COUNTY LEITRIM RESOURCE SURVEY

Part 1—Land Use Potential
(Soils, Grazing Capacity and Forestry)

An Foras Talúntais

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FOREWORD

For many years it has been recognised that some of the worst features of western decline are represented in County Lei trim. Controversy has surrounded the county' with regard to the possible means by which this continuing decline could be halted and reversed. Farming in the county is beset by many problems arising from natural, technical, economic and social forces.

The natural limitations of the county are those imposed mainly by a combination of heavy, poorly drained soils and a relatively wet climate. This dictates a predominantly grassland farming system which encounters serious problems such as poaching by grazing animals, short grazing season, the necessity for the conservation of large amounts of winter fodder, and poor trafficability for farm machinery. This latter problem is accentuated by the presence of many steep slopes associated with the predominant drumlin topography.

It is not surprising, therefore, to find serious sociological problems associated with these conditions. Farm size is small, off-farm employment is scarce, and the resulting outmigration has brought about a population structure dominated by the old and very young. This represents a very serious obstacle to economic development.

Against this background the Council of An Foras Taliintais decided in 1971 that the overall agricultural situation in Leitrim should be examined. It was realised that much of the information already available was related to situations of the past and was irrelevant in terms of future demands created by E.E.C. requirements. It was also realised that the positive way to progress is through identifying the resources available and. using those, to develop systems based on modern technology and innovation. Having completed an inventory of Leitrim's resources, recommendations could then be made with regard to alternative land-use systems. The objective is to bring about an overall improvement in the welfare of the people of the county', and of the drumlin belt as a whole, to which the results should equally well apply.

The conduct of such a comprehensive resource survey presented a formidable task, demanding the collective efforts of people in a wide variety of disciplines and from a number of organisations. The experience gained on methodology and organisation in the course of two previous resource surveys. West Cork and West Donegal, was of great value. It is hoped that the report of the present survey will go further than the other two in making an economic assessment, from the basic output potential data, of the major alternative land uses, namely, grassland and forestry.

It is a pleasure to be associated with the highly merited acknowledgments given to those within An Foras Taluntais and those outside who co-operated in this survey. Finally, may I commend the efforts of the Working Party who embarked on and completed this task with such dedication and enthusiasm.

T. Walsh,
Director

Dr. P. Ryan. Deputy Director, was most helpful in his capacity as advisor to the working party, and Dr. T. Walsh. Director, gave the study his enthusiastic support.

There was excellent collaboration from colleagues in An Foras Taluntais, especially Mr. S. Diamond on soil correlation; Mr. R. Hammond on peat classification and from Mr. J. Lynch and Mr. T. Shanley of the cartographic and laboratory sections of the National Soil Survey Department, respectively.

The contribution of Messrs. T. Martin. A. Comey, T. Radford. P. J. Bourke and R. Roldaan (on the exchange fellowship from Wageningen University) on the field mapping programme is acknowledged.

Finally thanks are due to those who assisted in the preparation of the report. especiaJly Mr. P. V. Geoghegan, Miss H. O'Donnell and Mr. E. Culleton for their editorial work.

M. J. Gardiner,
(Project Leader^

An Foras Taluntais.
November 1973.

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Dr. P. Ryan. Deputy Director, acted as Advisor to the Project Team.

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CHAPTER I

SUMMARY

M. J. Gardiner''

Part I of this report deals with three aspects of Leitrims resources, namely, soil resources, grazing capacity and forestry potential.

Soil resources

Of the total area of the county 7% has land with free internal drainage while *84%*(has land of poor drainage. About 3% of the county has variable drainage while the remaining 6 % is occupied by lakes and rivers.

Only about *4%* of the soils are suitable for tillage. Some 74% of the county is poorly suitable for grass production, because of poor drainage and poaching hazards, 2% is moderately suitable and 8.5^ is well suited. The suitability of the remaining 10% is variable but mainly poor.

Grazing potential

In 1971, there were 89.200 livestock units (L.U.)+ in the county. It has been estimated that the county is capable of carrying 144,200 L.U., i.e., an expansion ratio of 1.6.

Intensive grazing of livestock, i.e., >235 L.U./100 ha (>95 L.U./100 acres) is possible on only *6%* of the land. Moderate stocking intensities ranging between 125 and 200 L.U./100 ha (50 and 80 L.U./100 acres) are possible on 60% while the remaining 28% consists mainly of climatic peat which is suited only to low intensity livestock production.

Although livestock numbers showed little change between 1958 and 1968 there was an average annual increase of approximately *4%* between 1968 and 1971. At this rate of expansion it will take 15 years for the county to reach its capacity for livestock production.

Forestry potential

Measurements of forestry potential were made in order to compile basic data so that the economics of forestry versus agriculture could be assessed (Part III).

The study confirms that high growth rates of forestry species, mainly Sitka spruce, are possible. Highest production is obtained on the lowland drumlins particularly in south Leitrim. but yield classes ranged from 14 to 26 cubic metres per hectare per annum. Some 43% of the county is capable of very high yields (24 to 26 cubic metres/ha), 28% of high yield (20 to 22 cubic metres/ha) and 16% of moderate yields (14 to 18 cubic metres/ha). Some *%%* is unplantable.

The 12 state forests in Leitrim at present occupy 10,248 ha (25,313 acres) or 6.4% cf the county. During 1969-72 the Forestry Division, Department of Lands, acquired 4,290 acres of land in Leitrim but, because of current prices in agriculture, the rate of acquisition has dropped to very low levels.

'*Head.* National Soil Survey Department. An Foras Taluntais.

^Livestock unit = 533 kg (10.5 cwt) cow.

CHAPTER II

INTRODUCTION

M. J. Gardiner

County Leitrim has lost 50% of its population since 1926, the highest percentage loss of any county in the country. The decline still continues at a rate of 400 to 500 people per annum.

The county has 67% of its work-force engaged in agriculture which consists mainly of dairying, store cattle production, mountain sheep and some intensive pig rearing. Farm size is small, with over 80^ holdings less than 22.7 hectares (50 acres).

The land in Leitrim is difficult to farm. The principal soils are of the heavy impermeable type on drumlin topography. Farm incomes are low. Previous investigations (1) have shown that these wet impermeable soils not only dominate in Co. Leitrim but also occupy 0.5 million hectares throughout the area generally referred to as the north-west drumlin belt, including parts of Monaghan. Cavan, Longford and Roscommon.

The purpose of this study, then, was to examine the salient land-use problems more closely so that recommendations could be made for an improvement in the welfare of the people living in the drumlin belt as a whole and in Co. Leitrim in particular.

To carry out this study An Foras Taluntais selected an inter-disciplinary Project Teair4 from amongst its staff. The Project Team was primarily responsible for the study and met a number of times in order to coordinate their activities.

Cooperating agencies included: the Department of Agriculture and Fisheries, the Land Project, the Department of Lands, Bord Failte. Inland Fisheries Trust. Central Statistics Office, Meteorological Office, Geological Survey. Co. Leitrim Advisory Services.

Methodology

Most of the findings were derived through the following five methods:

a) complete surveys in the field, e.g., soils
b) farm income surveys on a random selection of farms
c) field experiments, e.g., grass production
d) questionnaires to farmers, e.g., sociology
e) use of existing knowledge, e.g., climatic and population records etc.

The results of the field experimental programme at An Foras Taluntais Research Station, Ballinamore. over the past number of years were also used in addition to those from the more recently established station at Drumboylan, Co. Roscommon.

JMembers of the Project Team are listed on page vi.

Objectives

The objectives of the survey were:

1. To provide basic factual information on the physical, economic and sociological resources of Leitrim against which the principal rural problems of low farm income and high population decline could be analysed.
2. To assess the optimum land-use enterprises for Co. Leitrim bearing in mind the predominant soils and climate.
3. To assess the potential for development within the county of a stable population where farm incomes would reach at least a minimum acceptable viable level.
4. To assess the potential for tourist income development in as far as this was directly related to agriculture, e.g., farm guest houses, fishing, boating, etc.

Since County Leitrim which occupies 158,937 ha (392,573 acres) is representative of an estimated 0.5 million ha of similar land in the north-west drumlin belt, the results are largely applicable to this entire region and to a lesser extent to similar land in West Limerick. North Kern' and Clare which occupies approximately 0.5 million hectares.

Reference

I. Gardiner, M. J. and Ryan, P.. *lr. J. agric. Res.* 8: 95. 1969

CHAPTER III

GENERAL DESCRIPTION OF THE AREA

*M. Walsh**

Location and Extent

County Leitrim (Fig. 1) is situated in north-central Ireland between 53° 48' and 54° 29' north latitude and 7° 35' and 8° 24' west longitude. Although mainly an inland county it has a short (4 km) north-western coasdine. It is bounded on the west by Counties Sligo and Roscommon, on the south by County Longford, on the east and north-east by Counties Cavan and Fermanagh and on the north by County Donegal.

The county occupies an area of 1,876 sq km (613 sq ml) or 158,937 ha (392,573 acres) and is the smallest county in Connacht. It is represented mainly on the ½-inch (1: 126,720) Ordnance Survey Sheet 19 with small portions on Sheets 3, 8 and 12. The principal towns in the county are Carrick-on-Shannon, Mohill, Manorhamilton, Ballinamore. Drumshanbo. Carrigallen, Drumkeeran. Kinlough, Kiltyclogher and Dromahair. Carrick-on-Shannon is the principal town of the county and has a population of 1,495 (1971). The population cf the county was 30,572 in 1966 which showed a decrease of 8.7% since 1961 while the population was 26,865 in 1971 showing a further decrease of 7.9% on the 1966 figures.

Topography

The relative relief features of the county, which is divided practically in half by Lough Allen, are shown in Figure 2.

The northern half consists of table-like mountains which alternate with sometimes spectacular and scenic valleys, e.g., Glencar and Glenade. The mountains reach their highest point just over 610 m (2,000 ft) O.D. near Truskmore on the Leitrim-Sligo border. The lower slopes of the valley sides and valley floors are occupied by drumlin landscape. Some large lakes are present, namely, Melvin. Macnean, Gill, Glencar, Glenade, Belhavel and Doo. Well-expressed scree and colluvial slopes occur on the valley sides of Glenade and Glencar.

Lough Allen, the uppermost lake on the river Shannon, and the largest in the county, is contained by Slieve Anierin on the east, Corry mountain on the west and by drumlins on the southern side.

The southern half of the county consists almost entirely of drumlins which generally range from 45 to 61 m (150 to 220 ft) O.D. at base level to 91 to 122 m (300 to 400 ft) O.D. at summit level.

* National Soil Survey Department. An Foras Taluntais.

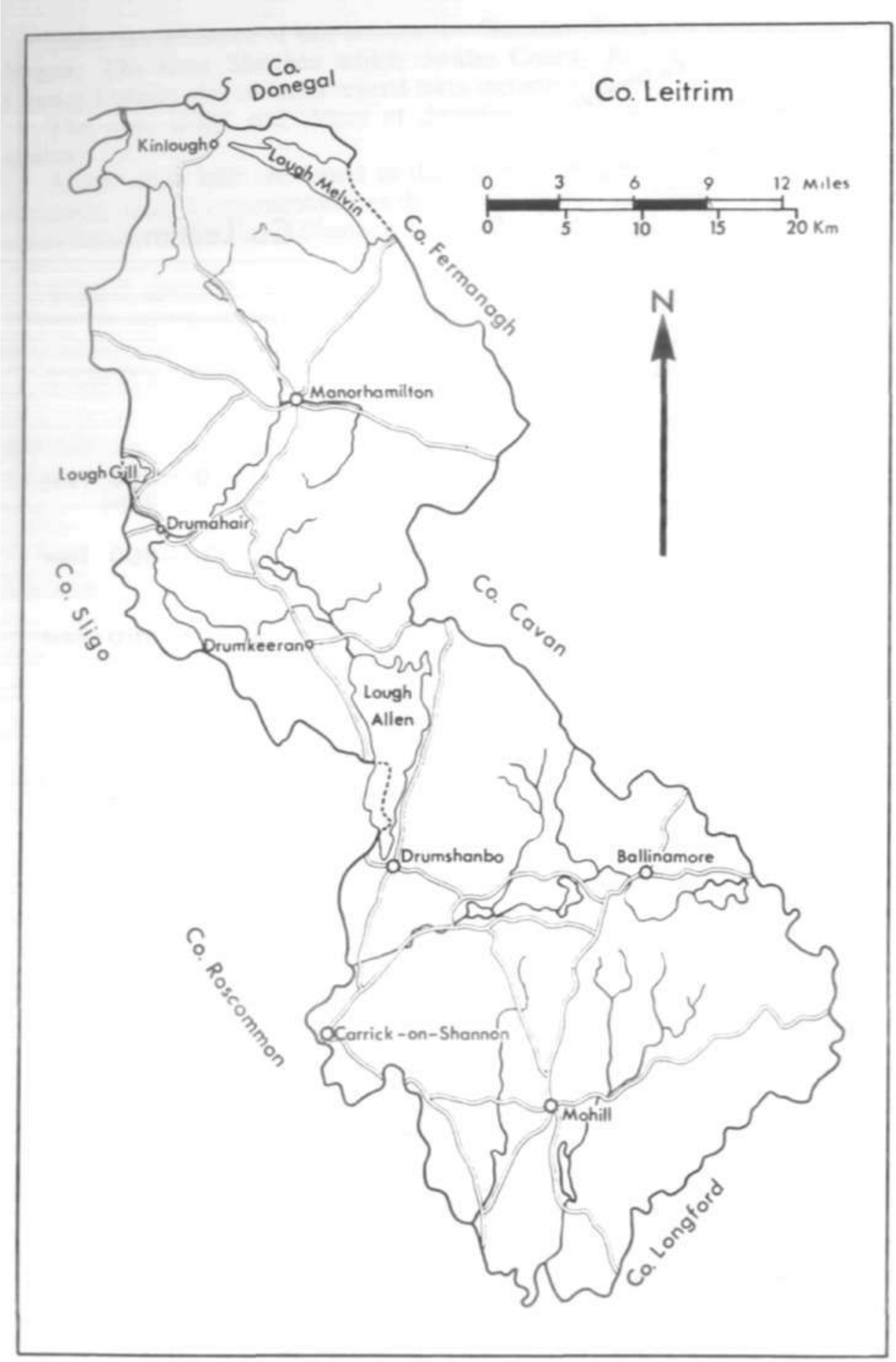

FIG 1: *County Leitrim—geographic location and principal towns and villages*

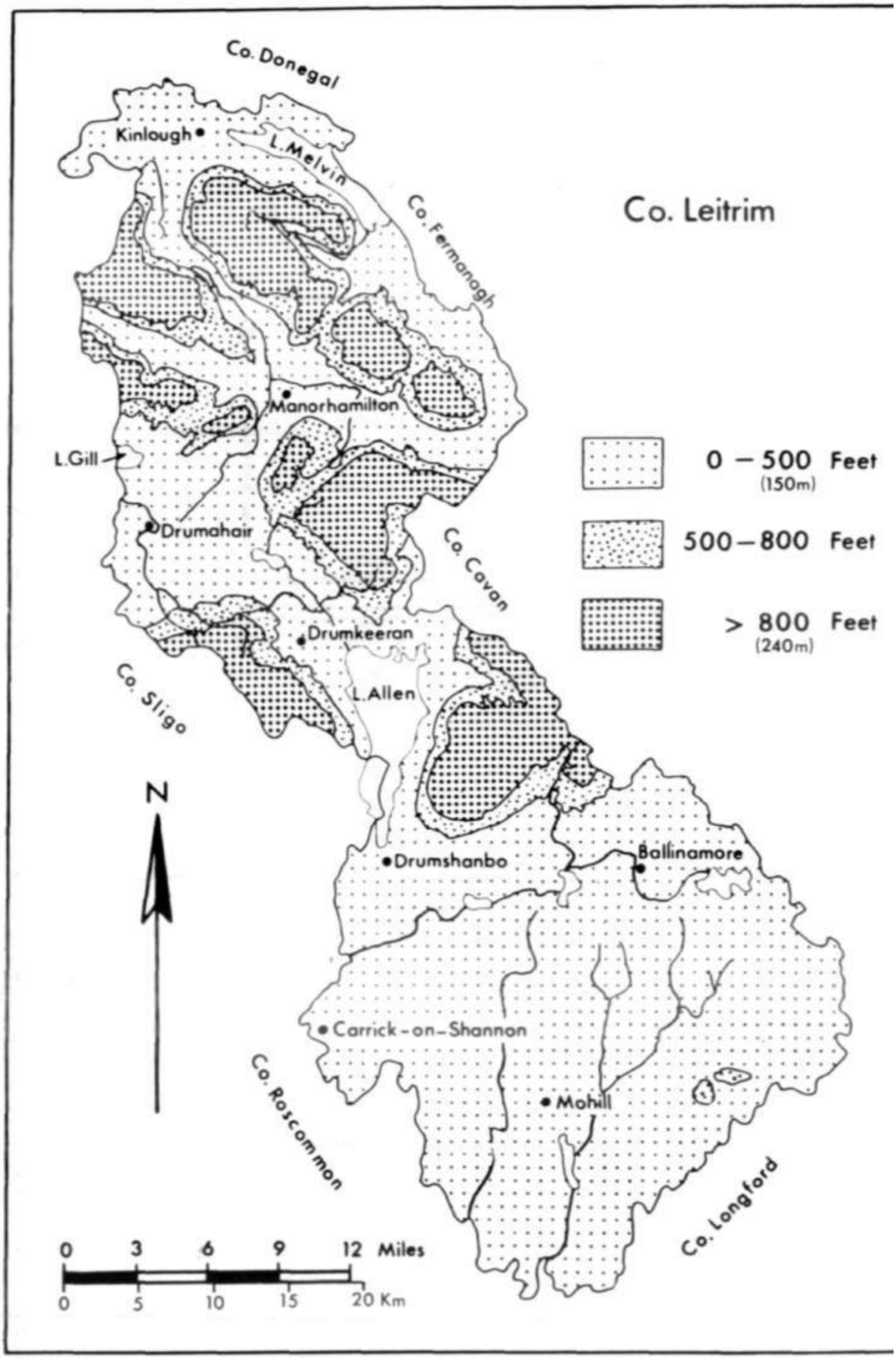

FIG 2: *County Leitrim—relative relief features*

Lakes are a feature of this landscape—Garadice. Rinn and Scur are among the largest. The river Shannon which divides County Roscommon from southern County Leitrim also contains several lakes including Boderg and Scannal.

The size, shape and slopes of drumlins vary considerably throughout the county".

A few small hills are found in the south—the highest 191 m (625 ft) O.D. occurring near Lugganammer south of Aghavas while Sheemore and Sheebeg occur between Carrick-on-Shannon and Keshcarrigan.

Table 1 shows the distribution of land between certain contour intervals in the county. A significant part (24$) of the county' is above 150 m (500 ft) O.D.

TABLE 1—Areas of land between certain contour intervals in Co. Leitrim

Feet **O.D**	**D-250**	**250-500**	**500-1000**	**1000-2000**
(Metres)	**D- 76**	**76-152**	**152- 305**	**305- 610**
Sq km	**640-85**	**540-34**	**241-58**	
Sq miles	**253-25**	**210-25**	**94**	
Percentage	**41 31**	34-30 **58-69***	**15-34** **24-39***	**905**

• **Total percentage of land over lowest contour.**

River Systems

The county is drained by the rivers Shannon. Bonet, Duff, Diffreen. and by tributaries to the Erne and to Lough Melvin (Fig. 3).

The Shannon catchment basin is the largest and drains the centre and south-west of the county. The gradient is very small and flooding occurs frequently. A similar situation occurs in the south east and in Glenfarne which are drained by slow-moving tributaries to the Erne. The Bonet which flows into Lough Gill drains much of the north-west of the county. The gradient is small especially in the Glenade area where flooding of roads is frequent even during summer. Glencar area is drained by the Diffreen.

The north-east of the county is drained by tributaries to Lough Melvin; this in turn is drained by the Drowes which forms part of the boundary between Leitrim and Donegal. The Duff drains the extreme north-west of the county and forms part of the boundary between Leitrim and Sligo. A small remaining area adjacent to the coast is drained directly to the sea by small streams.

Climate

Ireland has a typical west maritime climate with relatively mild, moist winters and cool, cloudy summers. For the greater pan of the year, warm maritime air associated with the Gulf Stream helps to moderate the climate. The prevailing winds are westerly to south-westerly. The average humidity is high. Annual average precipitation is highest on the west coast and in inland areas of high relief.

The information presented here on the climate of Co. Leitrim is based on records of the Meteorological Office.

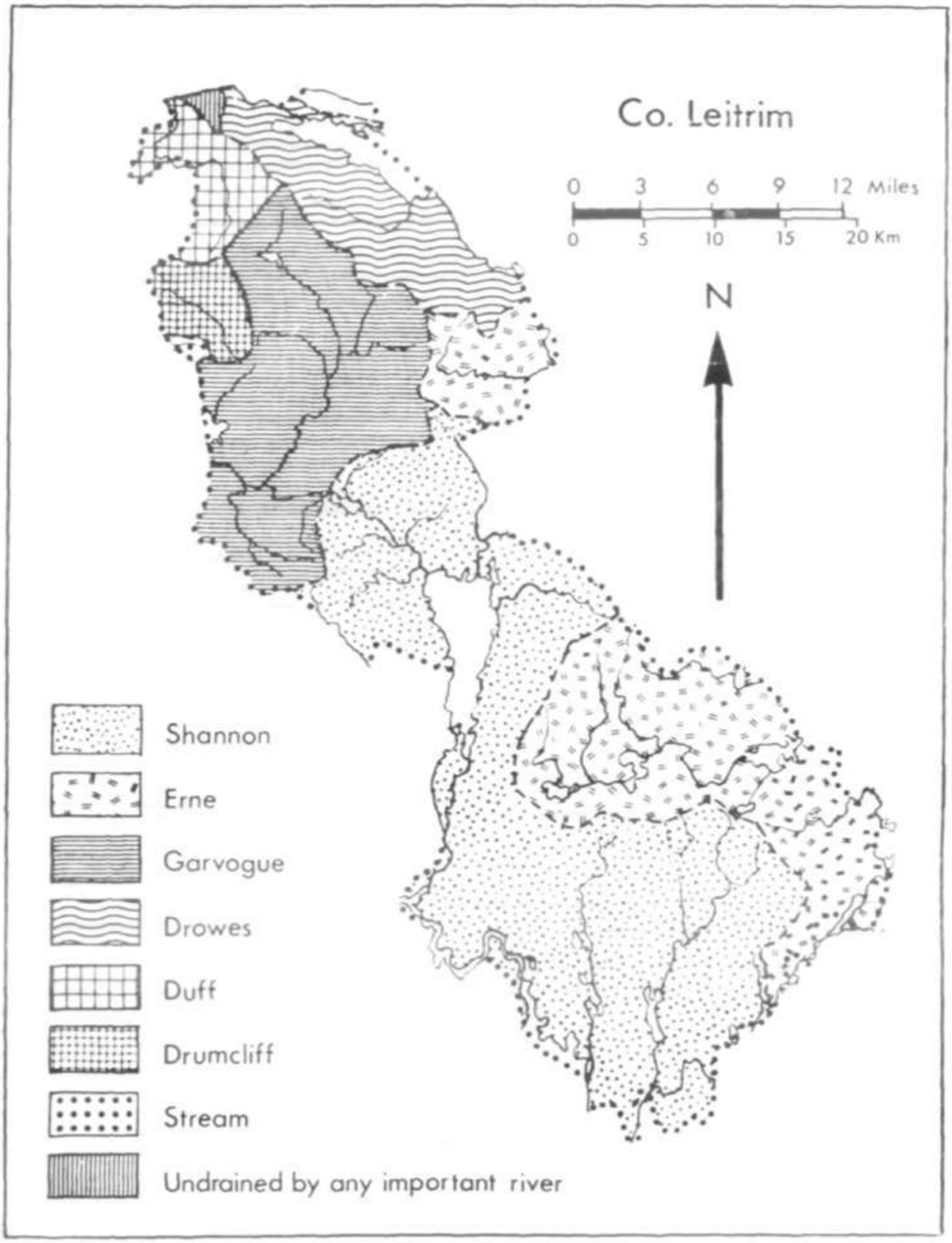

FIG 3 : *County Leitrim—rivers and their catchment basins*

Rainfall

The mean annual precipitation within the county, estimated over the period 1931-60, varies from about 1000 mm in the south to 1440 mm in the Manorhamilton area in the north (Fig. 4). In general the mean annual precipitation is below 1150 mm in the southern part and above 1200 mm in the northern part of the count>r. It is generally evenly distributed throughout the year with about 100 mm per month from January to March, slightly less from April to June and slightly more from August to December. One mm or more a day falls on about 180 days of the year in the county.

Temperature

Mean daily air temperature, estimated over the period 1931-60, ranges from 9 to 10 C within the county. Mean daily air temperatures range from 8.5 to 9.0 C in spring, from 14.0 to 15.0 C in summer, from 9.5 to 10.5 C in autumn and from 4.5 to 6.0 C in winter. Except in summer the northern part is slightly warmer than the southern part. January is the coldest month with mean daily air temperatures below 4.5 C and July is the warmest, just above 15 C in parts of the south.

County Leitrim is generally 1 C colder than the southern or south-eastern parts of the country. In summer, this difference is of the order of 2 C while for the remainder of the year it is of the order of 1 C.

Soil temperatures

A comparison of soil temperatures (1964) between Ballinamore, Co. Leitrim and Moorepark, Fermoy, Co. Cork is given in Table 2.

The mean monthly soil temperature values at 5 cm and 10 cm depths were 1.5 C higher in Moorepark. Co. Cork than in Ballinamore during the growing season. From May to July these differences increased to 2 and 3 C.

Maximum surface temperatures during the growing season in Grange, Co. Meath. are about 1.5 C higher than in Ballinamore.

TABLE 2—Soil temperatures (°C), 1964

Depth (cm)	Site	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Mean
5	Ballinamore Co. Leitrim	3-4	4-6	7-4	10 5	12 9	147	144	12-3	100
5	Moorepark Co. Cork	5-2	6-5	8-7	13-6	15 6	16-6»	16-6	14-4	118
10	Ballinamore Co. Leitrim	3-7	4-8	7-2	110	12-9	14 3	144	12 5	101
10	Moorepark Co. Cork	50	6 1	79	12-4	14-4	15-9*	15-2	13-9	11 4

•Mallow value.

Bright sunshine

The mean daily duration of bright sunshine, for County Leitrim, over the period 1931-60. was 3.5 hours or slightly less. By comparison it was approximately 4 hours in Countv Wexford.

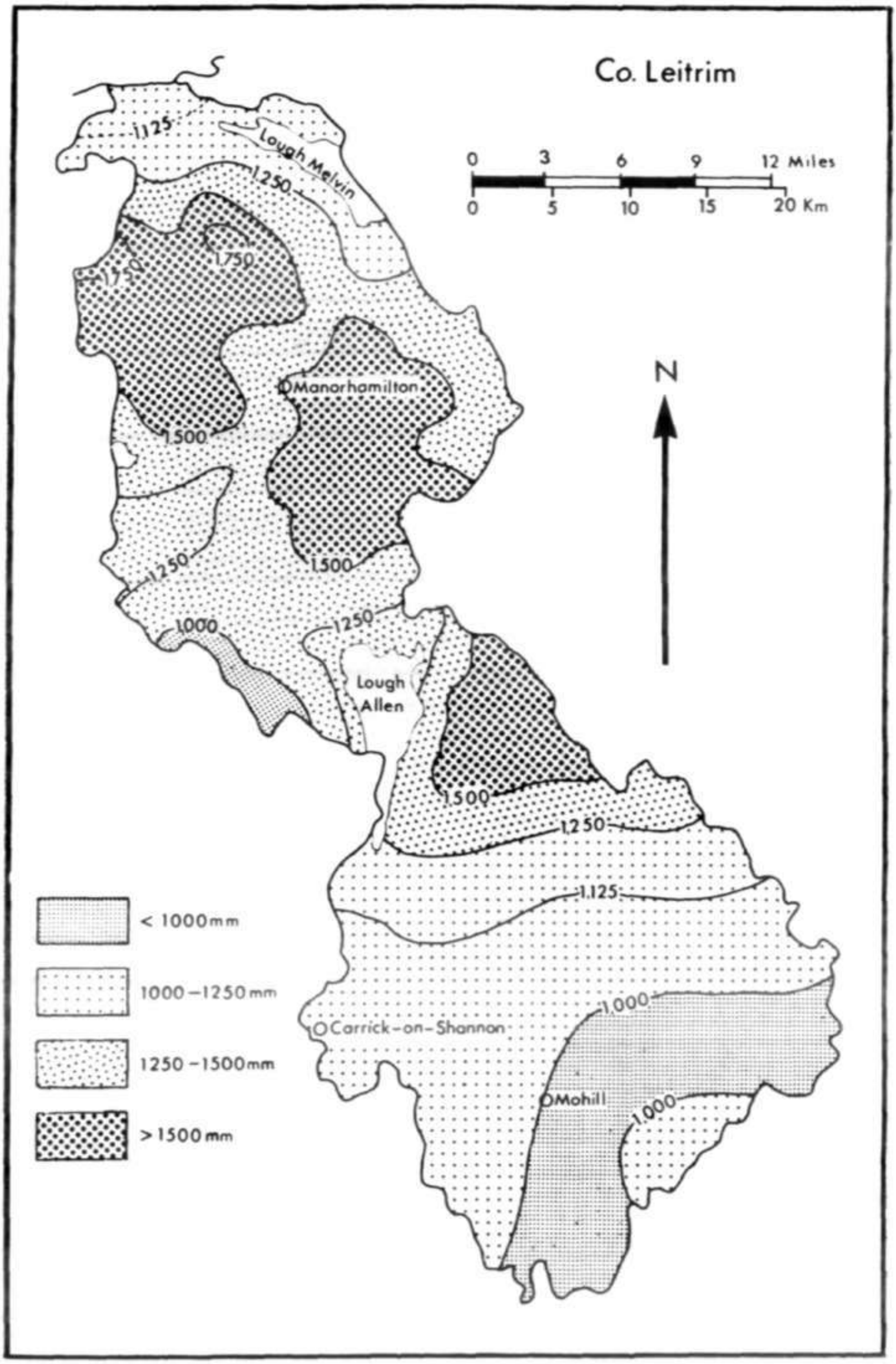

FIG. 4: *Rainfall distribution on an average annual basis* (1931-60)

The seasonal averages (Co. Leitrim) of the mean daily value over the period 1931-60 were: spring, slightly less than 5 hours; summer, from less than 4.5 to 5 hours; autumn, from 2.5 to 3.0 hours; and winter from 1.5 to 2 hours. The ranges in the values represent the difference between the northern and southern parts of the county, the northern part having the lower values in all seasons.

