**SoU Survey Bulletin No.** 35 2nd edition

# The Peatlands of Ireland

**To accompany Peatland Map of Ireland, 1978**

**by**

**R. F. HAMMOND**

Published by An Foras Taliintais, 19 Sandymount Avenue, Dublin 4 1981

# Preface to First Edition

This publication, Soil Survey Bulletin No. 35, has been prepared to accompany the new Peatland Map of Ireland (An Foras Taluntais, 1978). Modern concepts of peat classification have been used in this map and bulletin and these have changed significantly since compilation of the previous peat map of the country, by the Geological Survey in 1920.

Surveys and research work in the intervening years have shown that, while peat can make a significant contribution to agricultural and industrial development, great differences exist between different peat types. Much new data are available and these have been incorporated in the bulletin and map. In the bulletin, data on different peat types are presented on a county basis, both for the Republic and for Northern Ireland. This should prove a major advantage in planning, since previous data were so inadequate.

Mr. R. F. Hammond of the National Soil Survey was responsible for peat correlation and compilation of the map and bulletin. The map is based mainly on the work of the following staff of the National Soil Survey: M. Bulfin; S. Diamond; Dr. M. Conry;T. F. Finch; Dr. M. J. Gardiner; R. F. Hammond; J. Kiely; M. Walsh; P. J. Burke; E. Brennan; A. Comey; T. O'Shea; T. Radford and P. J. Hartigan.

Information on peat distribution was also provided by Dr. J. F. Collins, University College, Dublin, Mr. J. Cruickshank, Queen's University, Belfast and Dr. R. McKenzie of the Northern Ireland Dept. of Agriculture.

Acknowledgement is due to Prof. J.J. Moore, University College, Dublin, whose work provided the basis for the phytosociological separations shown on the map legend.

For helpful discussions acknowledgement is due to Professor W. A. Watts and Professor G. F. Mitchell, FRS, Trinity College, Dublin, to Mr. R. Parker, Queen's University and Mr. S. McConaghy and Mr. D. Dixon of the Northern Ireland Dept. of Agriculture.

Thanks are due to Bord na Mona and especially to Mr. T. Lee for the provision of all the base map material pertaining to their industrial peatland areas. Acknowledgement is also made to Erin Peat Products, Birr, for information provided and also to the Forest and Wildlife Service for map material showing forestry areas on peatland. Dr. A. Flegg, Geological Survey of Ireland co-operated in the use of aerial photographs.

The cartographic work, more difficult than usual because of the predominance of small enclaves of peat, was carried out by V. Staples, J. Lynch, O. Shudall and A. Cuddihy of the Cartographic Section of the National Soil Survey at Johnstown Castle. The map was printed by the Ordnance Survey and layout and printing of the bulletin was carried out by the Publications Dept of An Foras Taluntais.

The bulletin was edited by Dr. E. Culleton.

Grateful acknowledgement is made to all those mentioned here and to others who helped in various ways.

*M. J. Gardiner,*
Head, National Soil Survey of Ireland, 1979.

# Preface to Second Edition

The second edition of Soil Survey Bulletin No. 35 incorporates amendments and improvements to the text. Acknowledgement is made to all those who offered advice and suggestions and especially to Dr. A. M. O'Sullivan, An Foras Taluntais, and Dr. E. Farrell and Mr. G. Doyle, University College, Dublin.

*M. J. Gardiner*,
Head, National Soil Survey of Ireland, 1981.

# Contents

# 1

# Introduction

Peatland covers 16.2 per cent i.e. 134 million hectares of Ireland. Within the Republic peatlands cover 17.2 per cent of the land surface. Development of these peatlands has given rise to a major industry producing about 4 million tonnes of peat fuels per annum. Most of this goes to produce 25 per cent of the electricity generated in the country, the remainder is sold as fuel; some 1.13 million cu. m. of moss peat are also produced each year for horticultural use. In Northern Ireland 12.4 per cent of the land surface is covered by peatlands but no wide-scale industrial exploitation has taken place.

There is increasing interest in the future role of peatlands in the agricultural, horticultural and sylvicultural industries, either as private or state run enterprises. Their significance for conservation and amenity is also extremely important in long term national planning. Raised bogs, once typical of the lowland Midlands landscape, have virtually disappeared.

In 1920 the Geological Survey published a map of peat-bogs and coal-fields in Ireland which reflected the practical requirement for that time. This was included in the 1921 Report on Peat produced by a Government Commission appointed to examine the resources of the country. (This report formed the basis for the development of the peat fuel industry of to-day). Area figures quoted then and to-day are still based on the survey of 1810-1814 carried out by the Bog Commissioners. In the meantime much peat has been removed and attention is now focussing more on the ultimate land use potential of peatlands.

Research by An Foras Taliintais has shown their potential for agricultural production. However, a knowledge of the distribution, composition and characteristics of the various types of peat is a pre-requisite in planning the future development of our peat resources.

The 1920 Geological Survey peat map is now of little use since it does not separate the different peat types in the country. Since its publication and that of the General Soil Map of Ireland, (1969) a large amount of new data has become available from a broad spectrum of sources and disciplines. This new map classifies the extent of the various peat types in the country based on the current state of knowledge of peat composition and development.

## Data Sources **and Map** Compilation

To procure, assess and compile the data necessary to produce a new peat map of

Ireland was complicated because of the many sources and various forms in which it was available. Data for the map came from published and unpublished material, in map and written form, aerial photographic interpretation, personal communication with interested parties and original research into those aspects not previously covered.

Since 1968 the National Soil Survey programme of An Foras Taluntais has been operating in counties containing a significant amount of peatland (Table 1). These detailed studies have greatly expanded our knowledge of the extent and character of the different peatland categories.

Table 1: Area of peat soils in counties surveyed under the National Soil Survey

| County | Area ha | Peat soil area ha | % of County |
|---|---|---|---|
| **Carlow** | **89,691** | **1,047** | **1.2** |
| **Clare** | **345,050** | **61,483** | **17.8** |
| **Kildare** | **168,672** | **24,317** | **14.4** |
| **Laois** | **169,562** | **20,859** | **12.3** |
| **Leitrim** | **158,937** | **57,420** | **36.1** |
| **Limerick** | **267,910** | **20,795** | **7.8** |
| **Meath** | **233,372** | **10,289** | **4.4** |
| **Offaly** | **199,109** | **64,146** | **32.2** |
| **Westmeath** | **175,236** | **37,728** | **21.5** |
| **West Donegal** | **106,477** | **66,326** | **62.3** |
| **Wexford** | **236,648** | **728** | **0.3** |
| **West Mayo** | **558,643** | **155,961** | **27.9** |

Ground observations and depth measurements give the most accurate data for preparing the map. However, with a good base level of reference knowledge, the use of aerial photographs is an invaluable tool.

Aerial photographs taken 1973/1974, which cover most counties with the exception of Donegal, parts of Sligo, Cork, Waterford and Louth, were used with the permission of the Geological Survey of Ireland. The scale of 1 : 30,000 compared very favourably with the map scale 1 : 25,000 used by the National Soil Survey (base maps only).

Peatland distribution for Northern Ireland was derived from the Peat Bog Survey of Northern Ireland (1956), Land Use Survey Maps (1939), the 1920 Peat Map, and from personal contact with interested parties in Northern Ireland e.g., Botany Dept., Queen's University, and the Forestry and Soil Science sections of the Department of Agriculture.

## Map Scales and Procedures

A major difficulty with the map and photographic material used was the many different scales and ages of material. To facilitate cartographic procedures and at the same time make an accurate calculation of the different categories of peatland in the Republic all material was reduced to 1 : 126,720 scale. Area calculations for Northern Ireland were computed at 1 : 575,000 scale. The reduction and scale variations are shown schematically in Table 2. A reliability map showing the sources of data is shown in Fig. 1.

