Analysis of Maximum-Day Water Consumption at Dallas, Texas," Journal of the American Water Works Association, Vol. 50 (October, 1958), pp. 1391-1394.

Brown, Carl B., and Murphy, Warren T., "Conservation Begins in the Watersheds," Water: The Year Book of Agriculture. Washington, D.C.: U.S. Department of Agriculture (1955), pp. 161-165.

Bryan, E. H., "Water Supply and Pollution Control Aspects of Urbanization," Law and Contemporary Problems, Vol. 30 (Winter, 1965), pp. 176-192.

Bylund, H. Bruce, "The Human Factor and Changes in Water Usage Patterns," Water Resources Research, Vol. 3, No. 3 (First Quarter, 1966), pp. 365-369.

"The California State Water Project in 1965," Department of Water Resources, Resources Agency, California, Bulletin No. 132-65 (June, 1965).

Carhart, Arthur H., Water-Or Your Life. J. B. Lippincott Co., New York, 1951.

Ciriacy-Wantrup, S. V., "Water Policy and Economic Optimizing: Some Conceptual Programs in Water Research," American Economic Review: Papers and Proceedings, Vol. 57 (May, 1967), pp. 179-196.

Clawson, Marion and Dretsch, J. L., "Outdoor Recreation Research: Some Concepts and Suggested Areas of Study," Resources for the Future, Inc., Washington, D.C.: Reprint No. 43 (November, 1963), pp. 23.

Cole, Lucy W., and Wilkinson, Kenneth P., "Sociological Factors in Watershed Development, Preliminary Report No. 20." Social Science Research Center: Mississippi State University, July, 1967.

"30,000 Communities Without Water," Department of Agriculture, U.S. (1965).

Conway, Clarence M., "The Competitive Position of Agriculture for Usable Water," Louisville, Kentucky: Association of Southern Agricultural Workers, 1968.

Craine, Lyle E., "The Muskingum Watershed Conservancy District: A Study of Local Control," Law and Contemporary Social Problems, Vol. 22 (Summer, 1957), pp. 378-404.

Crain, R. L., "Fluoridation: The Diffusion of an Innovation Among Cities," Social Forces, Vol. 44 (June, 1966), pp. 467-476.

_____, and Rosenthal, D. B., "Structure and Value in Local Political Systems: The Case of Fluoridation Decisions," Journal of Politics, Vol. 28 (February, 1966), pp. 169-195.

"Customers React to Increased Rate by Reducing Water Consumption," Water Works Engineering, Vol. 110 (February, 1957), pp. 150, et passim.

Dasgupta, Satadal, "Attitudes of Local Residents Toward Watershed Development. Preliminary Report No. 18," State College: Mississippi State University, Social Science Research Center, 1967.

_____, "Sociology of Watershed Development," Jackson, Mississippi: Mississippi Water Resources Conference, April, 1968.

_____, and Wilkinson, Kenneth P., "Local Participation and Watershed Development: A Comparative Study of Two Communities," San Francisco: Third Annual American Water Resources Conference (November, 1967).

Downs, J. F., "Social Consequences of a Dry Well," American Anthropologist, Vol. 67 (December, 1965), pp. 1387-1416.

Dunn, Dorothy F., and Larson, T. E., "Relationship of Domestic Water Use to Assessed Evaluation, with Selected Demographic and Socio-economic Variables," Journal of the American Water Works Association, Vol. 55 (April, 1963), pp. 441-450.

Ellis, Harold H., "Legal Aspects of Rural-Urban Water Use Conflicts," Association of Southern Agricultural Workers, Louisville, Kentucky, 1968.

"Federal Assistance in Outdoor Recreation," Journal of Soil and Water Conservation, Vol. 18 (March-April, 1963), pp. 57-60.

Firey, W., "Coalition and Schism in a Regional Conservation Program," Human Organization, Vol. 15 (Winter, 1957), pp. 17-20.

