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of 14 Mississippi Soils

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Properties Affecting Water Relations and Management of Fourteen Mississippi Soils

By

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During the course of soil-moisture and other soil investigations in Mississippi, certain properties of representative soils were measured.[2] The properties included soil texture, plasticity, organic matter content, pH, bulk density, 1/3- and 15-atmosphere tension values, and infiltration and drying rates. These properties influence the intake, transmission, and retention of soil moisture, and in turn affect irrigation, drainage, and tillage practices.

Fourteen soils in the following thirteen series were investigated: Memphis, Loring, Grenada, Briensburg, Collins, Commerce, Sharkey, Bosket, Pachuta, Savannah, Sawyer, Stough, and Wahee. The Memphis series included an eroded phase and a soil with near-virgin conditions. It is hoped that the information given herein will aid in the identification and management of these soils.

Description of Soils

All soils except the near-virgin Memphis were old-field soils that at one time or another had been plowed, grazed, or otherwise disturbed. Some of the soils were not modal, or at least not representative of the most usual conditions of all soils in that series, but all came within the limits of characteristics prescribed in the official descriptions of the Soil Survey of the U. S. Department of Agriculture. The Collins soil was overlain by 6 to 18 inches of fill from old drainage ditches. The soil identified as Commerce was an over-wash phase with approximately 12 inches of slackwater deposits of Sharkey clay material at the surface.

The fourteen soils are among the principal ones of the state. The Memphis, Loring, and Grenada occur in uplands of the Brown Loam area (figure 1). Briensburg and Collins are also found in the Brown Loam area, but at the bases of slopes and along streams. Commerce, Sharkey, and Bosket are Delta soils. Pachuta is important in the Central Prairie. Savannah, Sawyer, Stough, and Wahee are widely distributed in the Longleaf Pine area, and are also found in the Sand-Clay Hills, the Flatwoods, and the Pontotoc Ridge.

Methods and Procedures

Representative bulk samples of the principal horizons or layers of each soil were taken from pit walls. Duplicate undisturbed cores were obtained for the determination of bulk density. Mechanical composition, plasticity constants, and moisture-tension values at 1/3 and 15 atmospheres pressure were determined from separate composite bulk samples.

In the laboratory the bulk samples were crumbled and crushed by hand to pass through a U. S. standard 9-mesh sieve. Particle size distribution and plasticity limits were determined for 10 of the soils in the soils laboratory of the Waterways Experiment Station at Vicksburg, Mississippi. The other samples were analyzed by the Mississippi Agricultural Experiment Station and the Vicksburg Infiltration Project.

Moisture tension values were determined by the pressure-membrane method (*3*).[3] Asbestos board was used as a membrane at 1/3-atmosphere pressure, and Visking sausage casing was used at a pressure of 15 atmospheres.

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[1] Soil Scientist, U. S. Forest Service; and Agronomist, Mississippi Agricultural Experiment Station, respectively.

[2] Data and information were obtained cooperatively by the Vicksburg Infiltration Project of the Southern Forest Experiment Station, and the Department of Agronomy, Mississippi Agricultural Experiment Station, State College, Mississippi. The Vicksburg Infiltration Project is maintained at Vicksburg, Mississippi, cooperatively by the Forest Service, U. S. Department of Agriculture, and the Corps of Engineers, U. S. Army.

[3] Italic numbers in parentheses refer to Literature Cited.

