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NON-AGRICULTURAL WATER USE
IN THE
UPPER EAST COAST PLANNING AREA

by

Carl Woehlcke and Donald R. Loving
Resource Planning Department
South Florida Water Management District
West Palm Beach, Florida 33402

TABLE OF CONTENTS

	<u>PAGE</u>
INTRODUCTION	1
METHODOLOGY	1
Identification of Water Users	2
Collection of Water Use Data	4
Estimating Populations Served	7
Estimating Water Use by Residential Self-Supplied Populations and Other Small Users	8
RESULTS	10
Identification of Water Users	10
Collection of Water Use Data	10
Estimating Populations Served	11
Residential Self-Supplied Estimates	13
Final Estimates	14

LIST OF TABLES

<u>NO.</u>		<u>PAGE</u>
1.	Summary of Data Collection Results for Water Systems in the Upper East Coast Planning Area - 1978	12
2.	Adjustment Ratios for DER Population Estimates	13
3.	1978 Martin County Non-Agricultural Water Demands	15
4.	1978 St. Lucie County Non-Agricultural Water Demands . .	16
5.	1978 Okeechobee County Non-Agricultural Water Demands . .	16

LIST OF FIGURES

<u>NO.</u>		<u>PAGE</u>
1.	Sample Data Collection Form	5

INTRODUCTION

This paper discusses the methodology used to develop non-agricultural water use estimates for the Upper East Coast Planning Area and presents the results of that investigation. This attempt at developing a water use data base was completed so that relevant background information would be readily available for the extensive water use planning efforts which the District will undertake in that area in fiscal year 1979-1980. As such, it represents part of a much larger effort at establishing a water use data base for the whole area of the South Florida Water Management District (SFWMD).

The Upper East Coast Planning Area encompasses all of St. Lucie County, all of Martin County except a very small area along the coast at the south end and the eastern part of Okeechobee County.

The non-agricultural water uses covered in this paper are meant to include all use of fresh or brackish water. These uses include residential, commercial, industrial, governmental and urban green space; however, measures of use by golf courses and industrial use by FPL are not presented.

This paper is divided into two principal sections, a discussion of the methodology and a presentation of the results.

METHODOLOGY

This section discusses the methodology and procedures used to estimate the non-agricultural water uses and populations served in the Upper East Coast Planning Area. Except in a few specially noted cases, this methodological description serves to explain the efforts being undertaken in other areas of the District as well.

The general strategy is to estimate water use for water utilities and for other large users, who can be identified, using reports they submit to regulatory agencies or by direct contact with the users. Thus, great care

is taken to assure that good data are collected for these users. In addition, populations served are estimated for these users and subtracted from total county populations to obtain an estimate of residual population. Water use for the residual population and by smaller identified water users are then estimated based on water use factors developed by contacts with a selected subsample of such water users and from other similar sources.

The overall estimation procedure may be divided into the following steps 1) identification of users, 2) obtaining data for major users, 3) estimating populations served by major users, and 4) estimating use by residential self-supplied populations and other small users. Each of these is discussed in a subsection below.

Identification of Water Users

Water users were identified by reference to previous studies of water use in south Florida¹, but principally from lists of users from the two principal water regulatory agencies, the South Florida Water Management District and the Florida Department of Environmental Regulation (DER).

The South Florida Water Management District regulates the withdrawal of surface and ground water through a permitting process. Users of more than 100,000 gallons per day are required to obtain an individual water use permit. Users of 10,000 gpd on an average day and 20,000 gpd on a maximum day are also required to obtain an individual permit in special areas of the District, in particular, the area north of Indian St. on the Stuart peninsula (Martin County). Under a recent rule, users of less than 100,000 gpd who are not in special areas, (such as the Stuart peninsula, and who are not members of certain exempt categories) are required to

¹These included a study by the U. S. Geological Survey, Public Water Supplies of Selected Municipalities in Florida, 1975 and unpublished studies of the South Florida Water Management District.

obtain a general water use permit which amounts to registration as a water user. Users who existed at the time of rule implementation (January, 1979) do not have to file notice of water usage with the District; rather, a general permit is construed to be in effect for these users. New users who began withdrawing water after the date of rule implementation must file a notice with the District. This notice contains an estimation of water use. Thus, the permitting process provides two lists of water users - those who had obtained individual permits and those who had obtained general permits. However, only the individual permittees must submit pumpage reports.

