by
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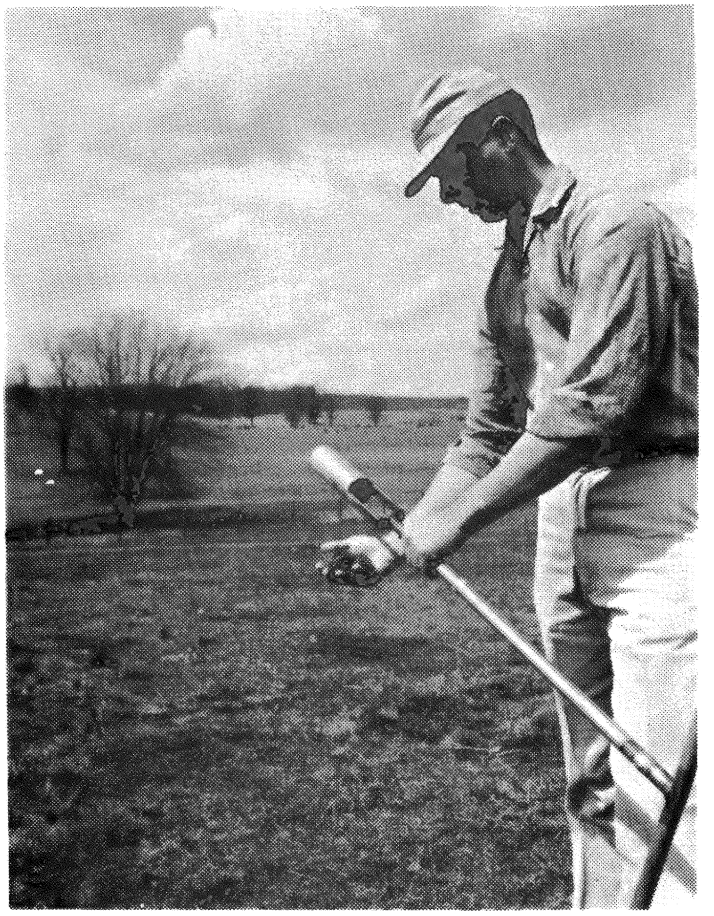

Chemical Properties of Washington County Soils

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CHEMICAL PROPERTIES OF

WASHINGTON COUNTY SOILS*

Introduction

A soil survey has been completed in Washington County. This survey was a cooperative effort between the Virginia Agricultural Experiment Station, the Bureau of Plant Industry, Soils and Agricultural Engineering, U.S.D.A.; and the Tennessee Valley Authority.

The soil survey map shows the extent and location of the various kinds of soil in the county. The soil survey report classifies these soils, grouping them according to use and management classes for specific purposes. These groupings are based upon their morphological, genetic, and physico-chemical properties.

To help classify the different soils for use and management, laboratory studies were made of the physical and the chemical characteristics of representative soils. Soil samples were collected for chemical analysis. The chemical data presented here supplements the information included in the soil survey report and related publications.

Explanation of Tables

When a proper balance of plant food and organic matter is maintained in the surface 7 inches of well-drained soil, optimum plant growth may be expected. Certain properties of the soil profile such as effective depth, structure, texture, and consistency are also quite important. These characteristics, to a large extent, determine water storage, water movement, and crop adaptation to the soil. The parent material, designated by the "C" horizon in Table 1 is in some cases quite important as a source of plant nutrients.

In Table 1 the "A" horizon includes that portion of the soil which is plowed. In Virginia, the plowed layer of soil is affected most by leaching and erosion. The "B" horizon represents layers of subsoil. The "B_2" layer ordinarily is finer textured than any other layer of the soil. Soil parent material is the "C" horizon. It's designated as layer "C_1", "C_2", etc.

The degree of soil acidity is expressed by pH. The following descriptive designations have been applied to pH values:

Extremely acid	Below 4.5
Very strongly acid	4.5 - 5.0
Strongly acid	5.1 - 5.5
Medium acid	5.6 - 6.0
Slightly acid	6.1 - 6.5
Neutral (essentially)	6.6 - 7.3
Mildly alkaline	7.4 - 7.8
Moderately alkaline	7.9 - 8.4
Strongly alkaline	8.5 - 9.0
Very strongly alkaline	9.1+

Truog phosphorus, a dilute acid soluble phosphorus, estimates the amount of phosphorus readily available to plants in

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acid soils. Generally, it is considered that 25 ppm. (50 lbs. per acre) is adequate for most crops grown in Virginia.