:


Fig. 1: Reliability map showing sources of data

Table 2: Different map scales and reduction steps used during the compilation.

| | | | | |
|---|---|---|---|---|
| 1:633,600 | 1:10,560 | 1:25,000 | 1:63,360 | 1:30,000 |
| | | 1:126,720 | | 1:25,000 |
| | | 1:575,000 | | |

Areas of north-west Sligo, Donegal, Cork and Waterford were not covered by detailed reconnaissance field sheets or aerial photographs. Compilation data were restricted to field excursions and the use of the geological sheets from which the 1920 peat map was prepared.

The accuracy and reliability of the data from the geological sheets were checked in the three following ways: The 1 : 633,600,1920 peat map was enlarged photographically, black outline on transparent base, to the publication scale of the new peatland map 1 : 575,000. Peat areas from the published soil map of Co. Clare (Finch 1971) were reduced to 1 : 575,000 and a comparison fit made between the two. It was found that the fit was tolerable. (Fig. 2). A further check was carried out using the 1 : 25,000 topographical maps. On these maps the peat areas were delineated with the knowledge of map symbol, topography, altitude, climate and field experience. The reduction of these areas to 1 : 63360 and comparison to the Geological map sheets also gave a tolerable fit. Thirdly, the aerial photographic interpretation data, when reduced to publication scale and checked back to the enlarged original map of 1920, also gave good correlation (Fig. 3).

The evidence, as presented in Figs. 2 and 3, shows that there is a tendency for the 1920 peat map to over represent peatlands in the country. This trend is more pronounced when using aerial photographs without ground control (Fig. 3) than when using orthodox field survey methods. However, the accuracy of these three checks carried out during compilation was sufficient to put a degree of trust in the 1 : 63360 maps for these regions not covered by aerial photographs.

Improvements over the original 1920 peat map are as follows: the scale at 1 : 575,000 is larger than the previous map at 1 : 633,600; also, whereas the latter map was only a single category monochrome map there are now thirteen separations for peatland types and land utilisation facets of peatlands.

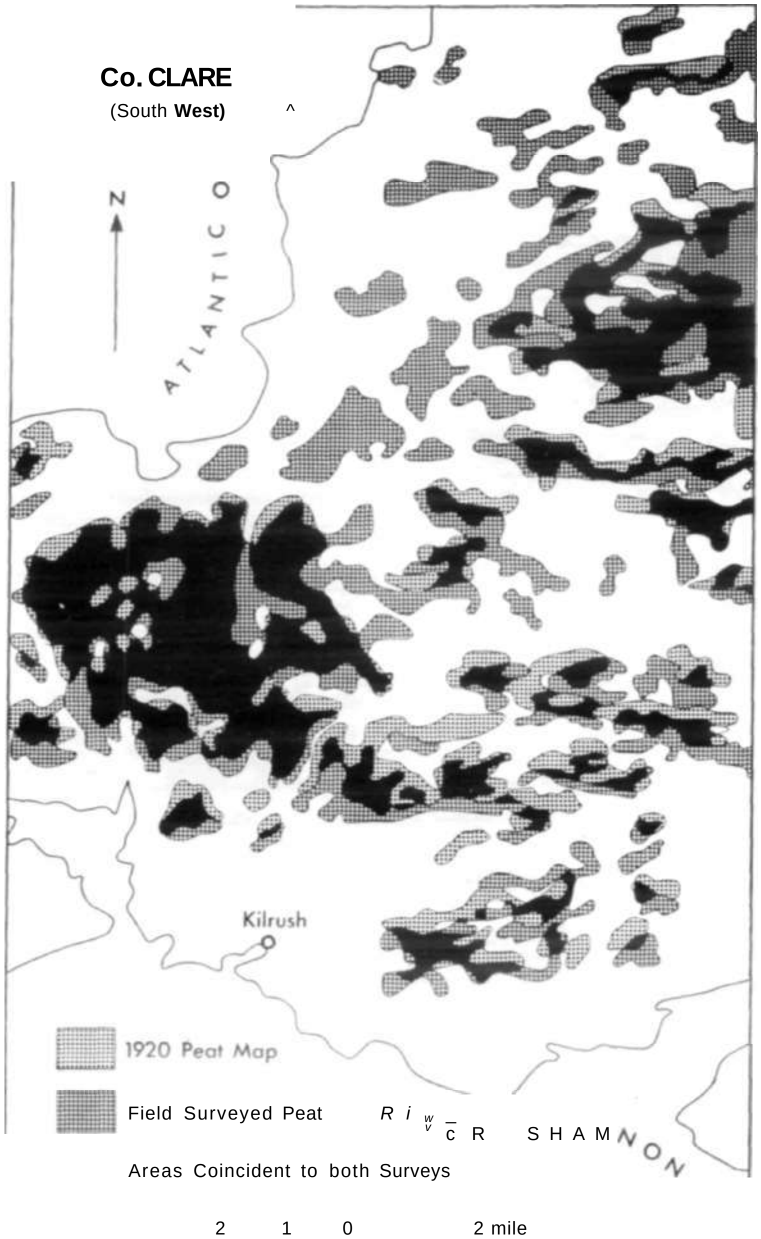



Fig. 2: Comparison of field surveyed peat areas to peat map of 1920

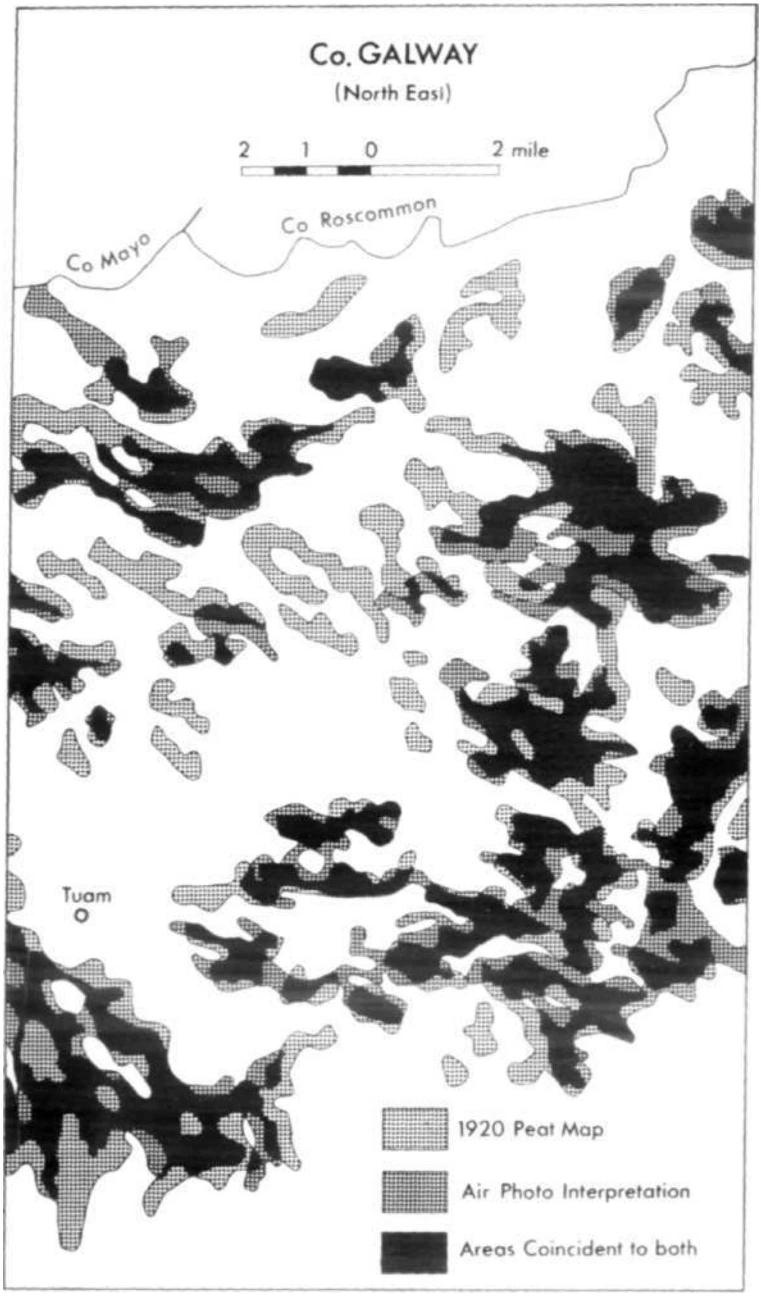



Fig. 3: Comparison of peat distribution from aerial photographic interpretation data to the same peat area on the 1920 map