Fox, I. K., "New Horizons in Water Resources Administration," Public Administration Review, Vol. 25 (May, 1965), pp. 61-69.

Gardner, B. Kilworth, and Schieh, Sett H., "Factors Affecting Consumption of Urban Household Water in Northern Utah," Logan, Utah Agricultural Experiment Station, Utah State University, Bulletin No. 449 (November, 1964), pp. 21.

Hamilton, H. R., "Bibliography of Socio-Economic Aspects of Water Resources," U.S. Office of Water Resources Research, 1966.

Haney, P. D., and Hamann, C. L., "Dual Water Systems," Journal of American Water Works Association, Vol. 57 (September, 1965), pp. 1096-1098.

Haveman, Robert H., "Water Resources Investment and the Public Interest: an Analysis of Federal Expenditures in Ten Southern States," Vanderbilt University Press (1965).

Heath, Milton S., Jr., and Godschalk, David, "How Population and Economic Trends May Affect Water Resources in North Carolina," Popular Government, Vol. 31 (November, 1964), pp. 8-10

Hirshleifer, J., and Milliman, J.W., "Urban Water Supply: A Second Look," American Economic Review, Papers and Proceedings, Vol. 57 (May, 1967), pp. 169-178; 190-196.

Hunter, Homer A., "Texas Water Need Forecast," Journal of the American Water Works Association, Vol. 53 (August, 1961), pp. 968-972.

Kiker, John E., Jr., and Morgan, W. H., "Research Highlights," Water Resources Research Center, Publication No. 1, University of Florida, Gainesville. (November, 1966).

Kneese, Allen V., "Socio-Economic Aspects of Water Quality Management," Journal of the Water Pollution Control Federation, Vol. 36 (February, 1964), pp. 254-262.

Kraenzel, Carl F., "Social Consequences of River Basin Development," Law and Contemporary Problems, Vol. 22 (Spring, 1957), pp. 221-236.

Kubat, Daniel, and Lei, Lillian, "Awareness of Water Consumption by Socio-Economic Status," Paper prepared for the Rural Sociological Society, Boston, 1968.

_____, and Watkins, George A., "Patterns of Water Use by South Florida Households," A paper presented to the American Water Works Association Conference, Hollywood, Florida, November, 1968.

Lei, Lillian Y. S., "Sociological Determinants of Water Use in Selected Southern Florida Households," Masters Thesis, University of Florida, Gainesville, 1968.

Linaweaver, F. Pierce, Jr., Geyer, John C., and Wolff, Jerome B., "A Study of Residential Water Uses: A Report Prepared for the Technical Studies Program of the Federal Housing Administration," Department of Housing and Urban Development (February, 1967).

_____, "Progress Report on the Residential Water Use Research Project," Journal of the American Water Works Association, Vol. 56 (July, 1964), pp. 1121-1128.

_____, "Residential Water Use, Research Project Report II, Phase 2, Department of Sanitary Engineering and Water Resources," Baltimore, Maryland, Johns Hopkins University, June, 1965.

Lloyd, T., "Water Resources Policy for Canada," Canada Geographical Journal, Vol. 73 (July, 1966), pp. 2-17.

Lumbard, Emily C., "Theses on Engineering, Economic, Social and Legal Aspects of Water," Water Resources Center Archives, University of California, Berkeley, Report No. 2 (October, 1958).

Lyle, C. V., "Economic Problems of Water Pollution Control in the Southeast," Association of Southern Agricultural Workers, Louisville, Kentucky, 1968.

Mendenhall, William, Introduction to Statistics. Belmont, California. Wadsworth Publishing Company, 1964.

Metz, A. S., "Analysis of Some Determinants of Attitude Toward Fluoridation," Social Forces, Vol. 44 (June, 1966), pp. 477-484.

Milliman, J. W., "Economic Consideration for the Design of Water Institutions," Public Administration Review, Vol. 25 (December, 1965), pp. 284-289.