Individual water use permits are divided according to purpose of use into the following 14 categories -- domestic, essential service, public water supply, livestock, agricultural, industrial, commercial, mining, power, recreational, residential, landscaping, urban, and other. The water users in all categories except livestock and agriculture were used in developing water use estimates in this paper. Some of the permit categories did not identify users in the Upper East Coast Planning Area. For example, no essential services were permitted in this area.

The present available list of holders of general water use permits was also reviewed; but, because of the newness of the program and the fact that it applies only to users who came into existence subsequent to the rule implementation, this provided only a few users to add to the list.

The second major list developed from regulatory files was from the Florida Department of Environmental Regulation. They regulate the water quality aspects of potable water supplies. The list of water users obtained from the DER is divided into two groups, community systems and non-community systems. Community systems represent those users who provide the basic household requirements of a significant permanent resident population (25 year-round residents or 15 connections serving year-round residents).

Non-community systems include all other public providers of potable water such as restaurants, hotels, etc.

Inspection of the two major lists of water users (from the DER and the SFWMD) revealed that the DER and the SFWMD lists complemented each other in that the DER list included the small community and non-community systems which are not regulated by the SFWMD while the SFWMD list included the non-potable water systems which are not regulated by DER. When combined it was felt that the two lists provided a reasonably complete inventory of water users. The next step was therefore the collection of available water use data.

Collection of Water Use Data

The basic strategy used in the collection of water use data was to obtain the information from report forms sent to the regulatory agencies and, for larger users, to obtain the data by direct contact whenever the basic data were incomplete.

In order to standardize the data collection effort as a means of assuring all relevant data were collected and as a means of insuring quality control, specific forms were developed for recording data obtained from the files of the regulatory agencies. A sample of the form used is attached as Figure 1. On the form, specific data elements of interest are recorded and space is left for additional entries which may be available. The specific data elements collected, whenever available, include raw water and treated water. These two elements are significant in determining the differences between utility requirements and customer demands and are especially significant in the case of desalt plants. The number of connections is a statistic useful in determining the population served. The maximum and minimum pumpages are useful in determining variability in demands.

FIGURE 1. Sample Data Collection Form
MONTHLY UTILITY PUMPAGE REPORTS

COUNTY _____ NAME OF UTILITY _____ SOURCE OF REPORTS _____

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Type of Information
													Water Leaving Plant x 1000 gal
													Raw Water x 1000 gal.
													Total Number of Connections
													Maximum Daily Pumpage
													Minimum Daily Pumpage
													Average Daily Pumpage
													Water Leaving Plant x 1000 gal
													Raw Water x 1000 gal.
													Total Number of Connections
													Maximum Daily Pumpage
													Minimum Daily Pumpage
													Average Daily Pumpage
													Water Leaving Plant x 1000 gal
													Raw Water x 1000 gal.
													Total Number of Connections
													Maximum Daily Pumpage
													Minimum Daily Pumpage
													Average Daily Pumpage

Available data were collected from files of the Resource Control Department. These data covered only the water uses regulated under the permit system of the District as discussed above. This list was fairly small because in the past only large water uses were permitted and because not all uses had been permitted by 1978 which was the time period used in developing a base year estimate of water consumption for the planning area. Also, the general permit process has been in effect for a short period of time and few new uses have been permitted. Some of the users had not been complying with the permit special conditions which required submission of pumpage data.

Data were also collected from the files of DER. In the case of the Upper East Coast Planning Area, the DER office containing water use records is located in Ft. Pierce. DER files contained a larger number of water users than District files because of the older and more established program covering both large and small users. Generally speaking, DER records covered more users, because of the longer history and a greater breadth of DER's water quality program as opposed to the District's water quantity program. As in the District's case, some of the water users had not been submitting pumpage data.

Once these data were collected, the users were divided into the categories of large utilities, small community systems with good data, small community systems with poor data and small community systems with no data reported. The distinction between large and small systems reflects a judgment as to which utilities were large enough relative to county size to warrant more detailed review of data to assure its completeness and accuracy. However, in the Upper East Coast Planning Area all large systems had good data so no followup action was required for these, or for the small systems with good data. Annual totals were estimated from the partial data of the small systems with poor data.