B. P. (Hammond, 1968). Gimate during this period varied and peat deposits reflect these changes either by change in the peat sediment type or by the fossil pollen assemblages preserved within the peat. Studies of peat deposits have enabled research workers to reconstruct post-glacial climatic events and to establish a chronology for their formation. Radio carbon ($^{14}C$) dating has enabled changes in climate and rate of peat formation to be dated accurately. These relationships between climatic changes and peat type with time are outlined in Table 3. Generally the rate of peat accumulation was slow in warm and dry periods and relatively quicker during moist periods.

Table 3: Chronology, post-glacial climate and sediment type for Ireland

| Years before present (1950) | Climate | Period | Sediment type |
|---|---|---|---|
| 12,000 | Cold<br>Mild<br>Cool | Late-glacial | Clay<br>Limnic/telmatic (aquatic/semi-aquatic)<br>Clay |
| 10,000 | Temperature rising | Pre-boreal | Limnic (aquatic) |
| 9.600 | Warm-dry | Early boreal | Limnic/telmatic (aquatic/semi-aquatic) |
| 8,000 | Climatic optimum | Late boreal | Terrestrial |
| 7,500 | Warm-wet | Atlantic | Mainly ombrogenous terrestrial |
| 5,100 | Warm but rather dry | Sub-boreal | Mainly ombrogenous terrestrial |
| 2,500 | Increasing wetness and falling temperature | Sub-Atlantic | Mainly ombrogenous terrestrial |

## Mire Types and Their Origins

The mire or peat types which occur in Ireland can be classified into two broad groupings (a) ombrogenous mires (raised and blanket bogs) where continued growth is due to the influence of atmospheric precipitation and (b) topogenous mires (fen peat types) where development is controlled by topography and the ground water table (Table 4).

Table 4: Fundamental mire (bog) types

| | Ombrogenous | | Topogenous |
|---|---|---|---|
| Mire type | Nutrient supply | Mire type | Nutrient supply |
| Raised bog[3] | Precipitation | Paludification bog" (von Post 1937) | Ground water |
| Blanket bog | Precipitation | 1 en (lowmoor) | Ground water |

*Hirowth at present controlled by rainfall but originally by ground water*
*bpeat forming environment where water table levels are high without forming open water*

The origins of topogenous mires and the subsequent development of raised mires vary from one location to another. Variables which influence these formations are related to local hydrology e.g., continuity of supply, nutrient content, depth, rate of flow and the climatic factors of sunshine, temperature and evapo-transpiration. These affect the productivity of the eco-system(s) by influencing the phytosociology and biomass production in a given location.

### Growth of ombrogenous mires

**Raised Mire:** Raised bogs are complex structures of organic debris attaining thicknesses of 9 to 12 metres in the undrained state, depending on the underlying topography. The stratigraphy of the sediments which comprise a raised bog fall into three categories: a basal tier of peat types formed under the influence of minerotrophic ground water, and sub-surface and upper tiers comprised of humified and poorly humified *Sphagnum* peats, respectively, formed under nutrient conditions of base-poor atmospheric precipitation.

The broad stratigraphical arrangement of peat types shown in a schematic diagram (Fig. 4) is drawn from an actual raised bog site.

The process of peat development from topogenous to ombrogenous (Fig. 5) is as follows: initial peat formation can be identified by the occurrence of post-glacial lakes (Godwin, 1956) or locally wet hollows if plaudification was the cause (von Post, 1937).

Local hydrology is an important element in peat formation. Bellamy (1972) defines such situations as templates of peat formation. He expresses the conditions instrumental in development in the form of an equation :

$$\text{Inflow} + \text{precipitation} = \text{Outflow} + \text{evaporation} + \text{retention}$$

In basins, the surrounding catchment area influences the water supply and its nutrient content. In the Central Plain, immediately succeeding the Midlandian Cold Stage, ground waters from unleached calcareous glacial drift contained substantial concentrations of calcium and magnesium, with lesser amounts of potassium and sodium. That river and lake waters were highly basic is seen by the presence of shell marls and *Chara* chalk muds beneath the bogs (Hammond, 1965; Carey, 1970).

In a lake or water-filled basin, aquatics, either floating or rooted, were the major peat formers (limnic). Near the shore line, in shallower water, semi-aquatics established as the major peat formers (telmatic). On senescence of the aerial and sub-aerial plant parts the debris accumulating in the water decreased water depth. This resulted in encroachment of plants into the lake and displacement and diversion of water. A net result of this was the establishment of higher water tables close to the environs of the lake and subsequent paludification i.e., (von Post, 1937). In turn, this created a suitable environment for the development of terrestrial eutrophic and/or mesotrophic peats, the secondary mire type of Bellamy and Moore (1973). The factors relating origin to nutrition and hydrology are summarised in Table 5. Simultaneous with the lateral spread vertical accumulation took place which influenced the ground water effect and the resultant stratigraphy.

The vertical accumulation of plant debris however, diminished the ground water effect and plants had an increasing dependence on rainfall to supply nutrients. With this change in the hydrosere a transitional zone developed where plant communities of one serai stage