Wind

No long-term data are available for this region. In 1964 and 1965 the mean wind at An Foras Taluntais station. Ballinamore was 6 m.p.h. mid-way up a drumlin. Drumlin crests are generally more exposed.

*Evapotranspiration**

Summer rainfall at An Foras Taluntais station, Ballinamore in 1964 and 1965 exceeded potential evapotranspiration by 200 and 250 mm respectively, while the yearly excess was 720 and 920 mm respectively.

Frost incidence

The mean dates of last and first air frosts over the short period 1964-68 suggest that Ballinamore has a longer frost-free period than Fermoy but a shorter frost-free period than Kinsealy (Table 3).

TABLE 3—Mean dates of last and first frosts

Station	Mean dates	
	Last	First
Ballinamore, Co. Leitrim	April 20	()t tober 29
Fermoy, Co. Cork	May 18	October 6
Kinsealy, Co. Dublin	April 11	November 9

*The data for soil temperatures, wind and evapotranspiration are taken largely from "A Review of Drumlin Soils Research" by J. Mulqueen and W. Burke, An Foras Taluntais, Dublin 1967.

CHAPTER IV

GEOLOGY

Solid Geology

.V. *B. Dhonau**

Within the boundaries of Co. Leitrim a wide variety of rocks occur, each associated with a particular type of scenery. Plateau hills of horizontally bedded shales and sandstones, capped by grits, characterise much of the northern part of the county. Long before the glaciations of the last three million years, weathering and erosion had already dissected the youngest rocks present in the county of Namurian (Upper Carboniferous) age. In the northern part of the county west of Manorhamilton such erosion had already exposed the underlying Visean (Lower Carboniferous) limestones. Further north, close to the coast, low scarps of Calp Sandstone are interbedded with the limestones.

Inliers of older rocks emerge through the cover of Carboniferous rocks in a number of zones trending southwest-northeast across the county. The oldest and most northerly of these is a craggy ridge of metamorphic rocks extending from the Co. Sligo boundary near Dromahaire to Benbo mountain near Manorhamilton. The second zone is represented by Devonian conglomerates outcropping near Drumshanbo and the third by highly folded Lower Palaeozoic shales and sandstones capped near Dromod by a jagged outcrop of Old Red Sandstone. These rocks mark the south edge of the Carboniferous basin rising as an undulating plateau from beneath basal Carboniferous limestones and elastics of Tournaisian age.

The five major rock formations mentioned will be now described in chronological order (Fig. 5).

Metamorphic rocks

These rocks, a prolongation of those that extend east of the Ox mountains in Co. Sligo. consist mainly of highly altered quartz-feldspar-rich sediments and occasional marbles. Small areas of basic igneous rocks have been intruded into the sediments and veins of granite, and the much coarser crystalline variety known as pegmatic is common. All these rocks have been recrystallised under considerable pressure and relatively high temperatures. A strong schistosity has been produced and the rocks are highly folded.

Lower Palaeozoic

Three areas of Lower Palaeozoic rocks occur; the largest is in the south-eastern part of the county forming a part of the Longford-Down massif. Smaller

"dcological Survey of Ireland.

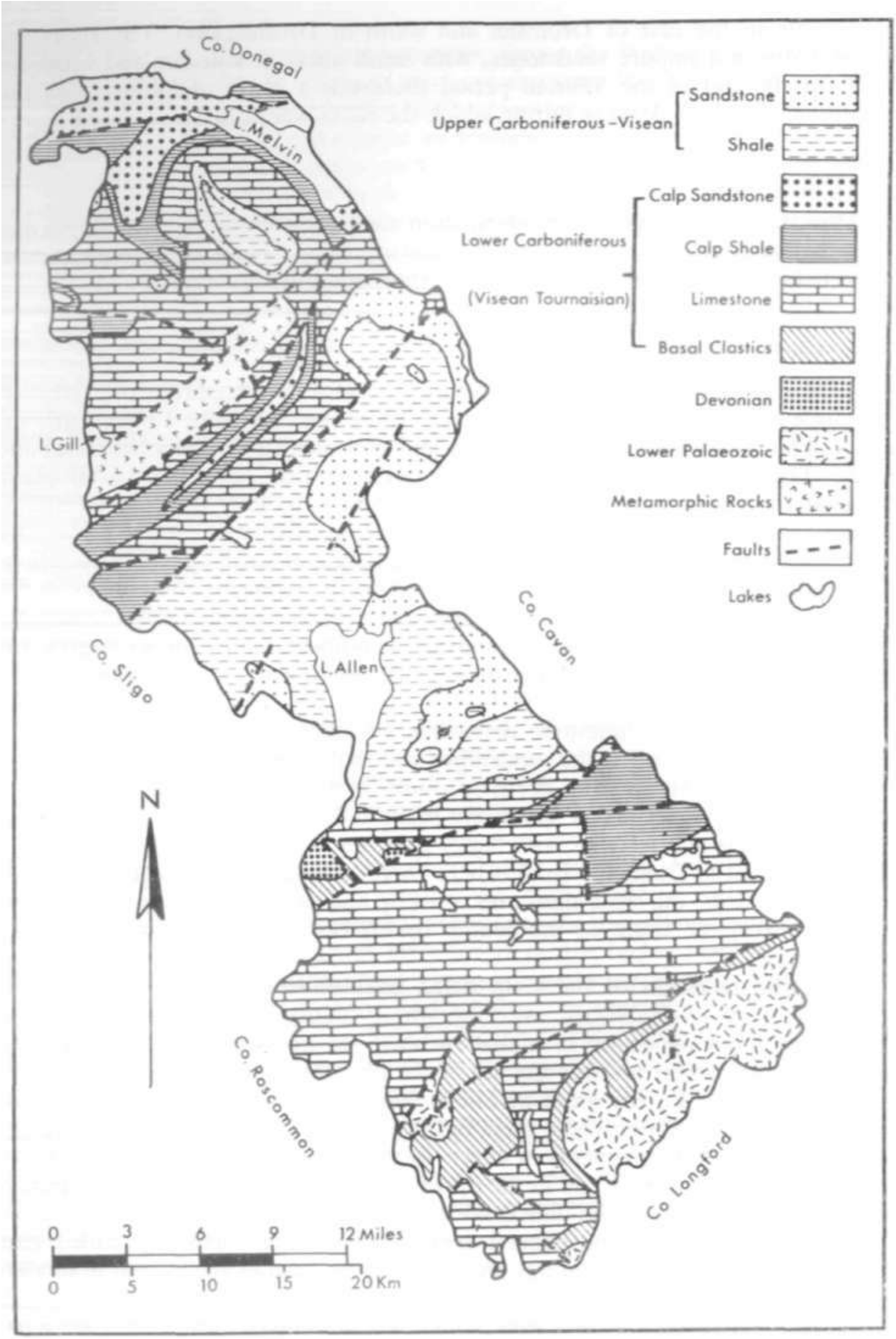

FIG. 5 : *Solid geological formations in County Leitrim*

areas occur to the east of Drumsna and south of Drumshanbo. The rocks are mainly slates and impure sandstones, with small areas of volcanic and intrusive rocks. At the end cf the Silurian period there was a phase of folding with the imposition of a slaty cleavage during which the rocks were tilted and raised.

Devonian

After the phase of uplift and deformation mentioned above, red sandstones and conglomerates were deposited by swiftly flowing rivers. These rocks were in turn folded before the deposition of the rocks of the Carboniferous system.

Lower Caiboniferous

At the beginning of the Carboniferous period a major marine transgression took place across Ireland, reaching Leitrim before the end of the Lower Carboniferous. The basal deposits consist of red and grey sandstones, conglomerates and shales. These represent the deposits of rivers flowing across a coastal plain. Occasional impure limestones in the uppermost parts indicate the onset of marine conditions. Then followed a dominantly calcareous sequence. Initial deposition was in shallow agitated water with oolitic (^consisting of small spherical accretions of calcite) and bioclastic (made up of broken fossil fragments) limestones as the main rock types. In places there are shales and very fine-grained black limestones with algal structures, indicative of intertidal conditions. These deposits give way upwards to purer bioclastic limestones, with occasional shales, deposited in a shallow shelf sea.

This first phase of limestone deposition was terminated by an advance of a delta from the north when the sandstones and shales of the Calp were deposited. These show a transition from north to south, away from the front of the delta. In the north, two calcareous shales are separated by a fine sandstone made up mainly of quartz and feldspar with flaggy intervals. This thins to the south and is absent south of O'Donnell's Rock where there is a single shale only. As this is traced southwards, the shale thins and splits up and progressively more limestones appear until in the south of the county the succession remains only calcareous throughout.

With the recession of the Calp delta, environments suitable for carbonate deposition were re-established over the whole county. Thick-bedded pure bioclastic limestones deposited in a shallow shelf sea predominate. Chert becomes increasingly important towards the top of the limestones, sometimes making up to 50^? of the rock. To the south of Slieve Anierin and west of Ballinamore there are a number of localities where there has been decalcification, producing deposits of siliceous clay with fragments of chert. In the lower parts of this interval in the central areas of the county and in the upper parts in the north, lenses and sheets of very fine-grained, unbedded limestone occur. These accumulated as carbonate mudbands rising above the general seafloor. They are commonly called reefs though there is no evidence of any rigid framework such as that found in modern coral reefs.

At the close of the Lower Carboniferous a second delta advance brought a halt to limestone deposition. Thick shales, with initially some black, fine-grained limestones, accumulated. Deltaic sandstone appears on the southern slopes of Slieve Anierin and thickens northward at the expense of the shales.

I' pper Carboniferous

Shale deposition was almost continuous across the boundary between Lower and Upper Carboniferous, although there are also some thin sandstones preserved At various levels, abundant nodules of clay-ironstone occur, which were formerly worked for iron-ore. The prominent escarpment near the top of Slieve Anierin and the hills west of Lough Allen mark the outcrop of a thick grit. This represents a non-marine deltaic deposit with thin coal seams within, as accumulations of coal swamps. The youngest preserved beds are shales with some sandstones and grits.

Glacial Geology

*F. M. Synge**

Like even' other county in Ireland. Leitrim was subjected to total glaciation on more than one occasion. Little, however, is known about the older glacial episodes as all traces of their presence has been effaced by the erosive effects of subsequent *ice* sheets that covered most of the country. In all probability the earlier glaciations followed a pattern similar to that of the latest one. In Ireland this latest accumulation of an ice cap has been termed the Midlandian Glaciation; it is the equivalent of the Weichsel Glaciation of north Europe.

Midlandian Glaciation

During this glaciation a great ice sheet built up over the midlands of Ireland about 20,000 years ago. The ice shed extended across Leitrim from southwest to northeast in the vicinity of the Lough Allen basin (Fig. 6). Ice streams flowed outwards from this ice shed northwest along the Drumkeeran corridor, the Melvin trough, Glenade and Glencar, and southwards from Slieve Anierin across the limestone lowlands of Drumshanbo, Ballinamore and Mohill. Boulders of the harder rocks were carried considerable distances by these ice streams—metamorphic boulders from Benbo can be found west and north of that mountain; and boulders of Old Red Sandstone from Finnalaghta Hill near Drumsna were carried southwards past Rooskey. But, as most of the glacial material was carried a short distance only, the bulk of the material is similar to the underlying bedrock.

During glaciation. erosion was most severe on the higher summits and in the deeper valleys such as Glencar and Glenade, that were aligned parallel to the direction of glaciation. Most of the lowland areas, on the other hand, are mantled by a thick cover of boulder clay deposited during a later stage of glaciation in the form of small hills or drumlins. These drumlins are oval in plan and vary in size up to 800 metres in length and 9 metres in height. As they were formed beneath flowing ice they tend to parallel the direction of ice flow. Generally the drumlins stand out as islands surrounded by marshy flats or lakes. This type of landscape is particularly well developed in the south east part of the county. Only in the northern or coastal lowlands around Kinlough were glacial conditions unfavourable to the formation of drumlins. Instead belts of stony moraines of Calp sandstone were deposited in successive zones as the ice margin retreated northwards into Donegal Bay.

At an early stage of glaciation the sandstone and limestone plateaus between Glencar and Lough Melvin had already emerged from the surface of the ice cap.

'Geological Survey of Ireland.

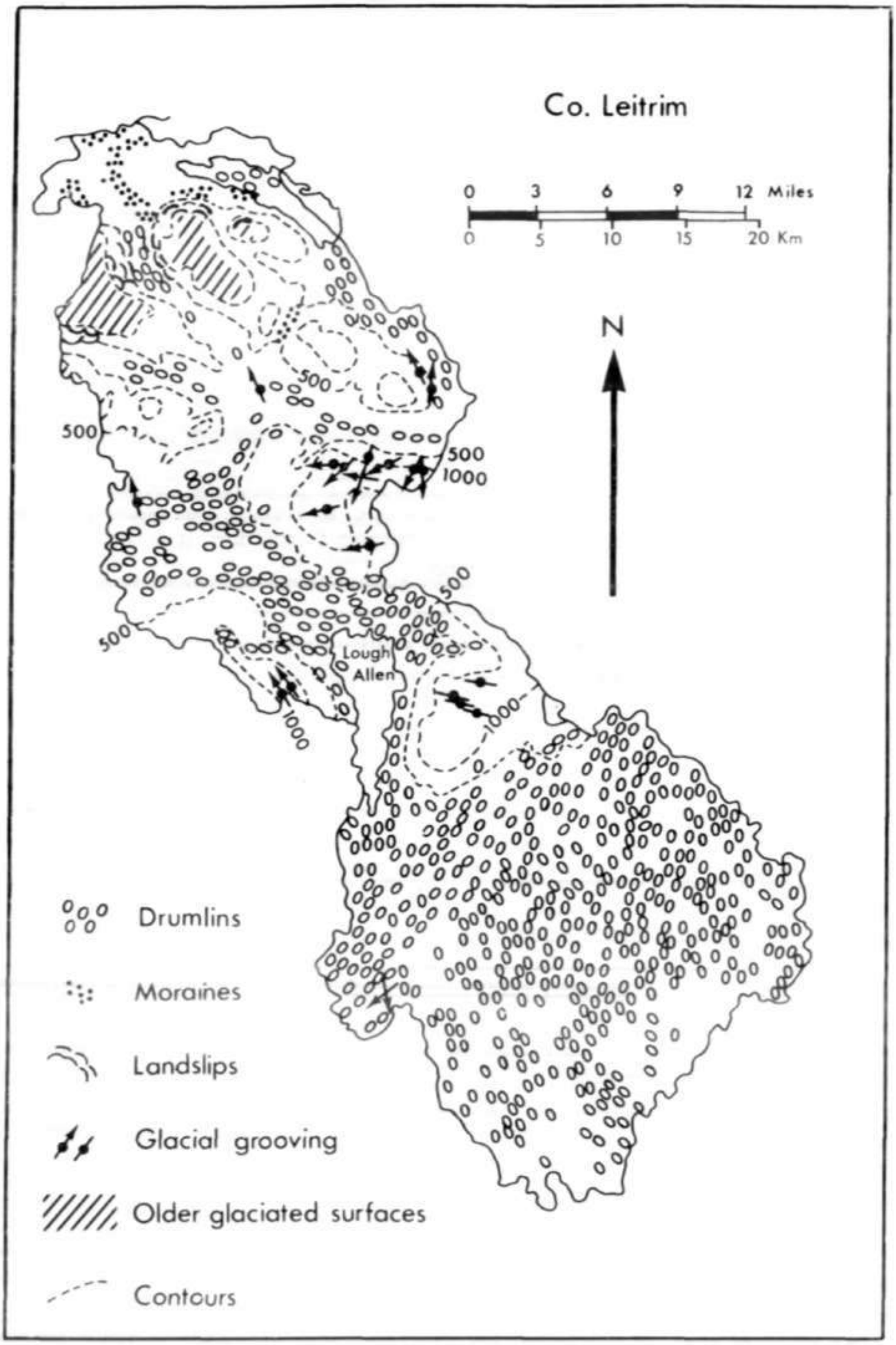

FIG. 6: *Glacial geology of County Leitrim*

Because these plateaus were exposed from beneath the ice for a much longer time than elsewhere, they have been deeply weathered. Later, about 17,000 years ago. the ice sheet again became active. At this time outflow glaciers were confined to the glens—Melvin, Glenade and Glencar—and being strongly erosive, undercut the steep bounding walls cf limestone by gouging away the soft underlying shale beds. Once the ice retreated the limestone cliffs, now unsupported, collapsed into the valley below in a series of spectacular landslips. Beneath the flowing glacier ice, boulder clay, produced by the grinding of pieces of bedrock, was deposited and later moulded into drumlins or hillocks aligned in the direction of ice flow. The pattern of drumlins clearly shows that as the old ice divide was dissipated the ice centre migrated northwards into Co. Cavan. The youngest drumlins radiate from the Cavan border: southwest round Ballinamore, slightly west of south at the head of Lcugh Allen, west in Glenfarne, and northwest round Kiltyclogher.

By about 15,000 years ago the last remnants of ice probably had melted away from the valleys. These final remnants were a series of wasting blocks of ice that occupied the lowest basins. Terraces of gravel around these basins represent materials washed into small lakes that bordered the ice remnants. Once the ice had melted completely these depressions were occupied by lakes. By this time the climate was still severe and only a Tundra vegetation could develop. There was a return of exceptionally cold conditions between 8800 and 8300 B.C. when small corrie glaciers reappeared on the higher mountains of Ireland and coarse debris was washed into lakes and depressions throughout the lowlands. Very shortly afterwards there was a very rapid climatic improvement, marking the beginning of the postglacial period.

Postglacial period

At first the climate became warmer and drier, and the early vegetation cover of heaths and grasses was rapidly followed by a dense forest cover of pine on the higher ground, and deciduous woods of elm and hazel in the more fertile lowlands. About 5000 B.C. the onset of wetter conditions caused the widespread development of blanket peat on the highlands. Depressions in the lowlands also became filled with peat along with the advent of Neolithic farmers at this time, who were engaged in extending their land at the expense of the forests which now suffered from deforestation. The lakes became more and more silted along their margins, and more recently many have disappeared altogether because of artificial drainage.

CHAPTER V

THE SOILS*

M. WdshX

Eighteen Soil Series have been recognised and mapped within County Leitrim; the series category is denned in Appendix I. The different series have been given geographic names based on the location in which the particular soils are best expressed or occur most widely. Three soil complexes, one association and three phases have also been recognised and described.

In mapping their distribution in any area the soils can be classified on a broad scale into major or Great Soil Groups, each consisting of a collection of closely related Soil Series. Each Great Soil Group then is comprised of soils having a number of important soil profile characteristics in common. A certain latitude in profile variation is allowable at this level of classification, nevertheless the degree of similarity is of quite a high order. A single Great Soil Group may not be confined to a particular geological parent material, as the basic criteria for classifying the soils at this stage are the characteristics of the profile. Each soil series, however, has its own distinctive parent material in addition to the same kind and sequence of horizons in the soil profile.

Description and discussion of the various soils mapped in County Leitrim. arranged according to Great Soil Groups, are given in the following pages and a soil map at a scale of 1: 126,720 (| inch to 1 mile) is folded in the back of Part I of this report. Table 4 shows the Great Soil Groups, and their respective series and the extent of the county occupied by each. Table 5 shows the main soil series in the county, grouped according to close geological similarities in parent materials.

TABLE 4—Classification of Main Soil Series in County Leitrim into Great Soil Groups and the relative extent of each group

Great Soil Groups	Series	Percent of total area*
Brown Earths	Loughmuirran	014
Grey Brown Podzolics	Clooncarreen	020
Brown Podzolics	Corriga, Kilnageer, Mountcollins, Wardhouse	1-78
Podzols	Stonepark	0-45
Glevs	Ballinamore, Drumkeeran, Ciarvagh, Howardstown, Kiltvclogher, Rinnagowna	46-82
Rendzinas	Burren	0-90
Lithosols	Crumpaun	0-45
Peats	Allen, Aughty	2603
Complexes	Ballinamore-Allen, Ballyhaise-Corriga, Mortarstown -Kinvarra	731
Association	Ardrum	1010

• **Refers to total area of County Leitrim.**

*The basic methodology and terminology employed in soil surveying is explained in Appendix I; definitions of terms used in profile descriptions are given in Appendix II.

{National Soil Survey Department, An Foras Taluntais.

TABLE 5__Soils grouped according to geological parent material

Soils	*Parent Material*
Crumpaun	Scree material derived from Glencar and Dartry Limestones—Visean Age, Lower Carboniferous Period
Loughmuirran	Colluvium derived from Benbulben Shale and Glencar Limestone—Visean Age, Lower Carboniferous Period
Burren	Very shallow glacial drift and calcareous bedrock; drift derived from calcareous rocks; all rocks are of Visean Age, Lower Carboniferous Period
Clooncarreen, Rinnagowna	Glacial drift derived from frequently calcareous sandstone, conglomerate, arkose and grit of the Boyle Sandstone Group—Visean Age, Lower Carboniferous Period
Corriga, Ballyhaise-Corriga	Glacial drift derived from greywacke, siltstone, mudstone and shale—Ordovician Period
Kilnageer, Stonepark	Glacial drift derived from coarse grained gneiss, quartzite, micaschist, and epidiorite—mainly Moinian Period
Mountcollins, Drumkeeran	Glacial drift derived from shales, coal measures, sandstones and conglomerates—Namurian Age, Upper Carboniferous Period
Wardhouse	Glacial drift derived from rocks of the Mullaghmore Sandstone and Bundoran Shale Group usually calcareous—Visean Age, Lower Carboniferous Period
Ballinamore	Glacial drift derived from calcareous shale, argillaceous and arenaceous limestone—Visean Age, Lower Carboniferous Period
Garvagh	Glacial drift derived from siliceous limestone with some sandstone influence—Visean Age, Lower Carboniferous Period.
Howardstown	Glacial drift derived from limestone with some sandstone shale and conglomerate influence—Visean Age, Lower Carboniferous Period
Kiltyclogher	Glacial drift derived from sandstone, shale and conglomerate—Namurian Age, Upper Carboniferous Period
Mortarstown-Kinvarra	Glacial drift derived from several varieties of limestone—siliceous, argillaceous and arenaceous with some sandstone and shale influence—Visean Age, Lower Carboniferous Period

Lithosol Group

Lithosols are skeletal, stony soils, often of an organic nature, overlying in fflost cases solid or shattered bedrock. Generally, rock outcrop occurs frequently in such soil areas. Lithosols are most often associated with Podzols and Climatic Peats at the higher elevations. Their use-range is limited mainly to extensive grazing an^ occasionally to forestry.

Crumpaun Series Soil 151 on Map)

Soil character: This series occupies 0.45% (715 ha; 1,767 acres) of the county - It occurs at elevations between 213 and 396 m (700 and 1,300 ft) O.D. on both sides of Glencar and Glenade. Slopes average 40 and patches of bare s£ree material (shattered rock) are common throughout the series. The parent material consists of scree derived frcm the Glencar and Dartry limestones of the Lower Carboniferous, Visean Age. The Glencar limestone is frequently dolomitised ^^ thin shaley partings and the Dartry limestone is crinoidol and has much chert-

The soils are well to excessively drained, of silt loam to silty clay loam texture and of low base status. The profile has an A/C horizonation with a gradual diffuse boundary between the two horizons. The A horizon varies in depth from 5 to 15 cm. ccntains 23 tc 36^ clay and 10 to 15% organic matter. The silt content varies from 49 to 61% . Soil permeability is good but root penetration is limited by excessive stoniness at a depth of 10 cm.

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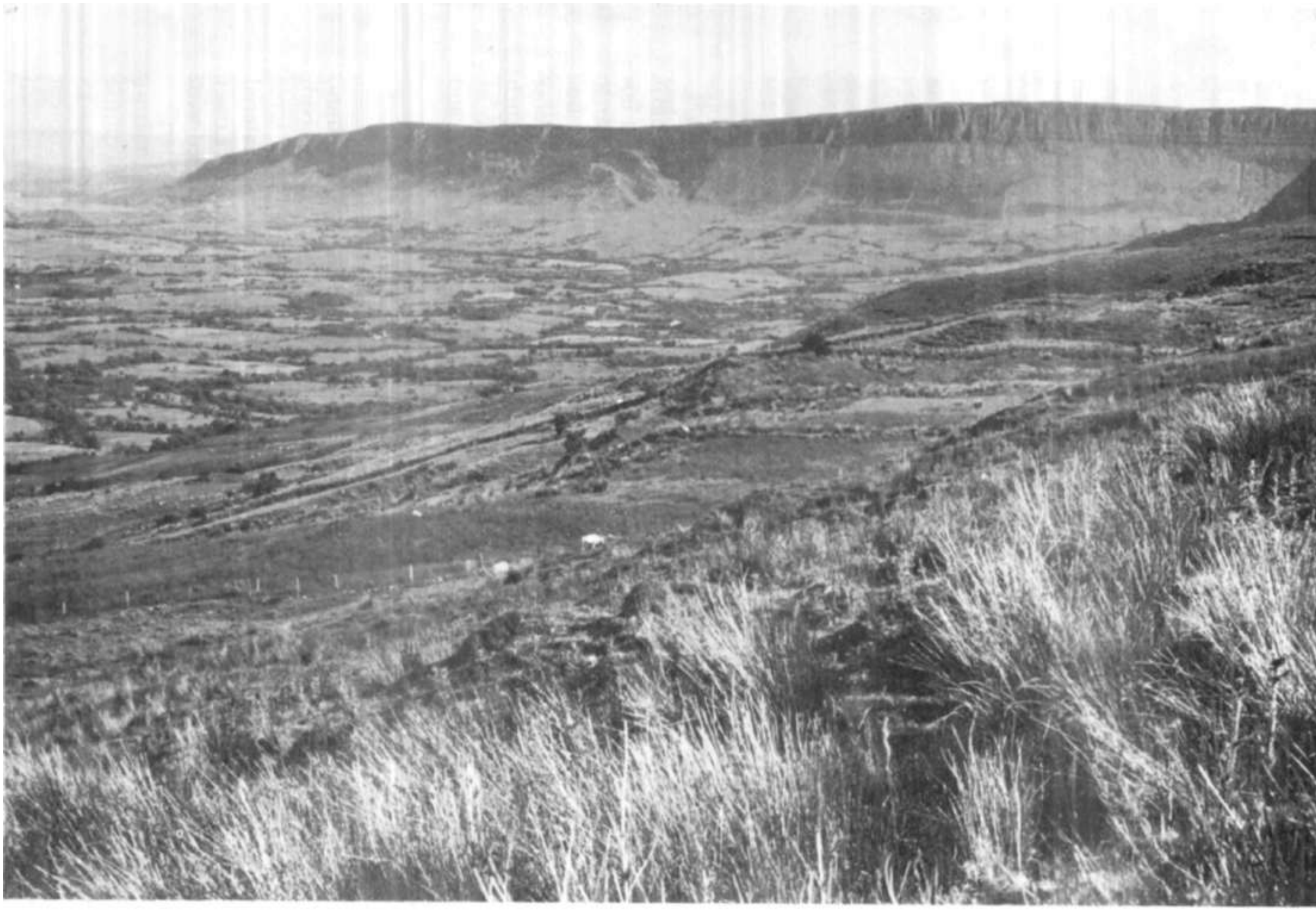

Plate 1—North facing slopes of Glenade, North Leitrim, Loughmuirran Series on colluvial slopes in foreground, Crumpaun and Loughmuirran Series on scree an J colluvial slopes in middle distance, Ballinamore Series in lowlands

c 7 *suitability.* High elevations, steep slopes and shallowness severely limit the range of these soils. The growth season is relatively late and short and thus ihcv are mainly suitable for extensive sheep grazing.

Profile descriptions and analyses—Appendix III. Tables 1 and 2.

Brown Earth Group

Brown Earths are relatively mature, well-drained, mineral soils possessing a rather uniform profile, with little differentiation into horizons. It follows, therefore, that these soils have not been too extensively leached or degraded, with the result that there are no obvicus signs in the profile of removal and deposition of materials such as iron oxide, humus or clay. However, in many cases leaching has occurred resulting in the translocation of soluble constituents, notably carbonates of calcium and magnesium.

Some Brown Earths are derived from parent materials poor in lime or base-rich components and are, therefore, inherently acid; these are called Acid Brown Earths or Brown Earths of low base status. Others are developed on more lime-rich parent materials, are less acid and may even be alkaline; these are known as Brown Earths of high base status. An intermediate sub-group classified as Brown Earths cf medium base status can also be distinguished. These and the Brown Earths of low base status can also develop on lime-rich parent materials under conditions conducive to excessive depletion of bases.

Brown Earths normally possess medium texture (sandy loam, loam, sandy clay loam), good structure and good drainage characteristics, and are very friable. They are generally good arable soils. Although normally of rather low nutrient status in their natural state, they respond well to manurial amendments. With good management they also constitute high-quality grassland soils as well as being ideallv suitable for a wide range of forest tree species.

Loughmuirran Series (Soil 152 on Map)

Soil character: The series occupies 0.14% (222 ha; 549 acres) of the county. It occurs generally between 122 and 244 m (400 and 800 ft) O.D. on the slopes of Glenade and Glenaniff in the north of the county. The topography consists of stepped colluvial slopes dipping from 22 to 35 . Colluvium derived mainly from Benbulben shale, with some influence from Glencar and Glenade limestone, forms the parent material. Benbulben shale is mainly calcareous while the limestones may be dolomitic or cherty.

The soils are moderately to imperfectly drained of silty clay texture and of low to medium base status. Organic matter content of the surface horizon is high, ranging from 11 to 17%. Soil structure is weak. The profile has an A/C or an A (B) C horizonation. Soil depth—26 to 80 cm— is very variable. A profile, examined on the west side of Glenade (Appendix III. Table 3), shows evidence of a buried soil.

Soil suitability: The soils occur on slopes of 22 to 35 and are inaccessible to conventional farm machinery. The slopes are too steep for tillage and localised soil slips occur occasionally following periods of persistent rainfall. Because of the steep slopes and the weak soil structure, sheep grazing forms the main farm enterprise. The soils are inherently fertile and will respond to fertilisation. Better farm management can improve the sward and output on these soils.