Relatively few of the non-community systems report their flows, but data were collected on those that do. Estimates for the other systems were formulated using procedures discussed in the section on the estimation of use by residual populations and other small users.

Estimating Populations Served

The next step was to estimate the populations served by those water systems for which water quantity data were collected. These estimates not only provide per capita water consumptions which are interesting in themselves, but provide a means of determining the populations for whom water use has not been estimated when the covered populations are subtracted from total county populations. The estimation of the water consumption for the residual populations is discussed in the next subsection of this paper. The residual population is expected to reflect those consumers who are not served by any community water system, but who provide for their own water needs (both domestic and irrigation) through an individual well or wells. Because no source could be found giving a count of residences and persons not on public water systems (except for dated estimates in the 1970 Census of Population), this residual method was the only one available to estimate the population served by their own individual water systems. It should be noted that this procedure does not provide any estimate of the number of users who are served by community system water for their domestic needs but who have a separate irrigation well or surface water pump which is needed for outdoor use.

In order to be able to apply the residual population estimates, it was necessary that the water system populations and the total county populations be estimated on a consistent basis. The concept chosen for population was that of permanent resident population. This is in contrast to seasonal

population estimates which are used in planning capacities of certain government services or equivalent residential populations which are used by some utilities, to translate commercial and industrial users into equivalent population. The chief advantage of the permanent resident population in this use is that it is carefully defined (used by the U. S. Bureau of Census) and generally available in all localities. Estimates of seasonal and equivalent residential populations are available only in scattered areas and standard definitions are not used.

Estimated populations were derived from alternative estimates available from several sources. These sources included SFWMD permit files, estimates assembled by DER in a special project, county and local planning departments and agencies, and the water utilities and community water systems themselves. These estimates were cross-checked with population estimates derived in earlier studies by the USGS and the SFWMD, and with municipal populations estimated by the University of Florida and the number of connections reported by the utilities.

Care was taken in each case to see that the estimates reflected the permanent resident concept as could best be determined. For the larger utilities, primary reliance was placed on permit records and population estimates by the governmental planning agencies. For the smaller community systems, more reliance was placed on estimates from the DER special study and phone calls to selected systems.

Estimating Water Use by Residential Self-Supplied Populations and Other Small Users

This section describes the procedures used to estimate the water use (and population where applicable) of populations not served by community systems, populations served by small community systems not reporting water

consumed (to DER or SFWMD), and non-community systems who are identified users but for which no flow data is available.

Water use of populations not served by community systems was estimated using information obtained from companies which provide water softening service to residents of the Upper East Coast Planning Area. These companies have rule of thumb average water consumption use patterns for residences which were used to estimate indoor use. Outdoor use was estimated using the quantity of water required to irrigate a one quarter acre lot using the climate and soil conditions for the Upper East Coast Planning Area. Together, the estimated indoor and outdoor use resulted in per capita water use close to the averages of water utilities in the area, which provides some cross-check on the reasonableness of the estimate.

Water use, for the community systems which did not report flow data, was estimated using the following procedure. Population estimates were available for these systems from a special interview study conducted by DER. However, phone interviews with selected community systems (both those reporting and those not reporting flow data) indicated that these estimates were generally biased upward when compared with permanent resident population. A check with DER indicated that the study had been conducted without adherence to any specific population concept and no documentation on the methods was available. Based on the sample of community systems called, percentage adjustments by housing type (mobile home, single-family, multi-family) were made to the DER estimated populations. The per capita consumption estimates by housing type for small community systems reporting flows was then used to estimate the flows of the non-reporting systems.

RESULTS

This section presents the results of an application of the methodology described in the previous section to the South Florida Water Management District's Upper East Coast Planning Area. It also presents and discusses the actual water use data as developed for 1978.

Identification of Water Users

Inventory lists of non-agricultural water users were obtained from permitting records of the Resource Control Department of the South Florida Water Management District (SFWMD) and the Florida Department of Environmental Regulation (DER) in Ft. Pierce. The SFWMD files revealed 17 public water supplies as well as 7 industrial self-supplied permittees and 18 golf course/recreation users. The DER files showed 81 community water systems and 177 non-community systems. All public water supplies and industrial users included in the SFWMD list were also included in the DER list. The DER does not cover (non-potable) water use by golf courses. These lists were then used as a guide in searching the available files of operating reports submitted to these agencies.