_____, "Price Policy and Land Value Taxation for Urban Water Supplies," American Journal of Economics, Vol. 25 (October, 1966), pp. 379-404.

Monroe, John, and Finkner, A. L., Hand Book of Area Sampling. Chilton Company Book Division, Philadelphia, 1959.

Morgan, Robert J., "The Small Watershed Program," Law and Contemporary Social Problems, Vol. 22 (September, 1957), pp. 405-432.

Moss, Frank E., The Water Crisis, F. A. Praeger, New York, 1967.

Mueller, J. E., "Politics of Fluoridation in Seven California Cities," Western Political Quarterly, Vol. 19 (March, 1966), pp. 54-67.

_____, Schuessler, Karl F., Statistical Reasoning in Sociology, Houghton Mifflin Company, Boston, 1961.

Murphy, Gardner, and Rensis, Likert, "Public Opinion and the Individual," Harper & Brothers Publishers, New York, 1938.

Nikolaieff, George A. (ed.), The Water Crisis, New York, W. W. Wilson, Co., 1967.

North, Ronald L., "Changes in Land Values Associated with Urbanization and Reservoir Development," Association of Southern Agricultural Workers, Louisville, Kentucky, 1968.

"Obtaining Census Statistics for a Selected Group of Persons," Data Access Descriptions, U.S. Department of Commerce, Bureau of the Census (March, 1967), 4 p.

Photiades, John D., Attitudes Toward the Water Resources Development Program in Central South Dakota, Preliminary Report No. 1 in Rural Sociology, South Dakota State College, Brookings, 1960.

Porges, Ralph, "Factors Influencing Per Capita Water Consumption," Water and Sewage Works, Vol. 104 (May, 1957), pp. 451-455.

Price, R. C., "Some Decisions in the State's Development of California's Water During the 1960's," Public Administration Review, Vol. 25 (December, 1965), pp. 290-296.

Proceedings of the Workshop for Sociological Aspects of Water Resources Research, Held at Utah State University, Logan, Utah, April 18-19, 1968, Report No. 1, Social Science Institute Series, Logan, 1968.

Quraishi, G. M., "Domestic Water Use in Sweden," Journal of the American Water Works Association, Vol. 55 (April, 1963), pp. 451-455.

Reid, Paul M., "Problems and Techniques in Population Forecasting," Journal of the American Water Works Association, Vol. 50 (May, 1958), pp. 655-660.

Remmers, Hermann H., Introduction to Opinion and Attitude Measurement, Harper, New York, 1954.

Renne, Roland R., "Social Problems in Water Resources Research," Unpublished paper. San Francisco, Rural Sociological Society Meeting, 1967.

"Report on Seven Cities Water Project, Yadkin River," Pratt and Davis, William C. Olsen and Association, Hazen and Sawyer, Engineers, (1957).

Schmid, A. A., "Nonmarket Values and Efficiency of Public Investments in Water Resources," American Economic Review: Papers and Proceedings, Vol. 57 (May, 1967), pp. 158-168.

Schram, Wilber (ed.), Studies of Innovation and Communication to the Public, Stanford University Institute for Communication Research, Palo Alto, California, 1962.

Scott, Guy R., "High Rates of Water Use," Journal of the American Water Works Association, Vol. 50 (March, 1958), pp. 369-374.

Seidel, Harris F., and Cleasky, John L., "A Statistical Analysis of Water Data for 1960," Journal of American Water Works Association, Vol. 58, No. 12 (December, 1966), pp. 1507-1527.

Siegel, Sidney, Nonparametric Statistics for the Behavioral Sciences, McGraw-Hill, New York, 1956.

Singh, R. N., and Wilkinson, Kenneth P., "Social Science Studies of Water Resources Problems: Review of Literature and Annotated Bibliography," Water Resources Research Institute, Mississippi State University, 1968.

"Six-Year Progress Report," Temporary State Committee on Water Resources Planning, Legislature, New York (1965).