Profile description and analyses—Appendix III, Tables 3 and 4.

Rendzina Group

These soils are shallow, usually not more than 50 cm (20 in.) deep, and derived from parent material containing over 40 to 50^ carbonates. The surface horizon is dark in colour with a moderately strong structure and neutral to alkaline reaction. A calcareous (B) horizon may be present. Drainage is always free to excessive.

Where they are sufficiently deep, Rendzinas are suitable for tillage but in many cases insufficient depth limits their suitability to grassland farming. The soils are excellent for winter pasturage.

Burren Series (Soil 140 on Map)
Soil character: This series which has been named after a more extensive soil in County Clare occupies 0.90^ (1.429 ha; 3,533 acres) of the county. Smaller areas, e.g., Sheemore, occur in the south of the county. The topography consists of hill and mountain rising to nearly 425 m (1,400 ft) O.D. Slopes, ranging from 10 to 15 are common. Parent material consists of Carboniferous limestone and calcareous shale bedrock, with localised areas of shallow glacial drift derived from these rocks.

The soils are generally well to excessively drained, of high base status and of clay loam texture. Chert gravel is often a feature of sub-surface textures. The profile has an A, C/R* horizonation. The surface horizon contains 299< clay. 15% organic matter and has a weak to moderate crumb and subangular blocky structure. The complete A horizon which is sub-divided into A11 and A12 is 17 cm thick and grades into a stony, gravelly C horizon. Profile depth is 35 cm but is often shallower due to frequent rock outcrop.
Soil suitability: Approximately 30^ of these soils are well suited to grassland farming. They have moderate structure, free drainage, a high base status and are generally accessible to farm machinery. The soils are too shallow for tillage. Some 70 ^ of the soils, however, occur on more elevated and rugged topography with frequent rock outcrop. Slopes range from 10 to 15 and the soils are very shallow. The area is generally inaccessible to farm machinery and the growing season is short. The soils are best suited to extensive grazing.

Profile description and analyses—Appendix III. Table 5.

Grey Brown Podzolic Group

The development of these soils is associated primarily with the leaching process; the principal constituent accumulated in the B horizon is the finely divided clay fraction. To qualify as a Grey Brown Podzolic, a soil must have a B horizon significandy higher in clay content than either the A or C horizon; such an horizon is termed a textural B or Bt horizon. The occurrence of clay skins on the structural ped surface is a further characteristic of the Bt horizon.

In general, the Grey Brown Podzolics possess a somewhat heavy texture; they are well to moderately well drained, possess a moderately well- or well-developed structure and are usually moderately acid to neutral in reaction. The organic matter content in the surface is within the normal range for mineral agricultural soils and the humus is of the desirable mull-type.

Under Irish climatic conditions, the "lighter" textured members of the Grey Brown Podzolics are good all-purpose soils and, when adequately manured and

•Refers to underlying rock

managed, are very productive under most agricultural enterprises. The "heavier" textured members are suitable grassland soils, responding well to good manurial and management practices. The grey brcwn podzolic soils are not generally available for afforestation but should be highly productive for this purpose.

Clooncarreen Series (Soil 153 en Map)
Soil character: This series occupies 0.207f (317 ha; 785 acres) of the county. It occurs on drumlin topography south and west of Rinn Lough in south Leitrim. The parent material is glacial drift derived from calcareous sandstones and conglomerates of the Carboniferous Boyle Sandstone Group.

The soils are well drained, cf medium base status and of loam to clay loam texture. The profile is about 1 m deep and has a well-developed textural B horizon between 40 and 65 cm. The surface horizon contains 26*/£ clay. 109£ organic matter and a moderate crumb and subangular blocky structure. It is sub-divided into A11 and A12 and is 30 cm deep. Large sandstone boulders are common and, despite the occurrence cf many micropores, natural drainage is impeded in flat areas and depressions.

Soil suitability: The soils have a wide use-range and are well suited to grassland farming and tillage. However, the occurrence of boulders together with weak structure in areas of impeded drainage restrict tillage operations. Artificial drainage is hampered by the amount and size of boulders in some areas.

In general, the soils have a deep, well-drained, well-structured and friable surface horizon. This gives them a high potential for grass production which can be utilised over a long grazing season.

Profile description and analyses—Appendix III, Table 6.

Brown Podzolic Group

The Brcwn Pcdzolics are a more intensely leached version of the Brown Earths and as a result the upper horizons are more depleted of bases and other constituents. A characteristic feature of these soils is a sub-surface horizon of strong red-brown or yellowish-brown colour due to enrichment, principally by iron oxides leached from die upper horizons. They are more degraded generally and of a more acid nature than die Brown Earths.

Although the Brown Pcdzolics are more leached and of lower natural nutrient status than the Brown Earths, they closely resemble each other in behaviour and productive capacity. On account of their desirable texture, structure, consistency and drainage, the Brown Podzolics are considered highly suitable for cultivated cropping, except where they occur on excessively steep slopes. Although lacking in natural nutrient and lime status they respond well to manurial amendments. Highly productive short-term leys can be obtained with the crop rotation, when manuring and management are satisfactory. Like the Brown Earths, they are ideal forest soils under Irish climatic conditions.

Corriga Series (Soil 154 on Map).
Soil character: This series occupies 0.38% (604 ha; 1,492 acres) of the county. It occurs on drumlin and undulating lowland in the south-east of the county mainly around Carrigallen. The parent material consists of glacial drift derived from greywackes, siltstones, mudstones and shales of the Ordovician Period. Slopes of the drumlins vary from 5 to 15 while those of the undulating lowland seldom exceed 5 and are generally 2 to 3 .

The soils are well to moderately well drained, of loam to clay loam texture and of low base status. The profile consists of a dark-brown surface horizon, 25 cm thick, overlying a yellowish-brown horizon, 13 cm thick, which has an accumulation of iron. The surface horizon contains 211 clay. 81 organic matter and has a moderate crumb and sub-angular blocky structure. The B horizon has net only a higher iron content but also a higher clay content (281) than either the A or C horizons which suggests that eluviation may also have involved mineral particles. The parent material appears to be more compact on drumlin topography than on undulating lowland which may have resulted in the impedance of natural drainage in the former.

Soil suitability: These soils have a moderately wide use-range. The desirable texture, structure, consistency and natural drainage make them very suitable for grassland farming. Steep slopes on the drumlins and boulder problems in parts of the undulating lowland hinder tillage operations. The more compact parent material of drumlin topography inhibits permeability to a greater extent than on other lowland topography. The soils on the former are thus more easily poached during periods of heavy rain and may have a slightly lower grazing capacity than the soils on the latter.

Profile description and analyses—Appendix III. Table 7.

Corriga Series—Bouldery Phase **(Not shown on Map)**

Soil character: A bouldery phase has been recognised within the series but has not been mapped separately because of its localised nature and intricate pattern of occurrence. The topography is hummocky with short steep slopes and contains many protruding boulders. The parent material is glacial drift, similar to that of the Corriga series but with a higher boulder content.

The soils are excessively drained, of loam to clay loam texture and of low base status. The surface Al horizon, is dark-brown, 20 cm deep, and has a high stone and boulder content. It contains 321 clay and 191 organic matter. It has an irregular boundary with a Bir horizon which is also boulder\'. The latter horizon contains 191 clay and 4.21 free iron which contrasts with 2.31 free iron in the surface horizon. The boundary between the B and C horizons is very gradual and diffuse because of the permeable nature of both.

Soil suitability: The soils are at present suitable only for grazing. The short steep slopes and numerous surface boulders prevent mechanised farming. Reclamation, involving boulder removal, levelling and reseeding can significantly increase agricultural production on these soils. A good standard of management and manurial practice is necessary to maintain these improvements.

Profile description and analyses—Appendix III, Table 8.

Kilnageer Series **(Soil 155 on Map)**

Soil character: This series occupies 0.46% (730 ha; 1,805 acres) of the county. It occurs in the neighbourhood of Manorhamilton and on the eastern foothills of Benbo mountain. The topography consists of rolling lowland and hill, with rock outcrop and protruding boulders a feature in some areas. The parent material consists of a stoney, friable glacial drift derived from coarse-grained gneiss, quartzite. micaschist and epidorite.

The soils are well drained, sandy loam to loamy sand in texture and of low

. 'status. The profile consists of a dark-brown, very friable surface horizon, 19 cm deep, overlying a strong to yellowish-brown, very friable horizon. 29 cm thick, which is enriched with sesquioxides. The surface Al horizon has 13^f~ clay and 7.5'^ organic matter. Clay content decreases to 4^r~ in the lower part of the sub-surface. Bir horizon. Soil structure in the surface is weak fine sub-angular blocky breaking to moderate fine crumb and becomes single grained approaching the C horizon.

Soil suitability: The soils are moderately suitable for tillage in areas where steep id rock outcrop are not a feature. Intensive grassland farming can also be ul in these areas. Because of the weak soil structure and the inherently low nutrient status, a high standard of management and manurial practice is necessary to maintain a high output on these soils. Areas affected by steep slopes and rock outcrop can provide good pasture for grazing.

Profile description and analyses—Appendix III. Table 9.

Mountcollins Series (Soil 55 on Map)

Soil character: This series occupies 0.16^ (254 ha; 628 acres) of the county. It occurs mainly on the Leitrim-Roscommon border near the shores of Lough Allen The topography consists of rolling lowland and drumlin with many slopes ranging from 7 to 12 . Parent material consists of glacial drift derived from Namurian shale with some sandstone influence.

The soils are well to imperfectly drained, of loam to clay loam texture and of low base status. The profile contains a surface A horizon about 18 cm thick, overlying a sesquioxide-enriched Bir horizon which is about 10 cm thick.

Soil suitability: The soils are generally poorly suitable for tillage as they occur on steeply sloping topography. They are suitable for grassland farming and, because of their desirable natural drainage and structure, stock numbers and grass production can be greatly increased on them. Care must be exercised on the steeper slopes which may become liable to poaching during periods of persistent rainfall.

Profile description and analyses—Appendix III. Table 10 (Taken from *"Soils of County Limerick"* by Finch, T. F. & Ryan, P. p. 47 & 150).

Ward house Series (Soil 156 on Map)

Soil character: This series occupies *0.7S7c* (1.239 ha; 3.062 acres) of the county. It occurs along the short coastline in the northern tip and south west of Kinlough in the neighbourhood of Balloor and Park as well as on the south-eastern foothills of Crocknagapple. The topography is lowland kame and kettle, which presents a hummocky terrain with many 7 to 8 slopes. The parent material consists of Carboniferous sandstone with some shale, both of which are usually calcareous.

The soils are well to excessively drained, of sandy loam texture and of low to medium base status. The profile consists of a dark-brown surface A horizon, 30 cm deep, overlying a sesquioxide-enriched, Bir horizon which extends to a depth of 75 cm. Structure is weak, fine and medium crumb in the surface horizon, becoming sub-angular blocky with depth. The parent material is loose, single-grained and very friable. The surface horizon contains 17^ clay and 8^ organic matter. The upper part of the A horizon contains *\S%* free iron and the B horizon 2.4^ which indicates leaching of sesquioxides.

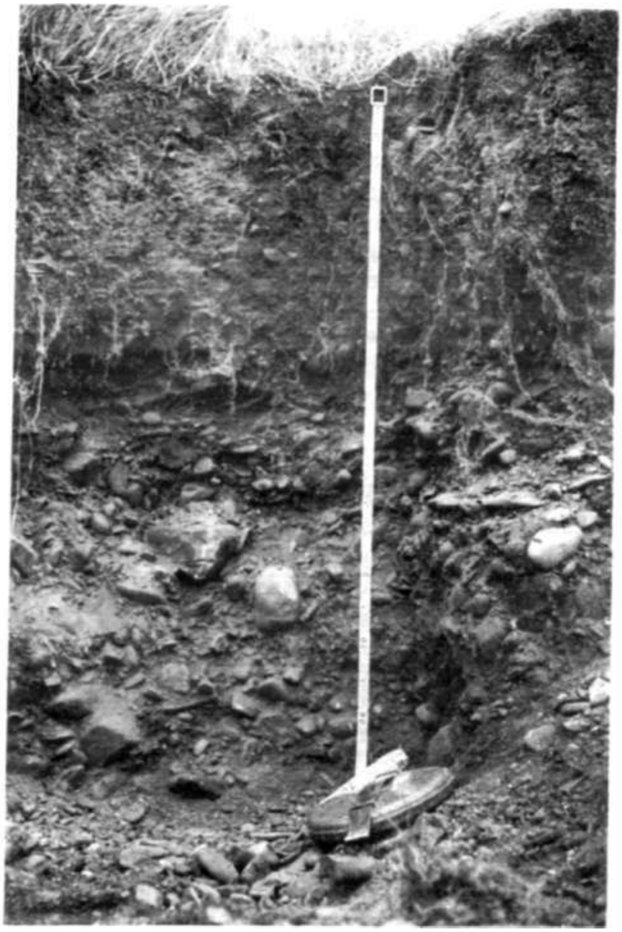

Plate 2—Wardhouse Series, Brown Podzolic, Wardhouse Td, north Leitrim.

Soil suitability: The soils are suitable for grassland farming but are generally unsuitable for tillage due to the hummocky nature of the topography and the many, short, steep slopes. Exposure is a problem facing all types of farming on the areas which are adjacent to the sea-coast. The excessive natural drainage may lead to a shorter growing season especially during drier years. The desirable textural and structural characteristics of the soils would help to maintain a much higher stocking rate than prevails at present. Because of their inherently low nutrient status, constant attention to fertiliser and manurial requirements is necessary to maintain increased production on these soils.

Profile description and analyses—Appendix III, Table 11.

Podzol Group

These soils are more intensely leached than the Brown Podzolics. They display well-defined horizons of depletion and accumulation within the profile and are considered to be degraded soils. They develop from parent materials of very low base reserves or under conditions which deplete the base reserves to a low level. Granite mountains for instance provide a situation in which both of these factors operate; with the acid nature of the geological parent materials together with the high rainfall, considerable leaching of soil constituents, principally bases, iron and aluminium oxides, and humus takes place. In more advanced deterioration, the surface becomes very acid, the environment for decomposition by micro-organisms becomes unfavourable, and a peat-like layer accumulates on the surface, on which heath-type vegetation develops.

Podzols are generally poor soils with high lime and fertiliser requirements. In their unreclaimed state they usually have a cover of semi-natural vegetation. In lowland areas, they have been successfully reclaimed for cultivated cropping and for other purposes, but unless management is good they revert easily. The more extreme forms, which occupy hill and mountain areas throughout the country, have not been ameliorated to any extent. In most cases the nature of the terrain associated with these soils is such that mechanical reclamation and cultivation are not feasible. Here they are devoted mostly to rough grazing or forestry. Stock-carrying capacity could be improved considerably by surface regeneration of the rough grazing, through manuring and improved management.

Where an iron-pan occurs within the profile, it hinders root penetration (an important factor in forestry and in the agricultural use of these soils) and water percolation. For the latter reason drainage in the surface horizons may be very poor—a further unfavourable feature of many of the podzols. Besides having a low level of major nutrients, these soils are usually very deficient in trace elements.

On a national scale podzols have been the most widely available mineral soils for afforestation and are usually planted with pines *(Pinus* spp.). However, with deep ploughing and the application of phosphorus fertiliser in particular, they can support other species, such as Sitka Spruce (Picea sitchensis), with relative success. Deep ploughing has also enabled the reclamation of some of these soils for grass production in recent years and, where other conditions are favourable, their potential for such purposes is moderately good.

Stone park Series (Soil 157 on Map)

Soil character: This series occupies 0.457c (715 ha; 1,767 acres) of the county. It occurs on the north-eastern and south-western foothills of Benbo mountain. The topography consists of rugged hill and lowland with much rock outcrop. The parent material consists mainly of compact glacial drift derived from gneiss, quartzite, mica-schist and epidiorite.

The soils generally have a peaty surface horizon overlying a well-developed, leached A2 horizon. An iron-pan, often continuous underlies the A2 horizon under which a sesquioxide-enriched, Bir horizon is present. This horizon attains thicknesses up to 2 m in sandy, friable pockets but is restricted to a thickness of 15 cm or less on the more widespread, compact glacial till. Mineral textures are sandy loams to loams. In areas close to Manorhamilton the peaty surface has been mixed by cultivation with the A2 horizon, thus lowering the organic matter content of the surface soil.

Soil suitability: These soils have a limited use-range. As a result of extreme podzolisation, natural lime and nutrient status is extremely low. Reclamation which breaks the iron-pan and mixes the subsoil with the peaty surface horizon improves the strength of the topsoil. This, followed by reseeding. proper liming and fertilising can significantly increase agricultural production on these soils. Grassland farming on the lowland and extensive grazing on the more rugged hilly areas are the most suitable farming enterprises. A high standard of management is required to maintain improvements on these soils as the natural, acid vegetation cover can re-establish very easily.

No profile was sampled.

Gley Group

Gleys are soils in which the effects of drainage impedance dominate and which have developed under conditions of permanent or intermittent water-logging. The impeded condition may be caused by a high water-table or by a "perched" water-table due to the relatively impervious nature of the soils and their parent materials and, in many cases, by both of these factors, together with excess run-off from higher slopes. For this reason, gley soils can occur both in depressions and on elevated sites.

Where the gley condition results from a high water-table, the soils are referred to as ground-water Gleys. Where it is due to the impermeable nature of the soils or of their parent material, the soils are usually referred to as surface-water Gleys.

The mineral horizons of Gleys are usually grey (or bluish-grey, in more extreme cases), with distinct ochreous mottling much in evidence. Relative to the podzolic soil groups, depletion of bases and other constituents is not so pronounced. However, rooting area is limited, aeration poor, rate of decomposition of organic matter slow, and many other unfavourable features prevail.

Podzolised Gleys are soils in which there is evidence of soil formation processes similar to those described for Brown Podzolics or Podzols associated with the Gleys, whilst Podzolic Gleys refer to soils displaying evidence of Grey-Brown Podzolic characteristics associated with the Gley.

The majority of gley soils have weak structure, are not very friable and. in the wet state, tend to become very sticky. Due to their poor physical properties, these soils, except in very favourable seasons, present difficulties in cultivation, especially in the development of a desirable tilth. The poor drainage conditions retard growth in the spring. Even for pasture production, this is a decided disadvantage. Besides poor drainage the characteristic weak structure renders these soils susceptible to poaching damage by grazing stock, a factor which curtails the length of grazing season and the proportion of fodder utilised. Despite their physical shortcomings however, the potential of these soils for pasture production is moderately high in many cases, provided management and manuring are satisfactory.

Gleys are generally considered to be relatively productive forest soils. However, windthrow caused by poor root penetration is a common hazard.

Ballinamore Series (Soil 158 on Map)

Soil character: The series occupies 10.29^ (16.345 ha; 40.390 acres) of the county. It occurs in the Killarga lowlands in Glenade. Glencar and on the southern shores of Lough Melvin in the northern half of the county and in the neighbourhood of Ballinamore and Carrick-on-Shannon—Drumsna in the southern half of the county. The topography consists of drumlins and approximately 20^ of the area has slopes over 13 . Slopes of up to 20 also occur but do not alter the main soil 'profile characteristics. The parent material consists of a sticky glacial till derived from Carboniferous limestone and shaley limestone with some sandstone influence.

The soils are poorly drained, of clay loam to clay texture and of medium base status. In the north of the county they tend to have coarser or "lighter" surface textures and a slightly higher sand content throughout the profile. This is due to metamorphic rock (mainly gneiss) influence in the Benbo mountain region and to an arenaceous limestone influence in the Kinlough—Lough Melvin area. The profile consists of a weakly structured A horizon, 5 to 15 cm thick, overlying a generally massive, sticky and plastic B horizon which varies from 30 to 40 cm in thickness. The A horizon has from 12 to 18S organic matter and an average of over 20S clay and 3 l'< silt. However, the clay and silt contents vary widely from US clay and 21S silt in the extreme north to 36S clay and 46' < silt near Ballinamore in the south. The B horizon which is much less variable in texture than the A horizon shows a significantly higher clay content throughout which ranges from 38 to 47S . This high clay content decreases in the C material. Large fragments of alder roots were found between 75 and 100 cm depth in most of the soil profile pits.

The roots of the present vegetation cover are restricted to the surface 5 to 15 cm and rarely penetrate the B horizon.

Soil suitability: These soils have a limited use-range. Poor-drainage, adverse soil physical conditions, high annual rainfall and steep slopes inhobit tillage operations.

They are moderately suitable for grassland farming and suitable for forestry. Weak soil structure and high rainfall restrict the grazing season and make it difficult to utilise fully the herbage produced on the soils. The long inwintering period of 5 to 6 months necessitates large quantities of silage or other winter feed. A high level of management, including controlled grazing as well as proper use of lime and fertilisers, is necessary to maintain full production and to alleviate serious rush infestation and poaching damage.

Drainage is difficult and expensive due to the plastic nature of the subsoil and to the frequent occurrence of large boulders within 30 to 50 cm of the soil surface. Boulder frequency increases in the neighbourhood of the mountains.

Profile descriptions and analyses—Appendix III, Tables 12 to 16.

Drumkeeran Series (Soil 159 on Map)

Soil character: This series occupies 9.58 \ 15.217 ha; 37,603 acres) of the countv. It occurs in the Drumshanbo-Drumkeeran lowlands surrounding Lough Allen and also in the Glenfarne lowlands. The topography consists of drumlins. Some of these, especially in the Drumkeeran lowlands, have a high proportion of steep slopes—49S of the area ranging from 13 to 20 . In the Glenfarne lowlands the area with similar slopes drops to about 8 % . The parent material consists of glacial drift derived mainly from non-calcareous, carbonaceous shales with some sandstone and conglomerate influence. All the rocks are of Namurian age.

The soils are poorly drained, of silty clay to clay texture and of low base status. The surface A1 horizon is 5 to 9 cm thick and has a very weak structure. It contains 15 to 17S organic matter and 45 S clay. It is underlain by a gleyed A12 or A2 horizon. The B horizon is also gleyed and is generally massive, sticky and plastic. Clay content ranges from 50 to 55S . The clay content throughout the profile is the highest recorded for a lowland soil (below 150 m; 500 ft) O.D. in the county.

Large sandstone boulders in solid and decaying state are very common especially near the mountains. Some large decaying root fragments occurred at the base of one profile pit.

A very low base saturation with values ranging from 8 to 11 % . is a feature of these soils.

Soil suitability: The soils have a very limited use-range. Adverse soil physical conditons. poor natural drainage, high organic matter content, high rainfall, and steep slopes inhibit tillage operations

They are difficult grassland soils. The high contents of organic matter and day with the high rainfall seldom allow them to become sufficiently dry for good grazing conditions. Soil structure is also very weak. A high level of management is required to cope with the problems of rush infestation/poaching, and the long in wintering period of about 6 months. The soils would appear best suited to grazing by light stock over short periods. They are also suitable for forestry.

Profile descriptions and analyses—Appendix III, Tables 17 and 18.

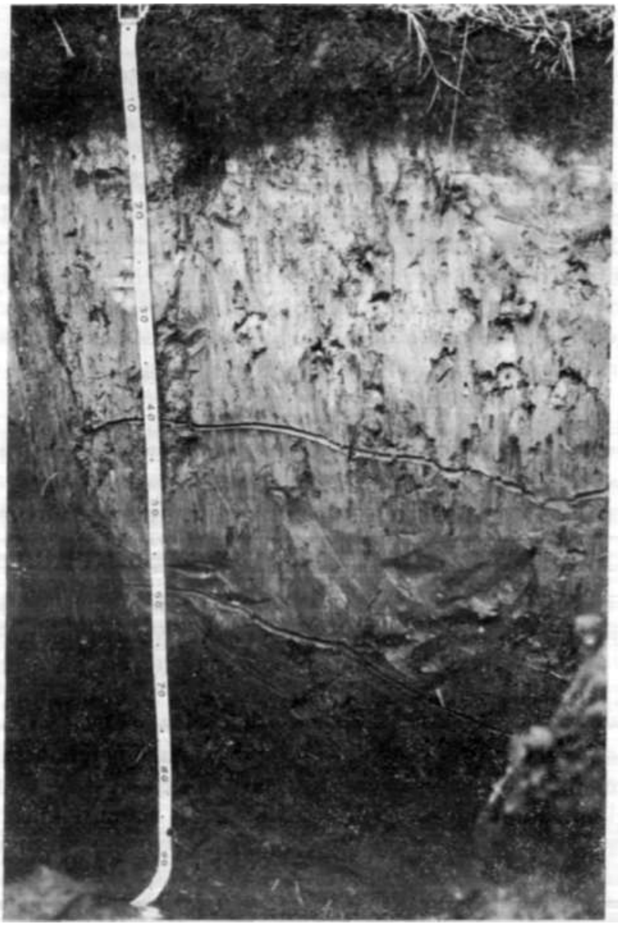

Plate 3—*Drumkeeran Series — peaty phase, sticky, fine-textured peaty gley soil with* 70^ *clay in B horizon Tully Td, north Leitrim.*

Drumkeeran Series—Peaty Phase (Soil 159A on Map)

character: This soil phase occupies 1.849? 2.923 ha; 7.223 acres) of the -ountv It occurs at higher elevations than the Drumkeeran Series and is a transitkroal soil mainly between tliat series and the Aughty Series—Climatic Peat. The topography consists mainly of steep mountain slopes. 152 to 305 m O.D. (500 to 1 000 ft The parent material is similar in composition and age to that of the series I that it has a little more limestone.

The soils have an organic topsoil, poor natural drainage, a silty clay to clay texture and medium to low base status. The soil structure and consistency haracteristics are similar to those of the Drumkeeran Series. There is 36^ organic matter in the surface horizon. The clay content—57% in the surface O horizon and 70% in the B2g—is the highest recorded in any profile in the county. Some large decaying root fragments occur near the base of the profile. Root penetration is mainly confined to the O horizon.

suitability: These soils have a very limited use-range. Peaty topsoils, high elevation and steep slopes generally restrict agricultural enterprises to extensive crazing by lightweight animals, often extensively rather than intensively, and to forestry. Good management is very difficult due to the soil problems oudined above and is made more difficult by the nature of the topography. Reclamation, including drainage, is hampered by a plastic, impervious subsoil and by frequent occurrence of sandstone boulders.

Profile description and analyses—Appendix III, Table 19.

Garvagh Series (Soil 160 on Map)

Soil characteristics: This series occupies 17.17% (27,277 ha, 67,400 acres) of the county. It occupies the greater part of the lowland area of the south of the county stretching from the river Shannon in the west to the boundary with county Cavan in the east. The topography consists of lowland drumlins with up to 20% ot drumlin areas having slopes from 13 to 20 . The parent material is glacial till derived from Visean siliceous limestone with some sandstone and shale influence The sandstones in the Leitrim village area appear to belong to the Boyle Sandstone Group and are often calciferous.

The soils are poorly drained, of cherry loam to clay texture and of low to medium base status. The profile consists of a surface A horizon, about 18 cm thick, the lower part of which is from 23 to almost 90 cm thick. The surface Al horizon is weakly structured, has 8.5 to 10% organic matter and an average clay plus silt content of about 65 % . The clay content varies from 14 to 22*^ . A compact layer, 8 to 30 cm thick of angular chert gravel, known locally as "channel", occurs beneath the Al horizon. In position it generally corresponds with an A2g horizon. The B horizon contains from 23 to 34% clay and has a weak prismatic structure tending to massive. Some decaying large root fragments occurred at the base of one profile pit. Root penetration is confined for the most part to the surface 10 to 15 cm.

Soil suitability: The soils have a limited use-range. Adverse physical conditions, poor natural drainage, the compact "channer' layer, steep slopes and high annual rainfall inhibit tillage operations.

Grassland farming is the most suitable enterprise. Severe rush infestation can be controlled by a high level of management. The grazing season is limited by high

Plate 4—*Chert layer — "channel" — which dries out when exposed, Garvagh Series, Drumshanagore Td, near Newtowngore, south Leitrim.*

rainfall and weak soil structure. Early or late grazing causes serious poaching damage. Full utilisation of the extra pasture production resulting from better management and greater fertiliser use can thus be a problem. The long inwintering period of 5 to 6 months necessitates large quantities of silage or other winter feed.

Drainage is difficult and expensive due to the compact "channel" layer, the plastic nature of the subsoil and the presence in some areas of large sandstone boulders.

Profile descriptions and analyses—Appendix III. Tables 20 to 22.

Hozoardstoton Series (Soil 70 on Map)

Soil character: This series, which receives its name from an extensive area of similar soils in County Limerick, occupies 1.577c (2,494 ha; 6,163 acres) of County Leitrim. The largest area occurs in the north near Manorhamilton and smaller areas occur in the southern tip of the county and in the neighbourhood of Ballinamore. The topography consists of undulating lowland and some drumlins. The parent material is glacial drift derived from Carboniferous limestone, shale and sandstone. Both the shale and sandstone are often calcareous.

The soils are poorly drained, of sandy loam to clay texture and of medium to high base status. Although structure throughout the profile is weak, it is better expressed than in any of the foregoing Gley Series—Ballinamore, Drumkeeran or Garvagh. The surface A horizon is 23 to 33 cm thick and gley colours and mottles already appear in its lower half. The texture is usually clay loam but clay contents have been found to range from 17 to 38% and organic matter from 8.5 to 14'", . The B horizon varies from 23 to 47 cm in thickness and has a weak prismatic structure, breaking to subangular blocky. Many fine pores occur in the peds. The clay content, ranging from 29 to 45^, shows a sharp increase from the A horizon. Large decaying root fragments occurred near the base of one profile pit.

Root penetration is good to a depth of 23 to 33 cm.

Soil suitability: These soils have a limited use-range. Adverse soil physical conditions, high annual rainfall, and occasional steep slopes make the soils poorly suitable for tillage.

They are, however, good grassland soils and are also suitable for forestry. A high standard of management including controlled grazing and the proper use of lime and fertilisers will give a high level of grass production. The long inwintering period and the weak soil structure hinder the efficient utilisation of the full productive capacity of the soils. Artificial drainage would be more effective than in the previously described Gley Series because of the better structure.

Profile description and analyses—Appendix III, Tables 23 and 24.

Kiltyclogher Series (Soil 161 on Map)

Soil character: This series occupies 2.28% (3,622 ha; 8,950 acres) of the county. It occurs on lowland drumlin topography between the northern shores of Lough Allen and Dowra, in Glenfarne near the boundary with County Cavan and in the Kiltyclogher-Rossinver area. The parent material consists of glacial drift derived from Namurian sandstone, conglomerate and shale.

