EVALUATION OF SOIL IN A LAND USE STUDY IN VIRGINIA

Thesis for the Degree of M. S.
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William W. Lewis

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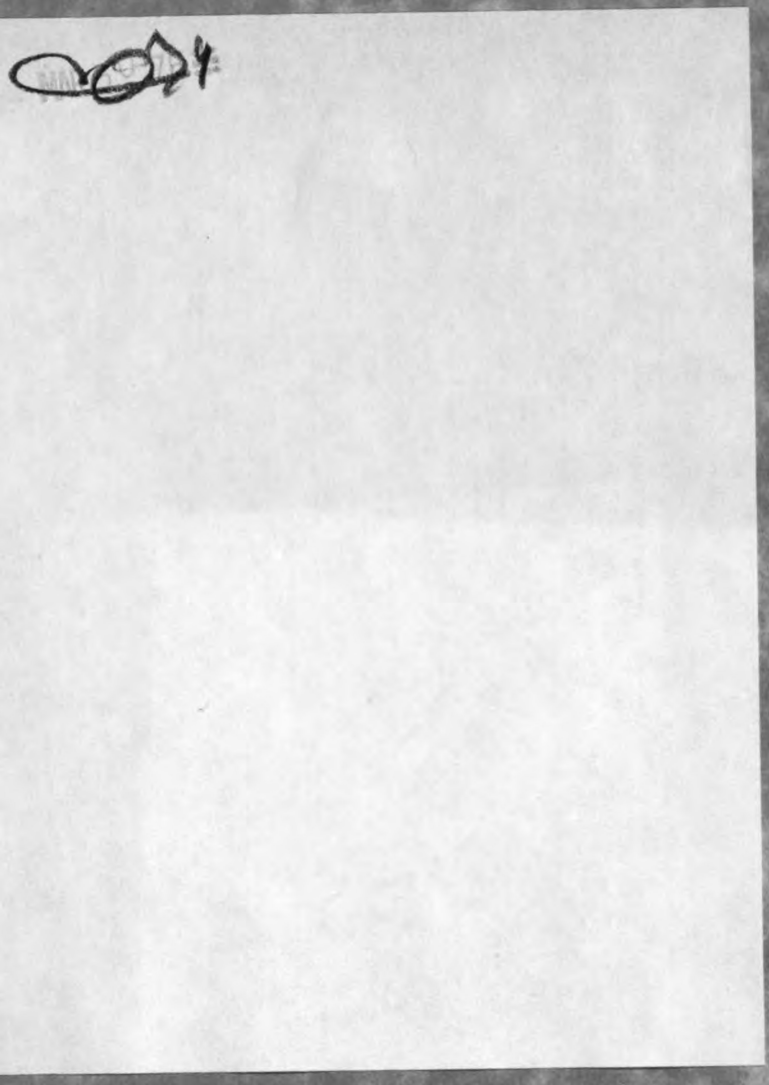

EVALUATION OF SOIL IN A LAND USE STUDY IN VIRGINIA

By

William Walker Lewis

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INTRODUCTION

It is generally thought that relationships exist between soil characteristics and land utilization; however, not very many studies have been made to show these relationships and how they are expressed in the social and economic conditions within a community. A study of this nature would aid in any land use adjustment program or long-time agricultural program within the community where the study was made and also in other communities that have similar soil and economic conditions.

This study was undertaken to determine, by quantitative methods, some of the relationships that exist between land use, type of soil, degree of slope, and other natural land features in a particular community.

AREA OF STUDY

The area selected is known as the Belfast Mills Community, located in Russell County, Virginia, in the Appalachian Valley Region of that State. This area comprises 8,075 acres of land, which is subdivided into 89 different ownerships. Seventy-seven of these ownerships are classified as farms and the remaining ownerships are either small lots, with possibly a house and garden, or publicly owned property.

HISTORY OF BELFAST MILLS COMMUNITY

According to local tradition, the Belfast Mills Community was known as good hunting grounds among the Indians. They found plenty of fish in the streams and game was plentiful in the woods. The Cherokee and Shawnee were the last two tribes of Indians to live in this section. On War Ridge, which is near this community, these two tribes fought, and the Cherokees were victorious. Chief Benje was the outstanding chief of

the Cherokee tribe during the latter part of their stay in this section. He was noted for being a very wise Indian; and although he kept his tribe at peace with the incoming whites, he never forgave them for taking the Indians' land. Finally, as the number of white people increased in this section, the Indians were forced to move westward into the Tennessee River Valley.

From all accounts, as the people from the Valley of Virginia and Eastern Virginia were moving into Kentucky and westward, some of them stopped in this community and nearby. The three Horton brothers were the first people to settle here. Enoch Horton settled where Dr. A. A. White now lives, Bill Horton settled near where Mrs. Minnie J. Bundy lives at present, and Bob Horton settled where Mr. John B. Ferguson's store now is. In 1781 John Horton, a descendant of one of the above, had 12 land grants filed.

Very soon, other families began to move in and take up land. The White family came from Maryland and bought 3000 acres of land from the Hortons for fifty cents an acre. This land was along the old Pincastle road where the Hortons first settled. The Taylors took up land all along Clinch Mountain. The Duff family came in from Ireland and took up land along both sides of what is now U.S. Highway No. 19. Other early families that settled in this section were Vercills, Mutters, Jacksons, Ferrells, and Fergusons.

The first big problem for the settlers was to clear the forest land for crops and pastures. Each had brought with him a small amount of seed and a few head of livestock. Bluegrass was well adapted to this section; and after it had been established in other sections of the county, the grass grew naturally wherever the forest was cleared. It was recognized as a fine pasture grass and allowed to remain wherever it occurred in the

pastures. The first crops were, principally, corn, wheat, and oats. The first settlers found some very fine virgin timber in this community. However, as there was no market for lumber, it was used only for local building and fuel purposes.

The people of this community went to church at the Old Smith Chapel. This church was located on what is now U.S. Highway No. 19, about 100 yards from the eastern edge of the community area. It was a Methodist Church and most of the people in this section were of that denomination.

The first store in this community was built over 100 years ago and was owned by Mr. Ed Taylor. It was located on what is now the J. H. and Leona Howard property. The first mill was a corn mill which was built in the latter part of the eighteenth century. This mill was run by Mr. Bill Horton and was located where the Old Belfast Mill now stands on Mr. John B. Ferguson's property. The old corn and wheat mill which now stands and from which the community got its name was built for Mr. Campbell Ferguson.

As more land was cleared, such fine pastures developed that, as the market became available, the people became interested in livestock. The first attempt to improve beef cattle in this area was the introduction of the Louden-Duke cattle of the Shorthorn breed. These cattle were first brought into Russell County by Colonel Chas. Smith, who bought them from one of the early importers in Kentucky. These cattle were dual-purpose and were well suited to the demand for export beef cattle. In later years, as the trend has been toward smaller cattle of better quality, the old breed has thinned out and the Hereford breed of cattle has largely taken its place.

The first improved sheep in the community were of the Hampshire breed. These were mixed with the "old mountain sheep" that the first settlers brought into the area. At present the Hampshire breed still dominates, with a few Southdown.

Tobacco is the most recent crop which has been introduced into the community. It was first grown by Mr. W. F. Taylor about 10 years ago. This is white burley tobacco and it is air-cured. Tobacco has developed into one of the leading cash crops of the community.

Many families in the community had slaves before the Civil War; but after the war, very few of the slaves remained in this section.

The people who now live in the Belfast Mills Community, except for a few, are descendants of the first families. These families have intermarried and most of the change of ownership of land has been through inheritance. The majority of the new families who have moved in have been tenants, some of whom have acquired small tracts of land.

Until approximately 15 years ago, Mr. John W. Ferguson's store was the main trading center of the community. The old mill also was in operation up until that time. Then U.S. Highway No. 19 was built through the northern edge of the area and the trading center shifted to Pratt's store. The present school and church are also in this section. One outstanding thing about this community is the number of small stores and filling stations that are located on the new highway.

The people in the Belfast Mills area have always been self-sustaining and have enjoyed a rather high standard of living. The pastures produce fine livestock and the soil and climatic conditions are favorable for a diversity of crops.

A GEOLOGICAL CLOSE SURVEY OF [illegible] AREA
SHOWING THE APPROXIMATE LOCATION OF THE
DIFFERENT SOIL SERIES, SLOPES, AND EROSION

The soils in Belfast Hills Area correlate very closely with the geologic formations. The geological strata strike northeast-southwest, with only a few interruptions. Steep knobs occur in the valley and these knobs are related geologically to Clinch Mountain, which borders the entire south side of the area.

Below is a list which shows the relationship of the geological formations to the soil series:

System	Formation	Soil Series
Silurian	Clinch	Buckingham
	Juniata	Hebron
Ordovician	Martinsburg	Westmoreland
	Moccasin	[illegible]
		Carlisle
		Hall Hill*
	Beekmantown	Hilliber
		Frederick
		Clarksville
		Washington*
	Chickamauga	Russell*
		Waynesboro
	Copper Ridge	Lehaven*
		Ledl*

Soils developed from residual materials, as well as soils developed from colluvial and alluvial deposits, are found in this area. The soils developed from residual materials which are formed in place from the underlying rocks occupy the larger part of this area. The soils developed

*Throughout this thesis, soils which are not officially recognized by the United States Department of Agriculture Correlation Committee are designated by an asterick.

from colluvial deposits which have moved down steep slopes and collected on the flatter areas or in the bottom of sinks are next in importance in regard to area. The soils developed from alluvial materials occupy only a very small acreage, but are important because of their high productivity. The soil series in this region are listed below in regard to origin of parent materials:

Parent Material	Soil Series
Soils from Residual Materials	(illegible) Hill*
	(illegible)
	(Lobdell
	(Westmoreland
	(Upshur
	(Carbo*
	(Elliber
	(Frederick
	(Clarksville
	(Washington*
	(Russell*
	(Paperton
	(Talbott*
	(Lodi*
Soils from Colluvial Materials	(Taylor*
	(Jefferson
	(Emory*
	(Bledsoe
	(Dunning*
Soils from Alluvial Materials	(Huntington
	(Lindside
	(Melvin
	(Meadow
	(Talk

The larger streams of the area run in an eastward direction. Many small natural drainageways, along the slopes of the Clinch Mountain and the ridge found in the valley, run in a north or south direction to enter the larger streams.

Springs are abundant over the whole area. However, the water from the springs found on the steep mountain slopes usually disappears underground at a short distance, due to underground cracks and passages

in the limestone formation. This supply of water collects and reappears at the surface as large springs and underground streams in the softer limestone formations which are found at the bottom of the valley. The south side of the area is bordered by the Clinch Mountain, which is capped with a hard resistant sandstone, the Clinch formation, belonging to the Silurian system. The area occupied by the Mountain is very rough and broken, and a large part of it is occupied by large boulders and rock outcrops. The slope varies from approximately 05% to 95%. This area was mapped as rough stony land, Muskingum soil material.

Beneath the Clinch formation is found a formation of interbedded sandstone and shale, also of the Silurian system. This is known as the Juniata formation and is dominantly red shale but also contains a small amount of red sandstone. The Lehew soils are developed from this formation. Due to the steepness of slope, the land is used primarily for forest. In a few spots it is used for white potatoes and, where properly fertilized, very high yields are obtained.

Just north of the Juniata formation, farther down the slope of the Clinch Mountain, is found the Martinsburg formation of the Ordovician system. This formation is made up of interbedded limestone and shale and occupies most of the steeper slopes of the Clinch Mountain. The Westmoreland soil series is developed from this geologic material. This Westmoreland series is subdivided into silt loam, silty clay loam, and shaly silt loam types. The silty clay loam is the most productive of these types and is used for cropland where the slope is not too extreme. The steeper slopes, however, are devoted to pasture and this soil type produces the best upland pasture of the area. The silty clay loam type is also characterized by having a large number of flat fossiliferous limestone rocks on the surface. The silt loam type is also devoted to pasture, but is less

productive than the silty clay loam. The shaly silt loam is a shallow unproductive soil which is adapted primarily to forest.

Still further down the slope of the Mountain is another occurrence of the Ordovician system, which is known as the Moccasin formation. The Moccasin formation is characteristically a red argillaceous limestone or mudrock but includes a few layers of pure, blue limestone. The red limestone is exposed in many places, weathers very easily, and crumbles into small cube-like particles. This formation gives rise to the Upshur soil series. In many places, solid rock outcrops are too numerous to allow cultivation of this soil; in which case, the land is devoted to pasture. Clovers and corn are well adapted to the soil.

North of the Moccasin formation and at the edge of the valley is found a very narrow strip of the high grade limestone, which is known as the Chickamauga formation. Due to the extreme erodibility of the soil material developed from this formation, practically the entire area was mapped as limestone rock land. The remaining soil material surrounding the rock outcrop would belong to either the Russell* or Hagerstown series. Many large underground streams come to the surface at the lower side of this formation which coincides with the valley floor. Cedars are found in abundance over this area and are a continuous annoyance in the limestone rockland pastures.

On the steep slopes of the Clinch Mountain there is a talus, derived from the Clinch, the Moccasin, and the Martinsburg formations, from which the Hayter* and Jefferson soil series are derived. This talus deposit lies in the drains, on the slopes, and widens in a fan shape as it nears the valley. Large sandstone boulders are often found scattered on the slopes and concentrated along the drains. The talus material completely covers the underlying geological formations at varying depths.

The Hayter* is the more productive of the two soils developed from talus and, where the sandstone boulders are not too plentiful, makes good cropland. The Jefferson soil is mapped as a fine sandy loam and is less productive. Sheet erosion is very bad on the Jefferson soil where the vegetative cover is thin.

As the mountain slope ends, a slight rise begins in the valley toward the north and extends to a high ridge which is situated northeast-southwest in the middle of the area. On the slopes of the ridge is found the Beckmantown formation. This formation is impure limestone which contains an abundance of chert nodules. Drainage is good in the slopes and runs south and north on each side of the ridge until it intersects the eastward drainage. The soils derived from this formation are the Frederick, Washington*, Elliber, and Clarksville series. All of these soils are characteristically cherty and are mapped as cherty phases, although a small number of non-cherty areas are found. Most of the cropland in this area is found on the above soils. They are least erosive and give good yields of small grain and tobacco.

On top of this ridge is found Copper Ridge Dolomite, which is characterized by beds of quartz sandstone scattered throughout. Less productive soils of the Lodi* and Lebanon* series are found in this section.

In a few spots in the area, a narrow strip of white and blue limestone outcrops is found. This limestone is very soft and it very readily disintegrates. The soil developed from this formation has been mapped as Ball Hill* silty clay loam.

The Chickamauga formation in the northeast section of the area has a karst topography. This section is used mostly for grazing, as the

sinks and rock outcrops are too numerous to permit cultivation. In the northwest section of the area where this same formation is found, deeper soils have developed, due to smoother topography, and some of this land is suitable for cultivation. The Russell* soil series, which is developed from the Chickamauga formation, is the most productive upland soil in the area.

The alluvial soils of the area are found along Indian Creek and its tributaries. These soils are mapped as the Huntington, Linkside, Melvin, and Elk series. The Elk soil is found in a terrace position and the others, which are found in first bottom positions, are distinguished on the basis of characteristics traceable to differences in natural drainage.

The colluvial soils are found in the bottom of sinks and along intermittent drains. These soils are mapped as Emory* and Glenford*. The first is formed from material washed from the pure limestone soils and the latter from material washed from impure limestone soils.

SOIL DESCRIPTIONS

Upland Soils

HARRISTOWN SILT LOAM, HILLY PHASE (10H): This is naturally, or inherently, one of the most fertile and productive soils in the area. It is derived from a soft, blue, highly calcareous limestone.

The surface 5 to 7 inches is a dark brown to light brown, friable silt loam. This surface soil contains an appreciable amount of organic matter that is mixed well with the soil.

The subsoil from 7 to 18 inches is light brown to reddish brown silty clay loam which contains many small, round, black concretions. This

portion of the subsoil has a granular structure and is mellow and friable throughout. From 18 to 42 inches, the subsoil is reddish brown to brownish red, compact silty clay to clay, which contains large black concretions and many partially weathered limestone fragments. In some places, this portion of the subsoil becomes somewhat plastic. The depth to bedrock varies from 3 to 6 or 8 feet.

The hilly phase occupies steeper slopes than the normal type and many more rock outcrops are present. Due to the greater relief, problems of crop rotation and soil management are more numerous. The loss of soil from run-off and the rock outcrops make cultivation a problem.

RUSSELL* SILT LOAM (SRS): The Russell silt loam, like the Hagerstown silt loam, is one of the most fertile and productive soils in the area. It is derived from residual material from a nearly pure limestone in which are embedded nodules and layers of black and gray chert.

The topsoil to 8 or 10 inches is brown, friable, mellow silt loam or heavy silt loam, carrying a large amount of well decomposed organic matter.

The portion of the subsoil from 8 to 38 inches is a yellowish brown, friable, crumbly, silty clay loam, which easily breaks down into a fine granular mass. Many small black mineral concretions are present throughout the soil layer. A few light gray angular chert particles are scattered in this layer. The black mineral particles make narrow black streaks on the cut surface. The soil when seen at certain angles has a slightly reddish cast in places, because faint coatings of dark red are on the breakage planes. From 38 to 45 inches, the subsoil is light yellowish brown silty clay loam, containing numerous dark and black mineral specks and coatings. In places, a dark reddish brown film can be seen on the breakage plane. This portion of the subsoil is slightly

lighter in color and slightly more friable than the overlying layer and contains some partially weathered limestone and chert fragments.

From 36 inches to the bedrock is a sticky plastic clay, which contains many partially weathered limestone particles. The depth to the bedrock from the surface varies considerably but averages probably $3\frac{1}{2}$ to $4\frac{1}{2}$ feet.

WASHINGTON* SILT LOAM (4): The Washington series differs from the other limestone soils, in that it has a lighter colored surface horizon and a somewhat plastic subsoil. This soil is rather productive where the proper soil management practices are followed, although it is less productive than the Hagerstown or Russell* silt loams.

The surface 6 inches are a brown, heavy silt loam which, when dry, is very light brown or light grayish brown in color. In forest, the soil is light gray or gray silt loam from one-half to 1 inch in depth. From 6 to 8 inches, this soil is yellowish brown, friable silty clay loam, with coatings of dark reddish brown on the breakage planes.

The subsoil to 32 inches is slightly reddish brown, tough, somewhat plastic silty clay, which has a glistening appearance in the cut. In some places, the color of this layer is yellowish brown; in other places, it is brownish yellow. From 32 to 45 inches, the soil is dark reddish brown, with small spots or streaks of ocherous yellow and very light gray, friable, slightly smooth silty clay loam.