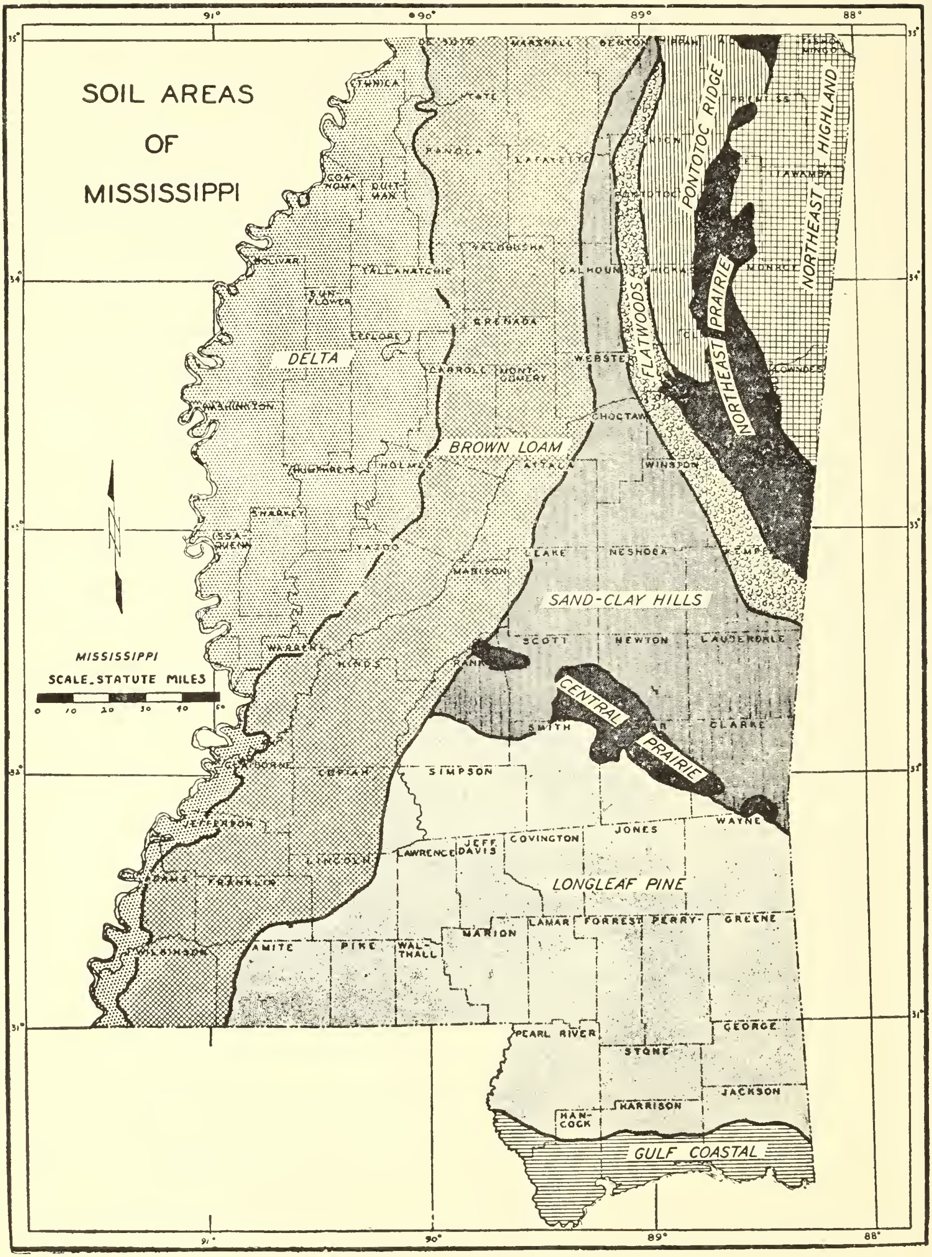

Figure 1. Soil areas of Mississippi.

Bulk densities of the Memphis, Briensburg, Pachuta, Stough, Sawyer, and Wahee soils were measured with the air-picnometer (*4*). Values were derived from nomographs which related field weight and air volume to bulk density. No significant difference was found between this and more conventional methods. For the remaining soils, bulk densities were determined either from blocks of soil one foot square and 3 inches in height, or by other methods in which undisturbed soil cores were oven-dried and weighed (*1*).

With the Rocky Mountain infiltrometer (*2*), infiltration rates were determined for 10 of the soils. The general procedure was to apply 5 inches of simulated rainfall per hour for 1 to 4 hours when the soil was relatively dry and then to repeat the application within the next 3 days while the soil was still wet.

Daily soil moisture records were secured for all soils except Grenada, Sharkey, Bosket, and Savannah. From these records was determined the average number of days required for the soil to dry from maximum field value to average field minimum.

In the tables and discussions of each soil that follow, certain properties and units of measure need explanation:

The **Munsell color code** was used as a standard in naming the soil colors. Unless otherwise stated, the color represents moist soil.

The **plastic limit** is the moisture content at or above which a soil will puddle if handled; **liquid limit** is the moisture content at which a soil will barely flow under an applied force; the **plasticity index** is the range in moisture content between these two limits.

Total pore space was calculated from the bulk density of the soil by using 2.65 as specific gravity for soil with low organic matter content and 2.60 for soils with about 5 percent organic matter.

Moisture content at **1/3-atmosphere tension** is considered the approximate upper limit of available water or field capacity, and at **15 atmospheres tension** the point at which plants wilt. **Available water capacity** is the difference between the two. **Drainage capacity** is the difference between the total pore space and the pore space occupied by water at 1/3-atmosphere tension. Values for these properties are expressed on a volume basis for ready conversion to inches depth.

The drying period, a value of interest to irrigators, was considered at the time required for a soil to reach wilting point following saturation. Drying periods are given by soil groups: the upland loess soils, the colluvial-alluvial stream bottomland soils, fine clay soils, and the Coastal Plain soils.

Memphis Silt Loam

The near-virgin Memphis soil, developed in loess, was on gently sloping upland under a well-stocked hardwood forest near Vicksburg, Mississippi. Properties of this soil are shown in table 1. Because of the forest cover, the surface 6-inch layer had a high organic content and porosity, and low available water capacity. This layer has a large volume of big pores (39 percent by volume) and is therefore very receptive to water; but only 11 percent of its volume can be occupied by water available to plants.

Drainage capacity, or aeration, decreases from 39 percent for the surface layer to 5 percent for the layer beginning at 19 inches. There is a corresponding, but less sharp, increase in bulk density, or compactness, and in moisture retained after drainage. The increase in wilting point below 14 inches can be attributed to the increase in clay content.