These soils are poorly drained, of sandy loam to clay texture and of low to medium base status. The surface A horizon is 15 cm thick, has a very weak structure and contains 17% organic matter and 16% clay in the top 3 cm. The B horizon is 65 cm thick, strongly gleyed, massive and sticky. It contains

38"'< clay and also some decaying root fragments in its lower parts. Large sandstone boulders are plentiful throughout the soil and on the soil surface.

Root penetration is confined to the surface 15 cm.

Soil suitability: These soils have a very limited use-range. Adverse physical conditions, high density of boulders, high rainfall and steep slopes inhibit tillage operations.

These soils are poorly to moderately suitable for grassland farming. The weak structure and high organic matter content of the surface soil as well as the high boulder density inhibit intensive stocking. The plastic nature of the subsoil and the high density of boulders in solid and decaying state make effective drainage very difficult and expensive. These difficulties coupled with the necessity for a long inwintering period make these soils best suited to extensive grazing or forestry.

Profile description and analyses—Appendix III. Table 25.

Rinnagowna Series (Soil 162 on Map)

Soil character: This series occupies 4.09^ (6,498 ha; 16,056 acres) of the county. It occurs in a belt in the south below a line from Drumsna and Carrigallen. The topography consists of lowland drumlins which are generally more gendy sloping than in any other part of the county. Seme of the drumlins have no slopes steeper than 13 while others, especially in the area bordering the Garvagh Series, have up to 20^ of their areas sloping between 13 and 20 . The parent material consists of glacial drift derived from Carboniferous calcareous sandstone, conglomerate, arkose and grit.

These soils are poorly drained, of sandy loam to clay loam texture and of medium to high base status. The surface A horizon is 25 cm thick and is subdivided into an All and an A12g. The All. which is 10 cm thick, contains 9.5^ organic matter and 15% clay. The structure is weak and consists of fine crumb in the All and fine subangular blocky in the A12g. The B horizon is 70 cm thick and is strongly gleyed. It contains 26 to 38^ clay and has a weak coarse prismatic structure. Large decaving root fragments occurred near the base of the profile pit. Boulders, sometimes flaggy in shape, are common.

Root penetration is good to a depth of 25 cm.

Soil suitability: These soils have a limited use range. Poor natural drainage, adverse physical conditions, high boulder density in some areas and some steep slopes inhibit tillage.

These soils are best suited to grassland farming. Rush infestation and poaching, which makes full utilisation of the sward difficult, are among the most serious problems associated with these soils. A high standard of management including rotational grazing and adequate use of lime and fertilisers is required to realise the full potential of these soils. Large quantities of winter feed are necessary because of the long inwintering period of 5 to 6 months.

Artificial drainage is hampered in some areas by high boulder density. These areas often occur on east and north facing drumlin slopes.

Profile description and analyses—Appendix III. Table 26.

*Ballinamore—Allen Complex** (Soil 163 en Map)

This complex occupies 0.87% (1,382 ha; 3,415 acres) of the county. It occurs along the southern shores of Lough Melvin and in a small area south of Kilty-

*A soil complex is defined on page 60.

clogrier. The topography consists of drumlins which occupy about half the area while interdrumlin flat topography occupies the remainder.

The Ballinamore Series (gley soils) occurs on the drumlins and is described on page 28. The Allen Series, which consists of Raised Bog, occurs in the inter-drumlin flat areas and is described on page 37. The two series occur in a very complex pattern with each ether and cannot be separated on the Soils Map at the present scale of publication.

Ballyhaise—Corriga Complex (Soil 164 on Map)

Soil character: This complex occupies 2.91^ (4,623 ha; 11,423 acres) of the county. It occurs mainly on lowland drumlin topography. The complex consists of the poorly drained Ballyhaise Series which occupies about 70^ of the area and the well- to moderately well-drained Corriga Series (page 23) occupying the remainder. The Corriga Series occurs in small areas on the steep slopes (generally over 13) near drumlin crests and cannot be shown separately at the present scale of publication. The parent material of both series consists of glacial drift from greywackes, siltstones, mudstones and shales of the Ordovician Period.

The soils of the Ballyhaise Series are poorly drained, of loam to clay loam texture and of medium to high base status. The surface A horizon is 20 cm thick, has a weak fine crumb to subangular blocky structure and is gleyed in the bottom 10 cm. The top 10 cm contains 99J organic matter and 24f~f clay. The B horizon is 55 cm thick, strongly gleyed and is slightly sticky and plastic. The structure is weak coarse prismatic, breaking to angular blocky, and the clay content is 28 to 30%. Some decaying root fragments occurred in the lower part of the profile pit.

Root development is confined mainly to the surface 20 cm.

Soil suitability: The soils of the Ballyhaise Series are suitable for grassland farming and only moderately to poorly suitable for tillage. The high annual rainfall, weak soil structure and poor natural drainage hinder tillage operations.

The soils respond well to artificial drainage and with a high standard of management and proper use of lime and fertilisers they have a relatively high potential for grass production. Early and late grazing should be avoided so as to prevent poaching damage to the soil.

The suitability of the Corriga soils is discussed on page 24.

Profile description and analysis—Appendix III, Table 27.

Ballyhaise Series—Lithic Phase (not shown on Map)

Soil character: This phase is of very small extent and has not been separately mapped. The topography consists of rolling lowland and drumlin. The parent material is similar to that of the Ballyhaise-Corriga Complex which consists of glacial till derived from greywackes, siltstones, mudstones and shales of the Ordovician Period.

The soil is poorly drained, of loam texture and of low base status. The surface A horizon is 17 cm thick and its lower half is gleyed. It contains \%°/(organic matter and 26^ clay. The B horizon, which rests on bedrock, is 2.3 cm thick and weakly structured. It contains the same amount of clay as the surface horizon.

Soil suitability: The suitability of these soils for land-use is somewhat similar to that of the Ballyhaise Series, but because of the proximity of the bedrock to the surface, artificial drainage is more difficult.

Profile description and analyses—Appendix III, Table 28.

Mortarstown—Kinvarra Complex (Soil 165 on Map)

Soil character: This complex occupies 3.53% (5.608 ha; 13.858 acres) of the county. It occurs in small isolated patches and is most extensive in the vicinity of Dromahair and Lurganbay in the north and near Leitrim village. Ballinwing. Fenagh and Nevvtovvngore in the south. The topography consists of undulating lowland but seme areas, about 20% of the total, have many short, steep slopes due to frequent rock cutcrops. The parent material consists of shallow glacial drift derived from Carboniferous limestone which frequently contains chert bands.

Due to many minor variations in topography and in the limestone rock, several soil profiles were examined and analysed. Three of the deeper profiles studied are similar to that of the Mortarstown Series, Co. Carlow* and three shallow profiles are correlated with the Kinvarra Series, Co. Clare**. Thus, the mapping unit was given the name Mortarstown-Kinvarra Complex.

Mortarstown Component: These soils are Grey Brown Podzolics, varying from 75 to 100 and occasionally 130 cm in depth. They are well to moderately well drained, of loam to clay loam texture and of medium to high base status. The surface A horizon has a moderate fine crumb to subangular blocky structure and is 22 to 25 cm thick. The top 10 cm contains 7 to *9%* organic matter and 26 to 30% clay. The B horizon is 30 to 48 cm thick and has a moderate to strong subangular blocky structure with well-developed clay skins. It contains 35 to 42% clay. Roots penetrate freely into the B horizon.

Profile descriptions and analyses—Appendix III. Tables 29 to 31.

Two further deep profiles—Appendix III, Tables 32 and 33, were also described and analysed. These represent variations of minor significance within the Mortarstown component.

Kinvarra Component: These soils are shallow Grey Brown Podzolics, varying in depth from 35 to 45 cm. They are well to occasionally imperfectiy drained, of clay loam, silt loam and clay texture and of low base status. The surface A horizon is 16 to 25 cm thick and has a weak to moderate fine crumb and subangular blocky structure. The top of the surface horizon contains 12% organic matter and 17 to 42% clay. The high carbon content in the surface horizon of the Ballynaboll profile is due mainly to a layer of forest litter. The B horizon is 10 to 22 cm thick, has a moderate subangular blocky structure and contains 28 to 52% clay. Some clay skins are evident in this horizon which rests direcdy on weathering limestone bedrock. Roots penetrate freely throughout the profile.

Profile descriptions and analyses—Appendix III, Tables 34 to 36.

Soil suitability: Both components of the complex occur in an intricate pattern with each other and thus the suitability of the complex is often determined by the component with the lower potential. The Kinvarra component is well suited to grassland farming but it is only moderately to poorly suitable for tillage because of frequent rock outcrop and localised areas of rugged micro-topography. The good natural drainage and the desirable texture and structure characteristics of all the soils enable the herbage produced to be fully utilised with minimum poaching hazard. Homogeneous areas of the Mortarstown component are moderately suitable for tillage. Tillage is not generally practised, however, due mainly to the high annual rainfall and the frequency of raindays.

'Soils of Co. Carlow. Conry. M. J. & Ryan P.. An Foras Taluntais, 1967.

**Soils of Co. Clare, Finch T. F. An Foras Taluntais. 1971.

'

Peat Soils

Peats are characterised by a high content of organic matter, over 30 cm (1 ft) in depth. Two basically different types, basin and blanket peat, occur in the country.

Basin Peats

Peat soils which have formed in lake basins, hollows, river valleys or where the subsoil is sufficiently impermeable to give a high water-table are termed Basin Peats. Two types, fen peats and raised bog peats, were recognised in Co. Leitrim.

Fen Peats

This peat type is formed under the influence of base-rich ground-water and is composed mainly of the remains of reeds, sedges and other semi-aquatic or woody plants. Variations in concentration of the ccmponent plant remains depend on the topographic situation and nutrient content of the water supply. Peat soils of this type occur in river valleys and interdrumlin hollows throughout the country. The fen peat does not occur as a homogeneous unit, but includes peaty soils and intermittent layers of alluvium—the Ardrum Association.

Ardrum Association

This Association occupies 10.10^ (15,034 ha; 39,616 acres) of the county. It occurs in interdrumlin flats and valleys throughout the county. The association consists of two main soils—fen peat* and peaty alluvium.* The fen peat was formed under the influence of a base-rich, grcund-water supply and the component plant remains are characteristic of minerotrophic growth conditions. Because of periodic flushing an acid peat layer was not formed on the surface.

Soil suitability: Where drainage is adequate these soils are suitable for grassland farming and vegetable growing. Frost hazards, high water-table during winter and spring and low base status are the main problems.

Profile descriptions and analyses—Appendix III, Tables 37 and 38.

Raised Bog Peat

Under suitable climatic conditions raised bog peat may be built up on top of fen peat. As the depth of fen peat increases its living vegetation is less influenced by ground water and more dependent on atmospheric precipitation as a source of moisture. This change in moisture supply results in the growth and development of a raised bog with its characteristic convex surface and acid plant remains.

The profile usually consists of a basal layer of fen, woody fen or wood-fen peat overlain by a layer of acid cmbrogenous peat characterised mainly by its high content of Sphagnum mosses, variable quantities of bog cotton *(Eriophorum* spp.) and ericaceous remains *{Calluna).* Much of the raised bog has been cut-over in County Leitrim but these areas have not been separately mapped.

Allen Series

This series which occurs in the extreme northern and southern parts, occupies 4.76% (7,575 ha; 18,720 acres) of the county. In an undisturbed state, peat depth may exceed 10 m (30 ft). The surface layers have been removed in many cases. Some of these areas have been reclaimed and used for grass production and small-scale arable farming.

Soil suitability: Raised bog peat in its natural state, where no physical "ripening" (i.e., loss of water and aeration of the profile) has taken place is largely unsuited

"Correlated respectively with Banagher Series (Soils of Co. Clare. An Foras Taluntais. 1971) and Banagher Series overlain by alluvium.

to any type of agricultural enterprise. However, with drainage, liming and fertilising, grass production and forestry are feasible.

The cut-over peat has a moderately wide use-range. Here the peat is usually well decomposed and has a moderately strong structure. Some mineral matter is often added to the surface, thus giving it further strength. Grassland farming and vegetable growing can be successful on these soils.

Profile descriptions and analyses—Appendix III, Tables 39 and 40.

Blanket Peat

Blanket peat accumulates under conditions of high rainfall and humidity. Such conditions prevail on the upper regions of the mountains in central and north Lei trim.

The climatic peat profile varies from 1 to 2 m (4 to 8 feet) in depth and is usually characterised by a basal layer of pine overlain by a more highly humified peat layer than that occurring in the basin peats. The degree of humification decreases towards the surface. The dominant plant remains include bog cotton *(Eriophorum* spp.), purple moor grass *(Molinia coerulea),* black bog rush *(Schoenus nigricans)* and bog asphodel *(Narthecium ossifragum).* In some instances variations may occur in botanical composition and nutrient status due to topographic and edaphic factors, particularly in the basal layer where the humified peat with pine *in situ* may be replaced in localised depressions by a peat composed mainly of reed remains.

Some areas of blanket peat on the lower mountain slopes have been cut-over and reclaimed.

Aughty Series

This series occupies 21.27% (33,792 ha; 83,500 acres) of the county. The profile is raw in nature with no evidence of soil amelioration. The peat is relatively homogeneous throughout and is composed dominandy of cyperaceous plant remains with some *Sphagnum* spp. embedded in a greasy humified matrix.

Soil suitability: The soils are best suited to extensive grazing. Their organic nature and elevation are the main problems. Improved grass swards can be established in some areas by drainage, manuring and surface seeding.

Profile descriptions and analyses—Appendix III, Tables 41 and 43.

Soil Suitability and Drainage

This account of the suitability of the soils refers to their general suitability in qualitative terms but a more detailed quantitative assessment of their potential for grass production and forestry is presented in Chapters VI and **VII** respectively.

• From the soil map it has been calculated that within the county (Table 6) 8.4% of the soils are good to very good for grassland, 2% are moderate and 48% are poor to very poor. The remaining 36% in each case are described as unclassified since they consist mainly of peats whose suitability in their natural state is poor but whose suitability where drainage and reclamation can be carried out may be moderate to good.

Some 4% of the soils are moderately suitable for tillage and 54% are poor to very poor.

Soil suitability classification is essentially a grouping of soils according to the potential use or uses to which they are most adaptable, and is based principally on the significance of the more permanent characteristics of the soil. A further step

TABLE 6—Soil suitability for grassland

Suitability Class	Series	Main limitations	Area		
			Hectares	Acres	% of county
A Very Good	Mortarstown-Kinvarra complex	Shallow soils, rugged microtopography in places	5,608	13,858	3·53
	Clooncarreen	Weak structure, boulders and impeded drainage in places	317	785	0·20
	Corriga	Some steep drumlin slopes, slowly permeable parent material	604	1,492	0·38
		Total	6,529	16,135	4·11
B Good	Mountcollins	Low nutrient status	254	628	0·16
	Kilnageer	High boulder content	730	1,805	0·46
	Wardhouse	High stone and boulder content, rugged microtopography	1,239	3,062	0·78
	Ballyhaise-Corriga complex	Imperfect and poor drainage, some steep slopes	4,623	11,423	2·91
		Total	6,846	16,918	4·31
C Moderate	Howardstown	Weak soil structure, poor drainage	2,494	6,163	1·57
	Loughmuirran	Weak soil structure, very steep slopes	222	549	0·14
		Total	2,716	6,712	1·71
D Poor	Stonepark	Peaty surface, iron pan, rugged microtopography	715	1,767	0·45
	Ballinamore Rinnagowna	Weak soil structure, poor drainage, very slowly permeable subsoil	22,843	56,446	14·38
	Garvagh	Poor drainage, compact chert gravel layer below topsoil, very slowly permeable subsoil	27,277	67,400	17·17
	Burren	Shallow soil over bedrock, liable to drought	1,429	3,533	0·90
		Total	52,264	129,146	32·90
E Very Poor	Crumpaun	Shallow soils, very steep slopes, high elevation	715	1,767	0·45
	Drumkeeran (incl. Peaty Phase)	Peaty surface soil, weak structure, poor drainage, very slowly permeable subsoil	18,140	44,826	11·42
	Kiltyclogher	Peaty surface soil, many boulders in solid and decaying state, very slowly permeable subsoil	3,622	8,950	2·28
	Ballinamore-Allen complex	See Ballinamore under D; Allen-organic	1,382	3,415	0·87
		Total	33,859	58,958	15·02
Unclassified	Allen		7,575	18,720	4·76
	Aughty		33,792	83,500	21·27
	Ardrum Association		15,034	39,616	10·10
		Total	56,401	141,836	36·13

in the suitability classification consists of an assessment of the production potential of each soil, for the normal range of farm and forest crops, under defined management standards. This provides the essential link between the physical and economic aspects of the use of soils. However, for this purpose reliable quantitative data on the productive capacity of each soil are required; these can only be provided by detailed field experimentation and yield observations over a number of years on sample areas representative of the particular soil. This has been done for County Leitrim in Chapter VI (grass potential; and Chapter VII (forestry potential).

Although the physical, chemical and biological properties of the soil merit foremost consideration in assessing soil suitability, environmental factors such as elevation, aspect, local climate, distance from the sea and factors such as accessibility, proximity to markets and consumer demands must also be taken into account. For instance, local features such as exposure to strong winds and late spring frosts can limit forest tree growth no matter how deep and fertile the soils may be. In general statements concerning soil suitability one must bear in mind, therefore, that environmental and other factors can influence considerably the economics of production and hence can modify the use-range to which the soils are otherwise ideally suited.

Furthermore, the concept of land quality has changed radically in recent years. With modem fertiliser technology', natural nutrient fertility problems in soils have become subordinate to physical ones such as defective natural drainage, "heavy" texture and poor structure, which are more difficult and more costly to rectify. Besides, an abundant farm labour supply no longer obtains, and its replacement by mechanisation has drastically altered the feasible cultural and management practices on many soils.

Suitability and major limitations of the Soils

The general qualitative suitability of the soils of County' Leitrim for grassland together with their major limitations are summarised in Table 6. A number of soil series is included in each suitability class. Even with optimum manurial and management practices, certain differences in overall productive capacity persist between the soils included in each case, as a result of inherent differences between series. Nevertheless, the soils in any one class have sufficient important characteristics in common in their use and productive potential to warrant their inclusion in the same suitability class.

In drawing up the suitability classification, only the normal or dominant phase of each soil has been considered. For instance, some of the series may contain small inclusions of soils that are too shallow, too rocky or that occur on slopes to steep for successful cultivation or management. Separate consideration of such exceptions within series is beyond the scope of this account. Besides, in any system of classification involving multiple variables, it is not possible to accommodate fully all exceptions without impairing the purpose of the classification. It must be accepted also that certain series placed in one general suitability class may be borderline to a neighbouring class.

The present suitability classification is based largely on a scale of values confined to the relative quality of the soils within the county. Therefore, some of the suitability classes established for the Leitrim soils may lose or gain status by reference to a national scale of suitability values.

rial •*Drumlin landscape cast of Sheemore, south Leitrim, Burren Scries in foreground, Garvagh Series on drumlins.*

TABLE 7—Classification of the soils according to natural drainage

Natural drainage **class**	Conditioning factors	Soils	",, of total area
Excessive	Rapid internal drainage	Crumpaun, Wardhouse, Bouldery Phase of Corriga Series	1 23
	Rapid run-off and permeability	Burren	0-90
Well drained	Modi ran- permeability, deep watertable	Clooncarreen, Corriga, Kilnageer Stonepark, Mortarstown-Kinvarra	5 02
Moderately well drained	Heavy texture	Mountcollins	0-16
Imperfectly drained	Heavy texture	Loughmuirran	014
Poorly drained	Slow permeability	I [owardstown	1-57
	Very slow permeability, heavy texture, seasonally high watertable	Ballinamore, Garvagh, Drumkeeran and Peaty Phase, Rinnagowna, Kiltyclogher	45-25
Very poorly drained	Slow permeability, high permanent watertable	Ardrum Association	1010
Variable		Hallyliaisc-Clorriga Complex Mallinamore-Allen Complex	3-78
Unclassified		Allen, Aughty	2603

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Soil suitability for tillage

Some Leitrim soils are moderately suitable for tillage. These include the Cloon--arreen and Corriga Series and the Mortarstown-Kinvarra Complex. Areas of high boulder density and frequent rock outcrop are the main obstacles. Areas of shallow soils and rugged micro-topography also occur. The climate, however, with its high incidence of raindays and lower sunshine hours than in most of the country is not conducive to tillage.

The Howardstown Series and the Ballyhaise-Corriga Complex are poorly suitable for tillage and the remaining soils are generally unsuitable for tillage. Their weak structure, high clay content and stickiness as well as their frequent occurrence on steep slopes are the main obstacles.

The Ardrum Association, where drainage and reclamation can be carried out, may be suitable for tillage.

Classification of the Soils according to Natural Drainage

Table 7 shows that 7% of the county is occupied by soils which have free internal drainage, 57% by soils which are impeded and require artificial drainage, 26% by peats which are mainly poorly drained, 0.87% by the Ballinamore-Allen complex which is mainly poorly drained and 2.91% by the Ballyhaise-Corriga complex which has variable drainage. Poorly drained soils therefore amount to almost 84% of the county. Some 6% of the county is occupied by lakes and rivers.

CHAPTER VI

GRAZING CAPACITY

J. Lee and M. Walsh**

The main objective of this part of the survey was to determine the potential of the county and of different regions within it for livestock based on grass production and utilisation. Such quantitative measurements are possible when the nature of the soils and climate are known and when grazing potential experimental results are available for representative different environments within the county. By comparing the potential targets thus obtained with present livestock numbers, the possible improvements in livestock density can be arrived at. This information can then be used as a target to aim at and also as part of the basic data whereby the optimum use of the land in question can be decided. The results are shown on the accompanying grazing capacity map and are discussed in this chapter.

Trend in grazing livestock numbers (1958-1971)

Grazing livestock numbers were obtained from the agricultural returns of the Central Statistics Office. Stock numbers for each of the years 1958 to 1971 were converted to standardised livestock units (L.U.) according to the method described by Attwood and Heavey (1). The results are shown in Table 8.

TABLE 8—Grazing livestock units in Leitrim (1958-1971)

Year	No. of L.U. (000)	Year	No. of L.U. (000)
1958	82-5	1965	86-3
1959	87-3	1966	83-6
1960	84-6	1967	81 7
1961	84-5	1968	79-7
1962	840	1969	83 1
1963	825	1970	87-4
1964	83-4	1971	89-2

Although numbers were fairly static between 1958 and 1968, there has been an upward trend since then.

'National Soil Survey Department. An Foras Taluntais

Present grazing livestock numbers (1971)*

n 1971 there were 89.200 livestock units in the county representing an average of approximately 59 L.U./100 ha (24 L.U./100 acres). However, there is considerable variation in stock density within the county depending on land quality.

s is evident from Table 9, which shows stock densities on a few of the more extensive soil series. Table 9 is based on an examination of livestock distribution on a District Electoral Division basis (1970) against the background of the soil map of Leitrim.

The relatively high stocking intensity on the Ballyhaise-Corriga Complex reflects the less impeded conditions of these drumlin soils compared with the more extensive Garvagh and Drumkeeran Series. Stock densities of 67 to 69 L.U./ 100 ha (27 to 28 L.U./100 acres) are typical of the extensive wet drumlin soil areas in the county. Stock densities of 25 L.U./100 ha (10 L.U./100 acres) are considered representative of the mountain areas.

Stock densities on the small proportion of free-draining soils, particularly the Mortarstown-Kinvarra Complex, are likely to be considerably higher than shown in Table 9 for the other soils.

The proportion of cows and heifers in calf is higher in the south of the county (Carrigallen-Aghavas area particularly) than in north-central Leitrim (Drumkeeran area). While sheep comprise an extremely small proportion of grazing livestock on the wet drumlin soils and indeed are absent in many cases in the south of the county , they comprise up to 30% of the grazing livestock in the mountain and hill zone of north Leitrim. Sheep concentration is particularly high above Glenade valley.

Horses comprise approximately 2% of grazing livestock.

TABLE 9—Grazing livestock density according to soil series (1970)

Soil series	Major occurrence	Total livestock density (L.U./lOOha)	' tot; 1 L.U.			
			Cows & heifers in-calf	Other cattle	Sheep	Horses
Ballvhaise-Corriga	Carrigallen, Aghavas	77	50-60	40-50	0-1	1-2
Garvagh	Ballinamore, Mohill. Newtowngore, Leitrim	69	40-50	45-55	0-2	0-2
Drumkeeran	Drumshanbo, Drumkeeran	67	30-40	55-65	0-1	2-3
Aughtv	Central and north Leitrim (mountain and hill)	25	30-45	30-50	20-30	1-3

Gross grazing capacity of soils

The physical output data necessary for evaluation of the grazing capacity of the different soils in Leitrim were extrapolated from experimental sites to similar areas defined by soil and climate. The grazing capacity estimates for the soil series are shown on the accompanying grazing capacity map and are also set out in Table 10. The estimates are based on nitrogenous fertiliser inputs of 48 kg and 230 kg/ha (43 lb and 206 lb/acre) together with adequate phosphorus and potassium. Artificial drainage of the wet mineral soil series is assumed.

*This is referred to as stock density.

TABLE 10—Grazing capacity of County Leitrim soils[a]

Soils	Area (ha)	48 kg N ha: Grazing capacitv (L.U. 100 ha)	48 kg N ha: Gross grazing capacitv (000 L.U.)	230 kg N ha: Grazing capacitv (L.U. 100 ha)	230 kg N ha: Gross grazing capacitv (000 L.U.)
Mortarstown-Kinvarra	5,608	197	11,086	247	13,858
Clooncarreen	317	197	628	247	785
C'orriga	604	197	1,194	247	1,492
kilnageer	730	188	1,372	235	1,715
Mountcollins	254	188	477	235	596
Wardhouse	1,239	188	2,327	235	2,909
Howardstown	2.4(H	166	4.129	203	5,053
Ballyhaise-Corriga	4,623	168	7,768	210	9,709
Ballinamore	16,345	136	22,214	—	—
(iarvagh	27,277	136	37,070	—	—
Rinnagowna	6,498	136	8,830	—	—
Drumkeeran	15,217	124	18,801	—	—
Drumkeeran Peaty Phase	2,923	124	3,611	—	—
Kiltvclogher	3,622	124	4.475	—	—
Ardrum	15,034	124	19,808	—	—
Ballinamore-Allen	1,382	69	956	—	—
C'rumpaun*	715	49	353	—	—
l.oughmuirran''	222	49	110	—	—
Burren A	767	188	804	235	1,006
Burren B*	1,000	49	495	—	—
Gross total	106,871	(265,718 acres)	146,508		153,846

a Kxcludes raised bog and climatic peat.
b Based on existing production.
Burren A is accessible. Burren B is larch inaccessible.

Animal production output data from An Foras Taliintais Research Station at Ballinamore and pasture dry matter output data provide the basis for the grazing capacity estimates for Ballinamore, Garvagh, Rinnagowna. Drumkeeran, Drumkeeran Peaty Phase and Kiltvclogher Series.

The stocking targets for the wet drumlin soils in Table 10 are based on outputs achieved with dairy cows. Recent research which would have direct application to Ballinamore, Garvagh and Rinnagowna soil series suggests that higher stocking targets than outlined in Table 10 can be achieved by using lighter animals. With light bullocks in a beef production system and using high nitrogen applications (230 kg/ha) stocking targets of 190 L.U./100 ha (77 L.U./100 acres) may be achieved. Since it is probably too early to draw conclusive results from these experiments these stocking targets are not included in Table 10.

Pasture dry matter production data from experimental sites in the Central Plain of Ireland provide the basis for the grazing capacity estimates for Howardstown and Ballyhaise series. Between the Central Plain and Leitrim one would expect a difference of *5%* in pasture production attributable to climate. Therefore in arriving at the grazing capacity estimates for Howardstown and Ballyhaise Series the climatic factor is taken into consideration. Similarly the grazing capacity estimate for Mortarstown-Kinvarra soils is based on production data from analagous experimental sites in central Ireland, and a reduction of 5% is made for ate and 5r? for soil and topographic limitations. Clooncarreen and Corriga Series are similarly evaluated. A further reduction of 5% is made for Kilnageer, Mountcollins and Wardhouse Series mainly because of topographic and rockiness

•cause of inaccessibility to conventional mechanisation for fertilisation, the grazing capacity of Crumpaun. Loughmuirran and Burren Series (Burren B 70% area is based on natural production. The pastures on these soils would show iderable response to fertiliser if application were feasible. Thirty per cent of Burren Series Burren A) is accessible and has a similar grazing capacity to Wardhouse Series.

In Table 10 the grazing capacity figure for Ardrum Association does not assume artificial drainage. With effective drainage, it is estimated that a conservative grazing capacity for this soil would be 148 and 210 L.U./100 ha (60 and 85 100 acres) based on low and high nitrogen use respectively. Existing production from Allen Series (raised bog) is negligible. Assuming this bog was cutaway, it is technically possible to develop livestock systems for these areas particularly in conjunction with adjacent mineral soils. Potential productivity from Allen Series depends on level of technology input. Research at Lullymore suggests that following drainage and reclamation cf the cutaway areas, stocking levels of 198 L.U. 100 ha (80 L.U./100 acres) are possible.

Where slope and rock outcrop are not limiting, improvement of Stonepark Scries may be obtained by deep ploughing.

Net grazing capacity—comparison with livestock numbers (1971)

Table 11 shows the net grazing capacity of the county after deducting land in non-agricultural uses and excluding also die raised bog area (7,575 ha) and the small area of podzols (715 ha).

TABLE 11—Net grazing capacity of County Leitrim

	Area		Grazing capacity (000 L.U.)	
	Ha (000)	Acres (000)	48kgN ha	230 kg N ha
Lowland and hill	107-6	265-7	146 5	153-8
Mountain peat	33-8	83-5	8-4	8-4
Urban, roads, fences etc.	8-6	21 3	117	12 3
Forest (1971)	9-3	230	55	5-7
Net	123 4	304-9	137-7	144-2

It is estimated* that 2,800 ha of lowland and 6,500 ha of mountain peat are devoted to forestry. The reduction for land under forestry is based on these areas. The grazing capacity of the mountain peat area (Aughty Series) is based on estimated existing production (25 L.U./100 ha). However, the development of improved systems of hill land utilisation at An Foras Taluntais Research Station

*Bulfin, M. Private communication

at Maam would suggest that it may be possible to increase stocking rates in these areas to 50 L.U./100 ha (20 L.U./100 acres).