The depth from the surface to the bedrock varies, but averages probably from 4 to 6 feet.

WASHINGTON* SILT LOAM, HILLY PHASE (4B): This soil is very similar to the Washington silt loam, except that it occupies a steeper relief of 15 to 30 per cent slopes. Where the proper soil management practices are followed, this soil can be used for cultivated crops and

gives good yields. Sheet erosion is somewhat more pronounced on this soil than on those of milder relief.

WASHINGTON* SILT LOAM, STEEP PHASE (17): This soil phase is essentially the same as the Washington silt loam (16, 47) as soils, the difference being in that the steep phase occupies a relief of 30 to 60 per cent slopes and is, therefore, adapted only to pasture and forest purposes. At present, this soil, under the existing conditions, is used mostly for pasture. It erodes very readily where the vegetative cover is thin and sheet erosion is pronounced over its entire area.

WASHINGTON* GRAVELLY SILT LOAM (300): This soil is somewhat less productive and more friable than the silt loam, due to the numerous chert fragments found throughout the profile. It is derived from a dolomitic limestone that has chert nodules in it. This limestone weathers and leaves the more resistant chert fragments in the soil.

The surface 5 or 6 inches are a grayish brown silt loam which, when dry, is very light gray or almost white. In some places in the pastures and forest, the first 2 inches are a dark silt loam, with a large amount of organic matter mixed well with the soil. From 6 to 11 inches, the soil is a brownish yellow, friable, silty clay loam. Up to 35 inches, the subsoil is yellowish brown, somewhat tough and plastic, friable, silty clay that takes a high polish on the cut surface. It breaks down into small angular soil particles, one-half to three-fourths inch in diameter, and these easily break into finer particles. From 35 to 45 inches, the soil is a mottled dark reddish brown, colorous yellow, and very light gray, friable, silty clay loam.

The bedrock is usually from 4 to 6 feet from the surface. This soil gives good yields of small grain, when properly handled, and all of it can be cultivated. Drainage is good and the soil is not very

susceptible to either sheet or gully erosion on the steeper relief.

WASHINGTON* SILTY SILT LOAM, HILLY PHASE (3CH): This soil differs from 3CG, primarily in occupying steeper relief of 15 to 30 per cent slopes. Due to the steeper relief, sheet erosion is somewhat pronounced in places where the soil has not been properly managed. Chert fragments, ranging in size from 1 inch to 6 inches, are more numerous on the surface than on similar soils of milder relief.

WASHINGTON* SILT LOAM, STEEP PHASE (3CP): Since this soil occupies slopes of 30 to 60 per cent, practically all of it is now being used for pasture or forest. Due to the steepness of slopes, most of the original topsoil has been removed by erosion. This soil gives a good pasture growth where it is not too badly eroded.

IOPI* SILT LOAM (3C): This soil is derived from the materials that underlie the Washington* and Frederick soils, with an addition of residual material from sandstone.

The surface 6 inches are brown, mellow, friable, fine sandy loam. When dry, this layer is light brown in color. From 6 to 12 inches, the soil material is a light brown, friable, very fine sandy clay.

The top layer of the subsoil to 37 inches is yellowish brown, with faint spots of dark reddish brown, friable, somewhat hard, silty clay loam containing an appreciable amount of very fine sand. This breaks into lumps 1 or 2 inches in diameter and these easily break into finer particles. From 37 to 45 inches, the soil material is light brown, with spots of ochreous yellow, friable, crumbly, silty clay loam material. This breaks into angular particles, 1 or 2 inches in diameter, which have reddish brown coatings on the cleavage planes.

Small angular particles of chert are found on the surface and throughout the profile. Pieces of brown sandstone are also present and

the soil is underlain at variable depths by bedrock of sandstone.

The Lodi fine sandy loam is about on a par in production with the Lebanon soils. It is porous on the surface, but is very susceptible to both sheet and gully erosion. White burley tobacco and potatoes give good yields on this soil.

LODI* HILL SANDY LOAM, HILLY PHASE (2P): This soil differs from 2C, in that it occupies a steeper relief. It is also more erosive and generally contains more stones and chert on the surface than when found on a milder relief.

LODI* HILL SANDY LOAM, STEEP PHASE (2T): Due to the steeper relief and erodibility of this soil, it is used for pasture and forest. Where the erosion has not taken off too much of the surface, this soil produces a fair pasture. Numerous sandstone boulders and some chert can be found on the surface of this soil.

[illegible] SILT LOAM (2LC): This soil is less productive than the Hagerstown or Russell* soils. Yields are rather low, except that this soil gives very good small grain and tobacco crops.

The surface 5 or 6 inches of this soil are gray to grayish brown, friable silt loam, which is underlain by a light yellowish brown, silty clay loam, extending to a depth of approximately 11 inches. Underneath this layer, the subsoil is brownish red, hard, brittle but friable, silty clay, breaking into angular particles from 1 to 2 inches in size and these easily break into finer particles. The cut surface is lighter in color than the broken surface.

From 20 to 45 inches, this soil is slightly reddish brown, with small spots of dark reddish brown and ochreous yellow, brittle but friable, silty clay loam material. This contains soft, chalk-like decomposed chert fragments.

LAMBERT SILT LOAM, HILLY PHASE (21P): This soil differs from 21C, primarily in occupying steeper relief of 15 to 30 per cent slopes. Where proper rotations and soil management practices are followed, this soil is utilized for cultivated crops.

LAMBERT SILT LOAM, STEEP PHASE (21E): Since this soil occupies a steep relief and is very erodible, it is used for pasture and forest land. This is its proper use, under the existing conditions. Where proper pasture management is obtained, this soil produces good pastures. Due to the rapid run-off, much of the surface soil is removed.

LAMBERT CHERTY SILT LOAM, HILLY PHASE (22P): This soil differs from the silt loam, primarily in that chert fragments are so abundant in the surface soil and on the surface that they materially affect the value of the land for crop production. In some spots, this soil is too cherty for cultivation and is used for pasture. Under good soil management practices, fair crop yields are obtained.

LAMBERT CHERTY SILT LOAM, STEEP PHASE (22E): Owing to the steepness of relief and rapid run-off, this soil is very erodible. It occupies slopes of 30 to 60 per cent. In view of the above conditions, it is used for pasture and forest, which is its proper use under the existing conditions. This soil produces a good pasture cover when too much of the surface has not been removed.

ELLIBER SILT LOAM (46C): The surface 6 or 8 inches are a brown to light brown, gritty silt loam. From 8 to 20 inches, the subsoil is a yellowish brown to brownish yellow, friable, silty clay loam, which is very porous and mellow. Below this layer and to the depth of 60 or 70 inches is a more compact yellowish brown, silty clay loam to silty clay layer, which contains many small weathered chert particles.

The bedrock is on an average of 6 to 8 feet below the surface. This bedrock is a dolomitic limestone, which may contain a few chert

nodules.

Small grains and tobacco are adapted to this soil. The run-off is very small and the absorption very great in this soil.

Elliber Cherty Silt Loam (EsC): The surface 7 or 8 inches are brown to grayish silt loam, containing many small light gray and brownish chert fragments that give it a gravelly appearance. The topsoil appears to be light grayish brown when dry. From 7 to 18 inches, the soil is a brownish yellow, friable, silty clay loam, containing light yellow partially decomposed chert.

The subsoil to 32 inches is a light brown, with mottling of very light gray, friable, silty clay, in which are present light yellow or white, soft, decomposed chert fragments. From 32 to 42 inches, this soil is a light brown, with mottlings or mingles of rust brown, very light gray, and ocherous yellow silty clay loam. Many small particles of white porous chert and some black mineral spots are found in this layer.

The bedrock is found from 4 to 6 feet from the surface. This is a dolomitic limestone and contains many chert nodules. Sheet erosion is present in some places but has not washed off much of the surface soil. Very good crop yields are obtained where a well planned crop rotation and soil management program is carried out.

Elliber Cherty Silt Loam, Hilly Phase (EsD): This soil responds favorably to proper soil management and conservation practices and offers somewhat of a problem when cultivated. Some of the surface soil has been removed, due to sheet erosion and rapid run-off. Chert fragments are more numerous on the surface than on the other Elliber soils of milder relief.

Elliber Cherty Silt Loam, Steep Phase (EsE): Due to steeper relief and erosion, which makes this soil characteristically more chert; and stony, it is used mostly for pasture and forest. It produces good pasture cover

where erosion is not too bad and stones are not too numerous on the surface.

FREDERICK-ELLIBER STONY SILT LOAM, ROLLING (F4C): This is not a soil type, strictly speaking, but a land condition that is a result of numerous bedrock outcrops. The soil material found in this condition may be one of several soils that are derived from impure limestone. The series included in this condition are: Elliber, Frederick, Washington*, Lodi*, Lebanon*, and Clarksville.

The bedrock outcrops are so numerous where this condition is found that cultivation over a wide area is impracticable. However, there may be areas large enough for cultivation to have a garden or small crop field. Due to the above, this complex is used for pasture land. This is the proper use for it at present and it produces fine pasture cover. In some places, the bedrock is so close to the surface that very little moisture can be absorbed. This causes the vegetative cover on these areas to suffer for moisture when the rainfall is light.

FREDERICK-ELLIBER STONY SILT LOAM, HILLY ROLLING COMPLEX (F4D): This condition differs from F4C, mainly in occupying steeper relief. On the more friable soils in this complex, sheet erosion is noticeable.

FREDERICK-ELLIBER STONY SILT LOAM, STEEP PHASE (F4E): Where too much of the soil material has not washed off, this condition produces good pastures. However, due to the steepness of relief and increased erodibility of the complex, this phase is on the border line between being used for pasture and forest. The individual condition will have to be analyzed and put into its best adaptation.

LEBANON* LOAM (2B2): The surface 6 or 8 inches are a brown, mellow loam, containing considerable well decomposed organic matter and a few small black mineral specks. When wet, this soil is very dark brown in color; when dry, it is slightly lighter in color.

From 8 to 34 inches, this soil is mingled brown and light yellowish, friable and crumbly, heavy loam or fine sandy clay loam, carrying numerous black mineral particles. The cut surface is yellowish brown streaked with black mineral concretions. The subsoil layer below this to 45 inches is mingled dark reddish brown and yellowish brown, friable, silty clay loam material. Small black mineral particles can be found in this layer, ranging in size from pinhead to buckshot. In many places, decomposed brown sandstone is present in this layer and some gray, partially decomposed chert.

Some sandstone and chert particles can be found scattered on the surface of this soil. The soil is porous and absorbs moisture readily. Due to the above fact, it does not erode easily.

This soil is found on the tops of high ridges and the steeper slopes of ridges in the valley. It is inherently poor for most crops, but is well adapted to white burley tobacco and small grains. Due to its porousness and high absorptive capacity, a well planned fertilizer and soil management program has to be followed to get good results on this soil.

LEBANON* LOAM, HILLY PHASE (22H): This soil differs from 22C, primarily in occupying steeper relief. Erosion is slight and this soil is used for cultivated crops.

LEBANON* LOAM, STEEP PHASE (22E): Because of steepness of relief, this soil is used for pasture purposes. The run-off is low, because of the porousness of the soil. Where utilized for pasture, a heavy mat of broom sedge is always found. If the vegetative cover is thin, there may be a slight amount of sheet erosion.

WESTMORELAND SILT LOAM, SLOPE PHASE (10C): The Westmoreland soil series is characteristically found on the steeper slopes. Although on the tops of some of the ridges are found small areas on milder relief that can

be used for cultivation. These areas have to be carefully managed, as this soil is very susceptible to erosion.

The surface soil is light brown to grayish brown silt loam, usually containing varying amounts of shale particles. The subsoil varies from light brown to reddish brown in color and is variable in depth.

WESTMORELAND SILT LOAM, HILLY PHASE (10F): The difference between the hilly phase and slope phase is, primarily, that the hilly phase is on steeper relief. Due to the steepness of relief, rapidity of run-off, and erodibility of the soil, it is used mostly for pasture.

WESTMORELAND SILT LOAM (10F): This soil is derived from an interbedded condition of limestone and shale. The shale is non-calcareous, is light in color, and prevalent on the surface and in the profile. There are a few loose flat limestone rocks found on the surface. The soil profile varies in depth, probably due to erosion and to the relative proportion of limestone and shale.

WESTMORELAND SHALY SILT LOAM, VERY STEEP PHASE (5CF): This soil has been separated from the silt loam, primarily on the basis of the amount of soil material present. The depth of this soil seldom is below 12 inches. The topsoil is light brown to grayish brown shaly loam mixed with varying amounts of non-calcareous shale, usually passing into a light brown silty clay at 6 to 10 inches. Occasionally, the soil is merely a mixture of a small amount of soil material with shale fragments. The effect of limestone in this soil is small.

WESTMORELAND SILTY CLAY LOAM, HILLY PHASE (6CD): This soil is found along the ridge tops and can be used in a rotated cropping system. It is rather productive and gives good yields of corn and legumes. It is not as erodible as the Westmoreland silt loam.

WESTMORELAND SILTY CLAY LOAM (C2E): The Westmoreland silty clay loam is the best and most productive upland pasture soil. It does not erode easily and is inherently or naturally very productive. The carrying capacity of pastures on this soil is approximately 3 to 4 acres per 1000-pound steer.

This soil is derived from highly calcareous fossiliferous limestone and calcareous shale interbedded. The surface 5 inches are grayish brown silty clay loam, which breaks into medium and fine angular particles held together by a mass of grass roots. Considerable decomposed organic matter is well incorporated with the soil.

From 5 to 12 inches, this soil is a yellowish brown, heavy, silty clay loam, which breaks readily into fine angular soil particles, ranging in size from one-eighth to one-fourth inch in diameter. Inside this are other particles that are finely mingled dark reddish brown to ocherous yellow. A brown film is found on the breakage plane. Below this layer and to the depth of 24 inches is a light yellowish brown, slightly tenacious, silty clay, which breaks down into angular soil particles, ranging in size from one-fourth to one-half inch in diameter. A brown coating can be seen on the breakage planes and a few black mineral particles are present in places.

From 24 to 30 inches, this soil is mingled ocherous yellow and brown, with small spots of dark reddish brown, friable, silty clay loam material. A few fine black mineral particles are present. The average depth to the bedrock from the surface is 3 feet.

Erosion is present, in the form of gullies and small landslides, to such an extent that the subsoil is exposed in many places. This soil is characterized by the choppy slopes and the slopes are cut by ravines. Also, there are some dome-shaped and cone-tipped hills.

WESTMORELAND SILTY CLAY LOAM, VERY STEEP PHASE (62E): This soil differs from 62D in slope and it is primarily adapted to pasture for sheep and light cattle. Where the erosion is too great, this soil is used for forest.

UPSHUR SILTY CLAY LOAM, HILLY PHASE (41E): The surface 2 inches are a dark brown silty clay loam with a purplish tinge. This layer has a granular structure. From 2 to 20 inches, this soil is brown to purplish brown compact clay, with many small partially weathered limestone fragments. Due to its erosiveness, the soil is very shallow; but it can be cropped where a carefully planned cropping system is followed.

UPSHUR SILTY CLAY LOAM (41D): Since this soil occupies a steeper relief and cannot be economically cropped, it is used for pasture. It produces an excellent pasture cover.

UPSHUR STONY SILTY CLAY LOAM, HILLY PHASE (141E): This is a land condition, rather than a soil, due to the numerous bedrock outcrops that occur. The soil material, as in the Elliber-Frederick complex, may be one of several soils. The soil types included in this condition are: Ball Hill*, Upshur, and Carbo*.

Due to the numerous rock outcrops, this condition is used for pasture. Bluegrass and other desirable pasture grasses grow readily on this condition and the carrying capacity of the pastures is much higher than that of the soils derived from impure limestone.

UPSHUR STONY SILTY CLAY LOAM (141F): This condition differs from Upshur stony silty clay loam, hilly phase, primarily in occupying steeper relief. Due to the rapid run-off, erosion is much greater on this condition.

CARBO* SILTY CLAY LOAM (70D): The surface 5 or 6 inches are slightly grayish brown, heavy silt loam or light, silty clay loam. In

some places it is distinctly a silty clay loam. Some organic matter is present and incorporated with the soil material.

From 8 to 12 inches, this soil is finely mingled ocherous yellow and brown, heavy, slightly plastic, silty clay loam, which breaks into angular lumps 1 to 2 inches in diameter. There is a coating of brown on the breakage plane and the cut surface is yellowish brown. Beneath this layer and to the depth of 22 inches, the soil is mingled reddish brown and ocherous yellow, plastic, silty clay. This breaks into lumps of 2 to 4 inches in diameter, which have coatings of brown and dark reddish brown on the breakage line.

From 22 to 32 inches, the soil is ocherous yellow, with fine specks of pale greenish yellow, friable, silty clay loam material. This is mixed with soft, decomposed, light greenish yellow shale. This soil is underlain in places by laminated fossiliferous limestone, platy limestone, argillaceous limestone, and bright green shale.

The Carbo soil is somewhat less productive than the soils from highly calcareous limestone. However, under a good rotation and soil management program, good crop yields can be obtained.

CARBO* SILTY CLAY LOAM, STEEP PHASE (7CT): Due to the erodibility of this soil, it is utilized for pasture. It has the same characteristics as the 7CT, except that it occupies steeper relief. The pastures found on this soil are above the average.

DALL HILL* SILTY CLAY LOAM (8CT): This soil is very productive and is derived from a gray or white soft limestone, which contains a small quantity of phosphates. It produces good corn and legumes.

The surface 3 or 4 inches are a steel gray to dark gray silty clay loam. From 4 to 20 inches, this soil is very plastic and continues to be the same color. The depth from the surface to bedrock varies considerably,

but is approximately from 3 to 4 feet. This soil does not erode easily and it can be cultivated on a relatively steep slope.

[illegible] STONY LAND, [illegible] SOIL MATERIAL (47Z): This soil is derived from material weathered from sandstone and shale interbedded. It is from the Juniata formation and is situated just beneath the sandstone-capped mountains. Most of this soil is used for forest and it cannot be economically used for pasture. It produces a vigorous forest growth. The surface soil is brown to purplish in color and is a fine sandy loam texture. Beneath this layer and at about 4 or 5 inches is a somewhat heavier textured layer. The color ranges from purplish to brown.