Collection of Water Use Data

Data from operating reports submitted to these two agencies by the permittees were assembled onto forms prepared for that purpose (see Figure 1). All available data back to 1976 were collected, although the 1978 data were the major source used in developing a base year estimate of water consumption for the planning area. Data collected for the other years provided useful cross checks of the 1978 data, were used to help fill in missing data, and will become part of a larger data base being assembled to assist the SFWMD planning efforts. Results of the collection efforts were mixed. Some utilities' reports were complete, while some were partial and

others failed to submit any reports at all. The reports were then assembled according to size of utilities, type of area served, and the completeness of reports as shown in Table 1.

An examination of Table 1 indicates some success, especially with the larger utilities where complete data were obtained, but also some significant data gaps. To estimate the coverage of the systems for which data had been collected and for those systems where data were lacking, it was necessary to estimate populations for the systems. This is covered in the next subsection.

Estimating Population Served

Estimates of permanent resident populations served by the community systems were formulated and compared to total county populations to determine the coverage of the water systems for which adequate data had been obtained.

The DER had completed a study of populations served by community water systems that covered all their listed systems; however, no documentation was available as to the methods used or the population concept (permanent resident, average, peak period) which the estimates reflected. Furthermore, a review of population per connection and water use per capita ratios implied by the DER populations showed a significant number which appeared unreasonable. As a result, further review of populations was considered necessary. This review was carried out by use of a number of different sources including permit applications, county planning agencies, and the water systems themselves.

The water systems contacted were selected by focussing on the larger systems and those for which inconsistent estimates had been obtained. When direct contact was made, not only were the populations checked; but information was obtained about the number of units within the development occupied during winter and summer, the number of persons per occupied

TABLE 1: Summary of Data Collection Results
for Water Systems in the Upper East
Coast Planning Area - 1978

<u>Community Systems</u>	<u>Martin County</u>	<u>St. Lucie County</u>	<u>Okeechobee County</u>
Major Utilities ¹	5	3	0
Small Utilities (Good Data) ²			
Single Family	3	1	0
Multi-Family	4	0	0
Mobile Homes	9	3	0
(Partial Data) ³			
Single Family	0	0	0
Multi-Family	5	0	0
Mobile Homes	2	5	0
(No Data)			
Single Family	5	1	0
Multi-Family	4	1	0
Mobile Homes	17	8	2
Other ⁴			3
<u>Non-Community Systems</u>			
Reporting	11	7	0
Not Reporting	85	72	2
<u>Golf Courses</u>			
Reporting	6	0	0
Not Reporting	9	3	0
Total Listed Systems	165	104	7

¹ Complete data (12 months) were obtained for all major utilities. Major utilities for the Upper East Coast Planning Area include those serving a population of more than 1,000 permanent residents.

² Data for 8 months or more were obtained.

³ Data for less than 8 months were obtained.

⁴ Housing for dairy employees.

unit, the age/working characteristics of residents, and the use of system water for lawn irrigation.

Generally, the DER estimates were found to have overstated permanent resident population, by indicating a peak seasonal population. Data from the systems contacted were assembled and population adjustment ratios were formulated. These adjustment ratios were then applied to the DER populations for those systems not directly contacted. These data are presented in Table 2. The adjustment ratios were used only for those utilities whose population estimates were not verified by any other means.

TABLE 2
Adjustment Ratios for DER
Population Estimates

TYPE OF SYSTEM	NUMBER CONTACTED	SFWM D ESTIMATES	DER ESTIMATES	RATIO OF SFWM D TO DER ESTIMATES
Single-family	1	175	210	.833
Multi-family	2	365	891	.409
Mobile Home	15	3,135	4,938	.635

Residential Self-Supplied Estimates

The only other information needed before the final water use estimates could be assembled were estimates of per capita consumption for the residential self-supplied users. These estimates were formulated largely from phone calls to companies offering water softening services in the Upper East Coast Planning Area. In all, four companies provided information. Depending on the county, they indicated inside water use from 71.4 to 75 gallons per person per day. Additional water use in the amount of 35.7 gallons per day was estimated for each dishwasher and washing machine. Estimated supple-

mental outdoor use per quarter acre lot was formulated at 250 gallons per day. The number of persons per residence used for each county was based on data reflecting the local experience of each area. For St. Lucie and Martin counties, it was assumed that each residence was on a one quarter acre lot, while in Okeechobee County no outdoor water use was assumed because of indications that in rural areas lawn watering is sporadic in nature.