Table 12 compares livestock numbers (1971) with possible stocking estimates.

TABLE 12—Livestock numbers (1971) and possible stocking estimates

Livestock no **(1971)**	Possible total **(000 L.U.)**	Expansion ratio
89-2	**144-0**	**1-6**

Livestock numbers (1971) were 60/£ of capacity. Results from preliminary experiments indicate that stocking rate can be increased (to a target of 192 L.U./ 100 ha; 77 L.U./100 acres) more satisfactorily with light animals (with high N use). If these results can be extended to the wet drumlin soils the grazing capacity o fthe county would increase to 189.000 L.U. This would enable livestock numbers to be more than doubled.

Reference

Attwood, E. A. and Heavey, J. F., *Ir. J. agric. Res.* 3: 249 1964.

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CHAPTER VII

FOREST PRODUCTION

Bulfin, G. Gallagher* and J. Dillon**

Introduction

Because of adverse soil conditions in County Leitrim (1) the number of land utilisation types is very limited. Grass production is the main agricultural usage, cither for beef production or dairying. Forestry—occupying 6.47< of the total county—is the other major land-use type (2, 3). In the agricultural sector, because mall farm size, low income from farming and high emigration, the county faces il and economic problems. Afforestation, therefore, particularly with fast-growing conifers like Sitka spruce, may offer the prospect of an economically competitive, alternative land-use enterprise.

The purpose of this part of the Resource Survey, therefore, is to establish the forestry potential of the different soils so that this information can be used to make an economic assessment of forestry- as an alternative land-use enterprise to agriculture for the county ^Part III).

While enough published data exist to indicate high growth rates in forestry (4), more specific information on the relationship of tree growth and soil type is en in this section. The results are also presented on the accompanying forest potential map (included in folder on inside back cover).

Forestry in Leitrim: *current status*

State forest lands occupy 10,248 ha (25,323 acres) of which, 8,935 ha (22.078 acres) are classed as productive (3). Most of these forests are concentrated in north and mid-Leitrim. There are small areas of state forest in south Leitrim and results from these are augmented by measurements in private forests.

In the three report periods during 1969/72 the Forest and Wildlife Service acquired 1,737 ha (4,290 acres) of productive forest land in Leitrim (2, 3). The rate of acquisition of land in the county as a percentage of county land area (0.27, 0.55, 0.35 respectively) was the highest in the country in each of these three report periods. However, acquisition has now slowed due to the higher agricultural and land prices under EEC conditions. It will take a few years to determine whether this is a temporary or permanent slowdown.

Conifers—particularly Sitka and Norway spruce and Contorta pine are the backbone of the state planting programme. In Leitrim the spruces occupy the lowland drumlin areas and are planted on good sites up to 366 metres (1,200 feet)

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tDr. G. Gallagher and Mr. J. Dillon are members of the Forest and Wildlife Service. Department of Lands.

Plate 6—Height/age measurements revealed fast tree growth rates on many soils in the county.

d'over. On the poorer high-elevation peats and on some of the basin peats, Contorta pine replaces Sitka spruce as a more suitable species.

Results

Production

Forest production was measured by sampling on soil series representative of 72 5^ °f the countv- Sufficient plantations did not occur on all soil types and estimates of potential production for these soils are given. These estimates are broken into two reliability categories. The first deals with soils closely related to other soils on which productivity measurements were taken. The second deals with dissimilar soils where the estimate may be less reliable (Table 13). A total of 418 stands of Sitka spruce were assessed for production. Young stands from 8 to 15 years old were chosen as being representative of plantations established using modern techniques.

TABLE 13 —Extent of soil series covered by forestry appraisal

	No. of plots measured	total countv area
Soils series appraised	406	72.53
Closely related soil series estimated	6	1009
Other soils estimated	6	11-56
Total soil series appraised or estimated		94-18
		5-82
	418	10000
•Implantable		7-98

•Part of soil series appraised and considered unsuitable for afforestation.

Production by Yield Class for each soil is shown in Table 14 Yield Class is determined from the height/age relationship of a particular stand of trees—the taller the trees at a given age, the greater their yield class will be. Yield Class is expressed as the maximum mean annual volume production in cubic metres per hectare per annum. The British Forestry Commission Management Tables for Sitka spruce show a range of Yield Classes from 6 to 24 cubic metres per hectare per annum (5). The current average production of pure Sitka spruce in the state forests in Ireland is calculated to be Yield Class 14 (6). The average Yield Class, for all Leitrim soils, weighted by area, exclusive of unplantable areas and water bodies, is Yield Class 22. Thus, the average for all plan table land in Leitrim, both good and bad, is estimated at four Yield Classes higher than the national average.

Highest forest production occurs on the lowland drumlins, particularly in the south of the county (see Forest Potential map). Here climate, topography and soils combine to provide an excellent growing environment for spruce and growth rates of 24 to 26 cubic metres per hectare per annum are obtained. This includes all of the following soils: Garvagh, Rinnagowna, Clooncareen and the southern areas of Howardstown.

Growth rates are also good at 26 cubic metres per hectare per annum on the mid-Leitrim lowlands on the Drumkeeran and Kiltyclogher soils, while growth on the floors of the north Leitrim valleys on the Ballinamore soil is slightly less at Yield Class 24.

TABLE 14—Potential forest production of County Leitrim soils

	Elevation class (metres)	Area (ha)	Yield Class (cu. metres ha annum)	Potential gross production* (cu. metres)
MINERAL SOILS				
Crumpaun		715	14	8,505
Loughmuirran		222	14	2.642
Burren		1.429	14	17,005
Clooncareen		317	24	6,467
C'orriga		604	24	12,322
Kilnageer		730	22	13,651
Mountcollins		254	24	5,182
YVardhouse		1,239	16	16,850
Stonepark		715	16	9,724
Ballinamore	under 122	13,100	24	267,240
Ballinamore	over 122	3,246	2<i	55,182
Drumkeeran	under 122	10,061	26	222,348
Drumkeeran	122-244	4,962	22	92,789
Drumkeeran	over 244	194	2<)	3,298
Drumkeeran peaty phase	under 244	2,292	22	42,860
Drumkeeran peaty phase	over 244	631	18	9,654
(iarvagh		27,277	26	602,822
1[owardstown		2,494	26	55.117
Kiltyclogher	under 122	2,618	26	57,857
Kiltyclogher	over 122	1,004	18	15,361
Rinnagowna		6,498	26	143.606
PEATS				
Aughty	under 244	10,032	20	170.544
Aughtj	over 244	11,092	14	131.995
Ardrum		16,034	20	272,578
Allen		7,575	18	115,898
COMPLEXES				
Ballinamore Allen		1,382	20	23,494
Ballyhaise C'orriga		4,623	24	94.309
Mortarstown Kinvarra		5,608	22	104,870
TOTAL				2,574,173

•A 15°o reduction is made in the calculation to allow for roads .buildings and small unproductive or understocked areas in the forest.

Conditions for tree growth become less favourable with increasing elevation because of adverse environmental conditions. Soil type varies less rapidly than tree growth with elevation. Thus, one soil type may support trees in a number of different yield classes on a mountain slope. This situation is exemplified on the Drumkeeran soil where three different Yield Class categories based on elevation are recognised. Production drops from Yield Class 26 under 122 metres (400 ft O.D.' to Yield Class 20 above 24.4 metres (800 ft O.D.), while the average production in the sector 122 to 244 metres O.D. is Yield Class 22.

Climatic peat is confined to the north and mid-Leitrim mountain areas. It first occurs in sites favourable for its formation as a thin skin of peaty material which overlies the mineral soil. The depth of peat occurring increases with elevation. The effect of peat on production is seen in a comparison of three soils, Drumkeeran.

n • ,.. .rin Peatv Phase and Aughty. Drumkeeran. which is a mineral soil, has a 2 S S S S J Class of 22 between 122 and 244 metres O.D. and Yield Class 20 244 metres O D The peaty phase of Drumkeeran produces Yield Class 22 and ,'rrcsponding elevations. The Aughty soil, which is a definite climatic peat. duced Yield Class 20 below 244 metres and only Yield Class 14 above 244 metres. it similar elevations a mineral soil will produce more than a peaty mineral oil or a peat soil. The upper elevations of the Aughty soil are classified as unplant- • due to adverse site and climatic conditions. A combination of severe exposure x>r peat soils combine to make this area unsuitable for afforestation. In total, an area of 12.666 hectares (31,300 acres) is classified as unplantable.

Production is least on the steep, thin, rock-strewn, broken landforms on the the table mountains and above Lough Gill. Although pockets of good : throughout most of these areas, the average production of any soil type u Included in this category are the following soils: Crumpaun, Loughmuirran. Burren and Stonepark; Kilnageer. parts of Burren and the rocky phase of Corriga differ in that they have the same broken characteristics but have less steep slopes because they occur on lowland areas. Production on the lowland areas of these would also be somewhat better because they are less exposed. The Wardhouse which occurs on sharply-rolling coarse sandy soil near the coast is rated low luse of its extremely exposed situation allied to the impoverished, droughty nature of the soil.

The percentage of the county in each Yield Class is shown in Table 15. The i area of potentially productive forest land in County Leitrim amounts to 86.2% of the total county area. Some 8.0^ is classed as unplantable due to adverse environmental conditions. The remaining 5.8% is occupied by lakes and rive;

Sitka spruce production on most Leitrim soils is very high—the national average production for pure Sitka spruce is Yield Class 14 while all production figures in Leitrim are equal to or greater than this. Also, the greatest area of land in any Yield Class (30.8%) is in Yield Class 26, which is very high. The two top Yield Classes together account for 42.7^ of the county. A further 28.0^—that occupied by Yield Classes 20 and 22—can be rated as highly productive. Some 7.0% of the county (Yield Classes 16 to 18) is just above the average national production for Sitka spruce which leaves only 8.5% of the county in the national average production category of Yield Class 14. Some of the soils in these lower Yield Classes are those which occur on the steep slopes of the table mountains or at high elevations as in the case of Aughty. While possible production is moderate on these soils, most of them would probably be precluded from afforestation due to inaccessibility.

Gross production figures are given by soil series in column 5, Table 14.

Gross production is calculated by multiplying the Yield Class by the area for any soil. Following normal forestry practice, a 15% reduction is made in this calculation to allow for roads, buildings and small unproductive or understocked areas in the forest. Thus, the gross production figures are representative of annual production from a large area of forest rather than from a fully-stocked hectare of land. The Yield Tables used to obtain gross production are those of the British Forestry Commission and relate to environmental conditions in Britain. Current research in Ireland indicates that production in Sitka spruce here is somewhat higher at any given tree height because of greater tree girth (7). The difference is of the order of one Yield Class, i.e. an underestimate of 2 cubic metres per hectare per annum. This would indicate that in the high Yield Classes there is an underestimate of gross production of some 8^ while in the lower Yield Classes the underestimate is in the region of 14^ on the figures presented here. Gross production for the county is 2,574,173 cubic metres per annum, not taking into account the under-estimate referred to above.

Future production

The foregoing potential production figures are based on current knowledge and management techniques within the Forest and Wildlife Service. Research in forestry is, of necessity, a slow process, but a sufficient body of research findings now exists to indicate that an improvement in future production trends is possible. Increased production due to improvements in fertiliser use, crop establishments and genetics will be possible in plantations currently being established. However, production is likely to be more rapidly improved at the lower end of the production scale.

TABLE 15—Forest production of County Leitrim soils by Yield Class

Yield Class	Soil Beriea	Elevation class (metres)	Area (ha)	°0 of county	",, of county in Yield Class
	Drumkeeran	under 122	10,061	6-34	
	(iarvagh		27,277	1717	
26	Howardstown		2,494	1 57	
	Kiltyclogher	under 122	2,618	**165**	
	Rinnagowna		6,498	409	3082
	Clooncareen		317	020	
	Corriga		604	0-38	
24	Mountcollins		254	**016**	
	Ballinamore	under 122	13,100	8-24	
	Ballyhaise Corriga		4,623	2-91	11-89
	Kilnageer		730	**046**	
	Drumkeeran	122-244	4,962	3 12	
22	Drumkeeran peaty phase	under 244	2,292	144	
	Mortarstown Kinvarra		5,608	*1-53*	8 55
	Ballinamore	over 122	3,246	204	
	Drumkeeran	over 244	194	**012**	
20	Aughty	under 244	10,032	6-32	
	Ardrum		16,034	10 10	
	Ballinamore/Allen		1,382	0-87	19-45
	Drumkeeran peaty phase	over 244	**631**	0-40	
18	Kiltyclogher	over 122	1,004	0-63	
	Allen		7,575	4-76	5-79
16	Wardhouse		1,239	0-78	
	Stonepark		715	0-45	1 23
	Crumpaun		715	**D-45**	
	Loughmuirran		222	014	
14	Burren		1,429	0-90	
	Aughty	over 244	11,092	6-98	8-47
	Lnplantable		12.666	7-98	
	Water			5-82	

P/ate 7—*Average yield of Sitka spruce in Leitrim was* 4 *yield classes higher than national average*

Summary

Forestry currently occupies 6.4% of County Leitrim—concentrated mosdy in north and mid-Leitrim areas. The present survey measured production by soil type on 72.5% of the county and estimates were made for the remainder of the soils.

Production on the lowland drumlin soils was very high, particularly on the drumlins in the south of the county. Soils such as Garvagh, Rinnagowna, Howards-town, and areas of Drumkeeran, Kiltyclogher and Ballinamore soils occurring at

low elevations ranged from Yield Class 24 to 26—a production level well above the national average of Yield Class 14 for pure Sitka spruce stands. Production was greatest at elevations below 122 metres (400 ft O.D.) and decreased with elevation. In the north Leitrim area production drops by approximately 2 Yield Classes for every 122 metres increase in elevation. Production also decreases with the onset of peaty conditions, which generally begin around 150 metres O.D. as a thin skin of peaty material overlying mineral soil. Generally by about 300 metres the soil is a peat of the Aughty series. Thus, the relationship between Yield Class and elevation was complicated by the onset of peaty conditions; where peat occurred the decrease in Yield Class was greater.

The very high forest potential of Leitrim soils is seen when the county is categcrised by the area in each Yield Class. Some 42^ of the county is capable of producing Yield Class 24 to 26; another 28^ of the county is in the high production categories of Yield Class 20 to 22; *1%* of the area has Yield Class 16 to 18 while 8'7 of the county is at the national average. A further 8^ is unplantable and 5.8^ of the county is covered by water.

The current average Yield Class for the county exclusive of the unplantable areas and water is Yield Class 22.*

Because large-scale planting has only recently begun on the drumlin soils, research into increased production is at an early stage. However, research into fertiliser use and other management techniques indicate that production per hectare may be increased in the future, particularly on the poorer peaty sites.

Acknowledgments

We gratefully acknowledge the assistance given by Mr. J. Freeman, Research forester, by Messrs. T. Radford. A. Comey, Field Technicians. An Foras Taluntais and by the staff of the Forest and Wildlife Service in Co. Leitrim.

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*The Kiltyclogher soil below 122m (1.65% of county) should be rated as Yield Class 22 and not 26 as in the text and on the map. This changes the average yield class for the county from 22.11 to 22.03 cu metres ha/annum and reduces the total potential production by 0.34%.

*

APPENDIX I

SOIL SURVEY METHOD

Introduction

Soil survey and classification require detailed descriptions of the various layers of soil which are exposed in any vertical section. The criteria used for differentiating between such layers and the reasons for their occurrence, together with details of the soil survey method, are summarised here.

The Soil Profile

The soil profile refers to a vertical section of the soil down to and including the geological parent material. The nature of the soil profile is important in many aspects of plant growth, including root development, moisture storage and nutrient supply. The profile is, therefore, the basic unit of study in assessing the true character of a soil. It usually displays a succession of layers that may differ in properties such as colour, texture, structure, consistence, porosity, chemical constitution, organic matter content and biological composition. These layers, known as soil horizons, occur approximately parallel to the land surface.

Soil Horizons

Most soil profiles include three main horizons that are usually identified by the letters A, B, C. The combined A and B horizons constitute the so-called solum or "true soil" whilst C refers to the parent material beneath. Certain soils lack a B horizon and are said to have AC profiles. In some soils also organic layers (0 horizons) overlie the mineral horizons.

Some soils may have a relatively uniform profile with A and C horizons whilst others are so complex that they possess not only A, B and C horizons, but also several sub-horizons. Where horizons need to be sub-divided on the basis of minor differences, the sub-horizons are identified by the horizon designation plus a suffix number thus: A1, A2, A3, B1, etc. The various horizons in a soil and their character reflect the processes of soil formation that have been operative, and present a picture of the true nature and salient characteristics of a soil which are important in its use and management.

The A horizon: This horizon is the uppermost layer in mineral soils and corresponds closely with the so-called "surface soil". It is that part of the soil in which living matter, e.g., plant roots, bacteria, fungi, earthworms, and small animals, is most abundant, and in which organic matter is usually most plentiful.

Being closest to the surface, this horizon is the first to be reached by rainfall and is, therefore, more leached than underlying horizons. The A horizons in most Irish soils have been depleted of soluble chemical substances and. in certain cases also, of seme of their very fine clay particles. In cases where the soils have been strongly leached they may be depleted of iron and aluminium oxides and of other constituents besides.

Two sub-divisions of the A horizon are commonly made, namely Al and A2. Either the Al or both may be represented in a profile. The Al is a surface mineral horizon that usually contains a higher proportion of organic matter, incorporated with the mineral matter, than any of the underlying horizons. In cultivated soils this horizon corresponds to the plough layer and may be designated Ap. The A2 is a comparatively light-coloured horizon and frequently has a bleached appearance. The A2 always refers to the horizon which has undergone the greatest degree of leaching. This is reflected in the lighter colour, mostly the result of a partial removal of colouring constituents, principally iron. A3 signifies a transition zone between the A and B horizons.

The B horizon: This horizon lies immediately beneath the A and corresponds closely to the so-called "subsoil". Lying between the A and C horizons, it possesses some of the properties of both. Living organisms are fewer than in the A but more abundant than in the C horizon. Compared with the A horizon, the B horizon is one of accumulation and usually has a relatively high content of iron and aluminium oxides, humus or clay that, in part at least, have been leached from the overlying horizons. Usually a more pronounced blocky or prismatic structure is found where this horizon is clay-enriched. Stronger colours are apparent in the B horizons, especially when the accumulation products are iron oxides or humus or both.

Depending on the degree and pattern of accumulation of constituents within the B horizon several divisions of the horizon e.g. Bl, B21, B22, B3, may be warrented, B2 representing the zone of most intense accumulation. Besides, symbols such as B2t, B2(ir) and B2h are used to denote significant accumulations of clay, iron and humus respectively. Bl and B3 denote transition horizons from A to B and from B to C horizons respectively. If the B horizon is without any appreciable accumulation of leached products but has distinctive colour or structure characteristics, it is usually referred to as a (B) horizon.

The C horizon: This horizon refers to the geological material beneath the A and B horizons (solum). It consists of the upper part of the loose and partly decayed rock or other geological material, such as glacial drift, similar to that from which the soil has developed. It may have accumulated locally by the breakdown of the native rock or it may have been transported by ice, water or wind. The C horizon is less weathered, generally, has less organic matter and is usually lighter in colour than overlying horizons.

The O horizon: This horizon refers to a surface layer of raw or partly decomposed organic matter, more usually associated with very poorly drained or very degraded (podzolised) mineral soils. Where little or no decomposition has taken place the symbol Ol is used; 02 denotes more advanced decomposition. The organic matter content of O horizons is commonly several times greater than that of the underlying mineral horizons or of surface A horizons.

Soil Series

It is principally on the basis of profile character, as expressed by the nature of the various horizons, that soils are classified and mapped. Although each profile has its individual character, some have so many important features in common that they can be placed together in a single primary category. The primary category used in mapping is the soil series, which comprises soils with similar type and arrangement of horizons, and developed from similar parent material. The soil series is also a basic category in soil classification.

A major problem in mapping soils is the delineation of boundaries between different series. Typical profiles of two different soil series may differ widely but, where the series are contiguous, it is usual for them to merge, sometimes over a considerable distance. Consequently, a line on the map very often defines the merging zone between soils rather than a sharp change in the soil character.

A soil series is named usually after the location in which the particular soils are best expressed or occur most widely.

Soil Variants

Variants are really separate soil series that are too small in extent to be shown at certain scales of mapping. A soil which is recognised and defined as a variant in one survey area, however, may be designated as a separate series later in another area, depending on its extent.

Other Soil Units

Soils within a series may be further sub-divided into soil types on the basis of textural differences in the surface soil. Different soil phases may also be mapped covering variations in features, such as slope, depth or stoniness, that are important in soil behaviour and land use. Segregation at these levels requires more detailed survey than that employed generally in County Leitrim.

Soil Associations

To relate soils to their environment and, in particular, to their geological parent materials, series may be grouped into larger mapping units, or soil associations. A soil association is a grouping of series developed on similar parent materials but varying in profile character as a result of differences in other soil-forming factors. Soils within the same association, therefore, although they may fall into a number of series on the basis of profile differences, have important physical and chemical properties in common which have been inherited from the same parent material. The association unit has been employed only once in County Leitrim.

Scale of Mapping

Field mapping is carried out on a scale of 6 inches to 1 mile (1: 10,560) but this detail is reduced to a scale of ½ inch to 1 mile (1: 126,720) for publication. Since one 6 inch sheet covers an area of 24 square miles (61.7 sq. km) to publish on this scale would necessitate, in the case of county Leitrim, thirty eight individual map sheets. Considerations such as the cost of colour printing, ease of handling and general use of the map warrant reduction to the smaller scale.

This reduction, however, introduces certain difficulties. It has been found necessary to consolidate and, in some cases, delete some of the least extensive soil separations shown on the larger scale. On a scale of 1: 126,720 it is possible to show a minimum area of 25 acres (10 ha), and so any uniformly coloured area on the published map may include enclaves of less than 25 acres. Where soil series are recognised, but where their distribution pattern with contiguous series is so intricate as to defy clearcut delineation on the map, a **soil complex** is mapped. The component series within the complex are named and, where possible, their relative proportions are given.

To accommodate those who are interested in more detail for special purposes, the field sheets (at a scale of 1: 10,560) showing the entire field survey records are being retained for consultation at the National Soil Survey headquarters, Johnstown Castle. Wexford.

Description of Soil Profiles

During the survey of an area, profiles typical of each soil are selected for special study. Fresh profile pits are cpened for this purpose. The depth of pit varies according to soil depth but is usually about 4 to 5 feet (1.2 to 1.5 m). Each profile is thoroughly examined and described and a record made of its salient characteristics.

A soil profile is described by first noting certain features of the soil's environment, followed by details of its general characteristics. The characteristics which apply to the site include relief, slope, aspect, altitude and vegetation. Drainage conditions and the pattern of horizon development within the profile are considered next and, finally, properties of the individual soil horizons such as texture, structure, consistence, colour, mottling, amount of organic matter, stoniness, presence of hardpans and root development are described.

A bulk sample from each soil horizon is analysed physically and chemically at the Soil Laboratory . The analytical data supplement many of the field observations and provide a more complete picture of the true soil character. The results of these analyses for representative profiles of each soil series are given in Appendix III.

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APPENDIX II

DEFINITION OF TERMS USED IN PROFILE DESCRIPTIONS* AND ANALYSES

Texture

Soil texture refers to the relative proportions of the various size particles in the mineral fraction of a soil. More specifically, it refers to the relative proportions of clay silt and sand in the mineral fraction less than 2 millimeters in diameter.

Texture which is one of the more important of the soil's physical characteristics, influences such factors as moisture retention, drainage and tilling properties of soils. their resistance to damage by stock and heavy machinery and earliness of crop growth.

Classes of texture are based on different combinations of sand, silt and clay; the proportions of these are determined by mechanical analyses in the laboratory. The basic textural classes in order of increasing proportions of the finer separates arc sand, loamy sand, sandy loam, silt-loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay and clay. Definitions of the basic classes in terms of clay (less than 0.002 mm), silt (0.002 to 0.05 mm) and sand (0.05 to 2.0 mm diameter size) are presented in graphic form (Fig. 7).

Structure

Soil structure refers to the aggregation of primary soil particles into compound particles, which are separated from adjoining aggregates by surfaces of weakness. An individual natural soil aggregate is called a ped.

The productivity of a soil and its response to management depend on its structure to a large extent. Soil structure influences pore space, aeration, drainage conditions, root development and ease of working. Soils with aggregates of spheroidal shape have a greater pore space between peds, are more permeable and are more desirable generally than soils that are massive or coarsely block)-.

Field descriptions of soil structure indicate the shape and arrangement, the size and the distinctness and durability of the aggregates. Shape and arrangement of peds are designated as **type** of soil structure; size of peds. as **class;** and degree of distinctness, as **grade.**

Porosity

Porosity of a soil is conditioned by the shape, size and abundance of the various crevices, passages and other soil cavaties which are included under the general name of soil pores. In this bulletin, porosity refers mainly to the voids between the soil structural units which is strictly the structural porosity. Soil porosity is

'The procedure mostly followed is that described in the *Soil Survey Manual* (U.S. Dept. Agric. Handbook No. 18, Washington D.C. 1951). Colour designations are according to the Munsell colour notation. Colour, structure and consistence are measured on the moist soil unless otherwise stated.

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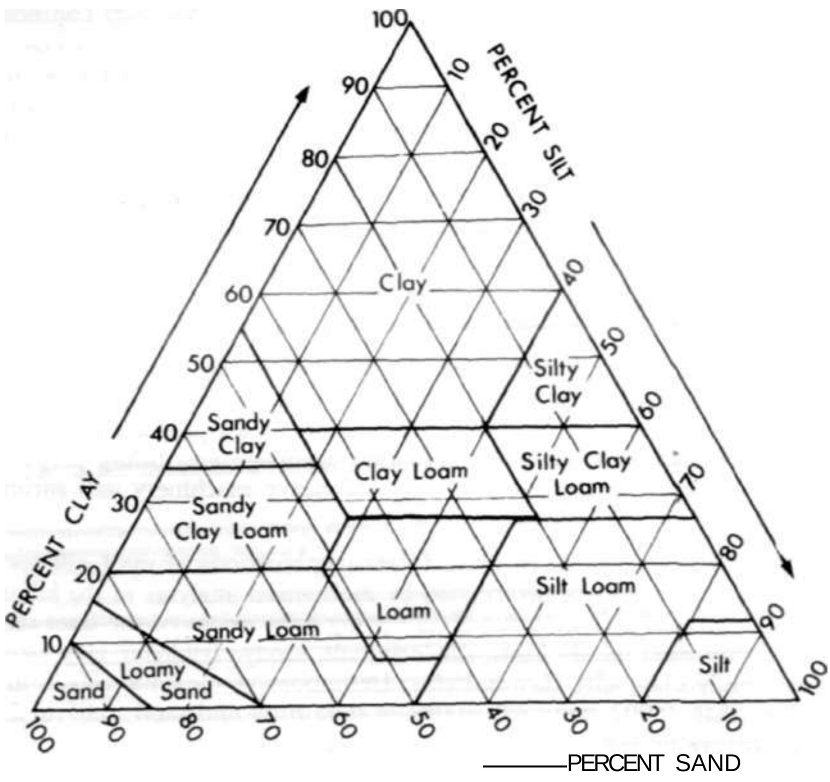

FIG. 7: *Chart showing the percentage of clay (less than* 0.002 *mm), silt* (0.002 *to* 0.05 *mm) and sand* 0.05 *to* 2.0 *mm) in the basic soil textural classes (after Soil Survey Manual, PS.DA. Handbook No.* 18. *Washington D.C.* 1951).

influenced largely by type of structure; it is also influenced by rooting and by the activity of earthworms and other soil macro-organisms.

Porosity determines, to a large extent, the permeability rate in the soil and the air to water ratio prevailing and is thus of considerable importance with regard to soil aeration and drainage regime.

Consistence

Soil consistence is an expression of the degree and kind of cohesion and adhesion or the resistance to deformation and rupture that obtains in a soil. Inter-related with texture and structure, and strongly influenced by the moisture condition of the soil, this characteristic is most important in developing a good tilth under cultivation practices. On account of the strong influence of moisture regime, the evaluation of soil consistence is usually considered at *three* levels of soil moisture—wet, moist and dry.

Cation Exchange Capacity

The cation exchange capacity, in its simplest terms, is an index of the capacity of a particular soil to adsorb and release cations such as hydrogen, calcium, magnesium, sodium and potassium. It is an indication of the ability of the soil to supply important nutrients to the growing plant, and of the crop response that can be expected to added nutrients in manurial amendments. The exchange capacity is governed chiefly by the organic matter and clay contents of the soil. Soils with high organic matter content usually have a high cation exchange capacity (25 to 40 meq/100 g of soil). The cation exchange capacity of a soil low in, or devoid of, organic matter is generally less than 12 meq/lOOg; here it is conditioned chiefly by the clay fraction.

Light sandy soils containing little organic matter or clay usually have a very low cation exchange capacity and, consequendy, a low potential for retaining applied plant nutrients; hence the necessity for relatively frequent fertiliser dressings on these soils. Heavier textured soils, on the other hand, usually have a high cation exchange capacity and are capable of adsorbing and retaining larger quantities of applied nutrients especially calcium and potassium; the nutrients are slowly released to meet the needs of growing plants. On such soils, therefore, fertiliser and lime applications can be larger and less frequent.

Percentage Base Saturation and pH

The base saturation of the exchange complex of a soil is obtained by determining the total exchangeable bases (plant nutrients such as calcium, potassium, sodium, magnesium) and expressing the figure obtained as a percentage of the cation exchange capacity. As such it is an index of the base status of the soil.

The natural base status of a soil is inherited from the parent material but may be modified subsequently by weathering, leaching and other influences including cultural practices. Where the parent material is base-rich and leaching has not been excessive, the rate of release of bases by weathering is sufficient to offset losses through leaching, cropping and other outlets and to provide for a high base status profile. However, where rainfall is heavy and evapotranspiration low, or where the coarse nature of the soil permits excessive leaching, or where large amounts of bases are removed by intensive cropping, the base content of a soil may be considerably depleted. Low base status may also be an inherent characteristic of soils related to the acid nature of the parent material.