[illegible] STONY LAND, [illegible] SOIL MATERIAL (47Y): This is a complex, rather than a soil, due to the outcropping of the bedrock. The main difference between this condition and the stony condition is that it has a higher percentage of the surface covered with outcrops and no part is suitable for cultivation. Due to the similarity of this condition in all soils, any soil material may be mapped. The greatest percentage of this condition is Hatboro soil material.

The land is used for pasture, although the use of the relief depends upon the amount of erosion that has taken place. In the better soil materials, this condition produces fine pasture cover. Due to the small amount of soil material on the bedrock, the absorptive capacity is low and pastures suffer in dry weather.

[illegible] STONY LAND, [illegible] SOIL MATERIAL (47Y): This complex differs from 47Z, primarily in occupying steeper relief. Due to the rapid run-off, most of the soil material has been removed by erosion and this condition is used for forest.

STEEP STONY LAND, MUSKINGUM SOIL MATERIAL (STT): This is a land condition, rather than a soil, due to the steepness of the area. It is characterized by the presence of bedrock escarpments and loose stones and boulders near the top of the mountain. This condition can only be used for forest.

CLARKSVILLE CHERTY SILT LOAM, STEEP PHASE (ZTT): The surface 2 inches are a grayish brown, light silt loam, containing small amounts of decomposed organic matter.

From 2 to 10 inches, this soil is light brown or light yellowish brown silt loam. In many places, only part of the two layers mentioned above are present, due to the amount of sheet erosion that has taken place.

The subsoil from 10 to 37 inches is a light yellowish brown, friable, crumbly, silty clay loam.

From 37 to 45 inches, this soil is finely mingled brown, rust brown, ocherous yellow, and very light gray in color, with some friable decomposed chert material and containing numerous small black mineral particles. The lower part of this layer to 55 inches is mingled brown, ocherous yellow, dark reddish brown, and very light gray, friable, crumbly, silty clay material. It is derived from decomposed limestone and chert.

Scattered on the surface, in the surface soil, and in the subsoil are numerous angular chert fragments, which give distinctly a cherty or gravelly appearance.

The Clarksville cherty silt loam is inherently a poor soil that is badly leached and low in organic material. Sheet erosion is somewhat pronounced; and in some places, part of the surface has been removed by run-off.

Alluvial Land

HUNTINGTON SILT LOAM (Ha): Huntington silt loam is the most productive alluvial soil in the area. Due to the fact that the streams overflow often, this soil maintains a high state of fertility. This is a first-bottom soil, developed from materials washed principally from soils underlain by limestone.

The surface 18 inches are dark brown, mellow, silt loam. This layer usually contains a large amount of organic matter that is partially decomposed. From 18 to 38 inches, this soil is light brown, friable, silty clay loam, with a few mineral specks. Beneath this layer and to the depth of 42 inches, this soil is light brown, friable, sticky, silty clay material. A few black mineral specks and small brownish yellow lime carborate concretions are found in this layer.

LINDSIDE SILT LOAM (Ld): This soil differs from Huntington, primarily in having a poorly drained subsoil from a depth of 12 inches down. The surface 12 inches are brown or light brown, friable silt loam. From 12 to 38 inches, this soil is mingled light grayish brown and rust brown, friable, crumbly, silty clay loam. This contains small spots, specks, and films of black mineral and shale material. Beneath this layer and to the depth of 50 inches, the soil is light gray or steel gray, with small spots of rust brown and colorous yellow silty clay loam material. Fibrous brown mineral matter, specks, and shale material are also found in this layer. At 40 inches, a layer of limestone and chert gravel is often found. The texture of the subsoil varies considerably, depending upon the surrounding soil materials.

The Lindside soil is rather productive, but the amount of rainfall greatly affects the present crop. If the rainfall is above normal, the

moisture becomes too great for good crop production.

LINDSIDE SILT LOAM, STEEPY PHASE (12S): This soil differs from 12A, primarily in occupying a steeper relief. Due to the steeper relief, the steepy phase has better drainage when rainfall is above normal.

MELVIN SILTY CLAY LOAM (7A): This soil differs from Lindside, primarily in being poorly drained throughout the profile. The surface soil is gray to dark gray silty clay loam. This is often mottled with rust brown, almost to the surface. The subsoil is gray or gray and rust brown, mottled, plastic, silty clay loam.

Due to the excessive amount of moisture in this soil, it is used mostly for pasture. It produces a vigorous pasture cover, which contains some marsh grasses and weeds.

ALLUVIAL SOILS (INDISCRIMINATE) (9A): This material is utilized almost entirely for pastures. It is a mixture of geologic materials, with some soil material that has not weathered into any definite soil type. Often sandstone and limestone boulders and chert fragments are on the surface and throughout the material.

ELK LOAM, SLOPE PHASE (20S): This soil is developed from material washed from limestone soils and occupies a terrace position. The surface 10 inches are brown, mellow loam, with a considerable amount of organic matter well incorporated with the soil material. From 10 to 20 inches, this soil is slightly yellowish brown, friable, slightly plastic, silty clay loam. Mineral particles can be found in this layer. Beneath this layer and to the depth of 40 inches, the soil is mottled brown and ocherous yellow, friable, silty clay loam. This, in some places, contains soft decomposed pieces of purple shale and sandstone. A few black mineral specks are also found in this layer.

Elk loam is not as productive as Huntington silt loam, but under proper practices will produce good crop yields.

Colluvial Land

HAYTER* LOAM, LEVEL PHASE (14A): This soil is found from a talus along the slopes of the mountains and is usually found in the drains running perpendicular to the top of the mountain. This talus widens as it reaches the milder slopes and concentrates along the drains. The material that has moved down the slopes has covered the residual limestone soils at varying depths. The geologic materials from which this soil developed are mixtures of highly calcareous limestone, impure limestone, sandstones, and shales.

The Hayter loam, level phase, is very productive and produces good crops. However, only a small acreage of this soil is found in the area.

HAYTER* LOAM, SMOOTH PHASE (14B): This soil differs from the level phase, primarily in occupying steeper relief. It, like the level phase, is very productive and gives good crop yields.

HAYTER* LOAM (14C): This soil, like 14A and 14B, is developed from a mixture of highly calcareous limestone, impure limestone, sandstones, and shales. It generally contains a large amount of organic matter and has a high water-holding capacity.

The surface 12 inches are brown to dark brown, mellow loam, containing a fairly large amount of organic matter. From 12 to 30 inches, the soil is light brown, friable, slightly plastic, silty clay loam. Some black mineral specks can be found in this layer.

Beneath this layer and to the depth of 42 inches is light brown, friable, silty clay loam, which contains mixed purple and ochreous yellow,

soft, decayed shale. Brown mineral specks and some partially decomposed sandstone can also be found in this layer.

This soil is very productive and gives good yields for crops. Due to its high productivity, all of it that can be economically cultivated is handled as such.

HAYTER* LOAM, HILLY PHASE (14D): This soil is characteristically the same as 14C, except that it occupies a steeper relief. Due to the rapid run-off, sheet erosion is pronounced in some places. Where this erosion has not taken off too much of the surface soil and good soil management is practiced, it gives good crop yields.

HAYTER* STONY LOAM, S[illegible] PHASE (34B): This is a land condition, rather than a soil type, due to the excessive number of sandstone boulders found on the surface and throughout the profile. The soil characteristics are the same as found in the Hayter loam. Due to the excessive number of boulders, this soil cannot be economically used for crops, except in very small areas. It produces fine pastures and the carrying capacity is from 3 to 5 acres per 1000-pound steer.

HAYTER* STONY LOAM (34C): This condition differs from 34B, in that it occupies a steeper relief.

HAYTER* STONY LOAM, HILLY PHASE (34D): This condition occupies a relief of 15 to 30 per cent slopes. It produces good pastures and is dominantly given this use.

HAYTER* STONY LOAM, STEEP PHASE (34E): Since this condition occupies a steeper relief and the boulders are more numerous, it is on the border line between being used for pasture or forest. The soil characteristics are the same as those of Hayter loam, except that a higher percentage of the land is covered with sandstone boulders.

JEFFERSON FINE SANDY LOAM, HILLY PHASE (20D): This soil occupies the same position as the Hayter* soils, but is developed primarily from materials of sandstone and shale. Due to the materials from which it is developed, this soil is less productive than the Hayter* soils. Under a good fertilizer and soil management program, this soil will produce good yields of white burley tobacco, potatoes, and truck crops. Because of its low productivity, it is used mostly for pasture.

The surface soil is gray to light grayish brown, fine, sandy loam, which crumbles easily into single grain particles. This is underlain at about 12 inches by a fine sandy clay, which at about 30 inches becomes reddish yellow to brownish yellow in color.

JEFFERSON FINE SANDY LOAM, STEEP PHASE (20E): This soil differs from 20D, primarily in occupying steeper relief. Due to the surface texture and rapid run-off, erosion is very pronounced. Because of the erodibility of this soil, it is either utilized for pasture or forest.

JEFFERSON STONY FINE SANDY LOAM (17C): This condition corresponds to the Jefferson fine sandy loam, as the Hayter* stony loam corresponds to the Hayter* loam. However, it is not as productive as the Hayter* soils.

JEFFERSON STONY FINE SANDY LOAM, HILLY PHASE (17D): This soil is on the border line between being used for pasture or forest. Due to its low productivity and rapid run-off, sheet and gully erosion is quite prominent. If the erosion is not too great, this soil can be economically used for pasture.

JEFFERSON STONY FINE SANDY LOAM, STEEP PHASE (17E): This soil differs from 17D, in that it occupies a relief of 30 to 60 per cent slopes. Due to its erodibility, this soil is mostly used for forest. That is its use under the existing conditions.

EWERY* SILT LOAM (2A): This soil is developed in depressions and along the lower slopes of hills. It is formed from material that has been washed from the better limestone soils. Due to its high productivity, it is used for cropland.

From 0 to 10 inches, this soil is a brown, mellow, silt loam. Beneath this layer and extending to 32 inches in depth, it is light brown, friable, silty clay loam soil material. It carries a large number of small black mineral particles, which increase in size and number as the soil layer deepens. The depth of Emory silt loam varies considerably.

The surface soil when wet is darker than in normal conditions or when moist. It contains a fairly large quantity of well decomposed organic matter, which is thoroughly interbedded in the soil.

Corn, small grains, truck crops, legumes, and grasses give excellent yields on this soil.

EMORY* SILT LOAM, SMOOTH PHASE (2): This soil is just as productive as 2A, but differs primarily in occupying steeper relief.

EMORY* SILT LOAM, HIGH PHASE (2C): This soil has the same characteristics as the other Emory soils, but is found on a relief of 7½ to 15 per cent slopes. It is located along the steeper slopes and intermittent drains.

ELKMONT SILT LOAM, SMOOTH PHASE (3Cp): This soil is formed from materials washed from impure limestone soils.

The surface 10 inches are light grayish brown to light grayish yellow silt loam. In some places, chert fragments can be found in the surface layer of this soil. From 10 to 32 inches, this soil is brownish and yellow, friable, silty clay loam, very fine sandy silty clay or even fine sandy clay. The lower portion of the subsoil is brownish yellow and contains spots of rust brown, ocherous yellow, and very light gray, friable,

silty clay or fine sandy clay.

The Bloxford soils are not as productive as the Tuxedo soils. However, under good management practices, good yields are obtained.

Tuxedo, gray silty clay loam, severely eroded (Tx). This soil is formed from material washed from Cecil silty clay loam, Cecil silty clay loam, Durham silty clay loam, and Cullenward silty clay loam. It is very productive and gives good yields of corn and legumes.

The surface 6 inches is gray silty clay loam, containing a few small spots of rust brown. From 6 to 24 inches, it is light gray, with spots of rust brown or brown plastic silty clay. Directly this layer and to the depth of 40 inches, it is light gray or steel gray, hard, plastic, silty clay. The brown colors more pronounced as depth increases. A few chert fragments are sometimes present below a 30 to 33 inches.

Table No. 1 - Per cent of Belfast Hills Area in different soil types and their uses in 1937.

Soil Number	Per Cent of Area	Pasture	Corn	Small Grain	Legumes and Grasses	Tobacco	(1) Special	Woods	Idle
10B	.10	83.7				1.1	6.9	1.4	
20B	.58	72.6		6.1	72.5	10.9	5.9		
40	.80	6.1	28.4	30.5	30.0	2.4	2.4	.4	
42	1.50	45.2	2.7	28.4	21.1	.9	1.7		
47	.60	72.1	10.6	12.7		2.6	.5	4.5	
50B	3.00	85.1	10.5	10.5	20.5	1.7		2.1	
52B	12.50	46.4	16.1	14.1	12.1	1.2	1.4	8.7	
53B	1.00	47.3	11.6	11.5	7.4	.4	1.6	20.9	
55	.65		5.1	35.9	53.9	5.1			
58	1.90	41.4	11.9	12.1	14.1		2.4	18.1	
75B	1.40	71.9	3.7	6.7	1.1	.9	.9	16.5	
91B	.35	46.1	53.9						
91D	.40	31.9	54.4	10.9	11.9				
91E	.35	94.1		5.9					
93B	.77	31.3	9.1	21.4	38.3				
93D	.90	9.1	10.9	51.9	30.9	2.3	2.3	12.5	

Table No. 1 - Continued

Soil Number	Per Cent of Area	Pasture	Corn	Small Grain	Grasses	Tobacco	(1) Special	Woods	Idle
[illegible]	.21	61.3	17.6		10.6	4.1	5.3		
16C	.03	16.7			83.3				
22C	.17	16.9	39.6		4.4	7.7	31.4		
22D	1.00	28.3	36.7	12.3	10.8		1.9	9.9	
22E	.55	77.9	6.3				1.6	14.2	
24C	.32	75.7			24.3				
24D	2.00	76.1	.3	.2	2.9		.2	18.4	
24E	6.05	72.2	1.8	.2	1.4	.2	.4	23.1	
32C	.30	10.7	2.3	55.5	22.2		9.2		
32D	.60	20.3	33.5	35.0	3.2	.3	7.2	1.3	
32E	1.30	65.2	5.8	7.2	20.6	.3	.6	.3	
33C	.21	81.7			18.3				
33D	1.00	82.3	4.0	.2	3.1			7.5	
33E	2.32	90.2	.3	.5	2.2			6.7	.1
50E	.23	100.0							
50F	.71	22.6						71.4	

Table No. 1 - Continued

Soil Number	Per Cent of Area	Pasture	Corn	Small Grain	Legumes and Grasses	Tobacco	(1) Special	Woods	Idle
63D	1.10	52.8	17.7	4.9	7.4	.6	8.3	15.7	2.7
63E	5.29	69.4	5.1	4.2	2.4		2.5	15.4	1.0
63F	3.10	52.7			2.1		1.2	42.4	
64D	.67	59.7	9.5	10.3	11.9		.3	.3	
64E	.01		100.0						
B43	.13	100.0							
B44B	3.89	95.9	1.0	.1			1.7	1.7	
B44D	1.69	85.8	1.9	2.7	4.9		.1	6.9	
70D	.50	37.1	11.2	25.1	12.9	1.7			
70E	.19	20.2		75.8					
77C	.01		100.0						
77D	.29	54.2		41.3	5.0				
87D	2.89	12.9			1.4		1.7	83.1	
87E	5.59	87.7	.7	.5			.4	.7	
87F	3.19	83.5	.8	.3	1.9			12.1	
87G	2.49	1.2						98.8	
87F	.29	15.2	10.6					74.1	

Table No. 1 - Continued

Soil Number	Per Cent of Area	Pasture	Corn	Small Grain	Legumes and Grasses	Tobacco	(1) Special	Woods	Idle
5	.77	7.3	41.2	20.8	23.1	.3	2.7		
12	.46	47.9	3.3	1.9	46.8		.5		
12B	1.00	40.5	18.6	7.7	19.3	1.4	2.7	4.7	
7	.16	90.7	5.3			3.3		5.3	
7A	.19	100.0							
8B	.13	40.8		47.3		11.3			
14B	.38	75.3	8.7	15.6	6.1		20.9		
14C	3.20	29.3	35.3	15.9	13.7	7.4	2.1	.3	
14D	1.03	59.8	29.1	9.5	.3	1.1	5.1	3.1	
34E	.25	83.4	9.9	6.8					
34D	5.33	91.3	4.3	2.1	3.3	.7	3.3	3.3	
34D	4.39	91.3	3.7	.7	3.3	.1	3.4	3.3	
34E	.37	83.3	7.3			.3			4.3
39B	.07	30.3	35.7		15.9		23.3		
39D	.73	17.3	17.4	37.3	27.4	1.3		3.7	
39E	.23	37.7	23.3	3.1	41.3				

Table No. 1 - Continued

Soil Number	Per Cent of Area	Pasture	Corn	Small Grain	Legumes and Grasses	Tobacco	(1) Special	Woods	Idle
17C	2.52	77.9	6.7	4.0	4.0		3.1	1.9	1.9
17E	1.65	77.6	7.5	2.3	6.9		3.4	10.4	
17F	.90	77.7	4.2				2.2	15.9	
21	.13	48.7	38.5	11.0	1.9				
22	.43	39.8	30.2		17.6	8.6	3.2	.6	
23	.24	47.0	47.0				6.0		
23B	.07	32.3	55.9	11.8					
27	.33	62.2			37.8				

(1) Includes orchards and truck crops.