Calcium, magnesium, and potassium, all exchangeable cations, are important plant nutrients. When in exchangeable form, these elements are available to plants to varying degrees. Potassium is generally more available and calcium less available than magnesium. As these bases are removed by plants, aluminum and hydrogen ions take their place. Because aluminum, like hydrogen acts as an acid, the exchangeable hydrogen reported includes exchangeable aluminum. The percent base saturation is the proportion of the total cations that is made up of exchangeable calcium, magnesium, and potassium. For Virginia conditions a fertile soil usually has a high percent base saturation.

The sum of the exchangeable cations, including aluminum and hydrogen, is equal to the total cation exchange capacity of the soil. The value is usually high when there is more clay or organic matter in the soil. Certain types of clay yield a higher value than others, but with few exceptions, humus or organic matter give a higher value, pound for pound, than clay. The higher the cation exchange capacity, the greater the nutrient holding capacity of the soil. Soils with low cation exchange capacity release stored nutrients to plants relatively more easily at lower nutrient content. It is much easier to raise the pH of a low exchange capacity soil.

The notation milli-equivalents per 100 grams of soil can be converted to pounds per acre of soil on the basis that an acre of soil 6- or 7-inches deep weighs approximately 2,000,000 pounds. One milli-equivalent per 100 gms. of soil is equivalent to 940 pounds of potash per acre or 1,000 pounds of limestone ($CaCO_3$) per acre to a furrow slice.

In Virginia a soil condition of at least 50 percent base saturation is desired in the surface 6- to 7-inches. These bases should be present in a proportion of about ten times as much calcium and two times as much magnesium as potassium as long as there is a minimum of 0.3 m.e. of potassium. A soil with a total of 10 m.e. of exchangeable cations would have a good nutrient condition if there were 5 m.e. hydrogen, 4 m.e. calcium, 0.7 m.e. magnesium, and 0.3 m.e. potassium. If the soil has a higher cation exchange capacity, it would be important to have much more calcium and slightly more potassium and magnesium. If the soil has a smaller cation exchange capacity, the calcium requirement is less, but the magnesium and, most important, the potassium level should be the same. Many cultivated soils in parts of Virginia contain a high proportion of magnesium as a result of the widespread use of dolomitic limestone. This may be unfavorable if the build-up of magnesium continues.

Table 1 gives the results of chemical analyses made of the soils mapped in the Soil Survey of Washington County. These soils are important throughout the Appalachian Physiographic Division of Virginia as well as in Washington County.

TABLE 1

Horizon	Depth (in.)	pH	Truog P (ppm.)	Organic matter (%)	Exchangeable Cations[1] Ca	Mg	K	H	Total[2]	Base Saturation (%)
				ASHE STONY LOAM (64)[3]						
A	0-8	4.63	3.9	15.70	0.15	0.14	0.22	41.85	42.36	1.20
B	8-32	4.81	1.9	2.49	0.01	0.05	0.08	18.84	18.98	0.74
C	32-40	4.84	1.9	0.93	0.04	0.03	0.04	11.44	11.55	0.95
				CLARKSVILLE CHERTY SILT LOAM (40)						
A	0-7	5.42	5.1	2.14	1.80	0.15	0.07	6.45	8.47	23.85
B_1	7-15	5.18	2.2	0.36	3.46	0.19	0.06	2.37	6.08	61.02
B_2	15-28	5.07	2.4	0.39	4.10	0.29	0.07	2.67	7.13	62.55
C	28-37	4.61	4.3	0.22	4.46	0.83	0.19	9.36	14.84	36.93
				DANDRIDGE SILT LOAM (28)						
A_1	0-1	6.41	16.9	16.06	24.13	4.43	0.69	10.81	40.06	73.02
A_2	1-7	4.89	2.9	3.08	2.95	0.99	0.25	11.73	15.92	26.32
A-B	7-26	4.92	1.9	0.72	2.23	0.98	0.22	6.77	10.20	33.63
C	26-34	4.78	1.2	0.66	1.84	0.84	0.20	6.64	9.52	30.25
				DUNMORE SILT LOAM (4)						
A_1	0-1	5.36	32.8	14.43	10.73	1.89	0.70	14.62	27.94	47.67
A_2	1-6	4.98	8.9	4.20	1.25	0.26	0.29	9.85	11.65	15.45
B_1	6-8	4.64	7.2	1.59	0.97	0.18	0.17	8.48	9.80	13.47
B_2	8-34	4.56	2.9	0.79	0.48	0.26	0.27	11.82	12.83	7.87
C	34-50	4.75	2.9	0.59	0.16	0.11	0.17	6.34	6.78	6.49
				DUNMORE SILT LOAM (21)						
A	0-7	4.97	1.9	2.15	0.48	0.15	0.15	7.04	7.82	9.97
B_1	7-10	4.62	2.9	1.26	1.07	0.17	0.17	8.14	9.55	14.76
B_2	10-32	4.47	1.7	0.57	1.22	0.51	0.13	11.00	12.86	14.46
C_1	32-37	4.43	2.2	0.32	0.98	0.67	0.14	8.30	10.09	17.74
C_2	37-42	4.48	1.9	0.26	0.62	0.31	0.27	10.19	11.39	10.54
				DUNNING SILTY CLAY LOAM (7)						
A	0-10	6.60	21.5	3.57	12.72	3.31	0.15	3.30	19.48	83.06
B	10-30	6.66	13.5	1.46	10.98	3.21	0.20	2.23	16.62	86.58
				GREENDALE SILT LOAM (30)						
A	0-18	5.80	8.0	3.05	6.48	0.90	0.29	8.04	15.71	48.82
B	18-32	5.86	5.8	0.99	3.01	0.38	0.10	6.45	9.94	35.11
C	32-38	5.22	5.8	0.37	3.93	0.35	0.12	4.45	8.85	49.72