This soil, in its present condition, could be plowed at a moisture content up to about 35 percent (the plastic limit) without causing it to puddle or form hard clods.

Data in table 1 may be used in irrigation practice to estimate the amount of water needed and the time necessary to apply it. For example, when the soil is dry or near the wilting point, the available water capacity of the entire 42-inch profile is 6.8 inches (obtained by multiplying the percentage of available water in each layer by

Table 1. Memphis silt loam (virgin).

Item	Soil layer 1	2	3	4
Depth	0 to 6 inches	6 to 14 inches	14 to 19 inches	19 to 42 inches
Color	Dark grayish brown (10 YR 4/2)	Brown (10 YR 5/3)	Dark yellowish brown (10 YR 4/4)	Dark brown (7.5 YR 4/4)
Textural class	Silt loam	Silt loam	Silty clay loam	Silty clay loam
Consistence	Very friable	Very friable	Friable	Friable, slighly plastic when wet
Structure	Weak medium granular	Weak fine granular	Weak fine blocky	Moderate medium blocky
Bulk density	.94	1.32	1.44	1.49
pH	6.6	5.2	5.0	5.0
		Percent by weight		
Organic matter	4.05	.70	.55	.51
Mechanical composition				
Sand	9	4	4	4
Silt	80	80	61	63
Clay	11	16	35	33
		Percent by volume		
Plasticity constants				
Liquid limit	45	33	62	62
Plastic limit	35	32	33	36
Plasticity index	10	1	29	26
Total pore space	59	49	46	44
Moisture content				
1/3-atmosphere	20	23	36	39
15 atmospheres	9	8	20	21
Drainage capacity	39	26	10	5
Available water capacity	11	15	16	18

depth of the layer and totaling the resulting values for all layers.) If water were applied at a rate equal to the infiltration rate (0.55 inch per hour for this soil), the 6.8 inches could be safely added, without runoff, in 14 hours. The amount needed to bring the soil up to field capacity from any determined moisture content likewise could be estimated from these data.

The surface 6 inches of this soil reaches the wilting point in 25 days, while 40 days are required for the surface foot to reach this point.

Memphis Silt Loam, Eroded Phase

This loessial upland soil was near Vicksburg on a 15-percent slope under a moderate to poor stand of 15-year-old loblolly pine. Before the trees came in, the site had been pastured and cultivated, and erosion had removed about 10 to 12 inches, or all of the A horizon. Approximately one inch of A_1 has developed since the loblolly pine stabilized the soil (table 2). Organic matter of this surface layer was 4.56 percent as compared to 4.05 percent for the A_1 layer of the virgin Memphis.

The drainage capacity of the two surface layers is less than of the virgin Memphis. This is probably because the second layer of this soil has a blocky structure whereas the upper layers of the virgin Memphis are granular.

During the winter, when rain is frequent and there is little soil drying, this silt loam probably would not drain below 32 percent moisture by volume. Since this is above the plastic limit (30 percent by volume), the soil should not be worked or plowed in winter.

Below six inches this soil contains less clay than the other Memphis. This fact, plus the lower bulk density, probably accounts for the better aeration in the lower layers of this soil than in the virgin Memphis. The available water capacity, however, is nearly the same for the two soils.

Table 2. Memphis silt loam, eroded phase

Item	Soil layer 1	2	3
Depth	0 to 1 inches	1 to 6 inches	6 to 42 inches
Color	Pale brown (10 YR 6/2, dry)	Brownish yellow (10 YR 6/6, dry)	Yellowship brown (10 YR 4/4, dry)
Textural class	Silt loam	Silty clay loam	Silt loam
Consistence	Very friable	Friable, slightly plastic when wet	Friable, slightly plastic when wet
Structure	Fine granular	Weak fine blocky	Moderate medium blocky, with white silt coatings
Bulk density	1.21	1.32	1.37
pH	5.8	4.9	5.1
		Percent by weight	
Organic matter	4.56	.78	.35
Mechanical composition			
Sand	13	8	6
Silt	71	65	72
Clay	16	27	22
		Percent by volume	
Plasticity constants			
Liquid limit	53	46	49
Plastic limit	38	30	32
Plasticity index	15	16	17
Total pore space	54	50	48
Moisture content			
1/3-atmosphere	30	32	32
15 atmospheres	17	14	14
Drainage capacity	24	18	16
Available water capacity	13	18	18

Drying time is the same as for the virgin Memphis—25 days for the surface 6 inches and 40 days for the surface 12 inches.

Loring Silt Loam

The Loring profile was on gently sloping upland soil in the National Military Park at Vicksburg, and, like Memphis, was developed in deep loess. The vegetative cover was herbaceous. The surface 8 inches (table 3) is probably an old plow layer of mixed A and B horizon material.

This soil has a silt loam texture down to about 14 inches, where it becomes a silty clay loam. At 32 inches, it is slightly more compact and firm than in the upper layers. Except for this firmness and a higher content of organic matter, the Loring is very similar to the near-virgin Memphis. Available water capacity for 42 inches of soil is 6.9 inches for Loring and 6.8 inches for the near-virgin Memphis soil.