Table No. 2 - Soil legend and [illegible]

Soil No.	Slope	Use Capa-bility	Series, Texture, and Phase
	(1)	(2)	UPLAND
19	D	3	Hagerstown silt loam, hilly phase
20	C	1	Russell* silt loam
4	C	1	Washington* silt loam
4	D	3	Washington* silt loam, hilly phase
4	E	F	Washington* silt loam, steep phase
30	C	3	Washington* clayey silt loam
30	D	3	Washington* clayey silt loam, hilly phase
30	E	F	Washington* clayey silt loam, steep phase
3	C	2	Lodi* fine sandy loam
3	D	3	Lodi* fine sandy loam, hilly phase
3	E	F	Lodi* fine sandy loam, steep phase
21	C	2	Frederick silt loam
21	D	3	Frederick silt loam, hilly phase
21	E	F	Frederick silt loam, steep phase
33	D	3	Frederick clayey silt loam, hilly phase
33	E	F	Frederick clayey silt loam, steep phase
40	C	2	Elliber silt loam
39	C	2	Elliber clayey silt loam
39	D	3	Elliber clayey silt loam, hilly phase
39	E	F	Elliber clayey silt loam, steep phase
34	C	F	Frederick-Elliber clayey silt loam, complex
34	D	F	Frederick-Elliber clayey silt loam, hilly phase complex
34	E	F	Frederick-Elliber clayey silt loam, steep phase complex
22	C	2	Delanco* loam

Table No. 2 - Continued

Soil No.	Slope	Use Adaptation	Series, Texture, and Phase
	(1)	(2)	WILLIS (Cont'd)
38	F	6	Willis* loam, hilly phase
39	V	7	Willis* loam, steep phase
10	C	7	Weatherford silt loam, steep phase
10	F	8	Weatherford silt loam, hilly phase
10	B	7	Westmoreland silt loam
56	B	6	Weatherford clay silt loam
56	F	7	Westmoreland clay silt loam, very steep phase
38	F	6	Weatherford silty clay loam, hilly phase
62	B	5	Weatherford silty clay loam
62	F	7	Westmoreland silty clay loam, very steep phase
41	B	5	Upshur silty clay loam, hilly phase
41	B	6	Upshur silty clay loam
241	E	7	Upshur stony silty clay loam, hilly phase
241	V	8	Upshur stony silty clay loam, steep phase
70	D	8	Durio* silty clay loam
70	E	8	Durant silty clay loam, steep phase
53	B	8	Tall Hill* silty clay loam
63	F	7	Yahola fine sandy loam, very steep phase
47	E	8	Collin stony sand, Darlington* soil material
47	B	7	Rough stony land, Darlington* soil material
57	F	7	Rough stony land, Wichita soil material
37	B	8	Clarksville stony silt loam, stony phase
			ALLUVIAL LAND
5	A	1	Martinsburg silt loam
12	A	8	Kinkaid silt loam
12	B	8	Kinkaid silt loam, smooth phase

Table No. 2 - Continued

Soil No.	Slope	Use Adaptation	Series, Texture, and Phase
	(1)	(2)	ALLUVIAL LAND (Cont'd)
7	A	P	Waldin silty clay loam
M	A	P	Alluvial soils (undifferentiated)
20	C	2	Elk loam, slope phase
			COLLUVIAL LAND
14	A	1	Hayter* loam, level phase
14	B	1	Hayter* loam, smooth phase
14	C	1	Hayter* loam
14	D	2	Hayter* loam, hilly phase
34	B	P	Hayter* stony loam, smooth phase
34	C	P	Hayter* stony loam
34	D	P	Hayter* stony loam, hilly phase
34	E	P	Hayter* stony loam, steep phase
80	C	2	Jefferson fine sandy loam
80	D	3	Jefferson fine sandy loam, hilly phase
80	E	4	Jefferson fine sandy loam, steep phase
17	C	P	Jefferson stony fine sandy loam
17	D	P	Jefferson stony fine sandy loam, hilly phase
17	E	P	Jefferson stony fine sandy loam, steep phase
2	A	1	Fenris silt loam

Table No. 8 - [illegible]

Soil No.	Slope	Use Adaptation	Series, Texture, and Phase
	(1)	(2)	SOUTHERN LAND (Cont'd)
8	-	1	Bluegrass silt loam, smooth phase
9	C	1	Bluegrass silt loam, slope phase
10	D	2	Clifford silt loam, smooth phase
11	D	1	Dunbar silty clay loam, smooth phase

(1) Slope Legend

A = 0-2%
B = 2-7%
C = 7-12%
D = 12-20%
E = 20-30%
F = 30-60%
G = 60% and above

(2) Use Adaptation

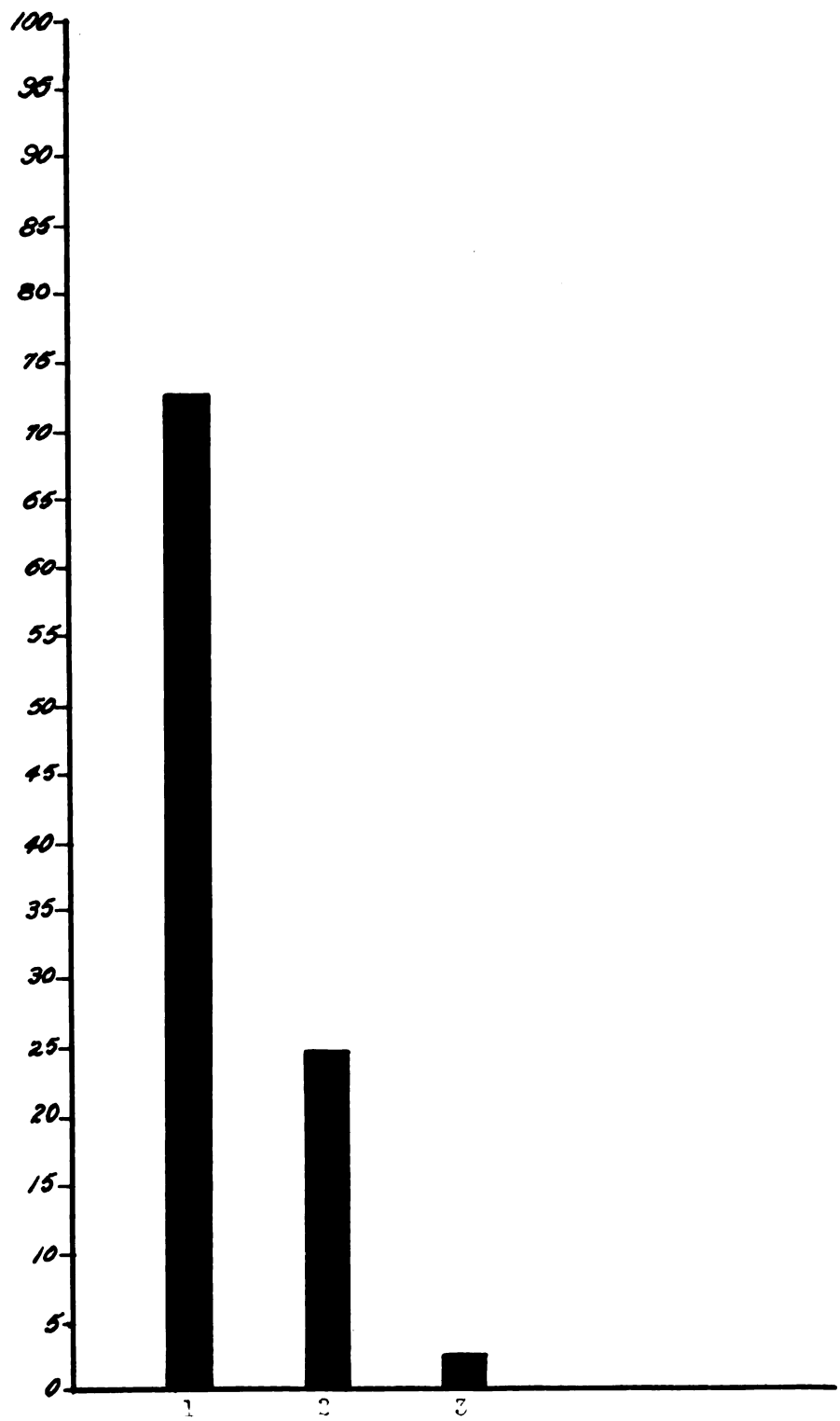
1 = First-class crop soil
2 = Second-class crop soil
3 = Third-class crop soil
4 = Forest soil
5 = Pasture soil

Table No. 3 - Farm Classification

Total number of farms in area - 77; Average size of farms - 98.0 acres; General type farming practiced - livestock

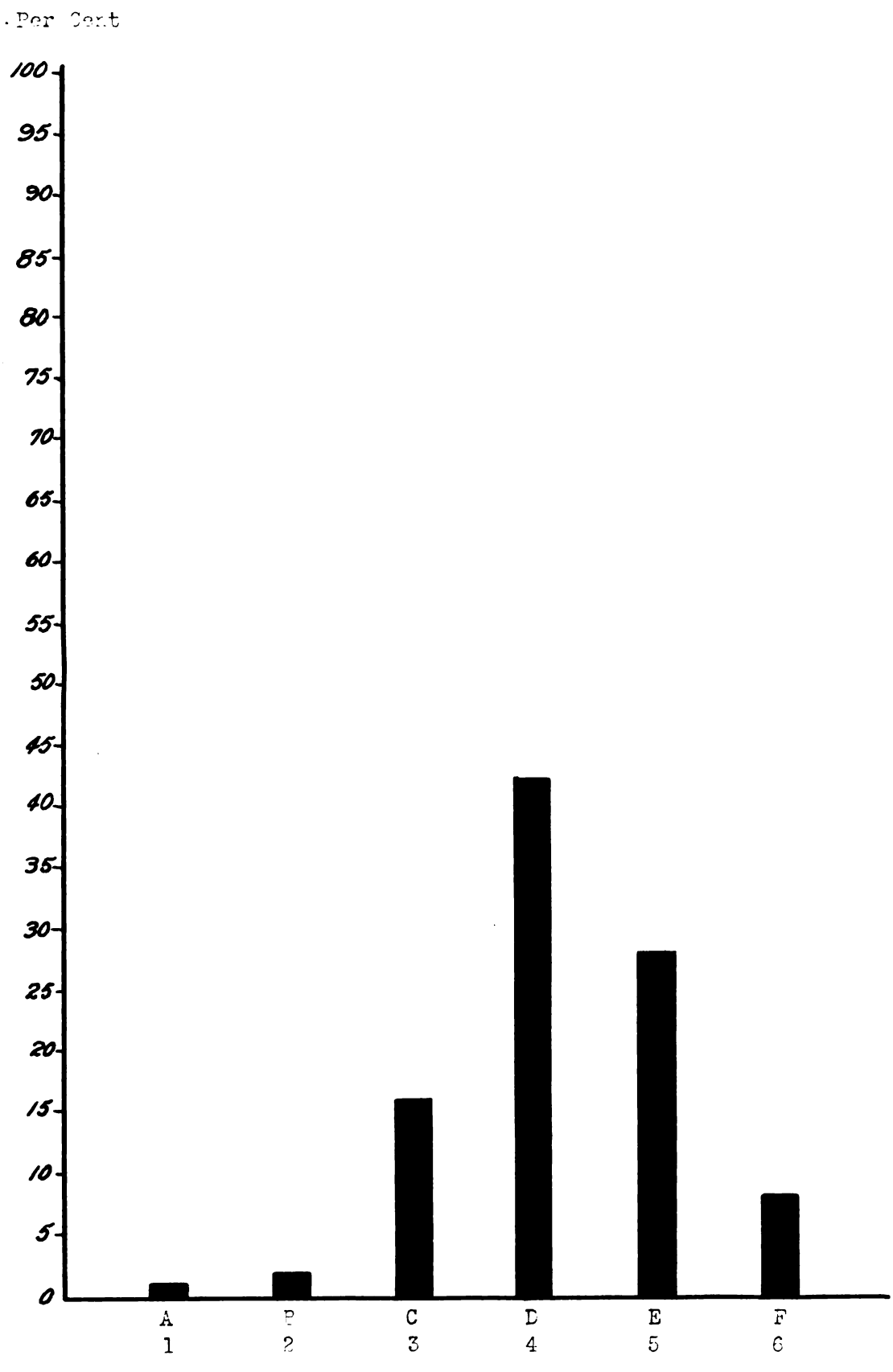
SIZE AND NO. OF FARMS			TENURE						TYPE OF FARMING				
Size of Farms	No. Farms	Per Cent of All Farms	No. Owner Operators	No. Managers	No. Tenant Operators	Average Length of Tenure	No. Share Croppers	Total No. Wage Hands	General	Live-stock	Dairy	Cotton	Truck
Under 10	3	3.9	3						3				
10-19	4	5.2	4						1				
20-49	20	26.0	14				6		20				
50-99	20	26.0	16		2		5	3	20				
100-174	16	20.8	12		1		23	3	6	8			
175-259	12	15.6	11		1		20		1	8			
260-499	3	3.5	1		1		4			3			
500-999													
1000+													
Total	77	100.0	63		5		57	6	53	19			
Self-supporting													

Graph No. 1 - Per Cent of Residual, Colluvial, and Alluvial Soils in Area



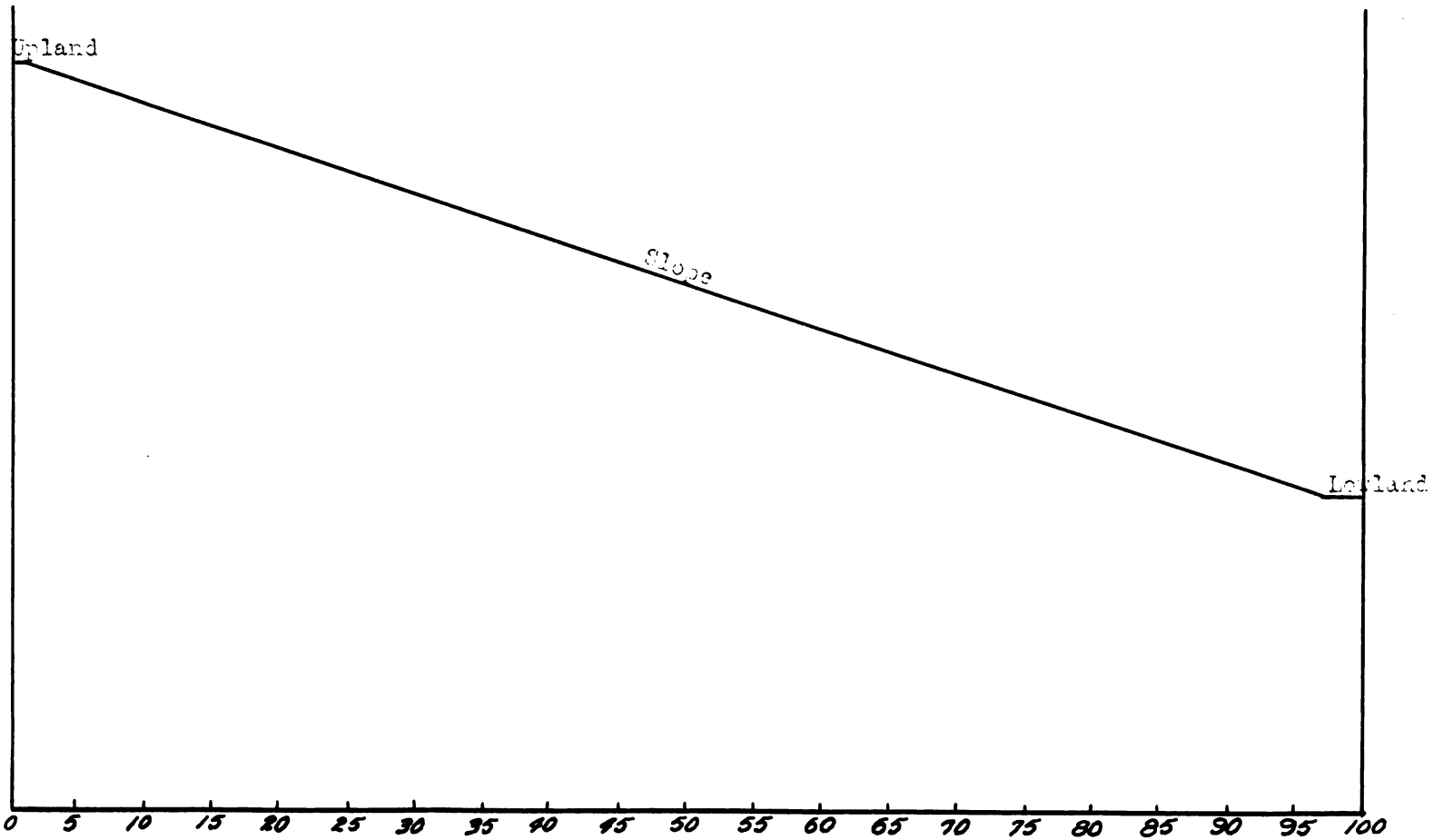
1 = Residual - 72.54%
2 = Colluvial - 24.62%
3 = Alluvial - 2.84%

Graph No. 2 - Per Cent of Slope Classes Within Area



Slope Classes	Per Cent of Classes
A = 0-2%	1 = 1.04%
B = 2-7%	2 = 2.05%
C = 7-15%	3 = 16.61%
D = 15-30%	4 = 42.71%
E = 30-60%	5 = 28.68%
F = 60% & up	6 = 8.74%

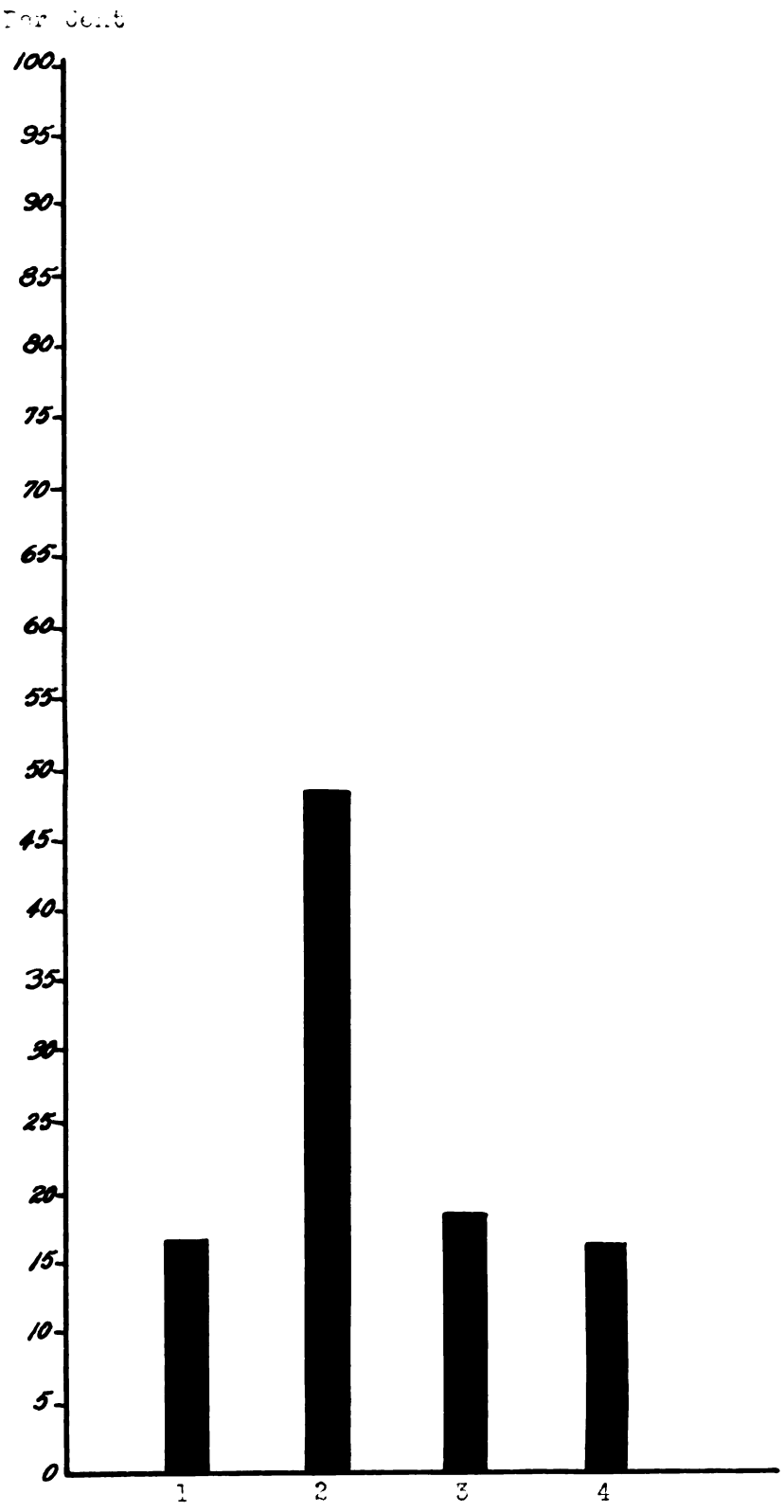
...ph No. 3 - Graphic Comparison of the Topography of the Area



