

WATER QUALITY FROM PRIVATE WELLS IN GEORGIA

Anthony W. Tyson¹ and Robert A. Isaac²

AUTHORS: ¹Extension Engineer, The University of Georgia Cooperative Extension Service, Landrum, Box 8112, Georgia Southern University, Statesboro, Georgia 30460 and ²Professor, Agricultural Services Laboratories, The University of Georgia Cooperative Extension Service, Athens, Georgia 30605.

REFERENCE: *Proceedings of the 1991 Georgia Water Resources Conference*, held March 19 and 20, 1991 at The University of Georgia, Kathryn J. Hatcher, Editor, Institute of Natural Resources, The University of Georgia, Athens, Georgia.

INTRODUCTION

In the early 1980s the University of Georgia initiated a water testing program for the use of individual clientele in Georgia. This paper presents a summary of the water test results from 896 private wells throughout the state. Even though the water samples were not randomly collected, the information reveals much about the types of contamination problems commonly encountered and the regional variations which occur. The information contained herein reinforces the need for educational efforts to encourage private well owners to have their water tested to ensure a safe supply of drinking water. It also has implications for the water treatment industry, currently one of the fastest growing businesses in the United States.

The well problems which show up most frequently are naturally occurring minerals such as iron and manganese. Fortunately, the majority of these are simply nuisance problems and are not considered health-threatening. On the other hand, some problems which are potential health threats have been identified. Examples include nitrates and lead, both of which usually result from man's activities.

The Water Testing Program:

A routine water analysis as performed by the UGA Soil Test Lab includes 16 mineral elements plus pH and calculated hardness. Nitrate-nitrogen may also be included as an option. For the past two years all water samples submitted have been tested for nitrate-nitrogen so that the information could be included in the data base. Table 1 lists the parameters which are included in a routine water analysis along with the EPA primary or secondary standard on those elements for which a standard has been established.

Sample bottles are available in the county extension offices. Clientele usually pick up the bottles in the county office where they are given instructions on how to collect the sample. The sample is then collected by the individual and returned to the county office to be sent to Athens. A computer printout is sent to the county with the results of

the test. If any elements exceed EPA's maximum contaminant levels, the printout will include comments listing possible causes and effects as well as options for treatment.

TABLE 1. Parameters Included in Standard Water Analysis

Parameter	EPA Primary Maximum Contaminant Level	EPA Sec. Maximum Contaminant Level
Phosphorous (P)	NS*	NS
Potassium (K)	NS	NS
Calcium (Ca)	NS	NS
Magnesium (Mg)	NS	NS
Manganese (Mn)		0.05 mg/l
Iron (Fe)	0.3 mg/l	
Aluminum (Al)	NS	NS
Boron (B)	NS	NS
Copper (Cu)		1.0 mg/l
Zinc (Zn)		5.0 mg/l
Lead (Pb)	.05 mg/l	
Sodium (Na)	NS	NS
Cadmium (Cd)	.01 mg/l	
Nickel (Ni)	NS	NS
Chromium (Cr)	.05 mg/l	
Molybdenum (Mo)	NS	NS
Nitrate-Nitrogen (N-NO ₃)	10 mg/l	
pH		6.5 - 8.0
Hardness	NS	

*NS - Indicates that EPA has not set a drinking water standard for this parameter.

In 1990, information such as well depth and well size was included on the water analysis submission form so that this information could be stored in the data base. The results presented in this paper were all collected in 1990 and include only those water samples where well depth was specified. This was done in order to better differentiate which problems tend to occur in shallow wells as opposed to deeper ones. The UGA soil Test Lab currently analyzes about 3000 water samples per year.

The results have been compiled and divided into six major land resource areas of Georgia (Fig. 1). The actual land use areas don't exactly follow county lines; therefore,