1/ Numbers refer to references in back of report.

Horizon	Depth (in.)	pH	Truog P (ppm.)	Organic matter (%)	Exchangeable Cations[1] Ca	Mg	K	H	Total[2]	Base Saturation (%)
				GREENDALE SILT LOAM (30)						
A_1	0-1/2	5.57	18.8	7.26	5.48	0.85	0.41	7.17	13.91	48.45
A_2	1/2-8	5.03	6.8	2.22	1.07	0.14	0.13	5.27	6.61	20.27
B	8-30	4.59	1.9	0.24	0.74	0.21	0.08	5.80	6.83	15.08
C	30-40	4.61	2.9	0.16	0.73	0.25	0.11	5.11	6.20	17.58
				HAGERSTOWN SILT LOAM (18)						
A	0-6	5.93	9.6	4.27	5.98	1.48	0.74	10.36	18.56	44.18
B_1	6-10	5.28	2.9	0.59	3.26	1.75	0.16	6.59	11.76	43.96
B_2	10-30	4.96	2.9	0.45	3.94	2.96	0.30	9.23	16.43	43.82
C	30-45	4.66	2.2	0.42	2.90	2.60	0.29	13.62	19.41	29.83
				HAYTER LOAM (14)						
A	0-18	5.17	4.3	4.44	1.91	0.38	0.24	15.95	18.48	13.69
B	18-32	4.65	14.7	0.79	1.60	0.68	0.24	15.80	18.32	13.76
C	32-36	4.59	8.2	0.45	0.56	0.60	0.17	13.78	15.11	8.80
				HOLSTON FINE SANDY LOAM, high terrace phase (46)						
A_1	0-2	6.22	17.8	8.11	10.61	1.33	0.38	5.69	18.01	68.41
A_2	2-10	6.28	4.3	0.99	2.56	0.19	0.12	2.64	5.51	52.09
B	10-32	5.38	5.8	0.29	1.94	0.39	0.16	2.21	4.70	52.98
C	32-37	4.95	3.9	0.28	2.19	0.60	0.15	3.77	6.71	43.82
				HOLSTON SILT LOAM (31)						
A_1	0-6	5.03	9.2	1.66	3.88	0.47	0.16	5.93	10.44	43.20
A_2	6-10	4.98	1.7	1.28	4.20	0.52	0.12	7.27	12.11	39.97
B	10-45	4.62	2.7	0.71	3.74	0.57	0.14	8.12	12.57	35.40
C	45-50	4.31	1.2	0.35	1.59	0.80	0.24	11.82	14.45	18.20
				JEFFERSON STONY FINE SANDY LOAM (--)						
A	0-6	4.32	10.1	14.38	0.48	0.25	0.09	29.77	30.59	2.68
C_1	6-10	4.40	2.9	11.40	0.33	0.28	0.17	37.44	38.22	2.04
C_2	10-20	4.72	1.2	1.25	0.03	0.08	0.09	11.55	11.75	1.70
				LINDSIDE SILT LOAM (12)						
A	0-18	6.25	7.0	2.93	7.62	1.74	0.12	4.43	13.91	68.15
B	18-26	6.69	13.7	2.57	7.94	2.01	0.09	3.19	13.23	75.89
C	26-34	6.66	2.9	1.27	7.42	2.13	0.10	2.34	11.99	80.48
				LODI LOAM (3)						
A_1	0-1/2	5.10	22.2	10.60	2.08	0.85	0.55	13.03	16.51	21.08
A_2	1/2-9	4.95	6.3	1.04	0.05	0.07	0.16	2.48	2.76	10.14
B_1	9-15	4.77	1.9	0.43	0.18	0.22	0.30	4.88	5.58	12.54
B_2	15-32	4.58	3.4	0.57	0.16	0.30	0.24	8.51	9.21	7.60
C	32-40	4.57	1.4	0.48	0.23	0.51	0.34	10.11	11.19	9.65