Upland = .5% Slope = 96.41% Lowland = 3.13%

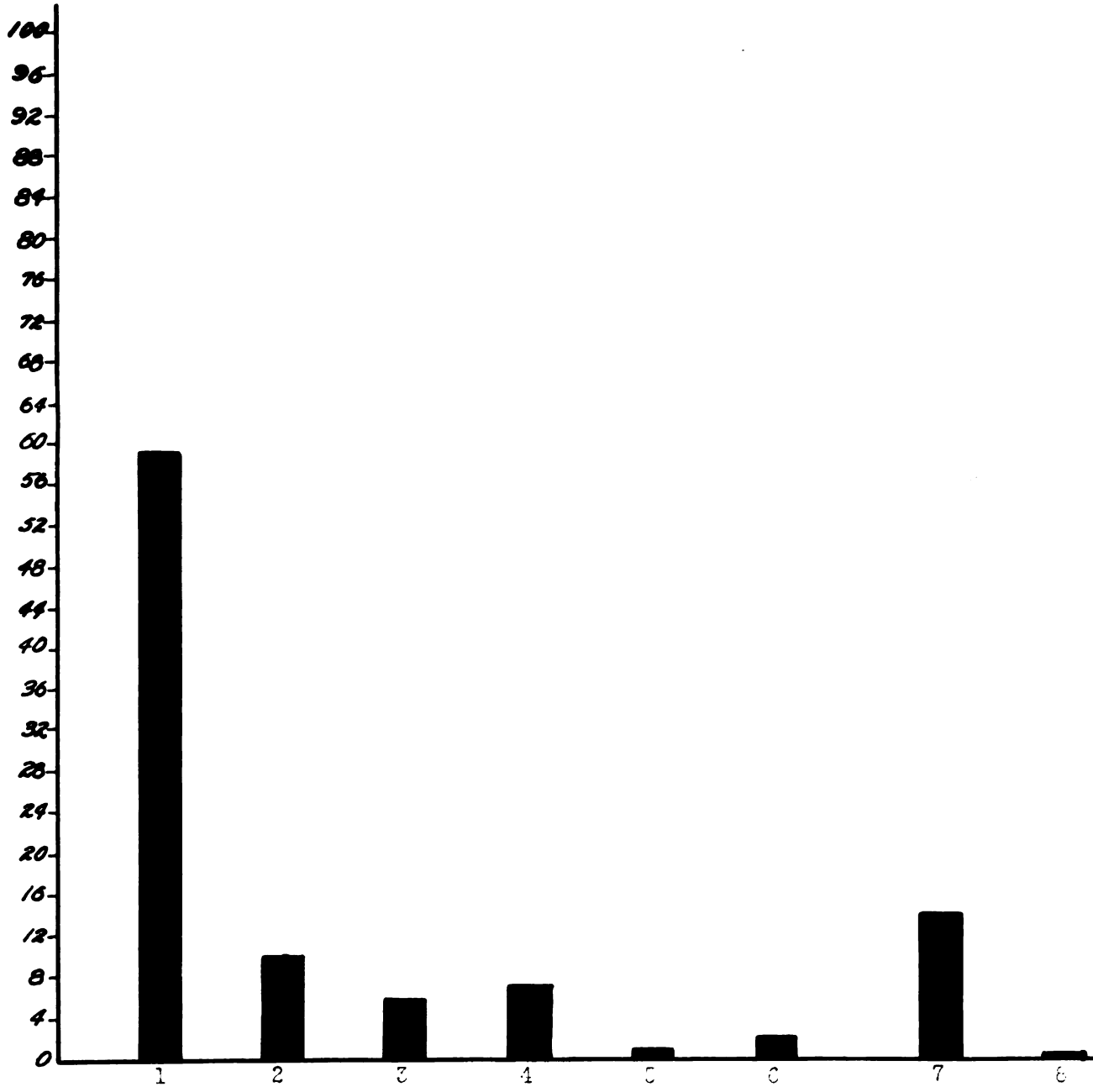
Per Cent of Total Area

Graph No. 4 - Per Cent of Different Soil Textures Within Area



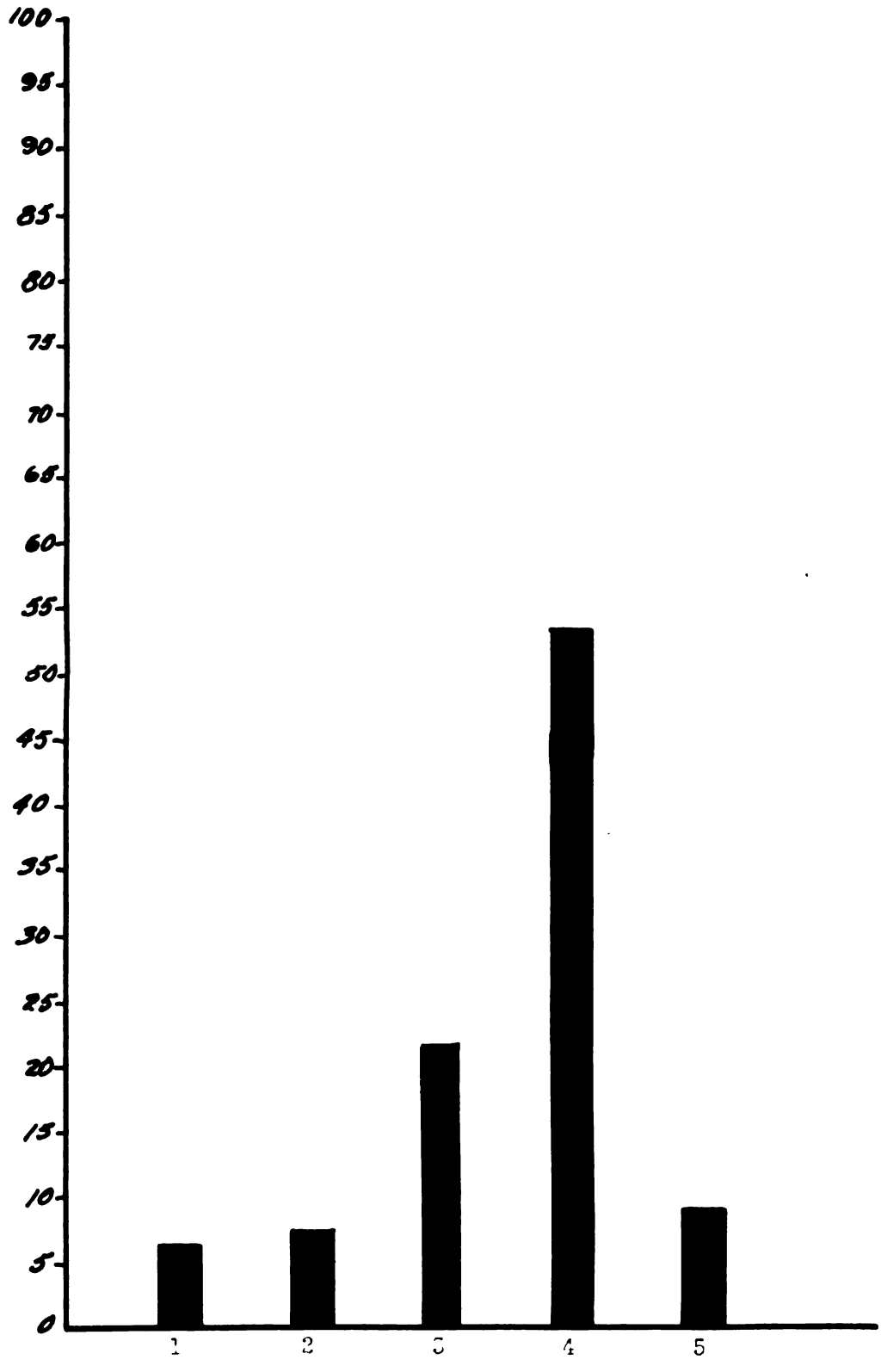
1 = Silty clay loam - 16.94%
2 = Silt loam - 48.48%
3 = Loam - 18.18%
4 = Fine sandy loam - 16.48%

Graph No. 5 - Land Use in Belfast Mills Area



1 = Pasture - 59.6%
2 = Corn - 10.2% (Includes all land fallowed due to time map was made)
3 = Small grain - 6.5%
4 = Legumes and meadows - 7.7%
5 = Tobacco - .4%
6 = Special - 1.2% (Includes orchards and truck crops)
7 = Woodland - 14.5%
8 = Idle - .1%

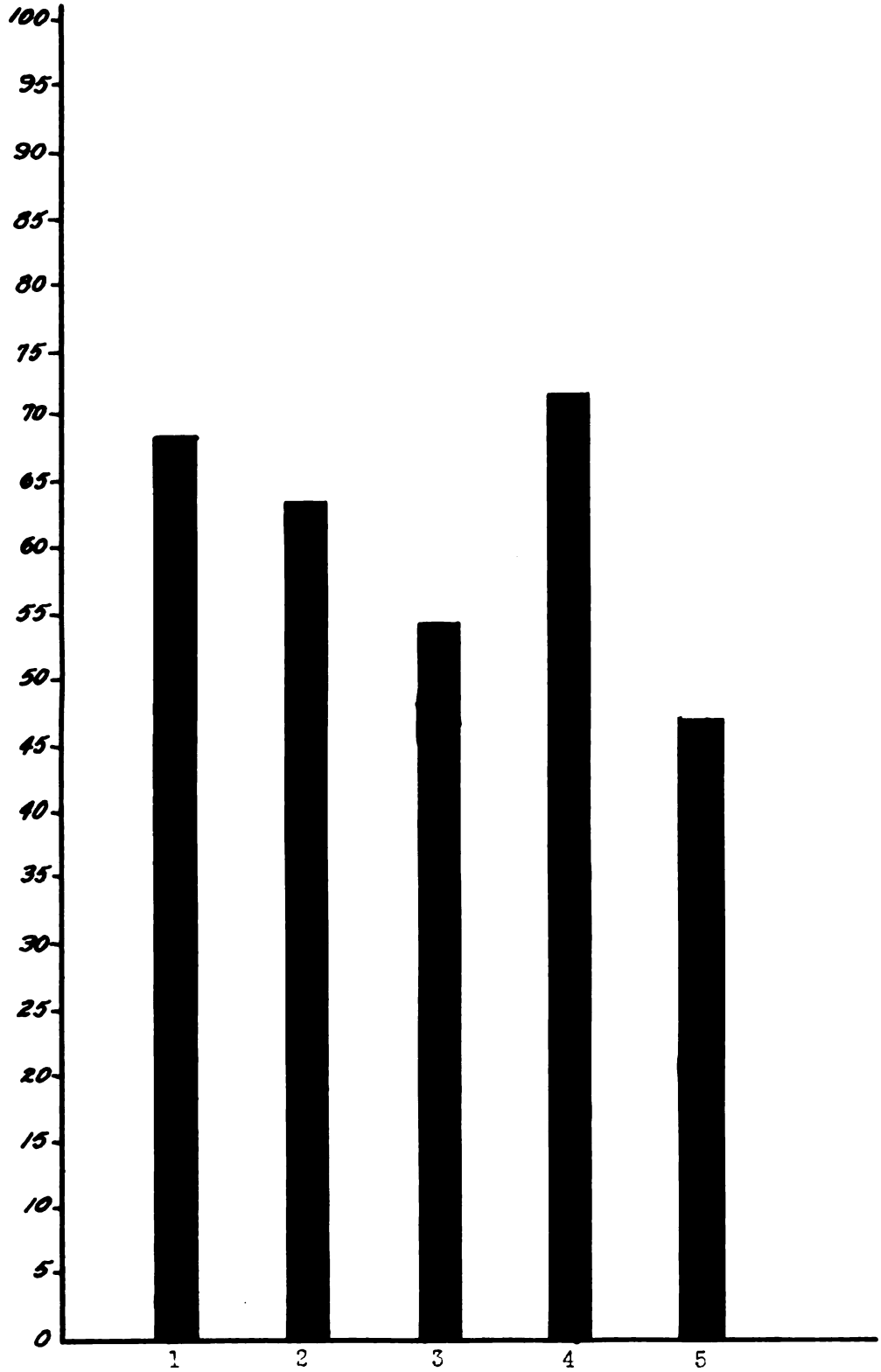
Graph No. 2 - Use Adaptation of Soils as Recommended by Soil Survey



1 = 1st crop soil - 6.29%
2 = 2nd crop soil - 7.41%
3 = 3rd crop soil - 20.69%
4 = Pasture soil - 53.13%
5 = Forest soil - 9.29%

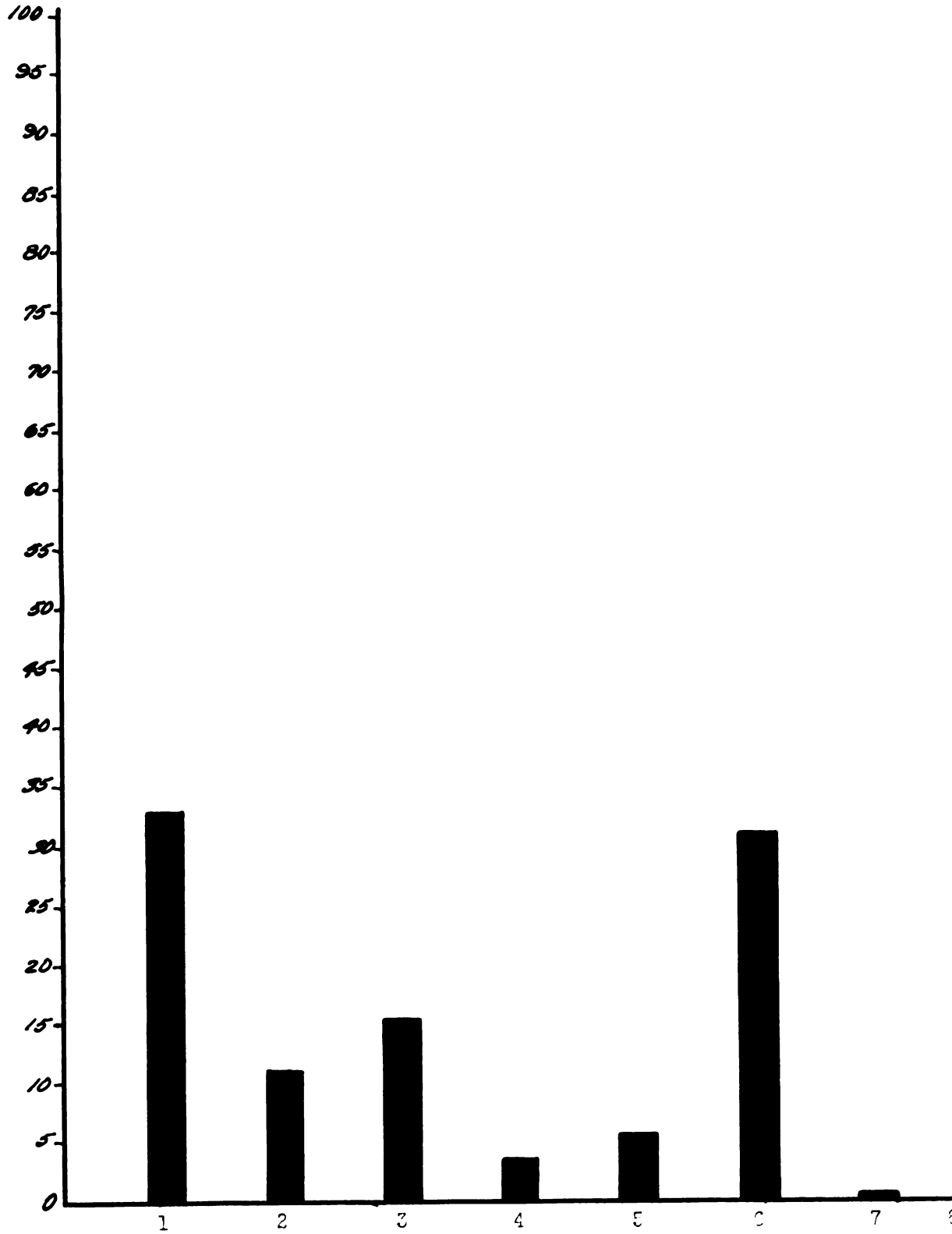
Graph No. 7 - Map Showing Soils of Area in Use Adjudged Best Suited by Soil Survey