The base status of acid soils can be improved by liming, the amount necessary being determined by (a) the ability of the soil to adsorb bases—the cation exchange capacity—(b) the prevailing base status and (c) the desired base status. Certain fertilisers also supplement the base status of the soil.

pH is a measure of soil acidity or alkalinity. A soil having a pH of 7.6 to 8.3 is moderately alkaline; pH 7.1 to 7.5 slighdy alkaline; pH 7.0. neutral; pH 6.6 to 6.9, nearly neutral; pH 6.0 to 6.5, slightly acid; pH 5.3 to 5.9, moderately acid; pH 4.6 to 5.2, strongly acid; and pH below 4.5, very acid.

It is not intended that the pH and base saturation analyses given for each modal profile (Appendix III) be used as a basis for lime recommendations. For accurate reccmmendations random soil sampling and analyses are required. However, certain general conclusions can be drawn from the analyses provided, which reveal the variation in base status with soil depth and between different soils.

Total Neutralising Value (TNV)

This is an index of the level of carbonates present in a soil. These carbonates modify the solubility of other nutrients. Soils shewing positive TNV values in the surface horizons contain adequate or excess neutralising materials and are not in need of liming.

Carbon and Nitrogen

The level of organic carbon indicates the amount of organic matter in a soil (CX 1.72 = organic matter). The content and nature of organic matter are of fundamental importance. Due to its high cation exchange capacity, organic matter is an ideal reservoir for plant nutrients, which are gradually released to meet the requirements of the growing plant. At the same time, acid humus supplements the supply by influencing the extraction of nutrients from the mineral fraction of soils. Organic matter creates favourable physical conditions for crop growth; it promotes granulation of structure by reducing plasticity, influences cohesion and increases the water-holding capacity of the soil. Organic matter in the surface also influences the temperature of soils and, thus, seasonal growth.

Depending on organic carbon content, soils are classified as follows: over 30%, peats; 20 to 30% , peaty; 10 to 20%, slightly peaty; and those with 7 to 10% are usually referred to as "organic". In the case of the terms "peaty", "slightly peaty", and "organic", the mineral textural class is included in the definition of the soil, *e.g.,* peaty sandy loam; slightly peaty clay loam; organic loam. The surface horizon of mineral soils in Ireland normally contains 3 to 6% organic carbon.

Nitrogen, which is normally present in soils in relatively small amounts, is extremely important as a plant nutrient. It is easily leached from the soil and supplies need to be constantly replenished. The ratio of carbon to nitrogen (C/N ratio) indicates generally the degree of decomposition of organic matter; a ratio between 8 and 15 is considered satisfactory and indicates conditions favourable to microbial activity. Ratios higher than 15 are associated with a slower decomposition rate and with the accumulation of raw organic matter or, in more extreme cases, with peat development, and are indicative of unfavourable conditions for microbial activity.

Free Iron

A localised accumulation of free iron in a soil profile (Bir horizon), as is evident in brown-podzolic and podzolic soils, indicates that leaching and podzolising processes have been operative. On the other hand, a uniform distribution of free iron throughout a profile, as is the case in the Brown Earths, indicates that the soils have not been strongly leached.

Summary of Analytical Methods

Particle Size Analysis: Determined by the International Pipette Method as described by Kilmer and Alexander (1949), using sodium hexametaphosphate as dispersing agent.

Cation Exchange Capacity: Determined by the method of Mehlich (1948). Soil was leached with buffered BaCL to displace exchangeable cations, Ba displaced by $CaCl_2$, and K2C1O1 was used in the colorimetric estimation.

Total Exchangeable Bases: Extracted by method of Mehlich (1948). Ca, Na and K estimated flamephctometrically, Mg by titan yellow method.

pH: Determined on 1: 2 soil/water suspension using a glass electrode.

Total Neutralising Value: Determined on a HC1 extract using phenolphthalein as indicator and titrating against NaOH. CaCO. was used as a 100^ standard.

Organic Carbon: Estimated by the Walkley-Black dichromate oxidation method as described by Jackson (1958), modified for colorimetric estimation. Values were read off on a Spekker Absorptiometer using Orange Filter No. 607. A recovery factor of 1.1 was used.

Total Nitrogen: Estimated by a modification of the method of Piper (1950) by digesting soil with cone. HSO. using selenium as a catalyst, distilling into boric acid and titrating with HC1.

Free Iron: Extracted with buffered sodium hydrosulphite (Mehra and Jackson. 1960). Fe determined colorimetrically using o-phenanthroline.

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APPENDIX III

PROFILE DESCRIPTIONS AND ANALYSES

Grid for Locating Soil Profile Sites on 6-inch Ordnance Survey Sheets

The grid used by the National Soil Survey for soil profile location is not the National Grid as the latter is not shown on the 6-inch field sheets.

The National Soil Survey grid is formed by dividing the 6-inch field sheet into four rectangles which are lettered A, B, C and D. The sides of the rectangle are divided vertically by 36 and horizontally by 26. The vertical lines (ordinates) are each given a number and the horizontal lines (abscissae) a letter.

A grid reference consists of:

County (abbreviated)	Six-Inch Sheet Number	Six-Inch Sheet Quarter
Le (Leitrim)	3	B

ORDINATE	ABSCISSA
13	P

Le 3 B 13 P

Crumpaun Series

Location:	Shcsknan Td.; I.eitrim 3 B 13 P
Topograph) :	Scree slope
Slope:	40
Altitude:	1200 ft (366m) O.I).
Drainage:	Excessive
Parent Material:	Scree material derived from siliceous limestone of the Carboniferous Period
Classification:	Lithosol; Lithic Dystrochrept

Horizon	*Dtpth f cm i*	*Di scription*
Al	**0-10**	Silty clay loam; dark brown (10 YR 4 3); weak fine crumb and subangular blocky; fairly friable: abundant very fine and fine roots; diffuse boundary into underlying cherty scree material

TABLE 1—Crumpaun Series (Sheskrian Td.V

Horizon	Coarse sand (%)	Fine sand	Silt	Clay (%)	PH	CEC (meq lOOg)	TEB (meq 100g)	Base sat.	C (%)	N (%)	Free iron
Al	9	6	49	36	5 0	49-6	16-37	33	8-6	0 3 9	1 1

Crumpaun Series

Location:	Loughmuirran Td.; Leitrim 4 A 1 Z
Topographv:	Scree slope
Slope:	40
Altitude:	900 ft (274m) O.D.
Drainage:	Excessive
Parent Material:	Scree material derived from siliceous limestone of the Carboniferous Period
Classification:	Lithosol; Lithic Dystrochrept

Horizon	*Depth (cm),*	*Description*
Al	0-5 15	Silt loam; dark brown (10 YR 4 3); moderate fine crumb in intensive rooting zone (0-2/3 cm) to moderate fine subangular blocky lower down; friable; abundant very fine and fine roots; gradual diffuse boundary into stonv scree material

TABLE 2—Crumpaun Series (Loughmuirran Td.)

Horizon	Coarse sand (%)	Fine sand (%)	Silt	UaN	pH	CEC (meq/ lOOg)	TEB (meq lOOg)	Base sat. (%)	e	Free iron (%)
A	8	h	**61**	23	S 4	**30-2**	**1216**	40	S 4	(17

' Coarse Sand 2.0-0.2 mm; Fine Sand 0.2-0.05 mm; Silt 0.05-0.002 mm; Clay<0.002 mm diameter size.

CEC = Cation Exchange Capacity; TEB Total Exchangeable Bases; nd = not determined.

Loughmuirran Series

Location:	Shesknan Td.; I.citrim 3 B 15 P
Topography:	Stepped colluvial slope
Slope:	22
Altitude:	900 Ft (274 m) O.D.
Drainage:	.Moderately well
Parent Material:	Colluvium derived from Benbulben shale (generally calcareous) and Clencar limestone
Classification:	Brown Karth; Typic Dystrochrept

Horizon	*Depth (cm)*	*Description*
All	0-10	Siltyclay; dark brown (10 VR 4 3); weak fine subangular blocky and crumb fairly friable; abundant fine and very fine roots; clear wavy boundary to:
A12	10-26	Cherty silty clay; yellowish brown (10 YR 5 4) with prominent common dark grey (10 YR 4 1) patches which include common medium prominent clear strong brown (7-5 YR 5 6) mottles; weak fine and medium subangular blocky; non sticky, slightly plastic; plentiful very fine and fine roots; clear wavy boundary to:
Allb	26-40	Silty clay; dark brown to greyish brown (10 YR 4/3 to 5/2) very weak medium subangular blocky; slightly sticky, slightly plastic; plentiful fine to medium decaying roots; very fine and fine living roots; sharp. smooth boundary to:
A 12b	40-55	Cherty clay loam; chert gravel equal to ca 80°$_o$ of bulk density of horizon; structureless; common very fine roots; dark brown to greyish brown (10 YR 4 3 to 5 2) sharp smooth boundary to:
Bb	55-75	Silty clay; yellowish brown (10 YR 5 '4) very weak structure; slightly sticky, plastic; common fine roots; gradual smooth boundary to:
Cb	75-125	Similar to overlying horizon but containing decaying black shale fragments; sharp boundary to silty clay loam, dark grey (N4 0) at lm 25 cm depth.

TABLE 3—Loughmuirran Series (Shesknan Td.)

Horizon	Coarse sand (%)	Fine sand (%)	Silt (%)	Clav (%)	pH	**CEC** (meq, 100g)	TEB **(meq** 100g)	Base sat. (%)	C (%)	N	Free iron (%)
All	6	7	45	42	5-4	**42-4**	14-36	34	6-2	0 60	1-3
A12	5	5	47	43	61	25-5	16-53	65	11	010	i s
Allb	7	6	**44**	43	**5-4**	37-6	16-60	44	31	**015**	IS
A12b	**20**	5	38	37	5-9	48-2	14-76	31	1-6	016	1-5
Clb	4	4	48	**44**	5-8	56-2	18-50	33	11	**010**	**2-4**
C2b	3	3	55	39	6-4	28-1	20-10	72	0-9	—	2-5

Loughmuirran Series

location:	Loughmuirran Td.; Leitrim 4 A 1 Z
Topograph) :	Colluvial slope
Slope:	25
Altitude:	680 ft (207m) O.D.
Drainage:	Imperfect
Parent Material:	Colluvium derived from Benbulben shale (generally calcareous) and Glencar limestone
Classification:	Brown Earth; Typic Dystrochrept

Horizon	*Depth en: i*	*Description*
All	0-13	Silty clay; dark brown (10 YR 4 3); moderately fine suhangular blocky and crumb; fairly friable; abundant very fine roots; clear wavy boundary to:
A12g	13-21	Silty clay; diffuse channel layer; greyish brown (25 Y 5 2) with common fine distinct clear strong brown (75 YR 5 6) mottles; weak fine sub-angular blocky; non sticky, slightly plastic; common micro and very fine random inped pores; plentiful very fine roots; clear wavy boundary to:
Big	21 47	Silty clay; yellowish brown (10 YR 5 8) with few coarse prominent clear grey (5 Y 5 1) mottles; massive; non sticky, slightly plastic; very few micro pores; rare to common very fine roots; gradual smooth boundary to:
B3i	47-80	Silty clay; dark yellowish brown (10 YR 5 8-4 8) with common coarse prominent clear strong brown (7-5 YR 5 6 and 4/4) mottles; massive; slightly sticky, slightly plastic; many micro and very fine continuous random pores; few coarse grey (5 Y 5 1) patches; rare to common very fine roots; clear wavy boundary to:
Cg	80	Silty clay loam; dark grey (5 Y 4 1) representing calcareous shales in advance stage of decay; massive; sticky, plastic; rare decaying roots

TABLE 4—Loughmuirran Series (Loughmuirran Td.)

Horizon	Coarse sand Co)	Fine sand (%)	Silt (%)	Clay (%)	pH	CEC (meq lOOg)	TEB (men lOOg)	Base sat. (%)	C (%)	N	Free iron (%)
All	2	5	T7	46	5-6	48.2	25.62	53	9.6	0-29	1.6
A12g	6	5	47	42	6.0	37-6	19.12	51	3.1	0-26	1.9
Big	4	5	51	40	6-2	41.0	13.65	33	0.7	–	2.1
	5	4	46	45	6-3	28.1	18.82	67	0-7	—	3.1
Cg	6	7	48	39	6-2	58.2	20.87	36	0-6		1-7

Burr en Series

Location: Sheemore Td.; Leitnm 27 B 28 V
Topograph) : Hill
Slope: 18
Altitude: 450 ft (137 m) O.D.
Drainage: Well drained
Parent Material: Shallow glacial drift derived from Carboniferous limestone and calcareous shale
Classification: Brown Earth; Lithic Eutrochrept

Horizon	*Depth (cm)*	*Description*
All	0-8	Clay loam; dark brown (10 YR 4/3); weak to moderate fine crumb becoming subangular blocky in lower part of horizon; friable; abundant very fine to medium roots; clear wavy boundary to:
A12	8-17	Cherty clay loam; yellowish brown (10 YR 5 4); weak fine subangular blocky; fairly friable; plentiful fine and very fine roots; clear wavy boundary to:
C	17-35	Clay loam with high boulder content; yellowish brown (10 YR 5 8); massive; slightly sticky, non plastic; common very fine to fine roots; abrupt wavy boundary to:
		Limestone bedrock

TABLE 5—Burren Series (Sheemore Td.)

Horizon	Coarse sand (%)	Fine sand (",.)	Silt	Clay (%)	PH	CEC (mcq 100g)	TLB (meq 100g)	Base sat. (%)	C (%)	Free iron
All	22	15	34	29	5-6	43 6	19.03	44	7.2	1 4
A12	26	14	31	29	7-2	35-4	21.43	61	3-6	1-5
C	20	18	28	34	7-5	22-8	16.80	74	1-4	1 4

Clooncarreen Series

Location:	Clooncarreen 'I'd.; Lettnm 37 B 33 C
Topography:	Drumlin
Slope:	
Altitude:	170 ft (52 m) O.I)
Drainage:	Well drained
Parent Material:	Glacial drift derived from carboniferous calcareous sandstone and conglomerate
Classification:	Grey-Brown Podzolic; Typic Hapludalf

Horizon	*Depth (cm/*	*Description*
All	0-11	Loam; dark brown (10 VR 4 3); moderate fine crumb and subangular blockv; friable; abundant very fine and fine roots; clear smooth boundary to:
A12	11-30	Loam; dark brown (10 VR 4 3); moderate medium subangular blocky; many micro and very fine random inped pores; frequent very fine roots; clear smooth boundary to:
A2 HI	30 42	Loam; dark yellowish brown to yellowish brown (10 YR 4/4—5 4); moderate medium subangular blocky; friable; many micro random inped pores; common very fine roots; clear wavy boundary to:
B2t	42-65	Clay loam; yellowish brown (10 YR 5 6); moderate medium to coarse subangular blocky; firm; many micro random inped pores; few very fine roots; gradual wavy boundary to:
C	65-1 m	Clay loam; dark yellowish brown (10 YR 4 4) with many medium very dark grey (10 YR 3 1) decaying shale fragments; massive; firm; micro random pores; very few very fine roots

TABLE 6—Clooncarreen Series

Horizon	Coarse sand	Fine sand (%)	Silt	CUj	pH	CEC (meq 100g)	TLB (meq 100g)	Base sat (%)	C (%)	N (%)	Free iron '%)
All	15	28	31	26	5-9	33-4	19.32	58	5-6	0.49	1.2
A12	15	30	31	24	6.1	19-3	10-54	55	2 3	0.19	1.3
A2/B1	17	27	31	25	6.1	18 2	10-40	57	1-5	0 .14	1.3
t»2t	13	23	34	30	6-2	15 8	9-96	63	0.6		1-7
C	12	19	31	38	6.4	19-3	4-88	77	*0-6*		21

Corriga Series

Location:	Bredagh Td.: Leitrim 30 C 27 ()
Topography:	Drumlin
Slope:	6
Altitude:	330 ft (104 m) O.D.
Drainage:	Moderately well
Parent Material:	Glacial drift derived from Ordovician grevwacke, siltstone, mudstone and shale
Classification:	Brown Pod/olic; Lithic Haplorthod

Horizon	*Depth (cm)*	*Description*
All	0 14	Loam; dark brown (10 YR 4 3); moderate fine crumb and subangular blocky; friable; abundant fine to very fine roots; clear smooth boundary to:
A12	14-25	Loam; dark brown to yellowish brown (10 YR 4 *3-5* 6): moderate fine subangular blocky; friable; plentiful fine and very fine roots; clear wavy boundary to:
B2ir	25-48	Clay loam; yellowish brown (10 YR 5 8); weak fine crumb and subangular blocky; many micro and very fine random transped pores; very friable; common fine and very fine roots; clear wavy boundary to:
Cg	48-60	Loam; olive (5 Y 5 3) with many coarse prominent clear strong brown (7-5 YR 5 6) mottles; massive; slightly sticky, non plastic; rare very fine roots

TABLE 7—Corriga Series (Bredagh Td.)

Horizon	Coarse sand (%)	Fine sand (%)	Silt (°o)	Clav (%)	PH	CEC (meq 100g)	TLB (meq lOOg)	Base sat. (%)	C	Free iron (%)
All	23	21	35	21	6 1	30-2	13-58	45	4-5	1-4
A12	25	20	32	23	6 1	24 1	9-68	40	2-8	1-5
B2ir	22	18	32	28	6-0	23-5	6-87	29	1-4	1-8
Cg	23	**19**	35	23	5-3	**10-9**	3-57	33	0-3	1-4

Corriga Series — Bouldery Phase

Location:	Gradoge Td.; Leitrim 33 B 34 1
Topography:	Hummockv lowland with frequent rock outcrop
Slope:	
Altitude:	400 ft (120 m) O.I).
Drainage:	Kxcessive
Parent Material:	Glacial drift derived from Ordovician greywackes, siltstones and mudstones and shales
Classification:	Brown Podzolic; Lithic Haplorthod

Horizon	*Depth (cm)*	*Description*
Al	0-20	Clay loam; dark brown (10 YR 4 3); moderate fine subangular blocky; very friable; abundant fine and very fine roots; extremely stony and bouldery; clear irregular boundary to:
Bir	20-70	Loam; yellowish red (5 YR 4 8>; grading to strong brown (75 YR 5/8); moderate fine crumb; very friable; plentiful fine and very fine-roots; irregular diffuse boundary to:
C		Glacial drift (not sampled)

TABLE 8—Corriga Series Bouldery Phase (Gradoge Td.)

Horizon	Coarse sand (%)	Fine sand (%)	Silt (°n)	Clav ("o>	PH	CEC (meq lOOg)	TEB (meq ' 100g)	Base sat. (%)	C (%)	Free iron (%)
Al	19	17	32	32	4-7	56-2	2-99	5	10-6	2-3
Bir	23	16	42	19	4-9	30-2	0-59	2	4-5	4-2

Kilnageer Series

Location:	Deerpark Td.; Leitrim 7 I) 13 ()
Topograph y:	Rockv rolling
Slope:	3
Altitude:	220 ft (67 m) O.D.
Drainage:	Well drained
Parent Material:	Glacial drift derived from coarse grained gneiss, quartzite, mica-schist and epidiorite
Classification:	Brown Podzolic; Typic Haplorthod

Horizon	*Depth cm* •	*Description*
Al	0-19	Sandy loam: dark brown (10 YR 4/4); weak fine subangular blocky breaking to moderate fine crumb; very friable; abundant roots; few small pieces of charcoal; clear wavy boundary to:
B2ir	19-34	Sandy loam; strong brown (7-5 YR 5/6); weak medium subangular blocky; very friable; plentiful very fine roots; clear smooth boundary to:
B3ir	34-48	Loamy sand; yellowish brown (10 YR 5 6); very weak medium subangular blocky to single grain; very friable; plentiful very fine and fine roots; many decaying fragments of gneiss; clear smooth boundary to:
C	48- 54	Gravelly loamy sand; yellowish brown (10 YR 5 8); consists mainly of decaying gneiss stones; common very fine roots.

TABLE 9—Kilnageer Series (Deerpark Td.)

Horizon	Coarse sand (%)	Fine sand	Silt	Clay	pH	CEC (meq/ 100g,	TEB (meq 100g»	Base sat. (%)	C (%)	N (%)	Free iron f%)
Al	33	31	23	13	51	32-8	1.69	5	4-2	0-23	1.2
B2ir	36	37	20	7	5-2	21 2	0-57	33	1-7	0-23	1.1
B3ir	40	34	*22*	4	4-9	167	0-57	3	1 4	0-23	0.9
C	48	33	16	3	5-2	10-9	1.36	12	(IS		0.8

MountcoUins Series

Slope:	
Altitude:	290 feet (31 Mm) O.D.
Drainage:	Well drained
Parent Material:	Colluvium predominantly of Coal Measure Shale origin with some glacial drift admixture of Millstone Grit origin: of Saale Age
Classification:	Brown Podzotic; Typic Haplorthod

Horizon	*Depth cm I*	*Description*
All	0-10	Shaly, gravelly clay loam to loam; very dark greyish-brown (10 YR 3 2); moderate, fine crumb structure: friable: abundant, diffuse roots; gradual, smooth boundary to:
A12	10-17	Shaly, gravelly loam to clay loam; dark-grey (10 YR 4 1); moderate, fine crumb structure; friable; plentiful, diffuse roots; clear, smooth boundary to:
B2(ir)	17-26	Shaly clay loam; yellowish-red (5 YR 5/6); moderate, fine crumb structure; friable; plentiful roots; clear, smooth boundary to:
B C	26-48	Shaly loam to clay loam; yellowish-brown (10 YR 5 6); weak, fine crumb structure; friable; abrupt, smooth boundary to:
R	48	Shale bedrock

TABLE 10—Mountcollins Series

Horizon	Coarse sand '%)	Fine sand <".,)	**Silt (%)**	Clav (%)	**pH**	CEC (meq lOOg)	**TEB** (meq **100g)**	Base sat Co)	C **(%)**	N	**Free iron (%)**
All	7	**19**	46	28	5-5	**310**	**16-8**	54	**10-7**	**0-82**	**2-3**
A12	8	**22**	44	26	5-3	31 7	**12-4**	39	**8-9**	**0-57**	**2 7**
B2 (ir)	14	**12**	44	30	5-5	**18-9**	**4 0**	21	3-6	**0-20**	**3-6**
B C	24	**11**	39	26.	5-4	**117**	2-8	24	2-5	**015**	**21**

Wardhouse Scries

I.ocation:	Wardhouse I'd.; Leitrim 1 I! Id T
Topography:	Kame and Kettle
Slope:	7 and 8
Altitude:	50 ft (15 m)O.D.
Drainage:	Well drained
Parent Material:	Glacial drift derived from carboniferous sandstone with some shale (usually calcareous)
Classification:	Brown Podzolic; Typic Haplorthod

Horizon	*Depth cm* I	*Description*
All	0-18	Sandy loam; dark brown (10 YR 4 3); weak fine and medium crumb; verj friable' abundant fine and very fine roots; clear smooth boundary to:
A12	18-30	Sandy loam; dark yellowish brown (10 YR 4 4) with some slightly darker patches; weak medium subangular blocky breaking to moderate fine crumb: very friable; plentiful very fine and fine roots; clear wavy boundary dipping to 40 cm in parts of profile face:
B21ir	30-47	Sandy loam; dark yellowish brown (10 YR 4 4 5 8); weak medium subangular blocky breaking to moderate medium crumb; very friable; plentiful very fine and fine roots; smooth boundary to:
B22ir	47-75	Sandy loam; strong brown (7 5 YR 5 6); weak medium subangular blocky breaking to moderate medium crumb; very friable; common very fine and fine roots; gradual smooth boundary to:
B I	> 75	Sandy loam; yellowish brown (10 YR 5 8); weak medium crumb to single grain; very friable; very few fine roots

TABLE 11—Wardhouse Series (Wardhouse Td.)

Horizon	Coarse sand	Fine sand (%)	Silt	Clay	PH	fmeq/ lOOg)	TEB (meq / lOOg)	Base vIT 1	C (%)	N (%)	Free iron (%)
All	16	43	24	17	5-2	241	5-46	23	4-4	0-33	1-9
A12	16	41	2?	18	5-6	17 2	5-80	34	1.9	0 1 0	2-4
B21ir	15	42	25	18	5-8	15-3	5-99	39	1-6	0 1 2	2 4
B22ir	24	31	30	15	6 1	15-8	4-93	51	1-4	0 0 6	2-3
B/C	28	31	30	11	6-3	9-4	4 0 5	45	0 7		1-6

Ballinamore Series

Location:	Cleendargan Td.; Leitrim 25 A 3 *V.*
Topograph) :	Drumlin
Slope at Profile Site:	5
Altitude:	330 ft (104 mi O.D.
Drainage:	Poor
Parent Material:	Glacial till dominantly of calcareous shale with some sandstone and siliceous limestone influence, some fossilised shell fragments present
Classification:	Gley; Alfic Haplaquept

Horizon	*Depth cm i*	*Description*
Al	0-5	Clay loam; dark greyish-brown (10 YR 4 2) with iron staining on root channels; weak medium subangular blockv structure: friable; abundant very fine and fine roots; clear smooth boundary to:
A2g	5-21	Clay loam; greyish brown (25 Y 5 2) with many medium prominent yellowish red (5 YR 4 8) mottles: very weak medium sub-angular blockv structure; friable; frequent roots; abrupt smooth boundary to:
Btg	21-52	Clay; grey (5 Y 6 1 I with fine and medium prominent yellowish brown (10 YR 5 4) mottles; massive tending to very weak coarse prismatic-structure; grey coating on ped faces; slightly sticky, plastic; common roots often penetrating along structural cracks; gradual smooth boundary to:
Cg	52-129	Silty clay loam; grey (N 6 0) with many medium prominent olive brown (25 Y 4 4) mottles; massive tending to form coarse prisms; sticky, plastic; large alder roots appearing in lower part of horizon

TABLE 12—Ballinamore Series (Cleendargan Td.)

Horizon	**Coarse sand**	**Fine** sand **(%)**	Silt	Clay	**pH**	(E< (meq **lOOg)**	**C**	**N**	**Free iron**
Al	**8**	**13**	43	36	7 1	**23-6**	**3 0**	**0-27**	**14**
A2g	**9**	14	45	32	6 0	**23-6**	**2-6**	**0-30**	**0-8**
Btg	**9**	7	**38**	46	5-8	**18 2**	**0-9**	**nd**	**21**
Cg	**15**	4	44	37	6-7	**13-8**	**0-3**	**ad**	**4 1 !**

Ballinamore Series

Ivocation:	Dromore Td.: Leitrim IS C 3 P
Topography:	Drumlin
Slope at Profile Site:	6
Altitude:	330 ft (104 m) O.I).
Drainage:	Poor
Parent Material:	Glacial till derived mainly from Carboniferous siliceous limestone and shale with some sandstone influence
Classification:	Gley; Alfic Haplaquept

Hon son	*Depth (cm)*	*Description*
Al	0-15	Loam; dark brown (10 YR 3 3) with common prcominent medium strong brown (75 YR 5 6) mottles along root channels;; weak fine and medium subangular blocky; friable; abundant very fine" and fine roots; clear wavy boundary to:
A2g	**15 2S**	Loam; greyish brown (25 Y 5 2) with common diistinct fine strong brown (7-5 YR 5 6) mottles; weak medium subangular blocky; firm; frequent very fine and fine roots; clear wavy boundary to::
Bg	**28-60**	(."lay: very dark grey (N 3 0) with many distinct coarse strong brown (7 5 YR 5 6) mottles; massive; slightly sticky; sllightly plastic, common very fine roots; gradual smooth boundary to:
Cg	**60-120**	Clay loam; very dark grey (N 3 0) with common distinct medium brown to dark brown (7-5 YR 4 4» mottles: massive: sticky, plastic; few very fine roots.

TABLE 13—Ballinamore Series (Dromore Td.

Horizon	Coarse sand (%)	Fine sand	Silt	Clav	pH	CEC (meq/ 100g)	C	N (%)	Free iron
Al	16	30	41	13	5-3	292	5-9	0-52	0-7
A2g	27	24	29	2d	5-8	18-2	1 4	017	0-8
Bg	11	14	34	41	5-9	160	0 7	nd	3-8
Cg	16	15	34	35	7 0	240	1 0	015	4-4

Ballinamore

Location:	Mullagh Td.; Leitnm 15 A 3 I
Topography:	Drumlin
Slope at Profile Site:	12
Altitude:	150ft(46m)O.D.
Drainage:	Poor
Parent Material:	Glacial till derived mainly from Carboniferous siliceous limestone with some shale, sandstone and gneiss influence.
Classification:	Gley; Alfic Haplaquept

Horizon	*Depth (cm)*	*Description*
Al	0-12	Loam; brown to dark brown (10 YR 4 3) with common prominent fine strong brown (7 5 YR 5 6) mottles along root channels; very weak medium subangular blocky; slightly sticky, slightly plastic: abundant very fine and fine roots; abrupt wavy boundary to:
A2g	12-25	Clay loam; greyish brown (25 Y 5 2) with common prominent medium strong brown (75 YR 5 6) mottles especially along root channels; massive; slightly sticky, slightly plastic; frequent very fine and fine roots; clear wavy boundary to:
Bg	25-55	Clay loam to clay; grey to dark grey (N 5 0-4 0) with many prominent medium strong brown (7-5 YR 5 6) mottles; massive; slightly sticky, plastic; common very fine roots; gradual smooth boundary to:
Cg	55-130	Clay loam: dark grey (10 YR 4 1) with few faint medium yellowish brown (10 YR 5 8) mottles; massive; sticky, plastic; few very fine roots; few fragments of coarse decaying roots

TABLE 14—Ballinamore Series (Mullagh Td.)