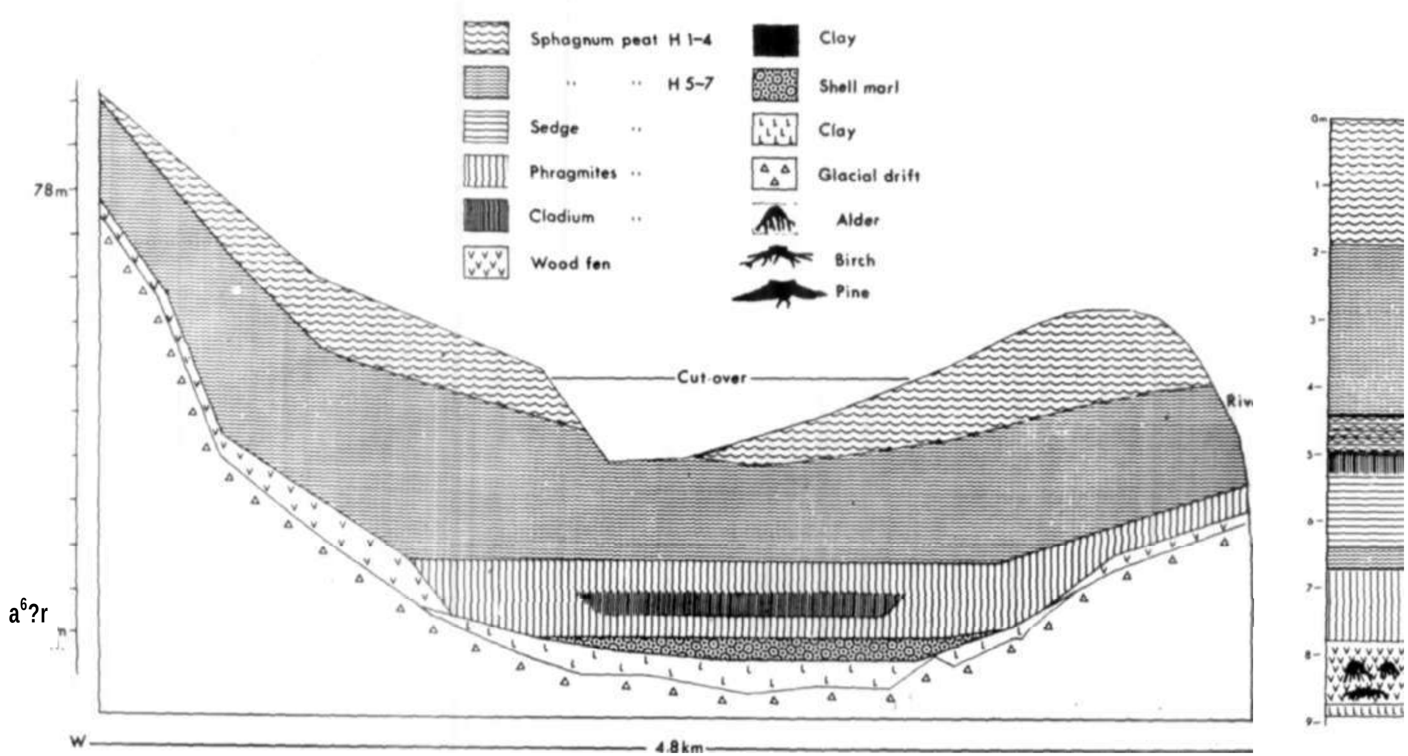



Figure 4: Schematic diagram showing cross section (Hammond, 1968) and detailed profile (Tansley, 1939) of raised bog in the Central

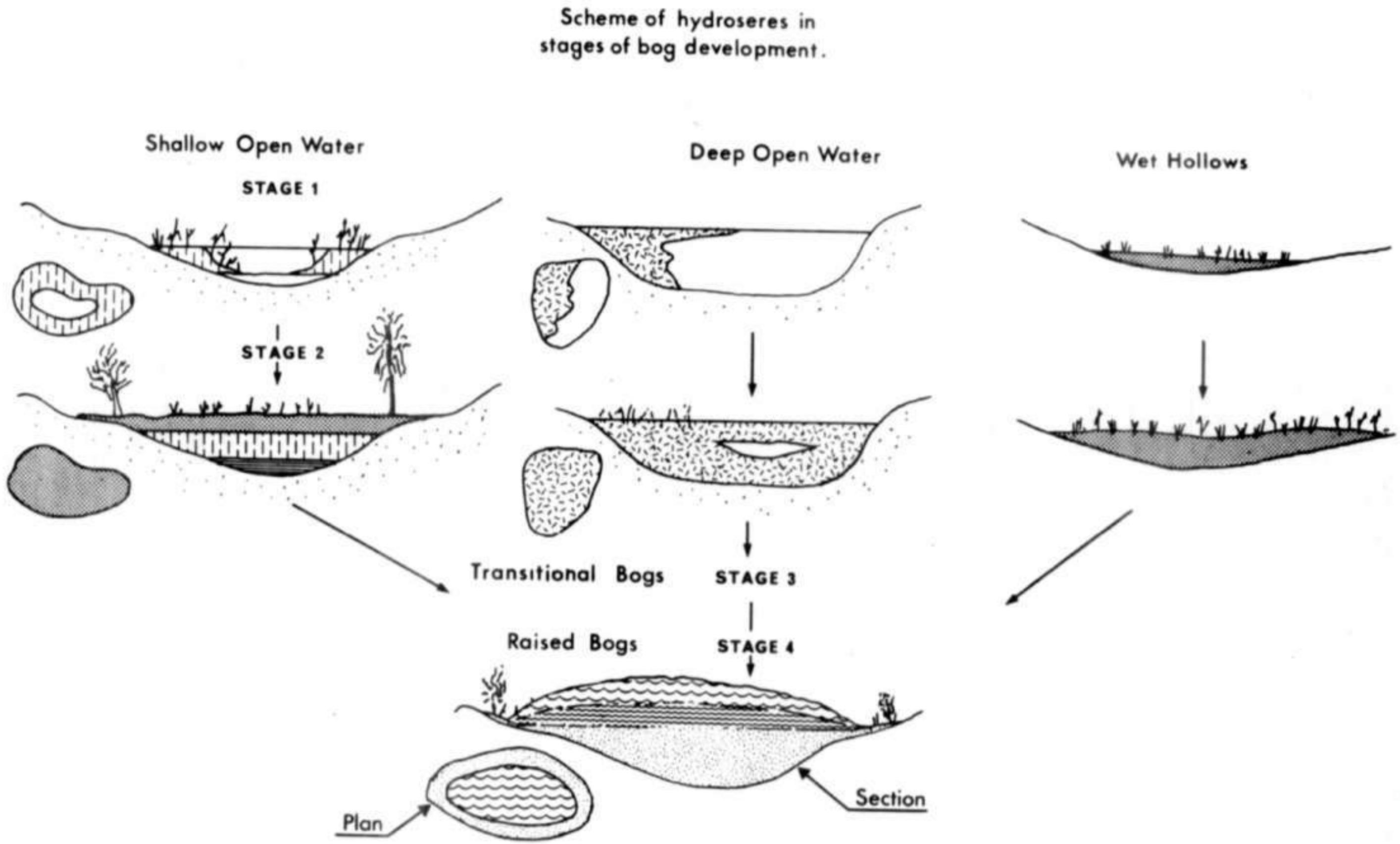



Figure 5: Scheme of hydroseres in stages of bog development

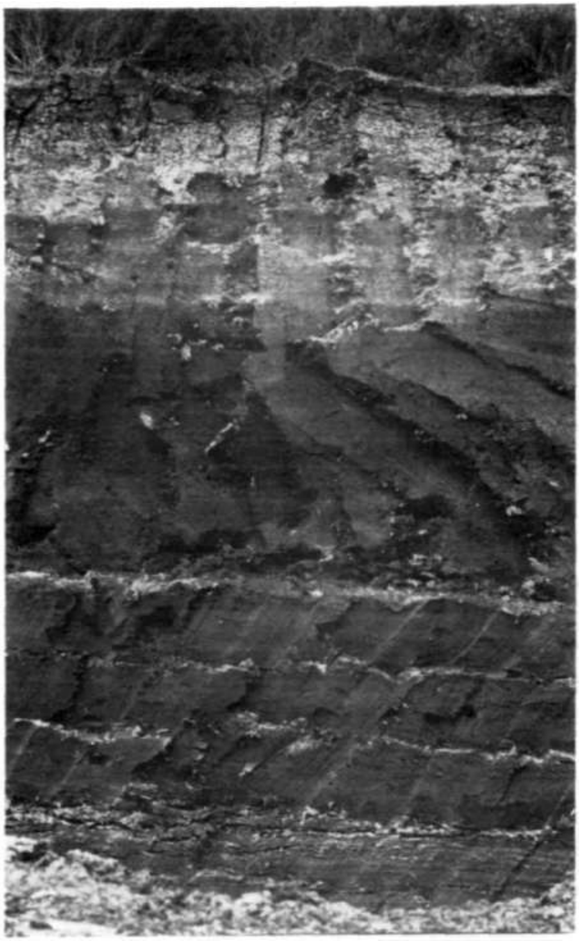


***Plate 1:***
A raised bog profile from Timahoe Bog, Co. Kildare, showing fen peat at the base, overlain by humified *Sphagnum* peat and the characteristic upper layer of poorly humified *Sphagnum* moss peat. The lighter colour towards the surface is due to drying out of the peat.
***(photo R. F. Hammond)***

were phasing out and the succeeding terrestrial ombrotrophic peats were attaining dominance. The ombrotrophic peats constitute the bulk of raised bog formations. Such vegetational sequences can be seen in peat cuttings throughout the Central Plain of Ireland. The upper layers of a raised bog present a complex appearance, the sequence of the sediments depending on the past phytosociology.