Horizon	Depth (in.)	pH	Truog P (ppm.)	Organic matter (%)	Exchangeable Cations 1/ Ca	Mg	K	H	Total 2/	Base Saturation (%)
					MASADA LOAM (11)					
A	0-10	5.02	6.0	3.27	1.10	0.34	0.78	13.60	15.82	14.03
B	10-40	4.80	3.6	0.63	1.20	0.24	1.30	11.30	14.04	19.52
					MASADA LOAM (20)					
A	0-15	5.32	9.6	1.95	1.91	0.19	0.07	8.43	10.60	20.47
B	15-34	5.12	3.9	0.39	3.09	0.89	0.11	5.55	9.64	42.43
C	34-50	4.73	4.3	0.21	0.81	0.59	0.11	6.78	8.29	18.21
					MONTEVALLO SHALY SILT LOAM (13)					
A_1	0-1/2	5.51	12.5	6.21	3.53	1.73	0.50	7.41	13.17	43.74
A_2	1/2-7	4.92	4.3	1.46	0.60	0.50	0.20	6.64	7.94	16.37
C_1	7-24	4.79	0.5	0.33	0.11	0.70	0.39	6.53	7.73	15.52
C_2	24-35	4.79	3.4	0.26	0.08	1.40	0.41	7.81	9.70	19.48
					MUSKINGUM STONY VERY FINE SANDY LOAM (17)					
A_1	0-1	4.52	12.1	10.68	1.33	0.41	0.19	13.99	15.92	12.12
A_2	1-9	4.81	1.7	1.48	0.07	0.05	0.06	3.58	3.76	4.79
A-B	9-24	4.77	3.4	0.46	0.17	0.27	0.09	4.85	5.38	9.85
C	24-34	4.57	1.4	0.41	0.13	0.35	0.11	9.19	9.78	6.03
					POPE LOAM (8)					
Layers										
1	0-18	7.51	9.6	2.27	26.99	0.59	0.12	0.00	27.70	100.00
2	18-32	7.41	13.5	1.72	20.54	0.78	0.10	0.45	21.87	97.94
					TELLICO VERY FINE SANDY LOAM (23)					
A_1	0-1/2	5.96	8.9	3.97	4.31	0.67	0.42	4.47	9.87	54.71
A_2	1/2-8	5.41	2.2	1.71	1.81	0.17	0.14	5.11	7.23	29.32
B	8-28	4.61	1.7	0.35	1.35	0.79	0.17	8.82	11.13	20.75
C	28-37	4.56	1.7	0.31	1.97	1.16	0.16	8.69	11.98	27.46
					WESTMORELAND SILT LOAM (10)					
A	0-6	5.81	6.3	5.20	4.16	1.10	0.39	7.33	12.98	43.53
B	6-24	4.68	1.9	0.89	6.64	1.30	0.21	10.15	18.30	44.54
C	24-34	4.71	1.9	0.63	3.64	1.84	0.23	14.93	20.64	27.66

1/ Milli-equivalents per 100 grams of soil.
2/ Summation of Exchangeable Cations.
3/ Legend identification numbers (original field sheets).