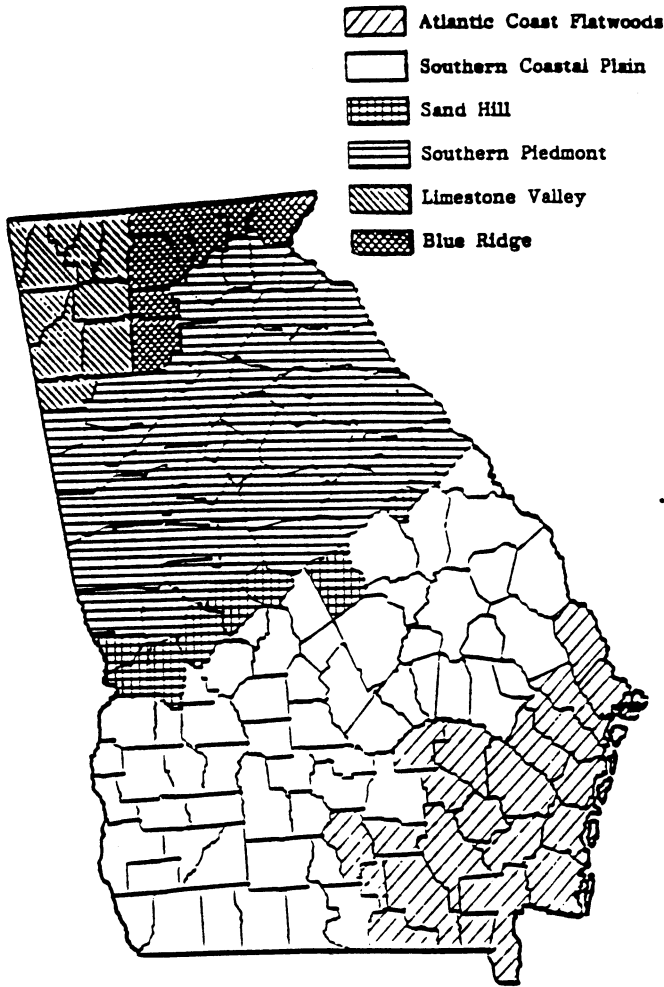


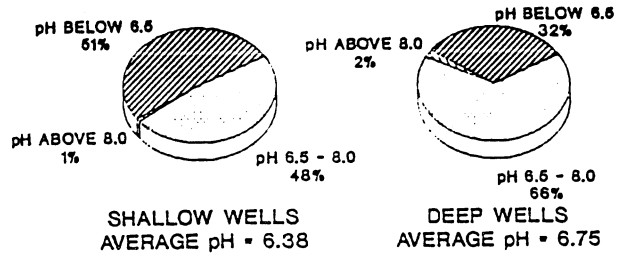
Figure 1. Major Land Resource Areas of Georgia

the counties were placed in the land use area which comprised the largest portion of the county. The majority of samples were submitted from the Southern Piedmont (640 out of 896). The number submitted from other areas ranges from 14 (Atlantic Coast Flatwoods) to 125 (Southern Coastal Plain).

Water tests for coliform bacteria are usually handled by the County Health Department and are not included in this study. The University of Georgia Agricultural Services Laboratories also have the capability to test for a variety of chemicals including volatile organics and pesticides, but these are not routinely performed unless a problem of that nature is suspected.

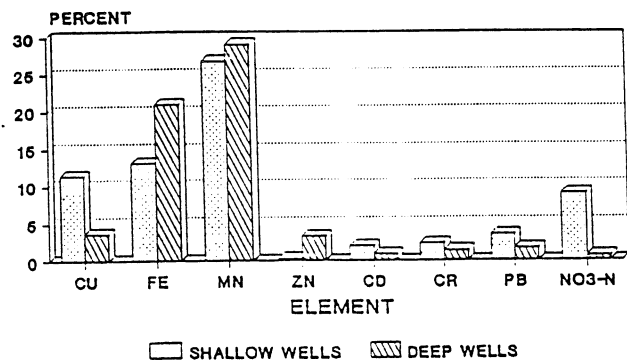
RESULTS

Tables 2 through 7 are a summary of results for iron, manganese, calculated hardness, nitrate-nitrogen, copper and lead, respectively. Table 8 indicates the average well depths for both shallow and deep wells and the percentage of samples which exceeded both EPA's primary and



FROM UGA WATER TEST RESULTS

Figure 2. pH of Wells in Georgia



FROM UGA WATER TEST RESULTS
1990 DATA - 698 SAMPLES

Figure 3. Percent of Wells Exceeding EPA's Standards for Certain Parameters

secondary drinking water standards. Shallow wells are those wells which are less than 100 feet deep, the majority of which withdraw water from the unconfined water table aquifer. Anything deeper than 100 feet is considered a deep well.

Table 9 and Figure 2 indicate pH values divided into three categories: less than 6.5, above 8.0 and from 6.5 to 8.0, which is generally considered a desirable range.

Figure 3 presents a statewide summary of the percentage of wells exceeding EPA's drinking water standard for all elements included in the test for which a standard exists.

CONCLUSIONS

The reader should keep in mind when examining this data that the samples were not randomly selected, and therefore one must be cautious in placing statistical significance on the results. There were very few samples from some areas, which would also limit the conclusions which can be drawn. Finally, it can probably be assumed that someone who is experiencing problems will be more likely to have his water tested; therefore, the percentages

biggest problem they cause is staining and possibly a bitter taste. They do not pose a threat to health.

(2) Copper and lead are fairly significant problems. These problems generally occur in areas with low-pH water and can usually be traced to corrosion of piping and other plumbing components in the home.

(3) Nitrate is the most prevalent contaminant which poses a threat to human health. High nitrate levels occur almost exclusively in shallow wells, which indicates that it is most likely leaching from the surface. Common sources include septic tanks, animal wastes, and agricultural fertilizers.

(4) Hard water is primarily a problem in deep wells which draw water from a limestone aquifer. Problem areas include the Limestone Valley and the Southern Coastal Plain areas of the state.

The information collected thus far indicates that the vast majority of private wells in the state yield water that is safe to drink, based on parameters measured. Lead and nitrates are the primary concerns (including bacteria) from a health standpoint. The majority of other problems are simply nuisance contaminants, most of which are naturally occurring and can be treated if the homeowner so desires.

TABLE 8. Summary of Samples Indicating Percentage above EPA's Primary and Secondary Drinking Water Standards

Province	Well Type	**		#	
		Average Well Depth (Ft.)	% Exceeding Primary Standard	% Exceeding Secondary Standard	No. of Samples
Atlantic Coast	Shallow	No Data	No Data	No Data	0
Flatwoods	Deep	416	7%	42%	14
Blue Ridge	Shallow	67	0	37.5%	16
	Deep	257	0	24%	49
Limestone Valley	Shallow	68	21%	50%	14
	Deep	198	0	25%	16
Sand Hills	Shallow	52	17%	0	6
	Deep	190	0	44%	16
Southern Coastal Plain	Shallow	45	50%	59%	44
	Deep	295	1%	32%	81
Southern Piedmont	Shallow	45	8%	43%	263
	Deep	297	4%	45%	377
STATE	Shallow	47	14%	44%	343
TOTALS	Deep	290	3%	40%	553

* - Shallow wells classified as those less than 100 ft. deep. Deep wells are those greater than 100 ft. deep.

** - EPA primary standards included in test are lead, cadmium, chromium, and nitrate-nitrogen.

- EPA secondary standards include iron, manganese, copper, and zinc.