If water were applied at the infiltration rate of 0.40 inch per hour, the available water capacity would be satisfied in 17 hours. The depletion period is the same as for the Memphis soils.

Grenada Silt Loam

The Grenada soil was also in the National Military Park at Vicksburg, in the same field as the Loring. Like the Loring and Memphis, it is an upland soil, derived from loess parent material and occurring on flat topography. The vegetative cover at the sampling point was herbaceous.

The characteristic feature of Grenada soil is the hardpan that occurs at 24 inches (table 4). Drainage capacity declines sharply from 30 percent in the surface layer to near zero in the hardpan. The low drainage capacity of the pan is reflected in the infiltration rate, which is only 0.10 inch per hour.

If it is assumed that plant roots do not penetrate the hardpan appreciably, the available water capacity is 3.48 inches.

Table 3. Loring silt loam

Item	Soil layer 1	2	3	4
Depth	0 to 8 inches	8 to 14 inches	14 to 32 inches	32 to 48 inches
Color	Light yellowish brown (10 YR 6/4)	Brownish yellow (10 YR 6/6)	Strong brown (7.5 YR 5/8)	Very pale brown (10 YR 7/3), highly mottled with shades of gray & yellow
Textural class	Silt loam	Silt loam	Silty clay loam	Silty clay loam
Consistence	Very friable	Friable	Friable, slightly plastic when wet	Firm
Structure	Weak fine granular	Moderate to weak medium blocky	Moderate medium blocky	Very weak medium blocky
Bulk density	1.34	1.38	1.50	1.50
pH	5.8	6.0	5.8	6.0
		Percent by weight		
Organic matter	1.60	.46	.44	.38
Mechanical composition				
Sand	8	5	5	6
Silt	74	75	64	65
Clay	18	20	31	29
		Percent by volume		
Plasticity constants				
Liquid limit	43	39	60	54
Plastic limit	34	32	33	33
Plasticity index	9	7	27	21
Total pore space	50	48	43	43
Moisture content				
1/3-atmosphere	28	25	36	36
15 atmospheres	13	8	20	18
Drainage capacity	22	23	7	7
Available water capacity	15	17	16	18

Table 4. Grenada silt loam.

Item	Soil layer 1	2	3
Depth	0 to 4 inches	4 to 24 inches	24 to 44+ inches
Color	Light yellowish brown	Brownish yellow	Light gray, mottled with shades of brown & yellow
Textural class	Silt loam	Silty clay loam	Silty clay loam
Consistence	Friable	Friable	Very firm (compact)
Structure	Weak fine granular	Moderate medium blocky	Very weak medium blocky to massive
Bulk density	1.18	1.36	1.54
pH	5.4	5.2	5.5
		Percent by weight	
Organic matter	2.35	.62	.32
Mechanical composition			
Sand	6	5	3
Silt	71	61	66
Clay	23	34	31
		Percent by volume	
Plasticity constants			
Liquid limit	40	65	66
Plastic limit	28	31	35
Plasticity index	12	34	31
Total pore space	56	49	42
Moisture content			
1/3-atmosphere	26	37	42
15 atmospheres	14	22	20
Drainage capacity	30	12	0
Available water capacity	12	15	22

The plastic limit of the surface layer is 28 percent, which is very near the limit of drainage, or 1/3-atmosphere moisture-tension value.

Briensburg Silt Loam

The Briensburg soil was sampled near Vicksburg, on level to gently sloping land at the base of a slope bordered by a small stream. This soil, developed in colluvium from the surrounding loess hills, had a herbaceous cover. Two properties of Briensburg that vary from the expected are a high pH, 7.6 to 7.8 (table 5), and a low infiltration rate, 0.20 inch per hour.

The high pH is probably due to alkaline soil materials washed in from the surrounding loess hills, or to the relatively high water table at this location. The stream adjacent to this soil contains backwater from a lake that may be alkaline.

The infiltration rate, 0.20 inch per hour, was obtained during a period when the water table was within 4 feet of the surface. The physical properties of the surface layers indicate that the rate would be much higher under normal summer conditions, when the water table is 10 feet or more below the surface.

The texture is quite uniform throughout, averaging less than 5 percent sand, about 80 percent silt, and a little more than 15 percent clay. The slight profile differentiation of this soil accounts for the uniform texture throughout. Most of the other properties do not vary much from layer to layer.

Organic matter decreases only slightly with depth, so that this soil, which has less organic matter in the surface than most of the other soils, has more in the lower depths.