The final estimates of per capita water consumption for residential self-supplied are 167.3 gallons per day for Martin and St. Lucie counties, and 85 gallons per day for Okeechobee County.

Final Estimates

The final estimates of non-agricultural water demands are presented in Tables 3, 4, and 5. The procedures for the final assembly of the estimates are discussed below.

The first component is the major utilities. There are five for Martin County, three for St. Lucie County and none for that portion of Okeechobee County within the Upper East Coast Planning Area. As was indicated earlier, firm data were obtained for all these utilities. Together, they accounted for 48.3 percent of total identified non-agricultural water use in Martin County and 58.3 percent in St. Lucie County.

The next component is the small utilities. These estimates are sums of the best data available. Estimates obtained from the utilities either by direct contact or through report forms submitted to regulatory agencies provided the highest quality data. When data were available only for some months, annual totals were formulated based upon the available data. When direct population data were not available, the DER estimates were adjusted using the ratios of best estimate to DER estimate, as presented in Table 2.

TABLE 3
 1978 Martin County
 Non-Agricultural Water Demands

	Demand (000 gallons per day)	Population Served
Major Utilities:		
Hobe Sound Water Company	956.2	2,039
Hydratech Inc.	216.3	1,288
Indian Town Company	374.1	3,598
Intracoastal Utilities	223.2	2,555
City of Stuart/Southern Gulf Utilities	<u>2,695.8</u>	<u>12,254</u>
Sub-Total	4,465.6	21,434
Small Utilities	1,163.0	8,558
Residential Self-Supplied	3,513.8	21,002
Commerical/Industrial Self-Supplied	103.7	
 TOTAL	 9,246.1	 50,995 ^a

^a This is the estimated population for the portion of Martin County in the Upper East Coast Planning Area. The comparable estimated total population for the county was 53,895.

TABLE 4
 1978 St. Lucie County
 Non-Agricultural Water Demands

	Demand (000 gallons per day)	Population Served
Major Utilities:		
Ft. Pierce Utilities Authority	5,688.1	34,761
General Development Corp. (Port St. Lucie)	1,503.0	13,000
Spanish Lakes Mobile Home Park	<u>217.5</u>	<u>2,500</u>
Sub-Total	7,408.6	50,261
Small Utilities	190.8	1,711
Residential Self-Supplied	4,266.9	25,505
Commercial/Industrial Self-Supplied	837.0	
 TOTAL	 12,703.3	 77,477

TABLE 5
 1978 Okeechobee County
 Non-Agricultural Water Demands

	Demand (000 gallons per day)	Population Served
Residential Self-Supplied	<u>460.0</u>	<u>5,420</u>
 TOTAL	 460.0	 5,420

Finally, when no flow data were available; use estimates were developed using the best estimated populations and per capita water consumptions of the small utilities serving the same types of developments - single family, multi-family, and mobile home. The small utilities account for 12.6 percent of the total identified water consumption in Martin County and 1.5 percent in St. Lucie County.

Residential self-supplied water use was estimated using residual populations from the right hand columns of Tables 3, 4, and 5 and the per capita estimates discussed in the previous subsection. Residential self-supplied water accounts for 38.0 percent of the total identified non-agricultural water use in Martin County, 33.6 percent in St. Lucie County, and 100 percent in Okeechobee County.

Commercial/industrial self-supplied is the final category. The estimates which are presented represent only the firm estimates of water use which could be obtained. There are 177 non-community water systems in this category, of which only 18 systems are reporting water use. The reported water use does not include water withdrawals to maintain the level of the Florida Power & Light Cooling Lake in western Martin County but does include water use reported to DER for potable water supplied to the power plant. Firm water use estimates were also not available at this time for Florida Steel Corporation, another potential major water user. Additional data collection for those non-community systems not reporting will be necessary to evaluate total water use by these types of systems.

This report also does not include urban green space use by golf courses or the Ft. Pierce - St. Lucie County Recreation Area. Adequate information about these water users is not available at this time and will require further investigation.