Blanket Mire: Blanket bog is a characteristic feature of many areas along the western seaboard and the higher hill and mountain masses. The onset of formation of this mire type is closely correlated with climatic deterioration within the post-glacial period. Development in upland areas had started before 4,000 B.P. (Mitchell, 1976). Pine stumps, now peat covered, testify to the better growing conditions at elevations of 600 m+ at periods earlier than 4,000 B.P. Blanket bog initiation has been dated to 4,150 - 2,150 B.P. (Smith *et al.* 1971). This shows that blanket bog formation took place in discrete locations over long periods of time, later coalescing into the widespread peat landscape we see today.

The term blanket bog was first used by A. G. Tansley (1939) to describe this type of peat terrain, which conforms to the underlying topography, except on very steep slopes.

Table 5: Sediment and peat types classified according to the environmental factors instrumental in their formation

| Origin | Sedimentary (Allochthonous) | | Sedentary (Autochthonous) | |
|---|---|---|---|---|
| Nutrition | Eutrophic | Oligotrophic | Minerotrophic | Ombrotrophic |
| *Hydrology* | | | | |
| Terrestrial | | | Woody fen peat | *Calluna* peat<br>*Sphagnum imbrication* peat<br>*Molinia* peat<br>*Trichophorum* peat |
| Telmatic (semi-aquatic) | | | *Carex* sedge fen peat<br>Reed peat | *Eriophorum vaginatum* peat |
| Limnic (Aquatic) | Sapropel<br>Gyttja<br>Shell marl<br>Diatomite | Dy | | *Sphagnum cuspidatum* peat |

Development of this mire type is controlled by climatic factors i.e. cool summers, high rainfall (> 1,250 mm) with more than 225 rain days per annum and very high atmospheric humidity. In the undrained state, depending on the underlying topography, peat depths vary between one and six metres.

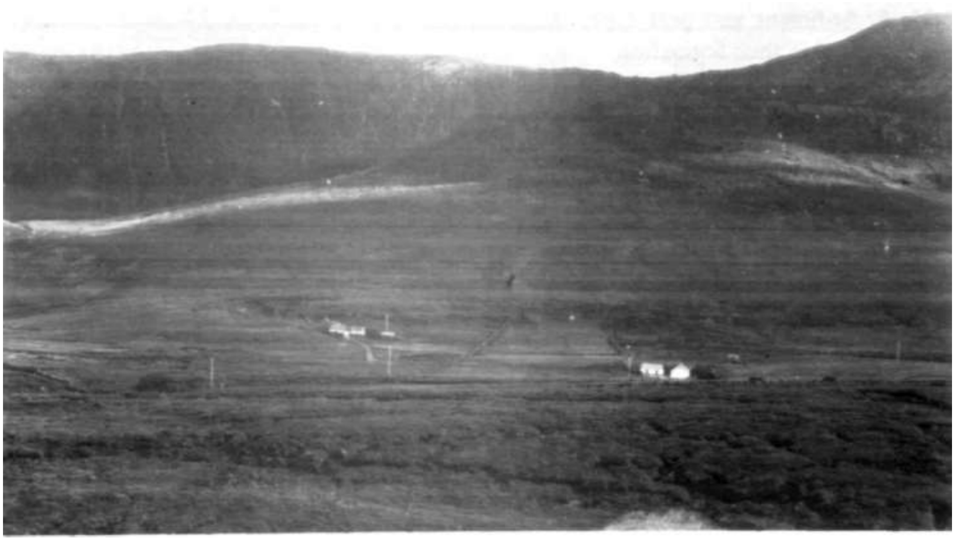
The morphology and physical characteristics of the peat profile differ markedly from that of raised bog. In the upper layers of a raised bog profile *Sphagnum* species predominate, with varied and complex changes in decomposition, colour and morphology. In blanket bog *Sphagnum* species are components of the surface vegetation but are never found within the peat profile in the same abundance as in Midland bogs.

Neither is there widespread occurrence of peat types of fen origin in the lowest layers of blanket bog. Plant remains more characteristic of eutrophic to mesotrophic plant environments are found in contained basins where local enrichment of nutrients took place. These are usually of limited extent relative to the overall area of blanket bog.

Blanket bog profiles are more homogenous in their morphology, although three basic layers are discernible. These are (1) an upper fibrous layer dominated by recent and sub-fossil roots of cyperaceous plants; (2) a sub-surface layer of pseudo-fibrous peat and (3) a basal layer of well-humified greasy peat with variable amounts of timber remains. With the exception of the basal layer where recognisable macro-fossils are few, the remainder of the profile is dominated by plants of grass *(Molinia)* and cyperaceous origin *(Eriophorum spp)* with the local occurrence of *Calluna vulgaris* and *Myrica gale* fragments embedded in the humified matrix.

## Growth of Topogenous Mires

**Fen Mire:** This peat category is ubiquitous and comprises limnic, telmatic and terrestrial peat types. These occur at the base of raised bogs in the Central Plain, in river valleys,



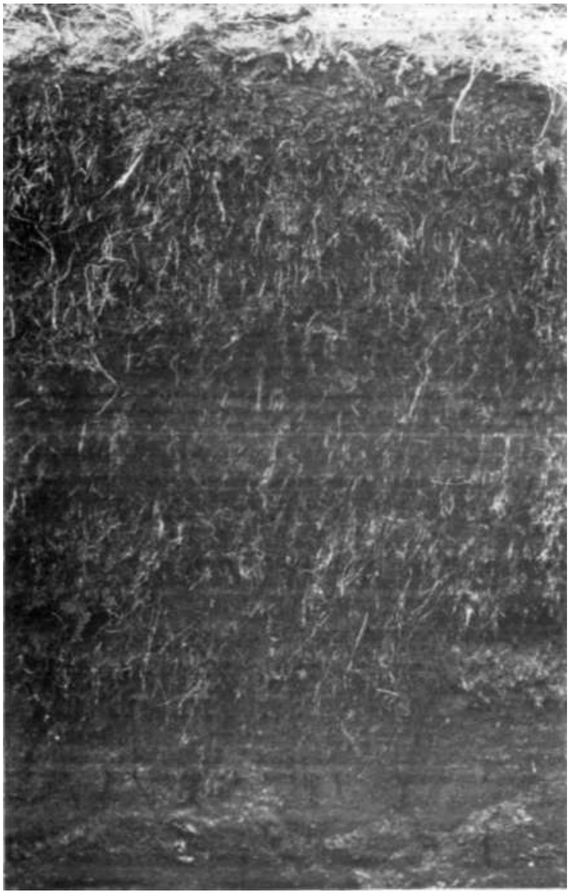


*Plate 2 above:*
Peat soils on the northern slopes of Slieve League, Co. Donegal, with deep blanket peat in foreground and cultivated peat soils in the middle distance. In the background shallower peat soils extend up into the mountain
*(photo C. Godson)*

*Plate 3 left:*
The top 110 cm of a deep blanket bog profile showing the upper fibrous layer dominated by recent and fossil roots of cyperaceous plants and the sub-surface layer of pseudo-fibrous peat
*(photo R. F. Hammond)*

poorly drained hollows and adjacent to raised bogs. Extensive development of ombrogenous *Sphagnum* peat has never taken place in these locations because of continued flushing bv base-rich ground waters preventing the development of oxyphilous plant species. Within Table 5 the major peat types which occur in fen mires are classified according to the environmental factors instrumental in their formation.