Horizon	Coarse sand	Fine sand	Silt	Clav	pH	CEC (meq 100g)	C	N (%)	Free iron
Al	16	33	30	21	5-6	624	9-3	0-88	21
A2g	20	21	2^	30	5-7	198	1 1	018	3 :
Bg	I0	17	33	40	6-6	188	0-3	nd	4-0
Cg	8	31	33	28	7-6	19-6	0-4	ad	3-8

Ballinamore Series

Location: Kinvarra Glebe 'I'd.; Leitrim 11 A 17 C
Topography: Drumlin
Slope: **10**
Altitude: 580 ft (177 m) O.D.
Drainage: Poor
Parent Material: Glacial drift derived from Carboniferous lirrnestone with some gneiss influence
Classification: Gley; Alfic Haplaquept

Horizon	*Depth < m*	*Description*
Al	**0-13**	Sandy clay loam; dark brown (**10** YR 3 3): we;ak fine and medium crust; friable; few medium and coarse roots; abumdant verv fine and fine roots; clear smooth boundary to:
V2g	**13-18**	Sandy loam; greyish brown **(10** YR 5 2) coan-se sandy loam with many fine prominent sharp yellowish red (5 YR 4 6) mottles: weak coarse crumb; friable; few medium and coarse roots; frequent fine and verv fine roots; clear smooth boundary to:
B21g	**18-40**	Clay; dark grey (2 5 Y 4 0); sandy influence in places; many fine and medium prominent clear yellowish red (5 YR. 5 8) mottles; verv weak coarse prismatic structure breaking to weak i medium angular blocky; slightly sticky, very plastic; common very fine aind fine roots, few medium roots; many micro discontinuous horizontal iinped pores; clear wavy boundary to:
B22g	40-60	Clay; dark grey (25 Y 4 0) with few fine prominent sharp yellowish red (5 YR 5 8) mottles; very weak medium^ angular blocky; sticky, very plastic; few medium roots; many micro discontinuous horizontal inped pores; clear wavy boundary to:
Cg	>60	Clay loam; dark grey (25_ Y 4 6) with many i medium prominent clear strong brown (75 YR 5 6) mottles; massi\\e; sticky, very plastic; common old decaying roots; many micro randdom discontinuous inped pores:
		Depth of profile pit = 90 cm

TABLE 15—Ballinamore Series (Kinvarra GWebe)

Horizon	Coarse sand 1%)	Fine sand (%)	Silt (%)	Clav Co)	pH	(meq ' lOOg)	TEB (meq / 100g)	Basse sat. (%))	C (%)	N (%)	Free iron (%)
Al	34	IS	21	27	5-5	320	910	2s	6-2	0-39	(IS
A2g	52	18	17	13	5-8	150	4-78	32	20	016	11
B21g	13	15	25	47	6-2	21-2	10-83	51	0-7		2-6
B22g	11	10	36	43	7-2	24-6	14-55	59	0-9		12
Cg	11	12	38	3>	MI	20-8	1411	68	D4		2-3

Ballinamore Series

I.<>iatinn	Edenvella Td.: Leitrim 2 A 10 T
Topographv	**Drumlin**
Slope:	**2**
Altitude:	**95 ft (29 m) O.I).**
Drainage:	Poor
Parent Material;	Glacial drift derived from limestone, calcareous sandstone and shale
Classification:	Gley; Alfic Haplat|iiept

Horizon	*Depth cm*	*Description*
All	**0-9**	Fine Bandy loam: dark brown (10 YR 4 3I: verv weak fine medium crumb; non sticky, slightly plastic; abundant very fine to medium roots; clear wavy boundary to:
\12L<	**9 22**	Sandy loam; greyish brown (2 5 Y 5 2) with common fine and medium distinct strong brown (75 YR 5 6) mottles especially along root channels; medium subangular blocky; fairly friable; few very fine discontinuous random pores; abundant very fine to medium roots; gradual smooth boundary to:
H21K	22 35	Loam including small sandy pockets gray\ iN 5 <)i with main medium and coarse prominent clear strong brown (7 5 YR 5 8) mottles: weak very coarse prismatic; sticky, plastic; few medium discontinuous pores; few fine medium roots; gradual smooth boundary to:
H22g	**35 5!**	Clay loam; dark grey (N 4 0) with many medium coarse prominent clear strong brown (7 5 YR 5 6) mottles; weak very coarse prismatic and massive; sticky, plastic; medium fine roots; gradual smooth boundary to:
Cg	**55 S7**	Gravelly claay loam: dark grey (X 4.0) with manv medium and coarse prominent clear yellowish brown to dark yellowish brown (10 YR 5 6-4 4) mottles; massive: sticky, plastic: rare medium and fine roots

TABLE 16—Ballinamore Series (Edenvella Tdj

1lonzon	sand	Fine sand	Silt	Clav	pH	CEC (meq lOOg)	TEB (meq lOOg,	Rase	C	\	Free iron
All	27	4li	22	11	5.9	**18 8**	**10-93**	58	4 2	0-28	0 4
A12g	29	36	21	14	5-9	**10-2**	6-99	69	17	**007**	tlh
H21g	22	35	20	25	6-3	**10-9**	9-73	89	0-5		1 *h*
B22g	13	24	25	38	7 5	15 8	17-56	sat.	HI		2 2
Cg	**13**	IS	28	41	8 0	**14 1**	**1600**	sat	0 4		17

Drumkeeran Series

Location: I.isgavneen Td.; Leitrim 17 B 9 I)
Topography: Drumlin
Slope: 5
Altitude: 475 ft (145 m)().D.
Drainage: Poor
Parent Material: Glacial drift derived from Upper Carboniferous shale with some conglomerate and sandstone influence
Classification: Gley; Alfic Haplaquept

Horizon	*Depth ' cm i*	*Description*
All	0-5	Silty clay; very dark greyish brown (10 YR 3 2); weak fine subangular blocky; friable; abundant very fine roots; clear smooth boundary t>
A12g	5-15	Silty clay; very dark greyish brown (10 YR 3 2); weak fine subangular blocky; friable; abundant very fine and few fine roots; abrupt smooth boundary to:
B2g	15-36	Silty clay; greyish brown (10 YR 5 2) with many medium and coarse prominent sharp yellowish red (5 YR 5 8) mottles; weak coarse prismatic-breaking to weak coarse angular blocky; slightly sticky, slightly plastic; Jen fine and very fine roots; clear wavy boundary to:
B3g	36-50	Silty clay; very dark greyish brown (10 YR 3 *2)* with many medium and coarse prominent sharp yellowish red (5 YR S 8) mottles—many occurring along root channels; weak coarse prismatic breaking to weak coarse angular blocky; sticky, plastic; few fine roots; gradual wavy boundary to:
Cg	> 50	Silty cla> ; very dark brown (10 YR 2 2) with many coarse prominent and sharp yellowish red (5 YR 5/8) mottles; massive; sticky, plastic; abundant weathering shale fragments; large old roots: Depth of profile pit = 90 cm

TABLE 17—Drumkeeran Series (Lisgavneen Td.)

Horizon	Coarse sand	Fine sand	Silt	Clav	pH	CIA (meq/ lOOg)	TEB (meq, lOOg)	Base sat.	C	N	Free iron
All	5	8	43	44	4-5	490	3-95	8	9-8	0-86	12
A12	3	8	43	44	4*.	46-8	2-21	5	5-9	0-58	14
B2g	2	3	43	52	4-8	28-4	2-54	9	10	018	1-4
B3g	1	2	42	33	4-7	320	3-42	11	12	0-23	2-4
•eg	3	8	44	45	4-7	33-6	3-86	11	1-7	0 24	2-6

Drumkeeran Series

Location:	Drumduffy I'd.; Leitrim 15 1) 19 S
Topograph) .	Drumlin
Slope at Profile Site:	9
Altitude:	270 ft (82 m) O.D.
Drainage:	Poor
Parent Material:	(ilacial till derived mainly from Upper Carboniferous shale with some sandstone and conglomerate influence
Classification:	(ile>•; Alfic Haplaquept

Horizon	*Dtptli tin*	*Description*
Al	0-9	Silty clay; dark greyish brown to brown (10 YR 4 2 4 3) with many prominent medium strong brown (75 YR 5 6) mottles along root channels; weak fine subangular blocky; friable; abundant very fine and fine roots; clear wavy boundary to:
A2g	9 27	Clay loam; grey (N 5 0) with common distinct fine strong brown (75 VR 5 6) mottles; weak coarse subangular blocky; firm; frequent very fine and fine roots; abrupt smooth boundary to:
BR	27-50	Clay; grey (N 5 0-10 YR 5 1) with many prominent medium yellowish red (5 YR 5 8> mottles; weak coarse prismatic tending to massive; sticky, plastic; common very fine and fine vertical roots; gradual smooth boundary to:
Clg	50 70	Clay loam; very dark grey (N 3 0) with many prominent medium yellowish red (5 YR 5 8) mottles; many decaying shale fragments; massive; sticky, plastic; common very fine vertical roots; gradual smooth boundary to:
C2g	70-100	Clay loam; colour, structure and consistency similar to Clg; frequent decaying shale fragments; few very fine roots.

TABLE 18—Drumkeeran Series (Drumduffy Td.)

Horizon	Coars< sand	sand	Silt	**Ckq**	pH	(meq 100g)	C	N	Free iron (%)
Al	9	1	4?	45	5-7	33-6	7-9	**0-71**	1*8
A2g	12	15	34	39	5-3	21 8	1-8	0 **28**	2-6
Bg	5	7	38	50	5-6	19-8	11	**018**	44
Clg	4	15	33	48	5-4	**210**	0-9	nd	44
C2g	7	19	37	37	5-8	23 2	12	0 19	4 4

Drumkeeran Series — Peaty Phase

Location:	TuUy Td.; Leitrim 7 A 18 (J
Topograph) :	Mountain slope
Slope:	3
Altitude:	550 ft (168 m) O.D.
Drainage:	Poor
Parent Material:	Glacial drift derived from Namurian shale with some limestone conglomerate and sandstone influence
Classification:	Peaty Gley; Histic Humaquept

Horizon	*Depth* <»:	*Description*
o	12-0	Clay; dark yellowish brown (10 YR 3 4); weak fine crumb; fairly friable; colour changes to very dark brown (10 YR 2 2) between 9 and 12 cm; abundant very fine to medium roots; clear wavy boundary to:
B1g	**0-28**	Clay; light brownish grey (25 V 6 2) with many fine to coarse prominent sharp Strong brown (7 5 YR 5 8) mottles; weak coarse prismatic; massive within prisms; slightly sticky, plastic; common fine and medium roots; mottles often follow root channels: clear smooth boundary to:
B2g	**28-53**	Clay; dark grey (N 4 0) with many coarse prominent clear strong brown (7 5 YR 5 6—5 8) mottles; weak coarse prismatic; medium to coarse decaying roots; rare fine living roots; gradual boundary to:
B3g	**53-71**	Silty clay; black (X 2 0); massive; stickv. plastic; common fine to medium decaying roots with common medium and coarse prominent sharp strong brown (7 5 YR 5 8) mottles along root channels; no living roots; clear smooth boundary to:
C	**71-80**	Gravelly clay loam; dark grey (10 YR 4 1); massive; sticky, slightly plastic; no roots; calcareous below 63 cm

TABLE 19—Drumkeeran Series — Peaty Phase (Tully Td.

Horizon	sand	Fine sand	**S.lt**	Clay	**pH**	**CEC (meq**	**TEB (meq 100g)**	Base sat.	**C**	N	Free **iron**
O	s	7	2s	57	**4 3**	**70-5**	**3-75**	**5**	**20-4**	**0-80**	**3 4**
Big	5	3	33	59	4 4	**34-4**	**5-80**	**17**	**0-9**	**007**	**2-5**
B2g	1	1	2s	70	**5-4**	**36-4**	19-47	**53**	**1-7**	**011**	**6 0**
B3g	5	4	43	48	**6-3**	**41-0**	**31-20**	**76**	0.5	**010**	**2 0**
C	31	10	24	**35**	**7-6**	**10-9**	**12-92**	**sat.**	**11**		**1-5**

Gawagh Series

Ivocation:	Creevy Td.; Leitrim 25 A S Z
Topography:	Drumlin
Slope at Profile Siti :	5
Altitude:	310 ft (94 m) O.D.
Drainage:	Poor
Parent Material:	Glacial till dominantly of siliceous limestone composition with some sandstone and shale influence, some fossils e.g. crinoids also present.
Classification:	Gley; Alfic Haplaquept

Horizon	*Depth (cm)*	*Description*
\1	0-10	Loam; brown to dark brown (10 YR 4 3) with strong brown (7-5 YR 5 6) mottles along root channels; weak fine granular and sub angular blocky structure; no pores visible; slightly sticky; slightly plastic; abundant very fine and fine roots; abrupt smooth boundary to:
A2g	10-18	Cherty loam; brown to dark greyish-brown (10 YR 4/3—4/2) with strong brown (7 5 YR 5 6) mottles along root channels, weak fine to medium sub angular blocky structure; few pores visible; friable; frequent very fine roots; abrupt smooth boundary to:
Big	18-35	I^oam; grey (10 YR 6/1) with many fine prominent (7 5 YR 5/6) mottles; moderate coarse prismatic structure; few pores visible; slightly sticky, plastic; common vertical roots; clear smooth boundary to:
B2tg	35-70	(lay loam; grey to dark grey (N 5 0-4 0) with many fine prominent (7-5 YR 5/6) mottles; structure visible as grey (N 5 0) silt-clay skin coating on vertical cracks, complete peds difficult to observe but are probably moderate coarse prismatic; slightly smooth boundary to:
Cg	70-95	Clay loam; dark grey (N 4 0) with many fine prominent (10 YR 5/6) mottles; massive; sticky, plastic; few decaying coarse root fragments

TABLE 20—Garvagh Series (Creevy Td.)

Horizon	Coarse sand (°o)	Fine sand *(%)*	Silt	Clav (%)	pH	CEC (meq 100g)	**C** (%)	**N (%)**	Free iron (%)
\1	lf»	IS	44	22	65	23-2	5-2	0 48	0-5
A 2	27	23	$4	16	6-5	9-4	14	016	14
Big	21	20	38	21	6-8	7-6	0-5	nd	4-0
H2tg	is	14	34	34	6-9	13-4	0-4	nd	3-7
Cg	*2u*	12	33	35	7-3	13-8	0-6	nd	3-9

Garvagh Series

Location: Aghoo Last 'I'd.; Lcitrim 25 I 32 T
1 opograph) . Drumlin
Slope of Profile Site 6
Altitude: 300 ft (91 m) O.I).
Drainage: Poor
Parent Material: Glacial till dominantlv of siliceous limestone composition with some sandstone influence, fossils, e.g. crinoids, alscP present
Classification: Gley; Alfic Haplaqucpt

Horizon	*Depth cm*	*Description*
All	0 14	Silt loam; dark greyish-brown (10 YR 4 22) with strong brown (7:> YR 5 6) mottles along root channels; wes^» fine granular and sub-angular blocky structure; no pores visible; triable; abundant very fine and fine roots; abrupt smooth boundarv to:
A12	14 19	Cherty loam; similar to above in colour, .structure and consistency; abundant fine roots; abrupt smooth boundary to:
A2g	19-23	Cherty loam; light grey to grey (10 YR 6/1); massive; few pores visible; frequent fine roots; clear wavy boundarv to:
Big	23-31	Cherty silt loam; grcv (10 YR 5 1) with many fine prominent (7o \R mottles; strong coarse prismatic stru<cture: ^rm< common fine vertical roots; clear smooth boundary to:
B2tg	31-45	Cherty loam; dark greyish brown to dark- brown (10 YR 4/2-3/3) with many fine prominent strong brown (7-5 YR 5/6) mottles; structure visible as grey (N 5/0) clay skin coated verbal cracks, complete peds difficult to observe but are probably strong coarse prismatic; sticky, plastic; few fine vertical roots; clear smooth iboundary to:
Cg	45-120	Clay loam; light brownish grev (25 Y 6 2) with many fine prominent strong brown (7 5 YR 5 6) mottles; structureless; massive; sticky, plastic; very few fine roots

TABLE 21—Garvagh Series Aghoo East: Td.)

Horizon	sand	Pine sand	Silt	Clay	pH	CEC (meq lOOg)	**(%)**	**N (%)**	Free iron **(%)**
All	17	19	50	14	**5-6**	182	4-9	0-35	0 2
A12	33	17	39	11	5-3	15.0	4 0	0-25	0-2
A2	30	16	**45**	9	5-6	3-6	0-7	nd	0-3
Big	17	is	**51**	14	5-5	6-8	0-4	nd	1-4
B2tg	17	16	**44**	23	5-4	7-2	0-5	nd	1 0
Cg	1"	15		30	5-2	100	**0-5**	nd	1-7

Garvagh Series

Location:	Drumhierney Td.; I^itrim 27 B 1 T
Topography:	Drumlin
Slope:	6
Altitude:	200 ft (61 m) O.D.
Drainage:	Poor
Parent Material:	Glacial drift derived from Visean (Lower Carb.) fossiliferous and chertr limestones. Calciferous sandstones of the Boyle Sandstone Group (Visean) are also present in the drift
Classification:	Gley; Alfic Haplaquept

Horizon	*Depth (cm)*	*Description*
Al	0-17	Clay loam; brown to dark brown (10 YR 4 3) weak fine crumb becoming subangular blocky with depth; fairly friable; abundant fine to coarse roots; clear wavy boundary to:
Big	17-27	Clay loam; dark yellowish brown (10 YR 4, 4); few medium faint yellowish brown (10 YR 5/6) mottles; moderate medium and coarse sub-angular blocky; fairly friable; plentiful medium and fine roots; clear sharp boundary to:
B2g	27-60	Clay; grey (10 YR 5/1); many prominent coarse strong brown (7 5 YR 5/6) mottles; massive; sticky, plastic; common vertical roots; clear smooth boundary to:
B3g	60-105	Clay; grey (N 5/0); many prominent coarse brown to dark brown (7-5 YR 4/4) mottles; massive; sticky, plastic; few vertical roots; clear smooth boundary to:
Cg	>105	Parent Material

TABLE 22—Garvagh Series (Drumhierney Td.)

Horizon	Coarse sand (%)	Fine sand (%)	Silt (%)	Clay* (%)	pH	CEC (meq/ 100g)	TLB (meq/ 100g)	Base sat. (%)	C (%)
Al	16	17	2S	39	4-5	41 0	8-54	21	48
Big	19	16	29	36	5-2	25-5	10-20	4U	2 2
B2g	11	11	33	45	6-2	23-5	17-51	75	07
B3g	9	10	38	45	6-5	24-8	21-93	88	0-6
C	9	13	42	36	6-7	21-8	2307	.sat.	07

*Clay content in this profile is higher than the normal range within the Garvagh Series.

Howards town Series

Location: Donagh Beg Td.; Leitrim 11 B 30 J).
Topography: Drumlin
Slope: 7
Altitude: 270 ft (82 m) O.D.
Drainage: Poor
Parent Material: Glacial drift derived from sandstone, shale ar,d conglomerate (frequently calcareous)
Classification: Gley; Alfic Haplaquept

Horizon	*Depth (cm)*	*Description*
All	0-6	Clay loam; dark brown (10 YR 4 3): weak fine crumb developing to weak fine subangular blocky lower down; fairly friable; abundant verj fine and fine roots; clear wavy boundary to:
A12g	6-23	Clay loam; greyish brown (25 Y 5 2); weak medium subangular blocky; friable; many micro and very fine discontinuous random transped pores; plentiful fine and very fine roots; clear wavy boundary to:
B2g	23-55	Clay; light yellowish brown (2 5 Y 6/4) with common fine prominent clear very dark grey (2 5 Y 3/0) mottles; weak coarse prismatic breaking to weak coarse subangular blocky; fairly firm; many micro and very fine random transped pores; common fine and very fine roots; gradual boundary to:
B3g	55-70	Clay; light olive brown (2 5 Y 5 4) with m«,ny coarse prominent clear yellowish brown (10 YR 5 6) mottles and coinrnon medium prominent sharp very dark brown (10 YR 2/2) mottles; many micro and very fine random transped pores; weak coarse prisniatic and massive; sticky, plastic; common decaying roots; rare very line living roots; clear waw boundary to:
Cg	70-95	Clay; massive; sticky, plastic; colour similar to above horizon; slightly calcareous at 90 cm

TABLE 23—Howardstown Series (Donagh Beg, Td.)

Horizon	Coarse sand (°/o)	Fine sand (°o)	Silt	Clav (°o)	pH	CEC (meq/ 100g)	TUB (m«;q / 100g)	Base sat. (%)	C (%)	Free iron (°u)
All	11	14	37	38	6-6	94-5	25-99	28	7-9	1-2
A12g	17	13	33	37	5-3	24 1	904	38	2 1	2()
B2g	11	11	33	45	5-6	18 8	11 19	60	0-5	1-6
B3g	10	11	35	44	6-5	21 2	15 66	74	0-4	17
Cg	10	10	37	43	7-5	22-8	20 22	89	1)4	1-5

Howardstovm Series

location:	Drumod Beg Td.; Leitrim 35 D 1 K
Topograph) :	Drumlin
Slope:	5^{C}
Altitude:	180 ft (55 m)O.D.
Drainage:	Poor
Parent Material:	Glacial drift derived from Carboniferous limestone and sandstone
Classification:	Gley; Typic Haplaquept

Horizon	*Depth (cm)*	*Description*
A_{PK}	0-8	Sandy loam; dark greyish brown (10 YR 4 2); common fine distinct clear strong brown (7 5 YR 5 6) mottles especially along root channels; weak very fine and fine subangular blockv; fairly friable; few micro and very fine random inped pores; abundant fine and very fine roots: clear smooth boundary to:
A12g	8-33	Sandy loam; dark greyish brown (10 YR 4/2); common fine to medium distinct clear strong brown and dark brown (7-5 YR 5/6 and 4 4) mottles; very weak fine to medium subangular blockv; friable; few micro and very fine random inped pores; plentiful fine and very fine roots; clear wavy boundary to:
Bg	33-55	Clay loam; dark yellowish brown (10 YR 4/4) with small localised grey (5 Y 5/1) patches sometimes following root channels; weak fine to medium subangular blocks; few yellowish brown (10 YR 5/6) ped cutans; slightly sticky, slightly plastic; common micro very fine discontinuous random inped pores; common very fine roots; gradual smooth boundary to:
B/Cg	55-75	Sandy clay loam; dark yellowish brown (10 YR 4 4); weak coarse prismatic with olive grey (5 Y 5/2) coating on ped faces; common very-fine and fine random inped tubular pores; slightly sticky, plastic; few very fine roots; sandstone boulders below

TABLE 24—Howardstown Series (Drumod Beg Td.)

Horizon	Coarse sand (%)	Fine sand (%)	Silt (%)	Clav (%)	pH	CEC (meq lOOg)	TEB (meq 100g)	Base sat. (°o)	C (%)	N (%)	Free iron (%)
A_P	**17**	37	29	17	5-2	241	803	33	4-4	0-43	**O.8**
A12g	**20**	38	24	IS	5-2	15-8	6-35	40	2 1	0-22	**O.8**
Bg	**\h**	26	29	29	5-8	141	9-86	**7(1**	0.5		21
B/Cg	2+	23	27	27	6-2	13-7	1117	82	0-5		15

Kiltyclogher Series

Location:	Brockagh Lower Td.; Leitrim 30 A 8 V
Topography:	Drumlin
Slope:	**4°**
Altitude:	280 ft (85 m) O.D.
Drainage:	Poor
Parent Material:	Glacial drift derived mainly from Namurian sandstone and conglomerate with some shale
Classification:	Gley; Alfic Haplaquept

Horizon	*Depth (cm)*	*Description*
All	0-3	Sandy loam; very dark brown (10 YR 2/2); light brown water escapes after squeezing, very weak fine crumb; abundant very fine to medium roots; clear smooth boundary to:
A12	3-15	Sandy loam; dark greyish brown (10 YR 4/2) with common fine distinct clear dark brown (75 YR 4 4) mottles especially along root channels; weak medium subangular blocky breaking to weak fine crumb; fairly friable; abundant fine to medium roots; clear wavy boundary to:
B2g	15-38	Sandy clay to clay loam; greyish brown (25 Y 5/2) with many coarse prominent clear strong brown (7-5 YR 5 8) mottles; weak coarse prismatic; massive within prism; slightly sticky, plastic; rare micro and very fine random pores; common very fine and medium roots also decaying fine roots; gradual smooth boundary to:
B3g	38-80	Clay loam; dark grey (N 4/0) with mottling similar to upper horizon structure similar to above; sticky, plastic; plentiful decaying fine and medium roots; gradual smooth boundary to:
Cg	80-100	Clay to clay loam; dark grey (N 4/0) with many coarse distinct clear olive brown (2-5 Y 4/4) mottles; massive; sticky, plastic; common decaying fine and medium roots

TABLE 25—Kiltyclogher Series (Brockagh Td.)

Horizon	Coarse sand (%)	Fine sand (%)	Silt (%)	Clay- (%)	pH	CEC 1 meq lOOg)	TEB (meq lOOg)	Base sat. (%)	C (%)	Free iron (%)
All	28	39	17	16	4-3	40-8	8-46	21	9-6	0-6
A12	33	37	17	13	4-4	20-5	1-64	S	2-9	0-6
B2g	20	25	17	38	4-6	22-2	4-96	22	0-8	2-7
B3g	18	20	24	38	60	21-8	14-62	70	0-7	2-4
Cg	15	19	26	40	6-9	19-9	15-32	77	0-7	21

Rinnagowna Series

Location: Beihy Td.; Leitrim 37 A 28 H
Topography: Drumlin
Slope: 5°
Altitude: 210 ft (64 m) O.D.
Drainage: Poor
Parent Material: Glacial drift derived from calcareous sandstone and conglomerate, arkose and grit
Classification: Gley; Alfic Haplaqucpt

Horizon	*Depth (cm)*	*Description*
All	0-10	Sandy loam; greyish brown to brown (10 YR 5 2-4 3); weak fine crumb; slightly sticky, slightly plastic; abundant very fine and fine roots; clear smooth boundary to:
A12g	10-25	Sandy loam; greyish brown (10 YR 5/2) with many fine distinct sharp strong brown (7-5 YR 5/6) mottles, many occurring along root channels; weak fine subangular blocky; non-sticky, slightly plastic; few very fine discontinuous random inped pores; abundant fine and very fine roots; abrupt smooth boundary to:
B21g	25-55	Sandy clay loam; weak red (2-5 Y 5/2) with many coarse prominent clear strong brown (7-5 YR 5/6 and 5/8) mottles; weak coarse prismatic-breaking to weak coarse angular blocky; non sticky, slightly plastic, common very fine discontinuous random inped pores; common fine and very fine roots; gradual smooth boundary to:
B22g	55-95	Clay loam; grey (N 5/0) with many coarse prominent clear strong brown (7-5 YR 5/6) mottles; weak coarse prismatic; sticky, plastic; few very fine discontinuous random inped pores; localised areas of clay accumulation; few decaying roots; common very fine roots; clear smooth boundary to:
Cg	>95	Clay loam; grey to dark grey (N 5/0-4/0); massive; sticky plastic; contains patches of coarse sand; common decaying roots; remains of alder stems broken off 40 cm above their roots

TABLE 26—Rinnagowna Series (Beihy Td.)

Horizon	Coarse sand (%)	Fine sand (%)	Silt (%)	Clay (%)	pH	CEC (meq/ 100g)	TEB (meq/ 100g)	Base sat. (%)	C (%)	N (%)	Free iron (%)
All	25	33	27	15	5-1	22-8	6-26	27	5-3	0-25	0-3
A12g	27	31	26	16	50	291	4-58	16	20	012	0-4
B21g	24	23	27	*26*	6-3	9-7	7-94	82	0-5		1-5
B22g	16	22	24	38	7 0	14-9	12-36	83	0-4		1-7
Cg	20	23	28	29	6-3	12-4	8-88	72	0-6		12

Ballvhaise — Corriga Complex — Ballyhaise Series

Location :	Beihy I'd.: Corramore, Leitrim 38 A 30 M
Topographv :	Drumlin
Slope:	2
Altitude:	210 ft (73 m) O.I)
Drainage:	Poor
Parent material:	Glacial drift derived from Ordovician greywackes, siltstones, mudstone and shales
Classification:	Gley; Alfic Haplaquept

Horizon	*Depth cm *	*Description*
All	0-10	Loam; dark brown (10 YR 4 3); weak fine and medium crumb; non sticky, slightly plastic; abundant very fine and fine roots; clear smooth boundary to:
A12g	10-20	Sandy loam; weak red (25 Y 5/2) with common fine distinct clear yellowish brown (10 YR 5 6) mottles especially along root channels; weak fine subangular blocky; friable; common very fine discontinuous inped pores; abundant very fine and fine roots; abrupt smooth boundary to:
B21g	20-50	Sandy clay loam; matrix consists of abundant coarse strong brown (7 5 S'R 5 8) mottles merging with each other with patches of olive grey (5 Y 5 *2)* intervening; weak coarse prismatic breaking to weak coarse angular blocky; common fine discontinuous inped pores; slightly sticky, slightly plastic; common fine vertical roots; clear smooth boundary to:
B22g	50-75	Clay loam; grey (25 Y 5 0) with common medium prominent clear strong brown (7 5 YR 5 6) mottles; weak coarse prismatic breaking to weak coarse angular blocky; sticky, plastic; few common very fine and few fine vertical roots; few fine decaying roots; clear smooth boundary to:
Cg	> 75	Clay loam; dark grey (N 4 0) with many medium prominent clear dark brown (75 YR 4 4) mottles; decaying limestone rock; massive; sticky, plastic; few fine roots and few decaying roots; calcareous
		Depth of pit—105 cm

TABLE 27—Ballyhaise — Corriga Complex — Ballyhaise Series (Beihy Td. Corramore)

Horizon	Coarse sand	Fine sand (%)	Silt (%J	Clav	pH	CEC (meq 100g)	TLB (meq lOOg)	Base sat. (%)	C (%)	N (%)	Free iron (%)
All	IS	2S	30	24	5-3	26-2	9-68	3 7	4-9	0-38	0 4
A12g	24	27	29	20	5-2	16 7	5 • 5 5	5 3	2 4	0 1 8	0-7
B21g	21	25	26	28	6-2	13 7	7-50	55	0 4		1 7
B22g	16	23	31	30	6-9	13 3	9-97	/ 5	0-5		1 2
Cg	In	22	30	32	7-3	13-3	1091	S2	0-6		1 5

Ballyhaise Series — Lithic Phase

Location:	Gortermore Td.; Leitrim 34 A 10 X
Topograph	Drumlin
Slope-:	3
Altitude:	370ft(113m)O.D.
Drainage:	Poor
Parent Material:	(ilacial drift derived from Ordovician greywackes, silts tones, mudstones, shales and sandstone.-
Classification:	Gley; Lithic Haplaquept

Horizon	*Depth cm)*	*Description*
All	0-10	Loam; dark brown (10 YR 3 3); very weak crumb; slightly sticky, slightly plastic; abundant very fine to fine roots: clear wavy boundary to:
A12g	10-17	Loam; dark greyish brown (10 YR 4 2) with much strong brown (75 YR 5 6) mottles along root channels; very weak fine subangular blocky and crumb; slightly sticky, slightly plastic; plentiful fine to medium mainly rush roots; clear wavy boundary to:
Bg	17 4(1	Loam; light olive brown (2 5 Y 5 4) with main medium and coarse prominent clear yellowish brown (10 YR 5 6) mottles; weak medium and coarse subangular blocky; fairly friable; many micro and fine random transped pores; common fine and medium roots; sharp boundarv to:
	40	Ordovician sandstone and shale

TABLE 28—Ballyhaise — Corriga Complex — Lithic phase Gortermore Td.