Per Cent



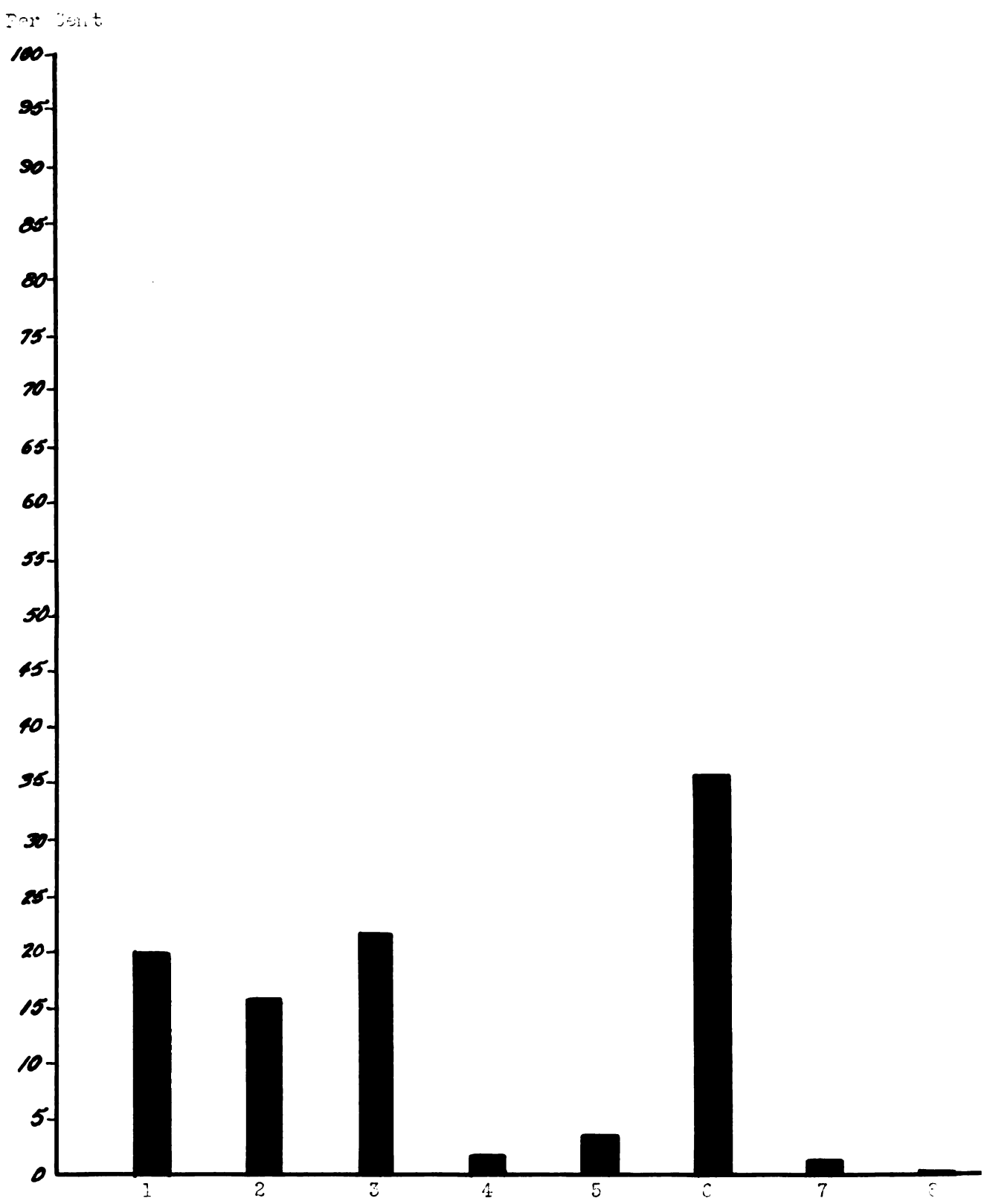
1 = 1st crop - [illegible]
2 = 2nd crop - [illegible]
3 = 3rd crop - [illegible]
4 = Pasture - 72.45%
5 = Forest - 47.02%

Graph No. 1 - Percentage of Farm Land Distributed Over Fields in Area Per Cent



1 = Corn - 32.9%
2 = Small grain - 11.2%
3 = Legumes and grasses - 15.7%
4 = Tobacco - 3.4%
5 = Special - 5.6%
6 = Pasture - 31.0%
7 = Woods - .1%
8 = Idle - 0%

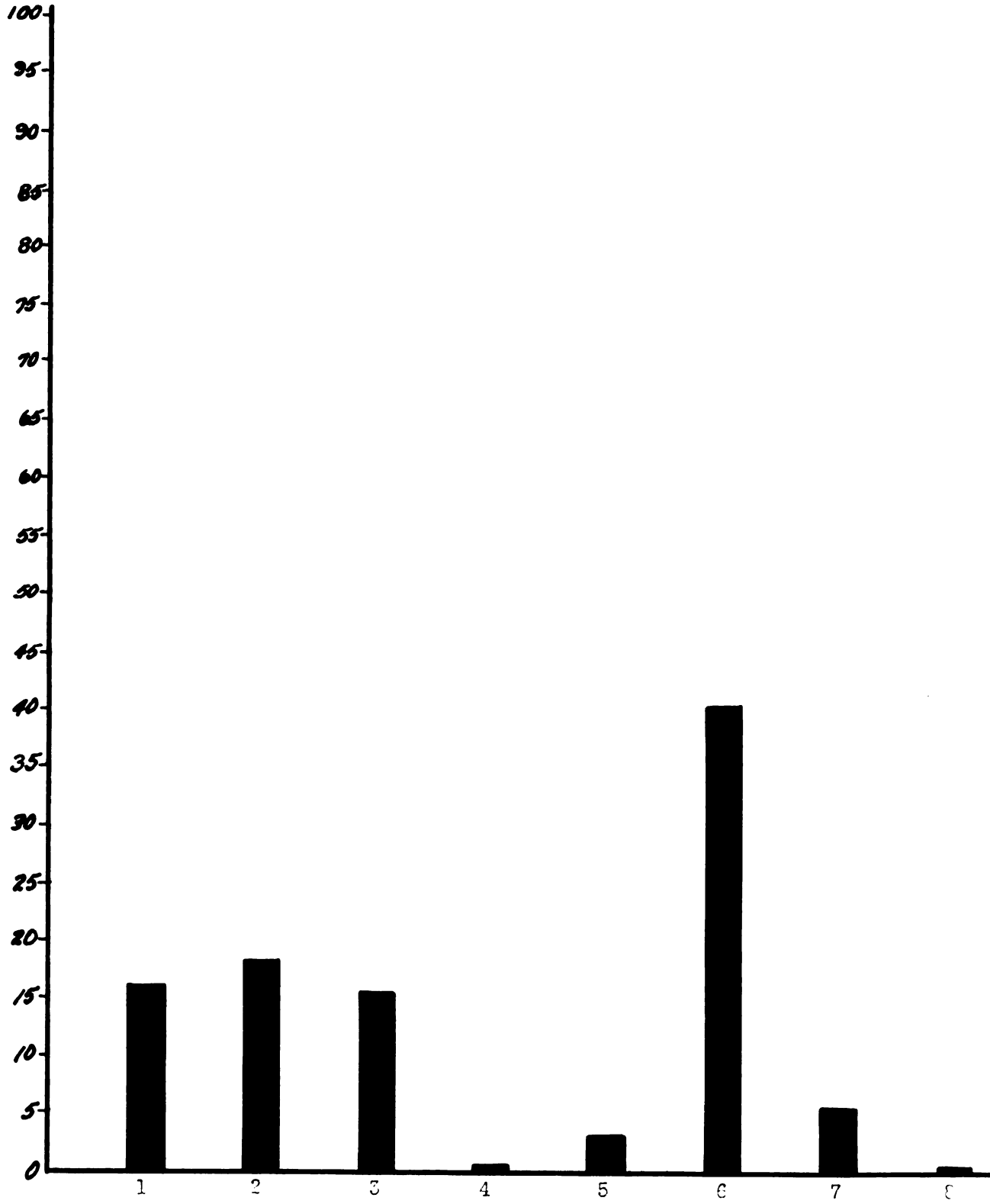
Graph No. 2 - Present Use of Improved Second-class Crop Soils in Area



1 = Corn - 19.99%
2 = Small grain - 15.83%
3 = Legumes & grasses - 21.87%
4 = Tobacco - 1.99%
5 = Special - 3.66%
6 = Pasture - 35.39%
7 = Woods - 1.09%
8 = Idle - 0%

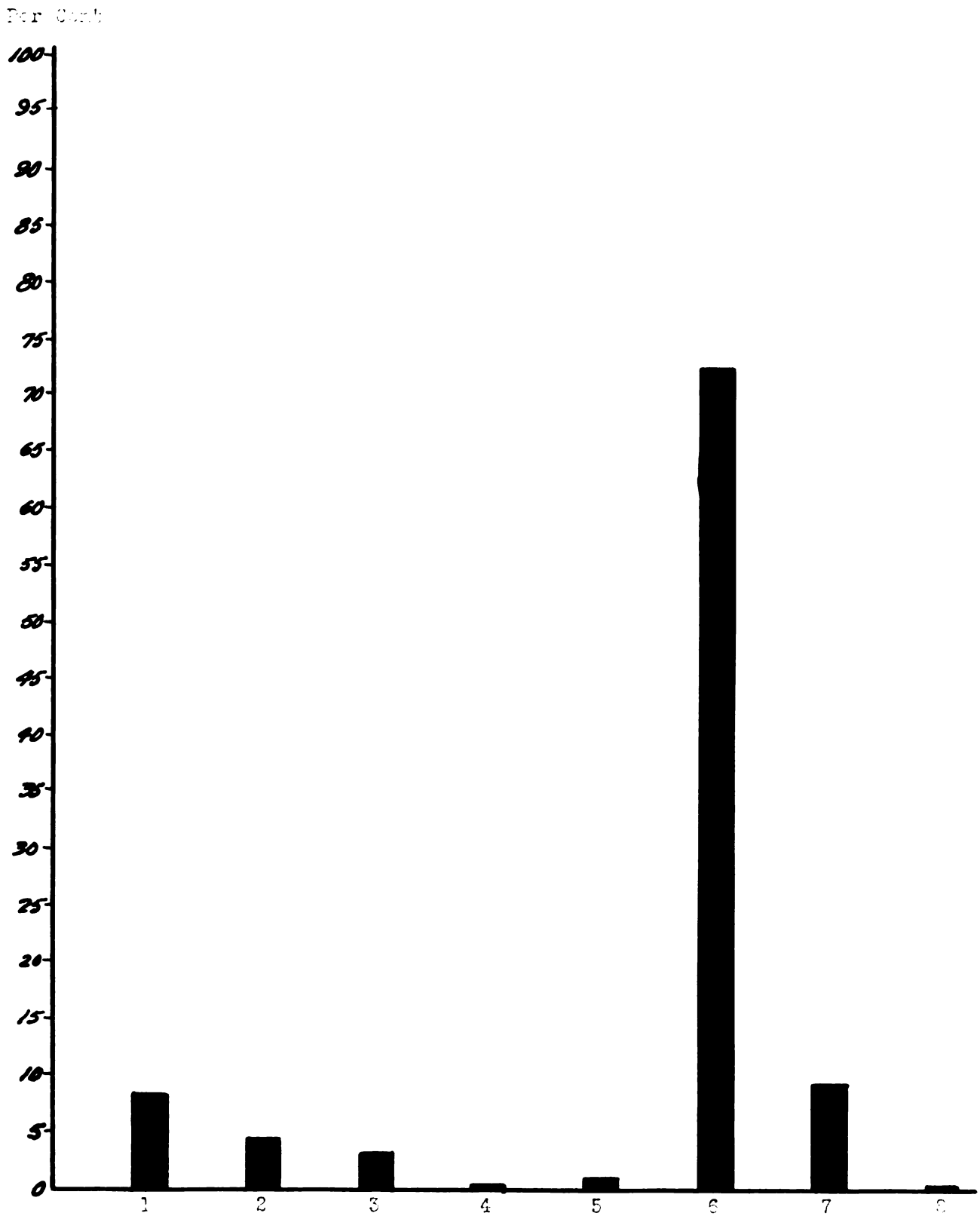
Graph No. 10 - Percent Use of Reclaimed Third-class Crop Soils in Area

Per Cent



1 = Corn - 16.19%
2 = Small grain - 18.41%
3 = Legume & grasses - 15.88%
4 = Tobacco - .03%
5 = Special - 2.83%
6 = Pasture - 40.0%
7 = Fodd - 5.37%
8 = Idle - .29%

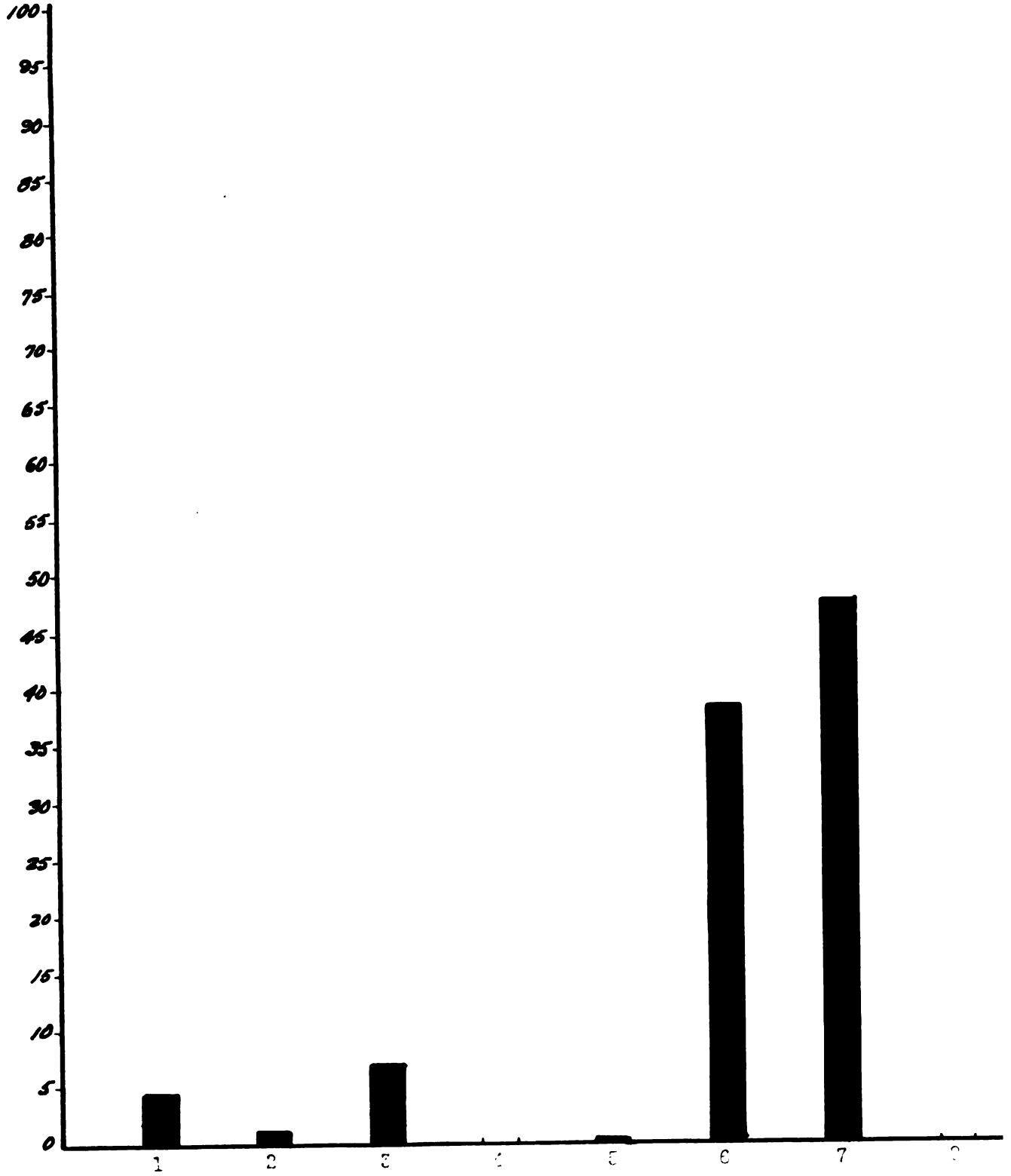
Graph No. 11 - Present Use of Improved Pasture Soils in Area



1 = Corn - 8.32%
2 = Small grain - 4.09%
3 = Legumes & Grasses - 3.31%
4 = Tobacco - .47%
5 = Special - .95%
6 = Pasture - 72.45%
7 = Woods - 9.47%
8 = Idle - .34%

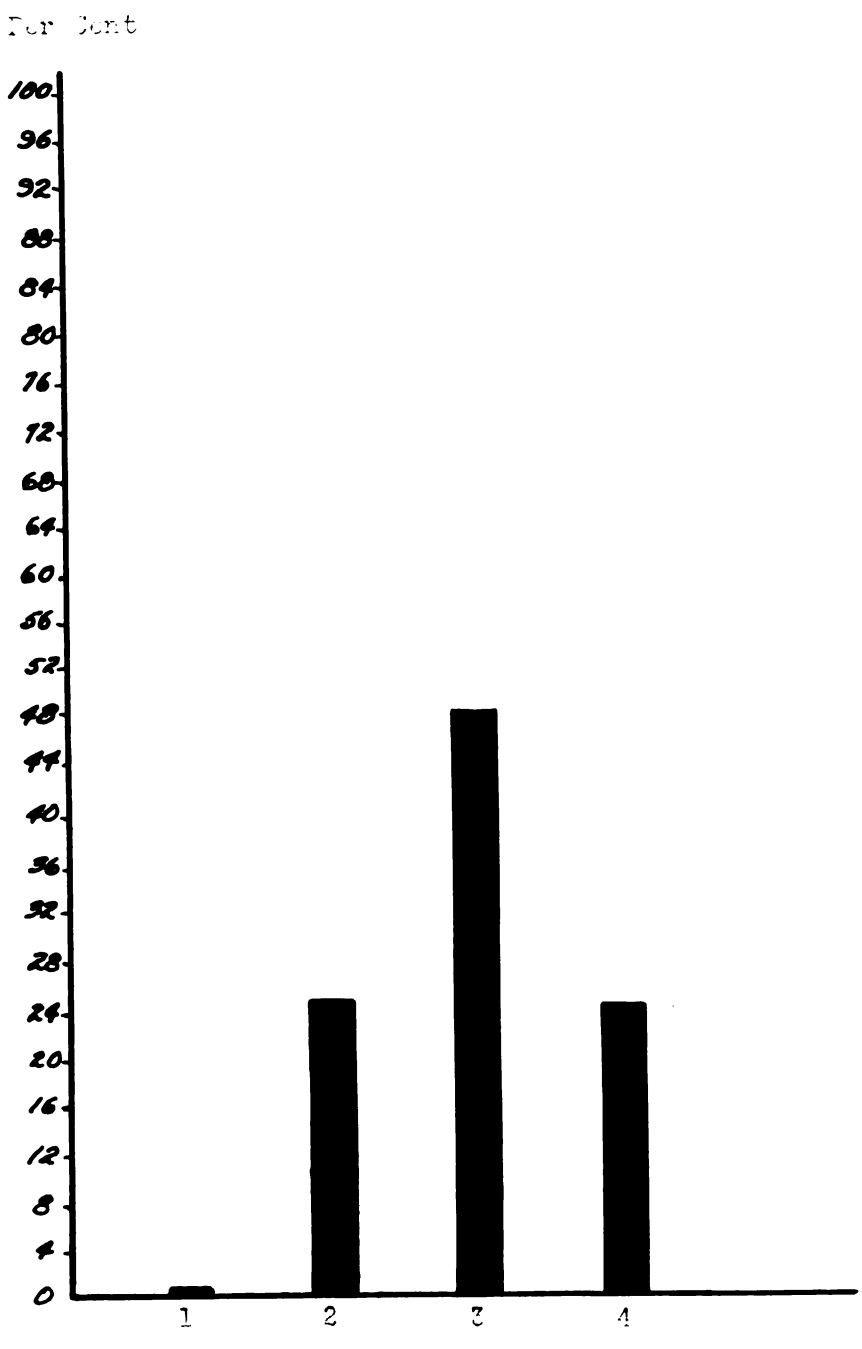
Graph No. 10 - Percent Use of Forested Forest Soils in Area