Undisturbed fens are very rare in Ireland, especially in the Midlands and those still in existence are being severely threatened by agricultural development. Most fens have been drained and cultivated in the past but have reverted to poor pasture. In some areas where drainage is blocked they now exhibit species which are more characteristic of undrained fen.

# 3

# Classification of Peat Soils

Classification of peatlands at the highest level is based on phytosociology and genetical concepts. The system of classification, at this level, can only be applied to undisturbed peatlands. It is limited in its application when applied to man-modified peatlands which are being used or are potential areas for agriculture, horticulture and forestry. Such peatland requires a classification scheme which defines the specific soil characteristics essential for evaluating their ultimate land use.

The National Soil Survey is compiling an inventory of the nation's soil resources, of which a major segment is the organic or peat soils. A knowledge of the different peat types, their related internal soil factors and fabric arrangement are important in considering the production and the adaptability of these soils to various crops, and productivity under defined sets of management conditions can only be quantified when soil properties are known.

There have been numerous attempts to devise an internationally acceptable peatland classification, so far without success. Therefore, for Irish peatlands a synthesis of classification criteria used both in Ireland and abroad has been used.

Classification systems are based on orderly concepts and arrangements so that groups of objects and materials can be placed in well defined classes. The purpose of a classification system is to group different types into uniform classes according to those properties which are of the greatest importance for a particular object. It is therefore understandable that different classifications have been developed for different purposes.

Botanists have used variations in botanical composition as a criterion for their peat classification, later complementing it with certain other criteria, for example, the trophic level. Geologists, in contrast have based their classification on such criteria as the morphology of the bog, and the ground water level. In agriculture and forestry the acidity and nutrient content of the peat have been used as criteria in classification. Lately, particularly for peat in horticultural use, the structure of the peat, its water and air capacity (fibrous, amorphous, granular) have been used as the main criteria.

## Classification of Peats

The classification of Irish peatlands (blanket bog, raised bog and fen) is derived from their surface vegetation and genesis (Tansley, 1939; Osvald, 1949; Moore, 1962). These classification separations were used by Barry (1954) and are the basis of the legend for the present map at a scale of 1:575,000. However, Barry's classification scheme applied only to those peatlands which are *in situ* and which have not been man-modified by past and present usage of peat bogs for fuel production (hand and industrial) and increased utilisation for agriculture and forestry.

The degree of decomposition of the peat material and its botanical composition form the basis for peat classification. These two factors are the easiest properties to identify in the field and they influence all the important physical characteristics of peat such as permeability, water holding capacity (W.H.C.), bulk density ($D_b$) and fibrosity. But these soil factors are altered by human activity, e.g. drainage of organic soils will accelerate the degree and rate of decomposition, increase bulk density and decrease fibrosity. The rates of alteration, especially in surface horizons, will be increased by the addition of mineral materials ("marling") and fertilisers.

The degree of decomposition or humification which is used as a criterion for peat classification is based on the method developed by the Swedish peat scientist Lennert von Post in the 1920s. The scale is based on values 1-10 (>number >decomposition). Three separations are made in this scale giving the following categories:

| **Class** | **Degree of decomposition or humification (von Post)** |
|---|---|
| **Light** | **H 1 - 3** |
| **Dark** | **H 4 - 6** |
| **Black** | **H 7 - 10** |

The validity of a classification based on botantical composition depends on how well the plants forming the peat can be classified into a few large homogenous groups so that the residues of a few plant groups are similar.

The degree to which peat forming plants were preserved depends on past climatic and edaphic conditions. Identification of plant species from more or less decomposed residues can be difficult. The more easily recognisable species are the mosses and lignaceous plants whereas herbaceous plants tend to decompose quickly. In several classification systems the following grouping is used.

1. *Sphagnum* peat mosses
2. *Hypnum* peat mosses
3. Sedge and some other plants, whose remains have similar properties
4. Woody plants

In the Central Plain *Sphagnum* mosses are the typical peat formers. In respect to the nutrient supply and moisture content of the substrate the *Sphagnum* moss forms a very heterogenous group. The sedge peat category of the classification grouping includes a broad spectrum of sub-fossil plant remains. The term sedge identifies with those plants which are found in the families *Cyperaceae. Carex* spp. in particular and *Gramineae.* The plant materials confer similar physical, chemical and morphological properties on this peat type. It is commonly found in the sub-fossil state and forms the parent materials for many peat soils on drained fen areas.

Similarly with true mosses *(Hypnum),* although occurring as a peat type group, they are not common *en masse,* but can be found as stratified layers in the bog, which indicate a high trophic level.

Under Irish conditions woody plants are usually associated with the basal layers of the bog formation. Such plants are characterised by their high lignin content and resistance to decomposition. They persist therefore for a long time and clearly indicate the origin of the peat.

The plant species composition is the best basis for classification in Ireland since the disciplines involved in peat research in Ireland can identify with the terminology and the major plant groupings recognised. The peat type is named after the dominant plant species or group if at least 75% of the peat mass originates from the species or group. In cases where the peat is composed of two plant groups or species both of these are included in describing the peat type with the more abundant species listed first.

Jessen (1949) in his classification of Irish bog sediments made two major divisions.

1. The swamp - and the fen - series of peats.
2. The *Sphagnum* - peat series.

He based his genetic classification on the fact that each type has been formed from the remains of a special plant association or a group (complex) of associations, and its character determined by plant remains and degree of decomposition. Using these two criteria the hydrological/ecological conditions under which these plants developed are defined as follows:

(1) Limnic — below low water level
(2) Telmatic - between low and high water level
(3) Terrestrial — above flood level

Thus fen peats were formed in limnic, limnic-telmatic and telmatic environments while wood peats formed under a terrestrial environment.

Whereas *Sphagnum imbricatum* peat formed mainly under terrestrial conditions - *Sphagnum cuspidatum* peat formed in a limnic-telmatic environment.

For practical purposes the various peat types are simplified under two broad groups of parent materials; i.e. ombrotrophic and minerotrophic origin (Table 5). The occurrence of these peat types in these two groups within the peatland landscape depends on the degree and type of man-modification. The inter-relationship between the type of man-modification and its position in the landscape is shown schematically in Fig. 6.

## Classification of Peats as Soils

Raised and blanket bogs should not be considered as soils in their own right but rather as landscape units which contain the parent materials (different peat types) from which organic soils are formed. Within this concept it is necessary, first, to quantify in strict physical terms what is meant by the terms peat and organic soil. The amount of organic matter in Irish soils varies from about 3-10% in mineral soils, and up to 98% in peats. Peat soil materials are defined as:

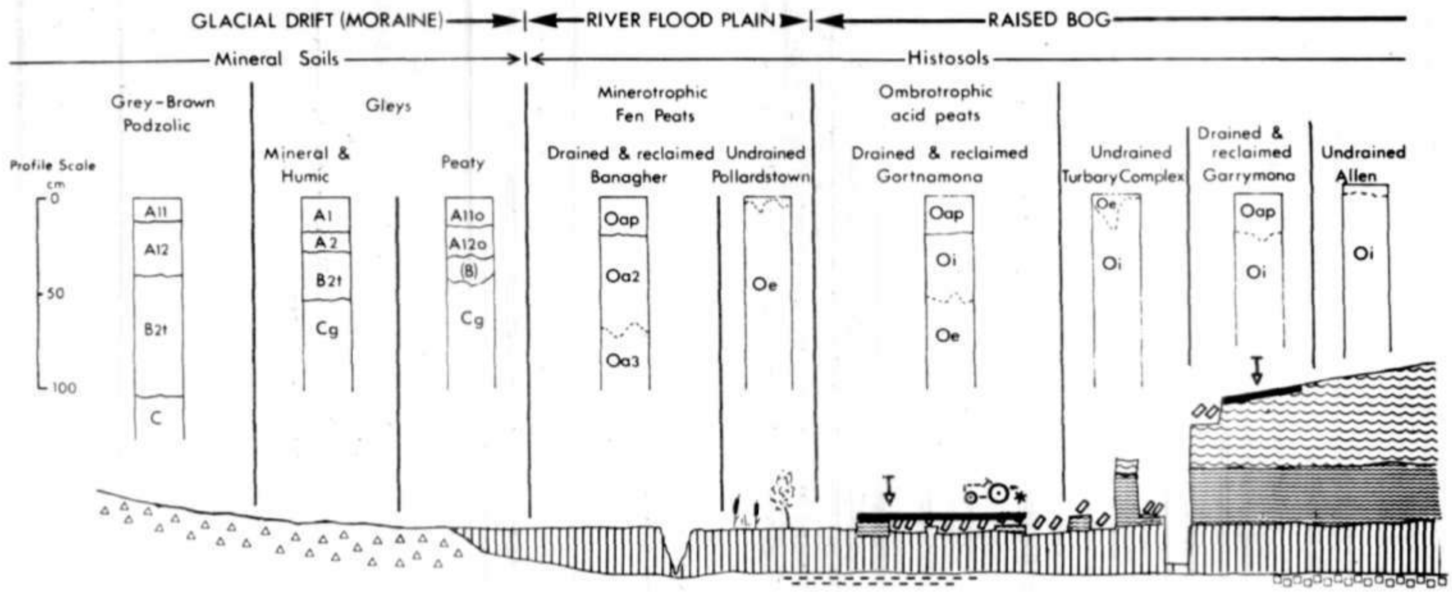



Figure 6: Schematic cross section of typical landscape with organic soils in the Irish midlands

> Organic soil materials that are saturated with water for prolonged periods, or are artificially drained, and have 30% or more organic matter if the mineral fraction is 50% or more clay, or 20% or more organic matter if the mineral fraction has no clay, or proportional intermediate organic matter contents if the clay fraction is intermediate. (Soil Survey Staff 1975).

From the early days of soil survey in Ireland a depth of 30 cm was taken as the minimum for a peat soil. This has then in part conditioned the acceptance of a definition based on this depth. The following is taken as the depth for organic material to constitute a soil in its own right:

> For land to be classed as peatland the depth of organic soil material, excluding the thickness of plant layer, must be at least 45 cm on undrained land and 30 cm on drained land.

These two definitions then define the exact nature of the peat material and its minimum depth as an organic soil. The American system (Soil Survey Staff, 1974) has established for practical purposes a control section of 160 cm for describing peat soils of moss origin and 130 cm for others.

Materials which fail to meet the above definitions are usually classified as peaty or humic sub-divisions of mineral soils e.g., peaty podzol, peaty gley. in The General Soil Map, Second Edition (1980). These criteria are the basis on which the organic soils have been mapped by the National Soil Survey of An Foras Taluntais.

In the county Soil Survey Bulletins published by An Foras Taluntais organic soils are mapped and described at the series level which is a basic category in soil classification. The soil series contains soils with a similar type and arrangement of horizons developed on similar parent materials. However, because of scale limitations it was not possible to show individual soil series on the present peatland map.

In the succeeding chapter the characteristic features of the peat soils are described. Profile descriptions for peat soils classified at series level are given in the appendices.

# 4

# The Peat Soils of Ireland

Knowledge of the composition and characteristics of various types of peatland soils is a pre-requisite in planning their future development. To meet these requirements definitive information on the extent of the different categories of peat soils and their suitability for different enterprises was required. The map legend to accompany this new peatland map of Ireland includes all peat soils, whether undisturbed or man modified.

The terminology used to describe large formations of organic debris is numerous e.g. bog (red bog, black bog), bogland, peatland, peat, turf, moss, moor, peat deposit, moory soils, mire, organic soil, histosols, hochmoor, fen, swamp, marsh, raised bog, blanket bog. Most of these terms have, at one time or another, been applied to accumulations of what is generally understood to be raw peat. This is a largely organic material produced by the incomplete decomposition of vegetable debris by micro-organisms under wet conditions where oxygen is limited or excluded.

For the map legend and bulletin, the terms used were chosen on the basis of (a) common usage in Ireland and (b) frequent use in English internationally. The terms bog and mire were selected as representing terms of national and international usage respectively. Bog is derived from the Gaelic *bogach* meaning a quagmire bog, whereas mire, used in recent years internationally, derives from myrr (Old Norse) meaning bog. The terms raised bog, blanket bog and fen are in common usage both at national and international level.

Table 6 shows the mire types, related sub-types, and areas for each in the country.

## Unmodified Mires

### Raised Mire Soils

Raised bogs are natural organic formations characteristic of the Central Plain, i.e. 'the Bog of Allen'. They have formed in depressed topography on calcareous glacial drift (Hammond, 1968). Their mode of formation has resulted in a characteristic 'raised' appearance, hence the term 'raised bog'.

Two sub-types are recognised, a True Midland sub-type and a Transitional sub-type (Moore, 1962). This division is based on the relationship between the botanical composition and the increasingly wet climate as one moves from east to west across the country (Fig. 7).

True Midland Sub-type: In the drier Midlands, the plant species indicative of the sub-type are *Andromeda polifolia* (Bog Rosemary) and *Vaccinium oxytocins* (Cranberry). In

Table 6: Classification of unmodified and modified mire types in Ireland

(a) Total area in Republic (b) Total area in Northern Ireland.

Northern Ireland, the relatively few unmodified raised bog areas which occur in counties Tyrone and Antrim are included in this category on the basis of similar rainfall and topography. However, these two species do not occur in the vegetation lists published for Northern Ireland (Anon., 1956).

Transitional Sub-type: The climatic division between the two sub-types is based on the 1,000 mm isohyet. With increasing oceanity of the climate westward the indicator species of the Transitional sub-types are *Pleurozia purpurea* and *Campylopus atrovirens* (Table 7). The occurrence of *Pleurozia purpurea* for the transitional type raised bog category mapped in Northern Ireland is recorded in the published vegetation lists (Anon., 1956).

As noted above these landscape units can be separated on the presence/or absence of certain plant species and shown on the map accordingly. In the soils context, however, the following considerations have to be taken into account. The depths of organic materials within these formations can vary from 3-8 m. Using the definitions for peat soils outlined in Chapter 3 only the uppermost 1.0-1.5 m are examined, described and analysed to determine the soil series.

Irrespective of botanical separation these landscape units are always associated with excessively wet surface conditions. In general they have an upper layer of poorly humified *Sphagnum* peat over variable depths of humified *Sphagnum* peat, with *Calluna* remains and *Eriophorum* fibres which in turn overlie a basal layer of woody and fen plant remains (Fig. 4).

From the data available to date for the peat type parent materials of these landscape units no marked differences can be seen between the soils of these botanically different sub-types. Therefore only one soil series is recognised, namely the Allen Series (Conry, *et al* 1970). This series is so called because of its strong association with the Bog of Allen, historically this name links all the raised bogs across the Midlands. A profile description, physical and chemical data and macrofossil content are given in Appendix I.

### Fen Mire Soils

No sub-divisions are made in the fen peats, since (a) many of the fens are contiguous to raised bogs, and (b) in most cases they have been drained and are now under permanent pasture.

Undisturbed fens are rare and can only be found in a few counties in Ireland. Owing to their small size their representation on the map is not possible, even their continued existence as natural entities is under threat from agricultural and urban pressures.

The characteristic dominant species associated with this peatland category in its natural state are *Schoenus nigricans* (Black Bog Rush), *Gadium mariscus* (Sword Sedge) and *Phragmites australis* (Common Reed).