Horizon	Coarsi sand	Fine sand	Silt	C'lav	pH	CEC (meq 100g)	TEB (meq lOOg)	B.lSt. sat.	C	Free iron
All	14	19	41	2'.	5-2	49-6	15-39	31	103	os
A12g	is.	l'<	.is	25	51	27-3	4-58	17		0-9
Bg	20	20	34	2'-	48	21 8	1-33	6	2n	I t

Mortarstmvn — Kinvarra Complex — Mortarstown Component

Location: Ballinwing Td.; Leitrim 27 H 16 Y
Topography: Rocky lowland
Slope: 3
Altitude: 193 ft (59 m) O.I).
Drainage: Moderate
Parent Material: Glacial drift derived from Carboniferous limestone
Classification: Grey Brown Fodzolic; Typic Hapludalf

Horizon	Depth cm	*Description*
All	0-9	Clay loam; dark brown (10 YR 4 3); moderate fine to medium crumb; friable; lower half of horizon—dark greyish brown (10 YR 4 21 with many fine distinct strong brown (7*5 YR 5 6) mottles especially along root channels; abundant fine to very fine roots; clear smooth boundary to:
A12	9-23	Clay loam: dark yellowish brown (10 YR 4 4) ; weak medium subangular blocky to crumb; friable; many very fine random inped pores; frequent fine and very fine roots; clear smooth boundary to:
H21t	23-45	Clay; yellowish brown (10 YR 5 4-5 6); moderate medium subangular blocky; fairly firm; yellowish brown (10 YR 5 4) clay skins on peds; many fine random inped pores; common very fine roots; gradual smooth boundary to:
H22	45-60	Clay; dark brown (10 YR 3 3); weak coarse angular blocky to massive; firm; rare very fine roots; common micro random inped pores; clear smooth boundary to:
	60-75	Gravelly clay: dark grey (10 YR 4 1); massive; slightly sticky, slightly plastic; bedrock at 75 cm; no roots; calcareous

TABLE 29—Mortarstown — Kinvarra Complex — Mortarstown Component (Ballinwing Td.)

Horizon	sand	Fine sand	Silt	Clas	PH	CEC (meq 100g>	TEB (meq 100g)	Base	C	N	Free iron
All	24	17	29	30	5-3	31-5	8-73	2s	3-9	0-42	1-6
A12	20	17	30	33	4(i	22-2	736	33	17	0-20	1-8
B21t	15	13	31	41	5 1	20-5	3-73	IS	0 8		*22*
B22t	11	9	38	42	5-6				0-8		2 1
C	11	14	31	44	7-6				0 6		17

Mortarstown — Kinvarra Complex — Mortarstown Component

Location	Drumlease Td.; Leitrim 15 A 2 ()
Topography:	Undulating lowland
Slope at Profile Site	2
Altitude:	145 ft (44 m) O.D.
Drainage:	Well drained
Parent Material:	Glacial till derived mainly from Carboniferous limestone with influence from shales, sandstones and some metamorphic rocks
Classification	Grey Brown Podzolic; Typic Hapludalf

Horizon	*Depth cm >*	*Description*
Al	0-11	Clay loam; dark yellowish brown (10 YR 4 4-3 4) moderate fine subangular blocky; friable; abundant very fine and fine roots; clear smooth boundary to:
A2	11 22	Clay loam; dark yellowish brown (10 YR 4 4>; moderate medium subangular blocky; friable; frequent very fine and fine roots; gradual smooth boundary to:
B21t	22-38	Clay loam; brown to strong brown (75 YR 5 4—4 4> moderate to strong medium subangular blocky; firm; common very fine and fine roots; gradual smooth boundary to:
B22t	38-70	Clay loam; brown to strong brown (7-5 YR 5 4—4 4); moderate to strong medium subangular blocky; firm; common well developed clay skins, common very fine and fine roots; gradual wavj boundary to:
C	70-130	Clay loam; brown to strong brown (7 5 YR 5 4-4 4): few pockets of fine sand: massive; compact; very few very fine roots

TABLE 30—Mortarstown — Kinvarra Complex — Mortarstown Component
Drumlease Td.)

Horizon	Coarse sand (%)	Fine sand	Silt	Clav	pH	CEC (meq lOOg)	1	N	Free iron
Al	12	25	34	2S>	5-7	32-6	51	0-50	3-2
A2	17	21	35	27	5-8	24-6	1-9	0-25	5 7
B21t	11	20	35	34	60	16-6	(if.	nd	4-0
B22t	10	17	36	37	61	17-2	0-3	nd	4 1
C	15	17	37	31	6-2	13-8	0-3	(Hi	1-9

Mortarstown — Kinvarra Complex — Mortarstown Component

Location	Castlerog) Td.; l.eitrini 25 A 10 I.
Topography:	Indulating lowland sometimes broken hv rock outcrop
Slope at Profile Site	1 to 2
Altitude:	205 ft (62 ml O.I).
Drainage:	Well drained
Parent Material:	Glacial till dominantly of Carboniferous siliceous limestone with some sandstone influence, small fragments of fossilised crinoids present
Classification:	Grey Brown Podzolic: Typic Hapludalf

Horizon	*Depth cm* I	*Description*
A1	0-10	Loam; brown to dark-brown (10 YR 4 3 > with much brown (7 5 YR 5 *2*\ intermixed, iron mottles along root channels; moderate fine subangular blocky structure; friable; abundant diffuse very fine and fine roots: abrupt smooth boundary to:
\:	10-25	Loam with many chert pebbles; dark yellowish brown (10 YR 4 4>; weak fine subangular blocky structure; friable; plentiful fine roots mainly vertical, clear smooth boundary to:
m	25 27	Transitional to:
B2i	27 45	Clay loam; yellowish brown (10 YR 5 6); moderate to strong coarse angular blocky structure; clay skins; firm; common fine vertical roots; clear wavy boundary to:
B3	45 55	Sandy clay loam: yellowish brown to dark yellowish brown (10 YR 5 ') 4 4); weak medium angular blocky structure; friable; common fine roots; gradual smooth boundary to:
CI	KMl	Sandy clay loam; yellowish brown to dark-yellowish brown (10 YR 5 6-4 4); weak medium subangular blocky structure: slightly sticky. •slightly plastic; few fine roots; abrupt boundary to:
	Below 100	Siliceous limestone

TABLE 31—Mortarstown — Kinvarra Complex Mortarstown Component (Castlerogy Td.)

) lorizon	Coarse sand	line sand	**Silt**	Cla\	I'M	CEC Cmeq lOOg)	C	N	free **iron (%)**
AI	17	15	42	2o	5-6	24-2		0-45	2 2
A2	29	14	i>	22	5-7	190	M	0-26	2 4
B2t	20	10	35	35	; 4	17 2	0-7	nd	2-9
B3	44	12	22	22	5-7	110	IH,	ml	3-4
C	41	11	2 s	2n	6 1	10-6	0-9	nd	3 s

Mortarstown — Kirrcarra Complex — Mortarstown Component, imperfectly drained phase

Location:	Drumreilly 'I'd.; Leitrim 2> H 34 J
Topography:	Undulating lowland
Slope at Profile Siu-:	3
Altitude:	280 ft (85 m) O.D.
Drainage:	Imperfect
Parent Material:	Glacial till derived mainly from Carboniferous siliceous limestone with some influence from Carboniferous shales and sandstones
Classification:	Gley; Aquic Dystrochrept

Horizon	*Depth i m I*	*Description*
Al	0-16	Loam; dark greyish brown (10 YR 4 4) with few faint fine greyish brown (2-5 Y 5 2) mottles; weak fine subangular blockv; friable; abundant very fine and fine roots; clear smooth boundary to:
Be	16-50	Loam; yellowish brown (10 YR 5/8) with many faint coarse light brownish grey (2 5 Y 6 2) mottles; weak to moderate medium subangular blockv; friable to firm; few very fine and fine vertical roots; gradual smooth boundary to:
	50 115	Loam; brownish yellow to yellowish brown (10 YR 6 6-5 6); massive; compact: few v erv fine roots

TABLE 32—Mortarstown — Kinvarra Complex — Mortarstown Component, imperfectly drained phase (Drumreilly Td.)

Horizon	Coarse sand (%)	Fine sand (%)	Silt Co)	Clay (%)	pH	CEC (meq lOOg)	C (%)	N (%)	Free iron (%)
Al	29	19	34	15	5-2	16 6	5 2	0-29	0-9
Bg	31	15	40	14	5-3	6-4	0-4	nd	2 0
(	25	21	29	27	5-3	9-4	0-4	nd	2-7

Aiortarstown — Kinvarra Complex

Location:	Cappagh Td.; I-eitrim 32 D 26 E
Topography:	Drumlin
Slope:	7
Altitude:	240 ft (73 m) OH.
Drainage:	Imperfect
Parent Material:	Glacial drift derived from Carboniferous limestone with chert
Classification:	Brown Earth; Alfic Dystrochrept

Horizon	*Depth | cm)*	*Description*
Al 1	0-5	Clay loam; dark brown (10 YR 4/3); moderate very tine and fine crumb; friable; abundant very fine and fine roots; clear wavy boundary to:
A12	5-18	Clay loam (chertv in places); dark greyish brown (10 YR 4 2); moderate very fine and fine subangular blocky with some moderate very fine crumb; many micro and very fine random transped pores; very friable; abundant very fine and fine roots; clear wavy boundary to:
B21tu	18-35	Clay loam; yellowish brown (10 YR 5 4) with many medium faint clear yellowish brown (10 YR 5 6) mottles; weak fine subangular blocky, many micro and very fine random transped pores; fairly firm; common clay skins of similar colour to matrix; few very dark greyish brown (10 YR 3 2) decaying limestone fragments; common small fragments of chert; common very fine roots; clear wavy boundary to:
B22tg	35-60	Clay loam; yellowish brown (10 YR 5 4) with many fine and medium distinct yellowish brown (10 YR 5 6 and 5 8) mottles; weak medium subangular blocky; non sticky, slightly plastic; many micro and very fine random transped pores; common clay skins of similar colour to matrix; many black (10 YR 2/1) fine to coarse decaying fragments of limestone: few very fine roots; gradual smooth boundary to:
Cg	60-90	Gravelly clay loam to clay; light olive brown (2-5 Y 5 4); massive; firm, many micro to fine random pores; rare decaying and living roots; common decaying fragments of limestone

TABLE 33—Mortarstown — Kinvarra Complex (Cappagh Td.)

Horizon	Coarse sand (°o>	Fine sand (°o)	Silt (%)	Clav (%)	P\i	CEC (meq 100g)	**(meq** lOOg)	Base sat. (%)	C' (%)	Tree iron 1%)
All	12	17	36	35	5-3	410	16-71	41	5-4	1-5
A12	19	16	33	32	51	30-2	1113	37	3-2	1-6
B21tg	13	14	35	38	5-5	20-5	11-60	57	0-7	1-9
B22tg	11	12	3"	is	61	**19-9**	12-76	64	0-5	1-9
Cg	13	13	34	40	7-8	**17-7**	16-62	•4	0-5	20

Mortarstown — Kinvarra Complex — Kinvarra Component, imperfectly drained phase

Location:	Killanummerry Td.: Leitrim 1? C 4 M
Topography:	Undulating lowland, rock outcrops common
Slope at Profile Site:	1
Altitude:	210 ft (64 m) O.I).
Drainage:	Imperfect
Parent Material:	Shallow glacial till derived mainly from Carboniferous limestone with some influence from Carboniferous sandstone
Classification:	Grey Brown Podzolic; Aquic Lithic Hapludalf

Horizon	*Depth (cm)*	*Description*
All	0-8	Silt loam; brown to dark brown (10 YR 4 3) with few faint fine strong brown (75 YR 5 6) mottles: moderate fine subangular blocky; very friable; abundant very fine and fine roots; abrupt smooth boundary to:
A12	8 2?	Loam; brown to dark brown (10 YR 4 3) with few faint medium strong brown (75 YR 5 6) mottles; moderate fine to medium subangular blocky; very friable: frequent very fine and fine roots; abrupt smooth boundary to:
B2g	25-35	Silty clay loam: strong brown (7-5 YR 5 6) with many prominent coarse pale red (25 YR 6 *2)* mottles: weak coarse subangular blocky; friable; common very fine and fine roots; abrupt smooth boundary to:
C R	35—	Decaying limestone rock with strong brown (10 YR 5'8) silt loam pockets

TABLE 34—iMortarstown — Kinvarra Complex — Kinvarra Component, imperfectly drained phase (Killanummerry Td.)

Horizon	Coarse sand	line sand	Silt	Clav	pH	CEC (meq **100g)**	C (%)	\ (%)	Free iron
All	9	14	60	17	5-7	**25-2**	6 5	0-59	0-6
A12	16	15	48	21	5-6	20-4	31	0-28	0-9
B2tg	6	12	54	2S	5-6	25-8	1-8	0 **13**	3-4
C K	19	14	55	12	5-5	**17-6**	0-9	**nd**	2-4

Mortarstown — Kinvarra Complex — Kinvarra Component

Izocation:	Glebe Td.; Leitrim 7 A 21 N
Topography:	Rolling
Slope:	4
Altitude:	320 ft (98 m) O.I).
Drainage:	Moderate
Parent Material:	Glacial drift derived from Carboniferous siliceous limestone
Classification:	Grey Brown Podzolii•; Lithic Hapludalf

Horizon	*Depth cm >*	*Description*
Al	0-7	Clay loam; dark brown (10 YR 4 3); weak very tine and tine subangular blocky with some weak very fine crumb; friable; abundant very fine to medium roots; clear smooth boundary to:
A2g	7-23	Cherty clay loam; greyish brown (10 YR 5 2); moderate fine subangular blocky; friable; many micro and very fine random inped pores; plentiful very fine and fine roots; sharp smooth aoundary to:
B2t	23-40 45	l lay; brownish yellow (10 YR 6 6) with common fine faint clear dark yellowish brown (10 YR 4 4) mottles; moderate medium subangular blocky; non sticky, slightly plastic; many micro and very fine random continuous transped pores; common fine and very fine roots; clear smooth boundary to:
C	>45	Cherty sandy loam; top 5 cm light brownish grey (25 Y 6 2) with common many medium and fine prominent strong brown (7-5 YR 5/6) mottles; below top 5 cm: yellowish brown (10 YR 5 6) with some faint common medium clear strong brown (7-5 YR 5 6) mottles; massive very firm; common micro fine and very fine random pores; no roots

TABLE 35—Mortarstown — Kinvarra Complex (Glebe Td.

Horizon	Coarse sand	Fine sand	Silt	Clav	pH	(meq 100g>	TEB (meq lOOg)	Base sat	C	\	Free iron
Al	19	If.	35	3()	5-5	39-8	8-79	22	70	0-77	1-8
A2g	19	16	37	2s	50	24 1	4-35	is	21	018	20
B2t	9	N	36	47	40	21-8	7-54	35	OS		2-6
C	27	32	30	11	5-6	51	1 61	32	0-2		0-9

Mortarstown — Kinvarra Complex — Kinvarra Component

location:	Ballvnaboll Td.; Leitrim 11 A 1<S I
Topography:	Hill
Slope:	3
Altitude:	570 ft (174 mi O.I).
Drainage:	Well drained
Parent Material:	Shallow glacial drift derived from Carboniferous limestone
Classification:	Shallow Grey Brown Podzolic; Lithic Hapludalf

Horizon	*Depth cm;*	*Description*
A1	0-7	Clay; very dark greyish brown (10 YR 3/2); weak fine and medium crumb; very friable; abundant very fine and fine roots; clear smooth boundary to:
\2	7-16	Clay loam; dark greyish brown (10 YR 4 2); moderate fine subangular blocky; friable; frequent fine and very fine roots; few medium roots; clear wavy boundary to:
A B	16-22	Not sampled; gradual wavy boundary to:
B2t	22-40	Clay; dark brown to brown (75 YR 4 4); moderate medium prismatic breaking to moderate coarse subangular blocky with clay skins; firm; common very fine and fine roots, few medium roots; many micro random continuous inped pores; below B2t material from overlying horizons which is generally mottled and has a moderate fine angular blocky structure is washed into crevices which are common in the limestone bedrock

TABLE 36—Mortarstown — Kinvarra Complex — Kinvarra Component (Ballynaboll Td.)

Horizon	Coarse sand	Fine sand	Silt	Clav	pH	CEC (meq lOOg)	TEB (meq 100g)	Base sat. (%)	C (°o)	N (%)	Free iron (°o>
Al	13	15	30	42	6-8	72-8	36-63	?U	140	in	13
A 2	21	16	[illegible]	34	4-8	37-4	5-50	15	4 0	0-5	*2-2*
B2t		14	27	*--2*	5-5	33-6	10-80	}2	1-5	0-25	4-3

Ardrutn Association—Banagher Series Component

Location:	Annaghderg Lower Td.; Leitrim 28 I) 34 E
Classification:	Reclaimed fen peat: Histosol (7th Approximation). Typic Medisaprita
Vegetation:	*jfuncus,* sedge and /MS
Topography:	Flat
Altitude:	70m (230 ft) O.D.
Slope:	nil

Horizon	*Depth (cm)*	*Description*
Al	0-17	Very dark greyish brown (10 VR 3 2); loamy peat; weak coarse subangular blocky structure; well humified; plant residues, recent root material and amorphous clay humus material, many seeds of *Junctu* (fresh); iron concretion and quartz grains; many recent roots; clear, smooth boundary to:
CI	17-23	Olive grey (25 Y 5 2); silty clay; discontinuous alluvium band; massive structure; slightly sticky, plastic; clear, smooth boundary to:
C2	23^5	Well-decomposed organic materials with few recognisable plant remains, *Canst* stem or leaf; black (5 YR 2 It; tine to medium moderate subangular blocky structure; plentiful recent roots; earthworms; gradual smooth boundary to:
C3	45-80	Humified peat matrix with fine woody fragments (bark and fine twigs); dark reddish-brown (5 YR 2 2); approx. one-third of peat material exudes between fingers; very recent roots, water content increases with depth.

TABLE 37—Analytical data

Horizon	Depth (cm)	Moisture (%)	Ash (%)	**Db*** (g cc)	Fibre (%)
Al	0-17	47-1	50-4	0-254	6-6-15 6
CI	17-23	—	—	—	—
C2	23-15	78 1	12-3	0228	15-7-261
C3	45-80	85-3	43-7	0-203	27-5-31-5

• **Bulk densitv.**

Ardrum Association—Banagher Series (Overlain by alluvium) Component

Location:	Ardrum 'I'd.; Leitrim 25 C 16 F
Classification:	Fen peat (overlain by alluvium); Histosol (7th Approximation); Sapric Medihemist
Vegetation:	*June us* spp.
Topography:	Flat
Altitude:	55m (108 ft) O.I)
Slope:	Nil
Parent material:	Fen peat

Horizion	Depth cm	*Description*
All	0-40	Alluvium: black to very dark grey (5 Y 2 5 1); peaty silt> clay; very weak moderate suhangular blocky structure; wet plastic; abundant recent roots in surface 10 cm, decreasing rapidly with depth; abrupt, smooth boundary to:
A12	40 45	Dark reddish brown to black (5 YR 2*5 1); peat; sapric; high mineral content; well humidified: greasy; plant residues, birch fragments, sedge and grasses; *Juncus* seed.
C	45-50	As above but with more mineral material; plant residues, cyperaceous rootlet and leaf material, occasional *Spkagmtm* leaves, *Junius seeds.*
HCg	50	Dark reddish brown (5 YR 2 2); peat: well humified matrix with heterogeneous mixture of woody debris and sedges; slightly greasy; plant residues, amorphous organic material dominant, with woody debris, many *Carex* seeds.

TABLE 38—Analytical data

Horizon	**Depth (cm)**	**Moisture 1 1**	**Ash**	**Db (g cc)**	**Fibre**
All	**0-40**	**67-8**	**58-4**	**0-340**	**2 0**
A12	**40-45**	85-6	**39-5**	—	**22-7-27-2**
C	**45-50**	**80-4**	**47-5**	—	**12** 3-15 **3**
II Cg	**50 •**	**82-5**	**43-7**	**0171**	**47-8-54-5**

Allen Series

Location: Drumard Td. (Magerraun); Leitrim 37 B 18 C
Classification: Allen Scries; Histosol (7th Approximation); Typic Medihemist
Vegetation: *Enca—CaUuna*
Topography: Flat
Altitude: 55 m (180 ft) O.D.
Slope: Nil

Horizon	*Depth cm)*	*Description*
1	0-35	Dark reddish brown (5 YR 3 2); peat; hemic, humified matrix with *Ertophontm* fibres; light brown water exudes on squeezing; plant residues, dominantly cyperaceous remains with some non-sphagnum moss, many fungal fruiting bodies; many Orabatid mite remains; clear, smooth boundary to:
	35-100	Dark reddish brown (5 YR 2 2); peat; hemic; dominantly of cyperaceous remains; no peat material exudes between fingers on squeezing; plant residues; short brown fibre material (cyperaceous) with much amorphous organic material; clear, smooth boundary to:
	100-135	Dark reddish brown (5 YR 2 2) to black (5 YR 2 1); peat; hemic; well humified, slightly fibrous; plant residues, dominantly ericaceous rootlet material with fine twigs and some amorphous organic material, fungal fruiting bodies; orabatid mite remains; clear smooth boundary to:
	135	Black (5 YR 2 1) matrix with brown patches (5 YR 3 2-3 3) anaerobic-colours; peat; birch wood fragments; turbid water exudes on squeezing plant residues; rootlet material ericaceous in origin, fine twigs amorphous organic material, some charcoal fragments:

TABLE 39—Analytical data

Horizon	Depth (cm)	Moisture	Ash	Db	Fibre
	0-35	831	ox	0122	400-43-5
	35-100	85-3	10	0114	37-5-43-3
	100-135	871	11	0110	311-40-7
	135-	88-4	0-9	0120	43-6-50-7

Allen Series — Cutoi'er and Reclaimed Phase

Location	Aghacashlaun Td.; Leitrim 24 A 33 Z
Classification:	Cut-over and reclaimed raised bog: Histosol (7th Approximation); Sapric Medihemist
Vegetation:	Poor Pasture
Topography:	Flat
Altitude:	76 m (250 ft) O.D.
Slope:	Nil

Horizon	*Depth cm /*	*Description*
Ap	0-16	Very dark grey to black (10 VR 3 15); peaty loam: weak, granular structure; many earthworms: abundant fine roots in surface 10 cm decreasing rapidly with depth; layer of cherty fine gravels at 10-12 cm; abrupt, smooth boundary to:
CI	16-27	Black (5 YR 2 i); peat; *Calluna* and sedge remains in humified matrix; sparse recent roots; humification 5 6; plant residues, heterogenous mixture *Calluna* and *Sphagnum*, rootlet debris and amorphous organic-material, abrupt, smooth boundary to:
C2	27 45	Dark reddish brown (5 VR 3 3); peat; hemic; poorly humified; humification 2; plant residues, Sphagnum mosses
CI	45 74	Dark reddish brown (5 VR 2 2); peat; sapric; *Calluna,* sedges and *Sphagnum* residues; well humified; greasy; humification 6/7; plant residues, very fine amorphous organic material; fragmented debris of rootlets and twigs; *Calluna* seed and occasional *Sphagnum;* abrupt boundary to:
C3	74-83	Dark reddish brown (5 YR 2/2); peat; strong in *Eriophorum* fibres with *Sphagnum;* moderately well humified; plant residues, ericaceous root material with *Sphagnum* leaves, *Calluna* seed and twig debris; abrupt boundary;
C4	83-95	Alternating bands of *Sphagnum cuspidatum* peat interspersed with bands of fresher Sphagum peat; hemic; abrupt boundary:
C5g	95-117	Dark reddish brown (5 YR 3/4) darkening rapidly on exposure to (5 YR 3 2); peat; *Sphagnum* and *Calluna* remains; moderately well humified; humification 4 5: some lenses of non-Sphagnum moss; strong smell of sulphides;

TABLE 40—Analytical data

Horizon	Depth (cm)	Moisture (%)	Ash	Db (g/cc)	Fibre
Ap	0-16	58-8	66-5	0-420	161-25-8
ci	16-27	86-7	6-4	0121	35-4-38-7
C2	27-45	90-5	3-3	0060	56-5-63-6
CI	45-68	89-3	1-8	0109	18-5-36-1
C3	74-83	900	1-5	—	36-6-36-9
C4	83-95	—	1-4		42-8-57-6
CSg	95-117	89-8	1-2	—	42-3-66-6

Aughty Series

Location	Slievenakilla Td.; Leitrim 19 I) 1 S
Classification	Aughty Scries; Histosol (7th Approximation); Hemic Terric Medisaprist
Vegetation:	*Calluna, Polytrichum, Eriophorum, Vacdtdum, Potentilla*
Topography:	Mountainous
Altitude:	280 m (920 ft) O.D.
Slope:	3-4

Horizon	*Dt pth i in*	*Description*
1	0-60	Dark reddish brown (5 YR 3 2); peat; hemic; well humified; greasy; humification 7; strong recent and fossil cvperaceous fibres; recent roots to at least 50 cm; plant residues, mostly cvperaceous root and leaf material; *Sphagnum* and *Calluna* leaves and leaflets. *Calluna* flower heads; *Jumus* seeds; clear, boundary to:
	60 <>	Dark reddish brown (5 YR 3 2); peat; strong in cvperaceous remains; sapric; well humified: greasy humification 7 8, increases towards base of layer; plant residues, mainly fine divided rootlet material with amorphous organic matter, charcoal fragments (carbonised *Calluna* leaflets), many remains of Carabid beetles; clear, boundary to:
	90-100	Black (5 YR 2 1); peat; sapric; very well humified; few fine fibres; greasy; plant residues, finely divided leaf and root material, woody remains of birch, much charcoal debris, *Junius* seeds common some fine quartz grains; abrupt, smooth boundary to:
	1(H)	Glacial till, Namurian shale with yellow sandstone.

TABLE 41— Analytical data

Horizon	Depth (cm)	Moisture (%)	Ash	**Db** (g cc)	Fibre
	0-30	85 1	4-2	0094	39-2-42-8
	30-60	90 5	1-9	0091	191 21 8
	60-90	89-7	3-6	0-094	21-2-27-2
	90-100	8626	5-2	0102	153-16 1

Aughty Series

Location	Larkfield Td.: l.eitnm 11 D 20 K
Classification:	Aughty Series; Histosol (7th Approximation): Typic Medihemist
Vegetation:	*Calluna, Polytrichum. Eriophorum, Vacrimum, Pot cut ilia*
Topography:	Mountain summit
Altitude:	289 m (950 ft) O.D.
Slope:	3-*

Horizon	*Depth (cm)*	*Description*
1	0-12	Dark reddish brown (5 YR 2 2); peat; hemic; recent roots in humified matrix; plant residues, cyperaceous leaf and rootlet material, some Sphagnum leaves *Juncus* seeds, single *Carex* seed; clear, smooth boundars to:
	12-34	Dark reddish brown (5 YR 2-5 2); peat: hemic; dominantly cyperaceous remains with some *Calluna;* plant residues, amorphous organic material with cyperaceous remains, *Juncus* seed; Colepteran and Orahatid mite remains; some fine quartz grains; clear, smooth boundary to:
	34-53	As for layer 2 but finer fibres and less fibrous.
	53-90	Black (5 YR 2 1); peat; hemic; well humified; yreasy; humification 7; mixed plant remains, woody debri?, occasional *Phragmites,* mostly cyperaceous residues with some *Calluna;* plant residues, amorphous organic material, fine bark fragments, herbaceous leaf material, *Carex* seed. *Ranunculus* seed; clear boundary to:
	90-120	Dark reddish brown (5 YR 3 4) rapidly darkening on exposure to (5 YR 3 2); peat; sapric to hemic; well humified, greasy; humification 7; cyperaceous plant remains and wood fragments; mineral material present at base of profile; plant residues, cyperaceous leaf and rootlet debris, amorphous organic material, *Carex* seeds, *Juncus* seed, Colepteran and Orabatid mite remains
	120+	(xlacial till

TABLE 42—Analytical data

Horizon	Depth (cm)	Moisture (°o)	Ash	Db	Fibre
	0-12	88-7	2-7		35-4-47 2
	12-34	881	2-5	0105	46-4-53-8
	34-53	89-2	1-9	0092	41-3-U-8
	53-90	89-8	1-8	0095	44-4-51-8
	90-120	900	11-5	0090	30-4-^50

Aughty Series

Location	Larkfield Td.; Leitrim 11 D 21 K
Classification:	Aughty Series; Histosol (7th Approximationt; Typic Medihemist
Vegetation:	*(alluna. Polxtrichum, Eriophorum, I Hccimum. Potentilla*
Topography:	Mountain summit
Altitude:	289 m (950 ft) O.D.
Slope:	3-4

Horizon	*Dtpth cm)*	*Description*
1	0-50	Dark reddish brown (5 YR 2 2); peat; moderately well humified; fibrous; mostly of cyperaceous origin; occasional fine *Calluna* twig; some recent roots; clear boundary to:
	50-98	Dark reddish brown (5 YR 3 2); peat; strong in Calluna and Eriophorum debris; moderately well humified; humification 4 5: clear boundary to:
	98-130	Dark reddish brown (5 YR 2 2); hemic; pseudo-fibrous; well humified: greasy; fine cyperaceous debris with some *Calluna;* humification 7; plant residues, mainly rootlet debris with some very weathered *Sphagnum* leaves, amorphous organic material, *Jfuncus* seeds and quartz grains, clear boundary to:
	130-165	Dark reddish brown (5 YR 2 2); hemic: well humified; tendency for layered structure, cyperaceous rootlet and leaf material, amorphous organic material, many *Juncus* seeds

TABLE 43—Analytical data

Horizon	Depth (cm)	Moisture (°o)	Ash (%)	Fibre (%)
	0-50			
	50-98	930	1-4	50-7
	98-130	866	5-2	43 7-51-6
	130-165	86-9	1-8	33-8-11-9

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