The moisture-depletion period for the surface 6 inches is 40 days and for the surface foot 55 days. These longer periods indicate that this soil could be

Table 5. Briensburg silt loam

Item	Soil layer			
	1	2	3	4
Depth	0 to 6 inches	6 to 12 inches	12 to 18 inches	18+
Color	Brown (10 YR 5/3)	Pale brown (10 YR 6/3), slightly mottled with shades of gray	Gray (10 YR 5/1), mottled with brown	Light gray (10 YR 7/2), mottled with shades of brown and yellow
Textural class	Silt loam	Silt loam	Silt loam	Silt loam
Consistence	Friable	Friable	Friable	Friable
Structure	Weak fine granular	Compound very weak angular blocky and moderate medium granular	Compound very weak angular blocky and moderate medium granular	Very weak angular blocky
Bulk density	1.27	1.31	1.34	1.40
pH	7.6	7.7	7.8	7.8
	Percent by weight			
Organic matter	1.55	1.45	1.29	.91
Mechanical composition				
Sand	0	4	6	2
Silt	84	79	78	81
Clay	16	17	16	17
	Percent by volume			
Plasticity constants				
Liquid limit	51	51	50	48
Plastic limit	36	34	34	35
Plasticity index	15	17	16	13
Total pore space	52	51	50	47
Moisture content				
1/3-atmosphere	32	34	34	32
15 atmospheres	13	13	12	11
Drainage capacity	20	17	16	15
Available water capacity	19	21	22	21

irrigated more economically than the upland loess Memphis and Loring soils.

Collins Silt Loam

Collins is a level to very gently sloping stream bottomland soil derived from loess washed in from surrounding hills. The sampling location was near Vicksburg, in an area that had been in cultivation and pasture.

The Collins properties described in table 6 are for a disturbed soil. Considerable fill material had been deposited on the area from a drainage ditch nearby. There is evidence of an artificially compacted layer about one foot deep. The increase in bulk density from 1.39 for the surface layer to 1.56 for the second layer, and a corresponding decrease in drainage capacity from 17 to 1 percent, mark this compacted zone.

The infiltration rate of 0.40 inch per hour is abnormally high in view of the compacted zone. However, the zone may not have been uniformly compact over the area, and possibly was not present at all at the point where infiltration was measured. The infiltration rate reflects a typical Collins profile—the pan is not typical. Other properties such as color, texture, organic matter, and plastic limits are characteristic of this series.

In organic matter, pH, and texture this soil is similar to the Briensburg. As in Briensburg, the high available water capacity is probably related to the high silt content. A similar relationship between silt content and available water capacity has been noted in other data secured by the Vicksburg Infiltration Project.

Drying periods in dry weather were of the same length as for the other low-lying soil, Briensburg. Plants would have moisture available for 15 days longer on these soils than on the upland loess soils. Where irrigation is not practiced, these extra 15 days will probably be the difference between failure and success for some crops in dry years.

Table 6. Collins silt loam.

Item	Soil layer			
	1	2	3	4
Depth	0 to 8 inches	8 to 16 inches	16 to 24 inches	24 to 42 inches
Color	Brown (10 YR 5/3)	Yellowish brown (10 YR 5/4), slightly mottled with gray and brown	Gray (10 YR 5/2), and yellow (10 YR 7/6) mottled	Light gray (10 YR 7/2), mottled wtih brown and gray
Textural class	Silt loam	Silt loam	Silt loam	Silt loam
Consistence	Friable	Firm	Slightly firm	Friable
Structure	Compound weak granular and medium subangular blocky	Very weak coarse subangular blocky	Weak moderate subangular blocky	Weak medium platy
Bulk density	1.39	1.56	1.52	1.43
pH	7.8	7.8	7.8	7.8
	Percent by weight			
Organic matter	1.71	1.00	1.00	.83
Mechanical composition				
Sand	5	3	3	4
Silt	78	78	72	74
Clay	17	19	25	22
	Percent by volume			
Plasticity constants				
Liquid limit	49	55	59	50
Plastic limit	39	40	38	33
Plasticity index	10	15	21	17
Total pore space	48	41	43	46
Moisture content				
1/3-atmosphere	31	40	41	34
15 atmospheres	10	14	18	16
Drainage capacity	17	1	2	12
Available water capacity	21	26	23	18

Commerce Silty Clay, Overwash Phase

The Commerce is a Mississippi River alluvial soil. The sampling location was near Vicksburg, in a field that had been in cultivation and pasture. Topography was level to very gently sloping.

This phase of Commerce has much more clay in the surface foot than normal Commerce, which tends to be silt loam and silty clay loam in texture (table 7). Associated with this higher clay content is a higher moisture content at 1/3- and 15-atmosphere tensions, and a low drainage capacity.

In the summer when this soil dries, large cracks form and permit ready entrance of water. In the winter the soil is wet, the cracks are closed, and drainage is slow. The winter infiltration rate is about 0.35 inch per hour.

The plastic limits indicate that the moisture content should be well below field capacity before this soil is tilled.

Thirty-five and 40 days are required for the surface 6- and 12-inch layers to reach the wilting point. Soil cracking is probably the cause of the small difference in time, the cracks permitting rapid exhaustion of the moisture in the second 6 inches.

Sharkey Clay

The samples of this soil were taken from a cotton field near Stoneville, Mississippi. The site was level to very gently sloping. The soil is derived from Mississippi River alluvium. Only the surface six inches was sampled (table 8). Underneath the sampled layer the soil is a dark gray to gray clay that is very sticky when wet, firm when moist, and very hard when dry. Structure of the deeper layers is moderate coarse blocky.