Per Cent



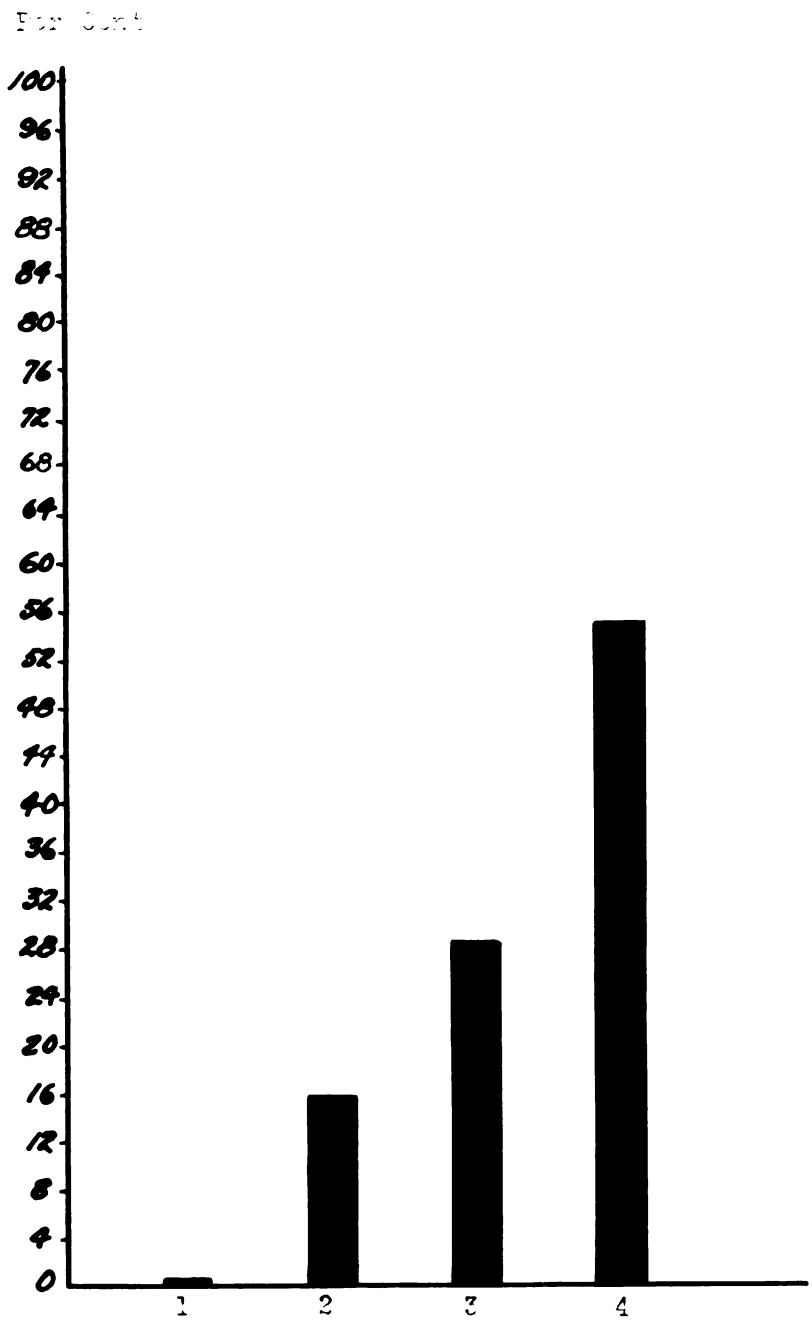
1 = Corn - 4.65%
2 = Small grain - 1.45%
3 = Legumes & grasses - 7.32%
4 = Tobacco - 0%
5 = Special - .69%
6 = Pasture - 38.75%
7 = Woods - 47.69%
8 = Idle - 0%

Graph No. 13 - Tests on pH in Walnut Hills Area
[illegible]



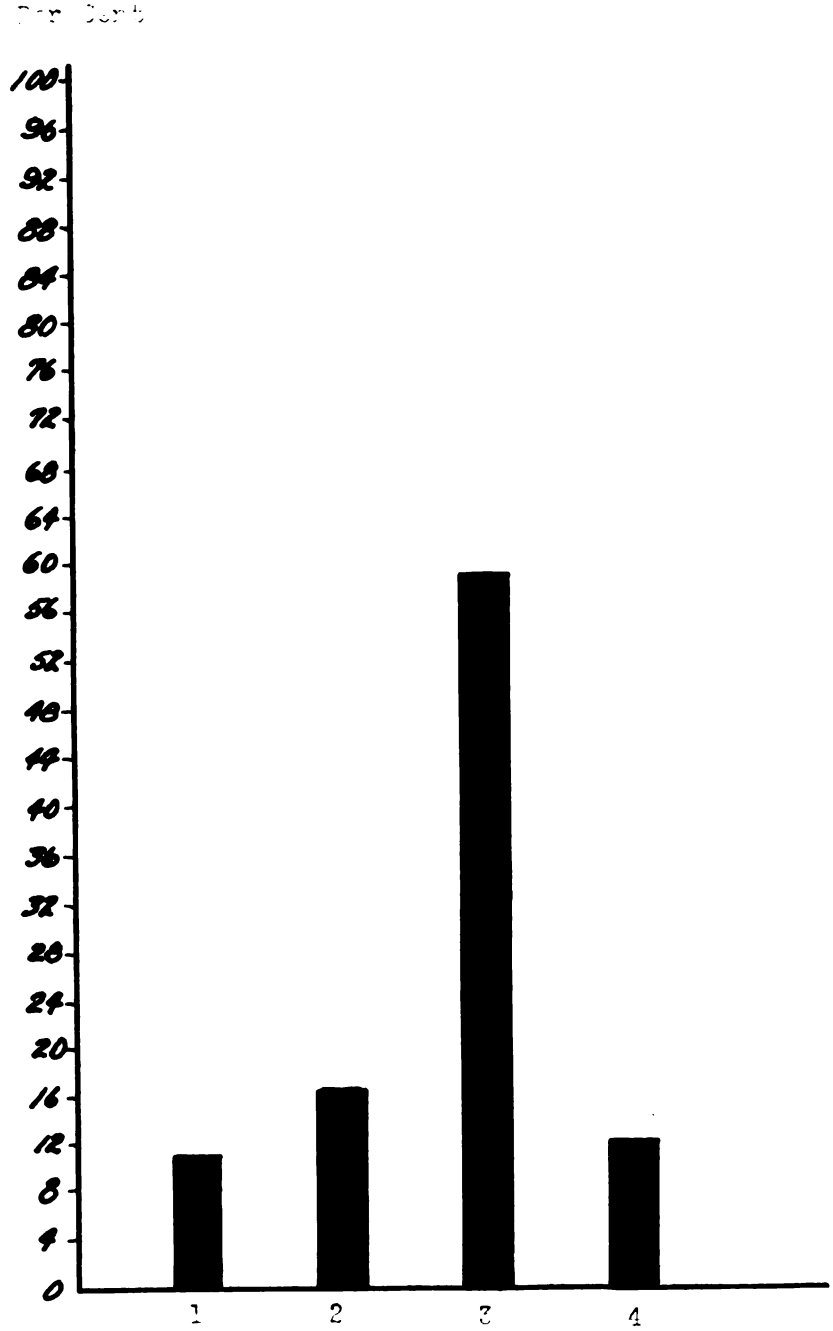
1 = Over 7 pH - 1%
2 = 6-7 pH - 25.2%
3 = 5.5-6 pH - 48.0%
4 = 4.05-5 pH - 24.8%

Graph No. 14 - Per Cent Qualitative Tests for Fluorides
in 270 Soil Samples in Telfair Wells Area



1 = Good - .4%
2 = Fair - 15.6%
3 = Poor - 28.5%
4 = Very Poor - 55.6%

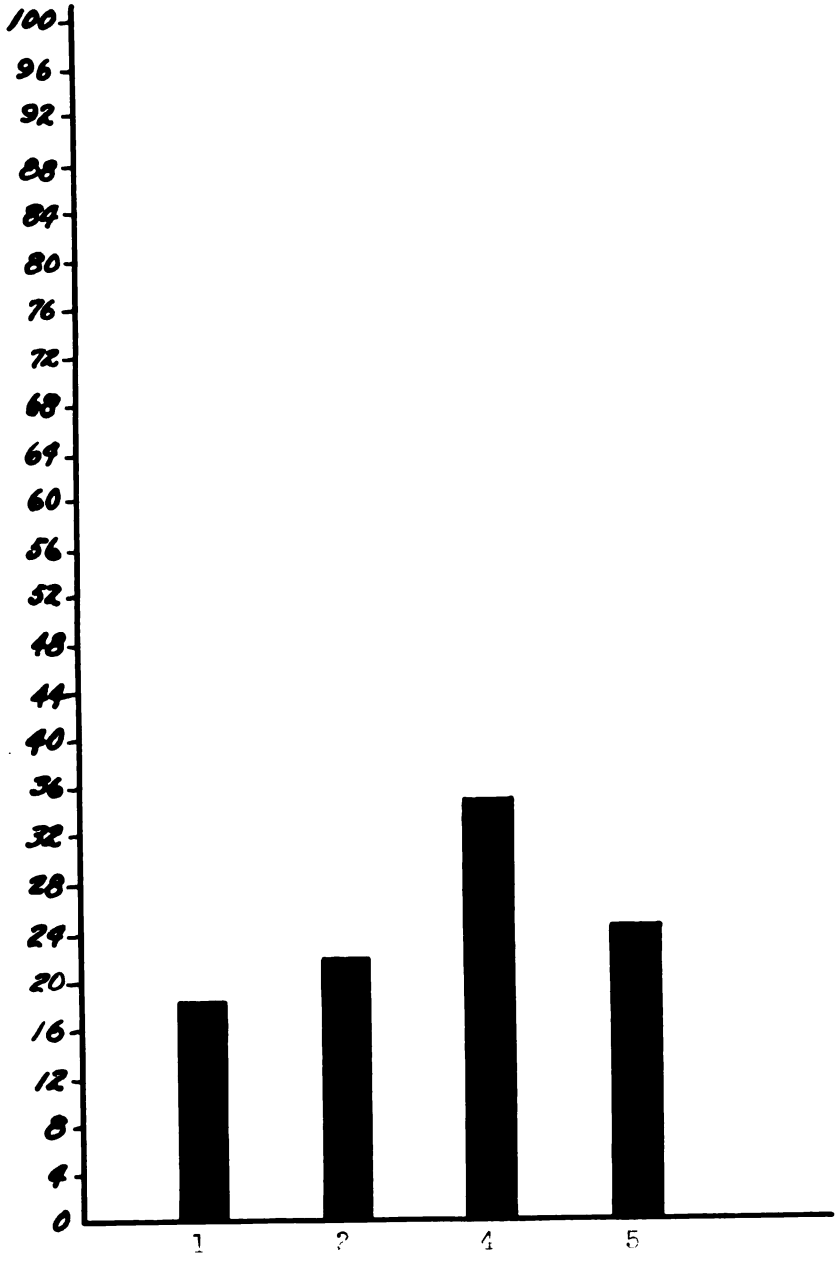
Graph No. 15 - Per Cent Fertilizer Tests for Potash in 272 Soil Samples in Talbot Mills Area



1 = Good - 11.8%
2 = Fair - 16.7%
3 = Poor - 58.1%
4 = Very Poor - 13.2%

Graph No. 11 - [illegible]

Per Cent



1 = Good - 19.0%
2 = Fair - 21.0%
3 = Poor - 35.5%
4 = Very poor - 24.6%

GENERAL DISCUSSION OF TABLES AND GRAPHS

The Belfast Mills Area is divided into farms which vary considerably in size, as is shown in Table No. 3. This Table also indicates that the farms have a wide variation in tenure and are operated under varying conditions. Of the 77 farms in the area, 76 per cent of the farms are classified as general farms; 24 per cent, as livestock farms, 40 per cent of the net income being derived from livestock. All of the livestock farms are 100 acres or more in size.

No soil type is represented by a very large acreage in the Belfast area, as is shown in Table No. 1. The highest percentage for any one soil type is 12.3 for Washington* cherty silt loam, hilly phase, and the lowest is .01 per cent for Upshur silty clay loam and Ball Mill* silty clay loam. The percentage of use for crops as shown in Table No. 1 would not be representative of the utilization of that particular soil type for specific crops, but shows the use being made of the soil types at the time the map was prepared. As a number of soil types would most likely be mapped on each farm, it would only be a coincidence if a large percentage of one particular crop were on a single soil type, except for a few specialized crops. However, as some rotation plan is usually followed, the percentage of use of a soil type will show whether the soil is utilized for crops, pasture, or forest.

The land use as presented in Graph No. 5 shows that 59.6 per cent of the soils are being used for pasture, whereas only 25.8 per cent are being used for crop production. Two-thirds of the soils being used for crop production are devoted to soil-depleting crops; one-third, to soil-conserving crops. This would appear to be balanced if the farmers were using a three-year rotation of corn, small grain, and legumes. However, 10.0 per cent of the area is being used for corn and .4 per cent for

tobacco, which shows that some of the farmers do not have any specific rotation on their farms. A large number of farmers use a four-year rotation of corn, small grain, legume, and timothy, which emphasizes this point. Only 14.5 per cent of the area is utilized for forest. Most of the forest in this area is found on the south side, along the sandstone escarpments at the top of the High Mountain, and in scattered woodlots on the farms. The .1 per cent idle land mapped is land that was used for row crops and was abandoned without the seeding of grasses or legumes. This land will eventually be used for pasture or put into cultivated crops, depending on the soil type.

The topography of this region, as discussed earlier in this paper, shows that it consists of relatively steep slopes, with practically no level divides and comparatively narrow valleys and bottomland. Nearly three-fourths of the soils of the area are residual, and nearly one-fourth of them are colluvial. A comparatively small percentage of the area is composed of alluvial soils. Graph No. 2 shows that 42.71 per cent of the soils are in Class D slope, which is from 15 to 20 per cent slopes; that only 3.69 per cent of the area has less than 7½ per cent slopes; and that 7.31 per cent of the area has slopes between 20 and 100 per cent. In making a graphic and quantitative comparison of slopes in the area, as shown in Graph No. 2, Veatch's (10) method was used. Only .5 per cent of the area fell in the upland class, whereas 7.19 per cent fell in the lowland class. This left a total of 92.31 per cent of the area that was in the slope classes. The average slope gradient of the Pulaski area is 22.2 per cent, which again brings out the steepness of slopes in this region. The distribution of slopes, as related with the soil types, can be seen on Map No. 3.

Only four texture differentiations were found in this area, these being (1) silty clay loam, (2) silt loam, (3) loam, and (4) fine sandy loam. Most of the erosion found in this area was on soils of a silty clay loam texture, and the least erosion was on soils of loam and fine sandy loam texture. The finest pastures were found on soils of silty clay loam and silt loam texture, whereas the forests were found on soils of sandy texture.

The evaluation of production ratings of soils in recent soils investigations, both by soil scientists and other workers interested in soils, has received quite a bit of attention. Out of this interest, a number of methods of productivity ratings have been derived. Whitson (2) (3), of the Bureau of Plant Industry, has done considerable work along this line.

The soils of the Talbot Hills area have been divided into three main groups (Table No. 2): namely, crop, pasture, and forest soils. The crop soils are further divided into first-, second-, and third-class crop soils. This method is used by the Tennessee Valley Authority (11) in grouping land as to its best adapted use. These crop soils are classified into the use groups on the basis of their natural character, and emphasis is given to the internal and external characteristics that are most significant to the management of land for the production of crops. The soils that are not classified as crop-adapted soils are grouped as being adapted to either pasture or forest, depending upon the characteristics of the soil. Map No. 3 shows the distribution of the adaptation of soils in the area, as recommended by this classification method. Graph No. 6 shows the percentage of the area that is adapted to each of the five uses, according to the soil survey. It points out that 56.47 per cent of the area is adapted to pasture and that 9.03 per cent is adapted to forest. From Map No. 3, it can be noted that a high percentage of

of the soils adapted to forest are along the south edge of the area on the rough stony land, Vanlirgan soil material, and on the north side of U.S. Highway No. 19 on rough stony land, Ashlington soil material. From the description of these two soil conditions, it is seen that there is not enough soil material to provide good pasture. A high percentage of the soils adapted to pasture are located on the slopes of the Black Mountain. Some of the types of the Hayter and Jefferson series are too stony to cultivate. This condition also exists on some types of the residual soils. However, most of these soils are put into the pasture class, because of the steepness of slope and susceptibility to erosion. When found on a milder relief, a high percentage of the soils recommended for pasture could successfully utilized for crop purposes. Six and forty-two per cent of the soils in the area fall in the first-class crop soil group, which comprises the better limestone soils on milder relief, alluvial soils, and colluvial soils. The second-class crop soil group comprises soils that are naturally less productive than the soils of the first-class crop soil group. Some of the soils of this second-class crop soil group are of the same series as found in the first-class crop soil group, except that they occupy a steeper relief. Erosion is somewhat of a problem on the second-class crop soils. The third-class crop soil group is the largest of the crop soil groups. This group comprises 20.69 per cent of the area. Most of the soils in this group occupy a rather steep relief and are susceptible to erosion. Soil management is somewhat of a problem on the third-class crop soils, which necessitates following a very carefully planned rotation.