Smith, Stephen C., "Population Demand for Land and Water Resources of the Hinterland," Land and Water Use, American Association for the Advance of Science, pp. 25-43.

Snedocer, George W., Statistical Methods, Ames, Iowa, The Iowa State University Press, 1956.

Spaulding, Irving A., Household Water Use and Social Status, Agriculture Experiment Station, University of Rhode Island, Bulletin 392 (December, 1967), Kingston.

Stern, Carlos, "Recreation in the Missouri River Basin," Water Resources 2545 (May, 1967), (Mimeograph).

"Symposium: Water Resources Research," Natural Resources Journal, Vol. 5 (October, 1965), pp. 218-297.

Taves, M., Hathaway, William, and Bultena, G., Canoe Country Vacationers, Misc. Report No. 39, Minnesota Agricultural Experiment Station, Bulletin 851 (1960).

The Big Water Fight, Brattleboro: The Stephen Greeme Press, The League of Women Voters Education Fund, 1966.

Warriner, Charles K., "Public Opinion and Collective Action: Formation of a Watershed District," Administrative Science Quarterly, Vol. 6 (December, 1961), pp. 333-359.

_____, "Water Problems and Social Processes: A Study of Social Action in the Delaware Watershed, Kansas," Laurence, Kansas, March, 1957, (Mimeograph).

"Water Consumption," Public Works, Vol. 92 (August, 1961), pp. 83-84.

"Water, Present and Future Estimate of Water Consumption," Public Works, Vol. 87 (December, 1956), pp. 73-77.

Watkins, George A., "Scaling of Attitudes Toward Water Conservation," Master's Thesis, University of Florida, Gainesville, 1968.

Wennergren, E. Boyd, "Value of Water for Boating Recreation," Agricultural Experiment Station, Utah State University, Bulletin No. 453 (June, 1965), Logan, Utah, p. 27.

Wilkinson, Kenneth P., Local Action and Acceptance of Watershed Development, Social Science Research Center, Mississippi State University, July, 1966. Bibliography.

_____, "Watershed Development in the Community Field," Rural Sociological Society, Boston, Massachusetts, 1968.

Wolff, Jerome B., "Peak Demands in Residential Areas," Journal of the American Water Works Association, Vol. 53 (October, 1961), pp. 1251-1260.

Wolman, Abel, "Effects of Population Changes on Environmental Health Problems and Programs," Journal of the American Water Works Association, Vol. 57 (June, 1965), pp. 811-818.

_____, "The Metabolism of Cities," Scientific American, Vol. 213, No. 3 (September, 1965), pp. 178-190.

Wright, James, The Coming Water Famine, Coward-McCann, Inc., 1966.

BIOGRAPHICAL SKETCH OF AUTHOR

Dr. George A. Watkins is an assistant professor of sociology at the University of Tulsa, Tulsa, Oklahoma. Before his current status of Graduate Advisor in the Department of Sociology, Dr. Watkins earned his B.A., M.A. and Ph.D. degrees from the University of Florida, Gainesville, Florida. While at the University of Florida, Dr. Watkins served as Assistant to the Principal Investigator for OWRR Project A-010-FLA. He has read papers on water conservation at the American Water Works Association meeting, Southern Sociological Society meeting, and at the Southwestern Sociological Association meeting. He has a paper to be published in the LSU Journal of Sociology on water conservation. In the Fall of 1972, Dr. Watkins will become the Academic Coordinator for Environmental Studies at Wright State University in Dayton, Ohio.

Dr. Watkins is currently a member of the American Association for the Advancement of Science, American Association of University Professors, American Sociological Association, Southwestern Sociological Association, National Council on Family Relations, Population Association of America, and the Southern Sociological Society. He is also currently the National Social Sciences Coordinator for Population Phase I, a member of the Phi Kappa Phi honorary, the past president of Alpha Kappa Delta, Beta Chapter, and past president of Gamma Beta Phi, Beta Chapter.