The high clay content, 80 percent by weight, is characteristic of this soil series. In determining moisture as a function of tension on fine-textured soils such as this, there is considerable

Table 7. Commerce silty clay, overwash phase

Item	Soil layer 1	2	3	4
Depth	0 to 6 inches	6 to 14 inches	14 to 38 inches	38+
Color	Dark grayish brown (10 YR 4/2), with faint mottles	Dark gray (10 YR 4/1)	Grayish brown (10 YR 5/2), mottled with gray, yellow, and brown	Grayish brown (10 YR 5/2), mottled with gray, yellow, and brown
Textural class	Silty clay	Silty clay	Silty clay loam	Clay
Consistence	Sticky	Sticky	Slightly sticky when wet	Sticky
Structure	Weak medium to fine granular	Moderate coarse angular blocky	Weak medium blocky	Very weak medium blocky
Bulk density	1.42	1.41	1.32	1.29
pH	7.0	6.8	7.8	7.7
	Percent by weight			
Organic matter	1.98	1.82	.93	.83
Mechanical composition				
Sand	5	6	6	11
Silt	50	49	57	34
Clay	45	45	37	55
	Percent by volume			
Plasticity constants				
Liquid limit	81	85	65	108
Plastic limit	37	35	32	39
Plasticity index	44	50	33	69
Total pore space	47	47	50	51
Moisture content				
1/3-atmosphere	43	48	48	49
15 atmospheres	29	31	22	36
Drainage capacity	4	0	2	2
Available water capacity	14	17	26	13

swelling with addition of water to the unconfined sample. Thus higher moisture values are obtained in the laboratory than are possible under field conditions.

Cracking is even more of a problem in this soil than in the Commerce. In the winter, when the soil is wet and swollen, drainage is practically nil; in summer, water can readily enter the cracks.

Bosket Sandy Loam

The Bosket soil is derived from Mississippi River alluvium. It is well drained and shows a very low degree of horizon differentiation. Samples were taken from a cotton field near Stoneville. Properties of the surface 8 inches, the only layer that was studied, are shown in table 8. Underlying layers of this soil are usually yellowish-brown silty clay loam or sandy clay loam of friable consistence, and exhibit a weakly developed blocky structure.

Table 8. Sharkey clay and Bosket sandy loam.

Item	Sharkey clay, layer 1	Bosket sandy loam, layer 1
Depth	0 to 6 inches	0 to 8 inches
Color	Very dark gray (10 YR 3/1)	Light brownish gray
Textural class	Clay	Sandy loam
Consistence	Plastic when wet	Very friable
Structure	Moderate medium to fine granular	Structureless—single grain
Bulk density	1.30	1.30
pH	5.9	6.1
	Percent by weight	
Organic matter	1.5	1.5
Mechanical composition		
Sand	1	60
Silt	19	31
Clay	80	9
	Percent by volume	
Plasticity constants		
Liquid limit	78	39
Plastic limit	47	16
Plasticity index	31	23
Total pore space	51	51
Moisture content		
1/3-atmosphere	81	39
15 atmospheres	44	8
Drainage capacity	0	12
Available water capacity	37	31

It is rather surprising that a soil of 60 percent sand would retain 39 percent by volume of water at 1/3-atmosphere tension. By the time 15 atmospheres is reached, 31 percent by volume of moisture has been released; this is unusually high for available water capacity of sandy loams. The ability to retain water may be due to the expanding-lattice type of clay mineral that is found in most Mississippi River alluvium.

Pachuta Clay Loam

The Pachuta soil is derived from calcareous clay in prairie areas within the Coastal Plain. The samples were obtained from a profile near Pachuta, Mississippi. Vegetative cover at time of sampling was herbaceous, but formerly the area had been in forest and then under cultivation. Layer number 3, from 11 to 14 inches depth, was not sampled.

Sand content in the surface layers of this soil (table 9) is higher than in the Sharkey and Commerce series. Even with 32 percent sand, the surface layer is sticky when wet and exhibits large cracks when dry.

The soil is plastic at moisture contents higher than 26 percent. A field capacity value of 33 percent indicates the inadvisability of working this soil except when it is relatively dry. A very high infiltration rate of 3.45 inches per hour is adequate proof that water entered the soil through cracks, or in planes of pre-existing cracks that had been loosely closed. The cracks extend deeper than 26 inches, or into the fifth layer.

Winter drainage capacity decreases rapidly with depth from 19 percent for the surface layer to 0 for the fifth layer. There are corresponding increases in available water capacity from 10 to 20 percent for the same depths.

The surface foot of this soil is acid even though lime concretions occur throughout the profile. The lower depths are alkaline, with a pH of 7.8. Soil-moisture depletion was similar to the Commerce soil.