Not all of the soils are used for the purpose to which they are best adapted, as is shown by Graph No. 7. Of the soils in their recommended use, a higher percentage of pasture soils are in pasture than are

[illegible] or any soils in forest and grass, respectively, the smallest proportions of soils in the grass and [illegible] forest and grass. In the hilly area, 61.6 per cent of the [illegible] first-class open soils are in crops, 27.2 per cent of the [illegible] second-class soils are in crops, and 11.2 per cent of the [illegible] third-class open soils are in crops. [illegible] No. 7 clearly indicates that there is no relationship between the land, for the number and percentage of each soil type that is [illegible] on the individual farms.

In breaking down the use given to the various types (Graphs Nos. 6, 7, 10, 11, and 12), a variety of results were found. Of the first-class open soils, 66.00 per cent are used for crops, .10 per cent are used for forest, and 8 per cent are utilized for pasture. In regard to the second-class open soils, 75.6 per cent are used for pasture, 1.00 per cent are used for woods, and 23.4 per cent are utilized for crop purposes. A larger proportion of the third-class open soils are being used for pasture and forest, the proportions being 40.00 per cent for the former and 5.77 per cent for the latter. Only 54.23 per cent of the third-class open soils are utilized for crops. Because of soil and climatic conditions, as well as of years of topography, live stock is the principal source of income in this region. Fine bluegrass pastures and [illegible] pasture [illegible] are of the main factors in the farm management practices. Of the soils recommended for pasture, 72.45 per cent are in pasture, 15.00 per cent being used for crops and 5.47 per cent being used for forest. Of the soils recommended for forest, only 47.61 per cent are in forest, 14.00 per cent being used for crops and 38.39 per cent being used for pasture.

[illegible] soil type map or 200 soil samples taken from the Ballard Hills area. The profiles of [illegible] in the Nos. 17, 24, 15, [illegible] addition of the fertility of this area. Approximately one fourth of the soil samples gave a pH reading that would be well adapted to the [illegible] for a satisfactory availability of phosphorus, according to Truog (14). The tests for potash were somewhat higher than the phosphorus tests. The tests for calcium did not correlate with the pH tests, but ran [illegible].

SUMMARY

A study of the history of the agricultural use of land and the ownership pattern in the Ballard Hills area gives an explanation for some of the land use problems that now exist in the area. Large farms have been divided, and the number of small farms, the size of these decreasing with each generation. The system of agriculture has changed -- the raising of [illegible] type of agriculture formerly carried, and now dairy and small [illegible] farms are, in most cases, near-subsistence farms, failing from their ability to furnish a satisfactory living.

The soil has played a large part in the development of the area, and the expansion of the soil is mainly the different social and economic conditions that now exist. From the land classification, as shown on Map No. 1, is an expression of the soils. In the north side of the area, along the steep slopes of the [illegible], social and economic conditions are at low ebb. The land class has not been found here, where intensive agriculture cannot be carried on. Even in the valley, where the relief is not so steep and a great deal of the soil is

agriculture is followed, the people, as well as the horses and the entire farm, are on a much higher scale.

Due to the fine texture and steepness of topography, the owners of the larger farms should continue to be prosperous. These farmers have enough cropland to have a fairly well balanced farm management program. However, the owners of the smaller farms will have to develop some intensive type of agriculture in order to exist.

The value of the soil is also reflected in the vegetative cover that exists on the different soil types, as shown on Map No. 5. A wide variation in the quality of the hardwood can be seen on the different soil types. This is especially noticeable on the pasture land, as it has received neither lime nor fertilizer.

A great variety of soils have been studied in this area, as there are 24 soil series and 71 soil types. However, not very large areas of any of the soil types are represented, which does not give a large number of samples of any of the soils and complicates any study in regard to the individual type.

The soils of this area belong to the Gray-Brown Podzolic Group. Due to steepness of topography and climatic conditions, there is a lack of profile development in some of these soils. The soils of the area correlate very closely with the geologic formations, which strike in a northeast-southwest direction. There has been a considerable amount of geologic erosion in this area, as road cuttings are numerous and, in many places stony land can be found.

The present land use shows that not all of the soils of the area are being used for the purpose to which they are best adapted. This is an individual farm problem, however, as one farmer may have a high

[illegible] of first-class crop soils in the area and only a small [illegible] of third-class or pasture soils. In most cases, due to the necessity of pasture land, the farmer, in order to maintain the proper balance, would have to utilize a portion of the crop soils for pasture. Just what soils they would be is doubtful; and in no case the soil map and land use map will be absolutely equal, there is a considerable [illegible] of adjustment that should be made.

The value of the soil is reflected in the soil type map in the area. The higher type of [illegible] the best limestone, silt loam soils, and silt loam soils. Things not [illegible] this order, but the higher ratings of all the qualities [illegible] should be the more productive soils.

1. [illegible], C. E. 1935. [illegible]. Soil Sci. Soc. of Amer. Proc., Vol. 1, pp. 115-127.

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STUDY AREA BOUNDARY

SEE ENLARGEMENT A

TO LEBANON

TO TAZEWELL

Belfast Mills

Repass

Creek

Fork

Left

Indian

Trail

Hogwallow

Branch

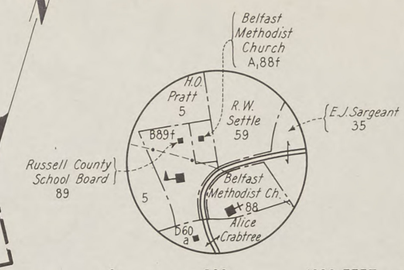
Line

Trans. Line

Appalachian Electric Power Co.

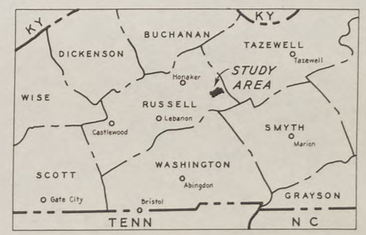
Chesapeake & Potomac Telephone Co. of the Lonesome Pine Trail

Clyde White E43b
N. H. White
E42b
B42b
G.F.Mash
D45b
Dale Mutter
C46b
C46d
Jim Settle
P. E. Settle 3
H.O. Pratt 5
P.E.Settle
Mrs. Minnie J. Bundy 2
W. H. Ferrell
E1be
D1a
E52a Bessie H. Robinson
C.B. Ratcliffe
B51a
C51c
Robert Payne
Mrs. D.R. Payne
E47b
D48f
Bessie H. Robinson 52
Lillian Beavers
C49a C48a
D
47a
E53b
53e A,53a
(Rob Taylor) 50e
D5b
Mont Cox 44
C42a
C41a
Grover C. Baker
A,40a
D40b
D39b
A3a
E.J. Sargeant 35
D9a
W.T. Harper
Roy Duff
C4b
B4a
C.K. Bundy 8
D7c
C7a
D6c
6e Indian
B6f
C10a
V.G. Lowe
E7b
C11a
A.L. Bundy
W.C. Bradshaw
Gorman White
C. Cumbow
E14d
D18a
W.M. Marshall
(A.E. Lester) (R.H. Vencil)
C19a
C20
C21a A.A. White
F.S. Lowe
C22a
Henry Grant Estate 17
Mont (Cox-C44a)
Kyle Vencill 55
A43a
E56a
Y51a
D58a
Henry Payne
Tom Cox
J.H. Robinson
D58f
D60a
Alice Crabtree
A 61a
C61b
Clyde White
Audrey V. Taylor
Charlie Barnette
H.O. Pratt
J.H. & Leona Howard
E54b
Mary M. Ferguson
E68a
D66b
B66a
A.G. Vencill
Jeff Taylor
B64a
B65a
E66f
E55d
Mrs. Mattie Vencill
E.N. Harmon Barnette
Conley Barnette
B55a
Charlie Taylor 69
W.E. Taylor
Kyle Vencill
Henry Payne 56
A.C. Taylor
D67b
B67a
C69a
C70a
Miss Grace Hankins
C71a
E74c
D.S. Hankins
E76a W.N. Jackson
Nannie B. Sargeant
E74d
Noah Barnette
D80b
D62b
E78f
E74d
Charlie Taylor
Ezra Hankins E72d
D.S. Hankins 71
E75a
John Mutter
Martha Ann Hankins E73a
45d
E86a
G. Tom Mutter
E86b
D85a
P.L. Hankins 87
Dale Mutter
A.C. Taylor 78
Frank Cox
D83a D83a
E80b
Calvin & Ed Taylor
E83d
Charlie Barnette
E64d
D84a
John Cox
Jim Robinson Estate 26
James Vencill
D33d
Roy Duff 4
Miss Mattie Vencill 77
Mrs. Harmon Barnette 82
Mary Vencill
D32b
D34f
Earnest Mercer
J.H. Harper
D81b
E35a
E35b
E.J. Sargeant
D81a
C8la
C62f
D61b
A62a
B64a
B38a
Mrs. Jim Graham B37a
C.H. Brewster
(C.K. Bundy-A8a)
(W.J. Nuckels-B36a)
(E.L. Mercer's Estate)
D63d
John B. Ferguson 62
B22b
B13a
V.A. & A.M. Lowe
B1
B2a
D8b
36e
C9c
(A.M. Lowe)
C.K. Bundy
Minnie J. Bundy
A,2a
A,14a
C17c
Henry Grant Estate
C16b
E16d Indian
E16c
Mrs. Gussie Davis 15
Mary R. White
H.H. White
Buford White
Arnold White
E14c
Mrs. Leona Davis
E30b
Rob Vencill Estate 31
E16d
Mrs. Gussie Davis 15
Mrs. Mattie Jones 28
A.E. Lester 19
Fred Lester 29
E27c
E19d
A.E. Lester
(Mrs. Ellen Mitchell)
J.J. White
B16a
Miss Zeola White 24
C23a
G.G. White
E24a
Miss Zeola White
Lena Mutter White 25
A.A. White 21
A.A. White 21
Creek
Mountain
BOUNDARY
AREA
STUDY
CLINCH



ENLARGEMENT A

Note:-
Capital letters-A,B,C,D &E indicate farmstead classification, A being best type, E being poorest type.
Numeral near house (22a) indicates ownership number-
a-owner
b-renter of house and property
c-share cropper
d-vacant house
e-commercial purpose
f-renter of house only
Tie mark (/) indicates same owner across natural feature.



LEGEND

- FEDERAL HIGHWAY
- GRAVEL COUNTY ROAD
- DIRT ROAD
- TRAIL
- OCCUPIED HOUSE
- EMPTY HOUSE
- CHURCH
- SCHOOL
- COMMERCIAL BUILDING
- PERMANENT STREAM
- INTERMITTENT STREAM (NOT CROSSABLE WITH FARM MACHINERY)
- INTERMITTENT STREAM (CROSSABLE WITH FARM MACHINERY)
- NON ARABLE SINK, ARABLE SINK
- SPRING
- OWNERSHIP LINE
- CEMETERY

LAND OWNERSHIP
BELFAST MILLS AREA
ELK GARDEN DISTRICT
RUSSELL COUNTY
VIRGINIA

8,075± ACRES AUGUST 1937

MAPPED BY W.W. LEWIS

SCALE 0 1,000 2,000 3,000 4,000 5,000 FEET
0 1/4 1/2 3/4 1 MILES

MAP-NO.1

LAND USE LEGEND

WOODLAND

H Hardwood
C Cedar
L Locust

H_1 (or C_1-L_1) - dense stand
H_2 - medium stand
H_3 - sparse stand
H_4 (or C_2-L_2) - mature growth
H_{2-3} - advanced second growth
H_{3-2} - young second growth
H_4 - recently cut over
H_5 - recently burned

Example:- $H1_{3-2}$ + medium stand, young and advanced second growth hardwood and locust; hardwood dominant; young second growth dominant.

100 CLASS - PERMANENT PASTURE

101 Blue Grass
102 Blue Grass and Clover
103 Mixed Grass
105 Lespedeza
108 Sedge Grass
112 Weeds
113 Briers
114 Clover

200 CLASS - FIELD CROPS

201 Corn, field
211 Wheat
212 Oats
213 Barley
214 Rye
222 Timothy
230 Farm Garden
235 Red Clover
236 Alsika Clover
239 Alfalfa
248 Orchard Grass
249 Cane
250 Mixed Grass
251 Mixed Feed (wheat, oats, rye, barley)
252 Mammouth Clover
253 Crimson Clover

300 CLASS - SPECIAL CROPS

301 Tobacco
302 Potatoes (white)
303 Potatoes (sweet)
305 Strawberries
312 Green Beans

400 CLASS - ORCHARDS AND VINEYARDS

401 Apples
402 Peaches
404 Cherries
407 Mixed

Field boundaries - fenced
Field subdivisions - unfenced
101 (or 201, 301, 401, etc) - good
101 - fair
101 - poor
a New ground
F Fallowed for crop indicated
(20) Idle land previously planted with crop indicated
' Tie mark indicates same land use across natural feature or boundary line.

LEGEND

FEDERAL HIGHWAY
GRAVEL COUNTY ROAD
DIRT ROAD
TRAIL
OCCUPIED HOUSE
EMPTY HOUSE
CHURCH
SCHOOL
COMMERCIAL BUILDING
PERMANENT STREAM
INTERMITTENT STREAM (NOT CROSSABLE WITH FARM MACHINERY)
INTERMITTENT STREAM (CROSSABLE WITH FARM MACHINERY)
NON ARABLE SINK, ARABLE SINK
SPRING
OWNERSHIP LINE
CEMETERY

LAND USE
BELFAST MILLS AREA
ELK GARDEN DISTRICT
RUSSELL COUNTY
VIRGINIA

8,075± ACRES AUGUST 1937

MAPPED BY W.W. LEWIS

SCALE 0 1,000 2,000 3,000 4,000 5,000 FEET
0 1/4 1/2 3/4 1 MILES

MAP-NO.2

SOIL LEGEND

No. Slope Series, Texture and Phase

UPLAND

18	D	Hagerstown silt loam, hilly phase
*58	C	Russell silt loam
* 4	C	Washington silt loam
* 4	D	Washington silt loam, hilly phase
* 4	E	Washington silt loam, steep phase
*36	C	Washington cherty silt loam
*36	D	Washington cherty silt loam, hilly phase
*36	E	Washington cherty silt loam, steep phase
* 3	C	Lodi fine sandy loam
* 3	D	Lodi fine sandy loam, hilly phase
* 3	E	Lodi fine sandy loam, steep phase
21	C	Frederick silt loam
21	D	Frederick silt loam, hilly phase
21	E	Frederick silt loam, steep phase
33	C,D	Frederick cherty silt loam, hilly phase
33	E	Frederick cherty silt loam, steep phase
46	C	Elliber silt loam
29	C	Elliber cherty silt loam
29	D	Elliber cherty silt loam, hilly phase
29	E	Elliber cherty silt loam, steep phase
R4	C	Frederick-Elliber stony silt loam, complex
R4	D	Frederick-Elliber stony silt loam, hilly phase complex
R4	E	Frederick-Elliber stony silt loam, steep phase complex
*22	C	Lebanon loam
*22	D	Lebanon loam, hilly phase
*22	E	Lebanon loam, steep phase
10	C	Westmoreland silt loam, slope phase
10	D	Westmoreland silt loam, hilly phase
10	E	Westmoreland silt loam
56	E,F	Westmoreland shaly silt loam, very steep phase
62	D	Westmoreland silty clay loam, hilly phase
62	E	Westmoreland silty clay loam
62	F	Westmoreland silty clay loam, very steep phase
44	D	Upshur silty clay loam, hilly phase
44	E	Upshur silty clay loam
R44	B,C,D	Upshur stony silty clay loam, hilly phase
R44	E	Upshur stony silty clay loam
*70	D	Carbo silty clay loam
*70	E	Carbo silty clay loam, steep phase
*53	D	Ball Hill silty clay loam
63	F	Lehew fine sandy loam, very steep phase
47	D	Rolling stony land, Washington soil material
47	E	Rough stony land, Washington soil material
57	F	Rough stony land, Muskingum soil material
37	E	Clarksville cherty silt loam, steep phase

ALLUVIAL LAND

5	A	Huntington silt loam
12	A	Lindside silt loam
12	B	Lindside silt loam, smooth phase
7	A	Melvin silty clay loam
M	A	Alluvial soils (undifferentiated)
20	C	Elk loam, slope phase

COLLUVIAL LAND

*14	A	Hayter loam, level phase
*14	B	Hayter loam, smooth phase
*14	C	Hayter loam
*14	D	Hayter loam, hilly phase
*34	B	Hayter stony loam, smooth phase
*34	C	Hayter stony loam
*34	D	Hayter stony loam, hilly phase
*34	E	Hayter stony loam, steep phase
90	C,D	Jefferson fine sandy loam, hilly phase
90	E	Jefferson fine sandy loam, steep phase
17	B,C	Jefferson stony fine sandy loam
17	D	Jefferson stony fine sandy loam, hilly phase
17	E	Jefferson stony fine sandy loam, steep phase
* 2	A	Emory silt loam
* 2	B	Emory silt loam, smooth phase
* 2	C	Emory silt loam, slope phase
*30	B	Glenford silt loam, smooth phase
* 6	B	Dunning silty clay loam, smooth phase

* Soils preceded by an asterisk not officially recognized

First class crop soils — Red
Second class crop soils — Brown
Third class crop soils — Yellow
Pasture soils — Green
Forest soils — Blue

SLOPE CLASSIFICATION
A 0 - 2½ % slope (not indicated)
B 2½ - 7½ % "
C 7½ - 15 % "
D 15 - 30 % "
E 30 - 60 % "
F 60 % and over

SYMBOLS
Rock outcrop
Loose stones on surface
Loose chert on surface
Area too stony to cultivate (2½ acres)
S Sheet erosion "
SS Severe sheet erosion "
g Gully erosion "
gg Severe gully erosion "
Sg Sheet and gully erosion "
Major gully

LEGEND
FEDERAL HIGHWAY
GRAVEL COUNTY ROAD
DIRT ROAD
TRAIL
OCCUPIED HOUSE
EMPTY HOUSE
CHURCH
SCHOOL
COMMERCIAL BUILDING
PERMANENT STREAM
INTERMITTENT STREAM (NOT CROSSABLE WITH FARM MACHINERY)
INTERMITTENT STREAM (CROSSABLE WITH FARM MACHINERY)
NON ARABLE SINK, ARABLE SINK
SPRING
OWNERSHIP LINE
CEMETERY
INTERMITTENTLY FLOODED SINK

SOIL SURVEY
BELFAST MILLS AREA
ELK GARDEN DISTRICT
RUSSELL COUNTY
VIRGINIA

8,075± ACRES AUGUST 1937

MAPPED BY W.W. LEWIS

SCALE 0 1,000 2,000 3,000 4,000 5,000 FEET
0 ¼ ½ ¾ 1 MILES

MAP-NO.3

ROOM USE ONLY