Table 9. **Pachuta clay loam.**

Item	Soil layer 1	2	4	5
Depth	0 to 5 inches	5 to 11 inches	14 to 26 inches	26+ inches
Color	Dark gray faintly mottled with reddish yellow	Pale olive mottled with brownish yellow	Olive yellow coarsely mottled with light olive gray	Pale olive gray, faintly mottled with light olive gray
Textural class	Clay loam	Clay	Clay	Clay
Consistence	Sticky when wet	Sticky when wet	Very sticky when wet	Very sticky when wet
Structure	Strong coarse and medium blocky surface slakes down to fine granular	Medium coarse sub-angular blocky	Weak coarse sub-angular blocky	Coarse and medium sub-angular blocky
Bulk density	1.26	1.25	1.25	1.25
pH	5.6	6.0	7.8	7.8
		Percent by weight		
Organic matter	2.87	.83	.62	.59
Mechanical composition				
Sand	32	18	8	12
Silt	35	36	39	31
Clay	33	46	53	57
		Percent by volume		
Plasticity constants				
Liquid limit	62	85	90	108
Plastic limit	26	29	31	30
Plasticity index	36	56	59	78
Total pore space	52	53	53	53
Moisture content				
1/3-atmosphere	33	42	52	55
15 atmospheres	23	29	34	35
Drainage capactiy	19	11	1	0
Available water capacity	10	13	18	20

Savannah Sandy Loam

This soil has developed in Coastal Plain sands and clays and occurs on gently sloping uplands. Samples were taken from a cotton field near Columbus, Mississippi.

Only the surface properties (table 10) were determined for this soil, the 4-inch layer that was sampled being from horizon Ap material.

This surface layer was rather high in sand content and available water capacity. In this and other characteristics it was similar to the sandy loam Bosket soil. A finer textured layer of sandy clay loam is usually found underneath the surface layer.

Table 10. **Savannah sandy loam**

Item	Soil layer 1
Depth	0 to 4 inches
Color	Very pale brown
Textural class	Sandy loam
Consistence	Friable
Structure	Structureless—single grain
Bulk density	1.30
pH	5.3
	Percent by weight
Organic matter	1.3
Mechanical composition	
Sand	63
Silt	24
Clay	13
	Percent by volume
Plasticity constants	
Liquid limit	38
Plastic limit	17
Plasticity index	21
Total pore space	51
Moisture content	
1/3-atmosphere	40
15 atmospheres	12
Drainage capacity	11
Available water capacity	28

Sawyer Silt Loam

The Sawyer samples were taken near Laurel, Mississippi, under miscellaneous herbaceous cover and a poorly stocked forest of mixed pine and hardwood. Past land use has been forest

Table 11. Sawyer silt loam.

Item	Soil layer 1	2	3	4	5	6
Depth	0 to 3 inches	3 to 7 inches	7 to 14 inches	14 to 24 inches	24 to 36 inches	36+ inches
Color	Grayish brown	Light yellowish brown	Yellow	Yellow, with medium mottles of reddish yellow	Yellow, with medium distinct mottles of yellowish brown	Red and light gray
Textural class	Silt loam	Silt loam	Silt loam	Silty clay loam	Loam	Clay
Consistence	Very friable	Very friable	Friable	Friable to firm	Friable	Sticky
Structure	Fine granular	Very weak fine granular	Weak medium fine subangular blocky	Strong coarse and medium subangular blocky	Weak medium subangular blocky	Massive
Bulk density	1.25	1.35	1.33	1.51	1.58	1.32
pH	5.6	5.2	5.0	5.2	5.2	4.9
				Percent by weight		
Organic matter	4.75	1.10	.83	.55	.42	.38
Mechanical composition						
Sand	30	26	21	18	30	22
Silt	60	59	54	52	45	30
Clay	10	15	25	30	25	48
				Percent by volume		
Plasticity constants						
Liquid limit	41	35	44	62	54	104
Plastic limit	35	27	25	33	28	33
Plasticity index	6	8	19	29	26	71
Total pore space	53	49	48	43	40	50
Moisture content						
1/3-atmosphere	24	22	28	36	33	41
15 atmospheres	10	7	11	17	14	24
Drainage capacity	29	27	20	7	7	9
Available water capacity	14	15	17	19	19	17

and pasture. The soil is derived from Coastal Plain sands and clays and occurs on gently sloping to rolling upland.

The Sawyer has five distinct horizons overlying a clay substratum at 36 inches (table 11). This is characteristic of the series; and the properties represent the most usual or modal profile conditions.

Organic matter decreases from 4.75 percent in the surface horizon to 0.42 percent in layer 5. The soil reaction is uniform throughout. Bulk density increases with depth from 1.25 for the surface layer to 1.58 for layer 5; layer 6, the substratum has a density of 1.32.

Total pore volume and drainage capacity decrease with depth until the substratum is reached, whereas the corresponding available water capacity increases.

An infiltration rate at 0.90 inch per hour for this soil is relatively high. It would take approximately 9 hours to apply enough water to satisfy the available water capacity to a depth of 42 inches.

Only 30 days were required to deplete the surface 6-inch layer of available moisture, and an additional 5 days for the surface 12 inches.

Stough Silt Loam

The Stough soil was near Ellisville, Mississippi, in a wooded pasture. Vegetation consisted of widely scattered post oak, pine, and brush. Minor vegetation was sparse miscellaneous grasses and weeds.

The soil is old alluvium from Coastal Plain sands and clays, and occurs on a nearly level, old stream terrace. Characteristics are presented in table 12. A 2-inch layer that occurred at 5 to 7 inches depth was not sampled.

In the field this soil feels much like a very fine sandy loam, but the particle size distribution curve reveals that it is coarse silt. The Coastal Plain soils differ from the loess-derived silt loams in having a higher percentage of sand and less silt. This probably accounts for the slightly smaller available water capacity of the Coastal Plain soils.

Organic matter of Stough is 5.18 percent in the A_1 layer but decreases sharply to 0.83 and 0.62 percent in the lower layers.

The third and fourth layers resemble each other, except for consistence and color. Layer 4 is a compacted and weakly cemented fragi-pan, whereas layer 3 is friable. This weak pan, with a 15-percent drainage capacity, apparently does not reduce the infiltration rate, which for this soil was 0.55 inch per hour. The soil-moisture depletion characteristics are similar to those of Sawyer.

Wahee Silt Loam

The Wahee soil was also in a woodland pasture near Ellisville. There was a sparse cover of post oak, small pine, oak brush, and miscellaneous weeds and grasses. The soil is old alluvium from Coastal Plain sands and clays; it occurs on a nearly level to undulating old stream terrace.

The surface 8 inches (table 13) is the only material examined that did not exhibit some degree of plasticity, yet the textural class was silt loam. This soil would not puddle even if it were tilled immediately after rainfall. The wilting point of the surface layers is lower than in the corresponding layers of other soils.

Drainage capacity decreases from 32 percent in the surface layer to 5 percent in the fourth; it then increases to 15 percent in the 24-to 30-inch layer. and decreases sharply to zero at 30 inches depth. At this depth the soil is very compact, bulk density being 1.71.

Available water capacity increased from the surface downward through the third layer, then decreased slightly in the fourth and fifth layers, and fially increased in the sixth, or deepest, layer.

Infiltration rate was 0.55 inch per hour, the same as for Stough, the other old terrace soil. Moisture-depletion properties were also similar to those of Stough.

Table 12. Stough silt loam

Item	Soil layer 1	3	4
Depth	0 to 5 inches	7 to 15 inches	15 to 43 inches
Color	Dark grayish brown	Yellow, highly mottled with yellowish brown	Light gray, faintly mottled with yellowish brown
Textural class	Silt loam	Silt loam	Silt loam
Consistence	Very friable	Friable	Compacted and weakly cemented
Structure	Fine granular	Weak coarse subangular blocky	Coarse subangular blocky
Bulk density	1.11	1.51	1.56
pH	5.4	5.0	5.0
		Percent by weight	
Organic matter	5.18	.83	.62
Mechanical composition			
Sand	35	30	31
Silt	57	56	52
Clay	8	14	17
		Percent by volume	
Plasticity constants			
Liquid limit	36	35	42
Plastic limit	30	26	25
Plasticity index	6	9	17
Total pore space	58	43	41
Moisture content			
1/3-atmosphere	22	24	26
15 atmospheres	9	8	9
Drainage capacity	36	19	15
Available water capacity	13	16	17

Table 13. Wahee silt loam

Item	Soil layer					
	1	2	3	4	5	6
Depth	0 to 3 inches	3 to 8 inches	8 to 14 inches	14 to 24 inches	24 to 30 inches	30 +
Color	Grayish brown	Very pale brown faintly mottled with yellowish brown	Yellow, with distinct fine mottles of yellowish brown	Pale brown, with distinct fine and medium mottles of yellowish brown	Light brownish gray, distinctly mottled with brownish yellow	Light brownish gray, mottled with brownish yellow
Textural class	Silt loam	Silt loam	Silt loam	Silty clay loam	Silt loam	Loam
Consistence	Very friable	Very friable	Friable	Firm	Friable to firm	Very friable
Structure	Weak fine granular	Weak very fine granular with few soft dark concretions	Weak medum and fine subangular blocky	Strong coarse. medium and fine subangular blocky	Weak medium subangular blocky, numerous small iron concretions, and small pockets of silty clay	Weak subangular blocky with numerous small pockets of sandy clay
Bulk density	1.25	1.43	1.57	1.55	1.45	1.71
pH	5.5	5.2	5.1	5.3	5.3	5.0
				Percent by weight		
Organic matter	3.32	1.60	.62	.46	.42	.35
Mechanical composition						
Sand	32	32	29	19	22	31
Silt	61	63	60	50	52	45
Clay	7	5	11	31	26	24
				Percent by volume		
Plasticity constants						
Liquid limit	nonplastic	nonplastic	30	62	59	55
Plastic limit	nonplastic	nonplastic	27	34	26	27
Plasticity index	nonplastic	nonplastic	3	28	33	28
Total pore space	53	46	41	42	45	36
Moisture content						
1/3-atmosphere	21	21	25	37	30	36
15 atmospheres	6	3	3	19	16	17
Drainage capacity	32	25	16	5	15	0
Available water capacity	15	18	22	18	14	19

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