### Blanket Mire Soils

Blanket bog has been divided into two sub-groups, an Atlantic sub-type and a Montane sub-type. Along the western seaboard where blanket bog is extensive, the division is made at the 150 m contour, since Moore (1962) found that up to the 150 m contour *Schoenus*

preted. In the Slieve Blooms the high level sub-type occurs at altitudes greater than 210 m whereas in the Wicklow Mountains bog formation occurs at 330 m. Cruickshank (1970) has shown that in Northern Ireland the occurrence of blanket bogs can be correlated with the 300 m contour. These soils in the natural state are acid, extremely wet and poorly drained. With increased reliance on such areas to provide soils for forest trees, the areas of untouched bog are decreasing annually. The profile chosen to represent the montane type is from Co. Leitrim (Walsh, 1975). Peat depths are variable depending on slope. At breaks in slope or on very gentle slopes, depths can be 2-3 m but as a general rule the average is 1.2 m. A profile description and analytical data are given in Appendix **I.**

## Modified Mires

Man-modified peatlands are defined as those areas where the bogland surface has been physically disturbed and the natural vegetation altered. In such cases peatlands have been drained (for agriculture, forestry, fuel production), grazed, marled and cut for peat fuels.

The vegetation growing on man modified unreclaimed peatland can indicate the soil condition and therefore its economic potential for land development. Peat depth, peat type, nutrient supply and micro topography created during modification all influence the plant species present, their extent, vigour etc. Table 8 lists some of the more common plant species associated with man-modified areas.

The occurrence of a particular species depends largely on the drainage condition and soil reaction. Mainly birch scrub may dominate on the older drier sites of cut-over areas in raised bogs: willow scrub may be dominant in wetter depressions. Drier sites of younger age will be colonised by heather *(Calluna vulgaris).* Wetter acid areas are colonised by plant species which also occur on the undrained raised bog, e.g. *Sphagnum* spp. and *Eriophorum* spp. Whilst all the species mentioned will grow in acid soil situations they do differentiate the drainage condition. This is a major consideration in the assessment of land development potential. Where the new surface is sufficiently close to the minerotrophic ground water and consists of weakly acid to alkaline peat, re-colonisation is by plant species typical of the same eutrophic peat environment (Table 8).

Those species listed under strongly acid soils (Table 8) also occur on colonised cutover blanket bog. With increased nutrient supply *Juncus* spp. and *Mohnia caerulea* constitute major components.

The practice of hand-cutting turf for fuel has been and still is widespread throughout Ireland. The techniques and management of turf cutting employed over the years has had a strong influence on the organic soils which occur on modified peatlands. These areas have become an increasingly important land resource to the farming community for reclamation and improvement. There are four main reasons for this (1) the advent of higher farm gate prices on gaining entry to the EEC; (2) farmer desire to increase farm size and obtain higher output; (3) inflated price of mineral soils; (4) increased awareness of reclamation techniques (drainage, fertiliser usage).

Soils of Man-Modified Raised Mires: Hand-cutting turf for fuel gives an uneven microtopography consisting of deep bog holes which may be separated by variable extents *of* flat areas used for hand spreading the cut peat. This category is mapped as a complex due

*Plate 4:*
Man modification of the peatland landscape by hand cutting

*(Photo Cork Examiner)*

*Plate 5:*
Machine modification. The Bord na Mona milled peat bog at Boora, Co. Offaly

*(photo Bord na Mona)*

# 5

# Land Use of Irish Peat Soils

Utilisation of peatlands for energy, agriculture and other uses e.g. chemicals, waxes has had a chequered history (Cooke, 1970). In the past 160 years several major parliamentary committees (Bog Commissioners 1810-1814; Anon., 1921) have deliberated on its use for various purposes. It was not until the 1940's that major investments were made to develop the peat fuel industry we know to-day. Four million tonnes of peat fuels per annum are now harvested by mechanical methods. In Northern Ireland detailed surveys (Anon., 1956), conducted on the larger peat areas found that they were too small and too shallow to merit economic development at that time.

## Research Developments

In recent years discussion has centred on the best land use for such (machine cutover) areas when worked out for fuel. Research work started in the 1950s and 1960s covered a broad spectrum of activity. Basic surveys were carried out on sub-soils beneath the peatlands and on peat types themselves (Barry *etal,* 1973; Carey, 1970; Carey and Hammond, 1970). Research on the suitability of crop varieties and their nutrient requirements showed the potential of peat soils for agriculture and horticulture. (An Foras Taluntais - Annual Research Reports). Research findings have now been translated into commercial practice (Bord na Mona Annual Reports 1975-76; 76-77; 77-78).

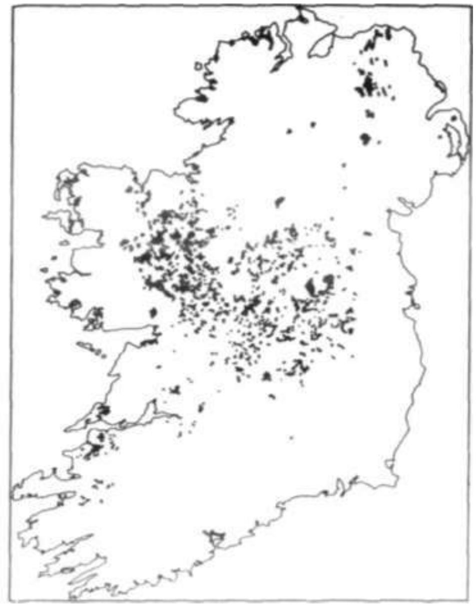
O'Muirgheasa (1978) discussed the role of forestry as a component for future land use planning on peatland.

Eventually there will be about 80,000 ha of industrially worked out land available for development. In the past decade a large area of farmer owned peatland has been reclaimed for agriculture as a direct result of escalating prices of upland mineral soils, increased grants-in-aid for land reclamation, and better prices for farm products.

Tables 9—12 show the extent and distribution of the different peatland categories on a county and province basis. Table 13 summarises the land use suitability of the different categories and their limitations for use. Table 13 also lists the soil series mapped by the National Soil Survey, these can be referred to in the Soil Survey bulletins e.g. Finch (1978). Figures 8 and 9 show the distribution patterns of the different categories mapped throughout Ireland.

Fig. 8.

(a) Distribution of industrial peat areas.



(b) Distribution of raised bog-man modified.

(c) Distribution of fen peat man modified.

(d) Distribution of raised bog unmodified.

Fig. 9.

(a) Distribution of blanket bog-Atlantic sub-type,

(b) Distribution of blanket bog-montane sub-type.

(c) Distribution of blanket bog man-modilied Atlantic sub-type.

(d) Distribution of blanket bog man-modified montane sub-type.

## Land Use on Midland Peat Soils

Research work at the Peatland Experimental Centre, Lullymore, Co. Kildare on reclamation and amelioration of worked out industrial peat areas has progressed to a stage where commercial application of the results is now being undertaken.

Since the mid fifties the Forest and Wildlife Service have been conducting a research programme to assess the tree species suitability and nutrient requirements when grown on man-modified peat soils. O'Muirgheasa (1978) reports on the performance of Sitka spruce when grown on peat soils developed on cut-over peatland < 2 m deep and that of lodgepole pine growing on deeper peat soils in the Irish Midlands. Sitka spruce has been particularly successful. This resource offers exciting possibilities for future development.

Cole (1976) and MacNaeidhe (1976) spelt out the management factors and capabilities for cut-over Midland peat soils to produce grass and crops. Good drainage, good soil management techniques (prevention of compaction, good ploughing technique), crop nutrition and weed control are essential. On newly reclaimed organic soils high initial applications of the macro elements (NPK) are required and lime must be well mixed into the top 15 to 20 cm. Optimum pH is around 5.5.

Micro-nutrients are essential to crop establishment in newly reclaimed peat soils. Chemical weed control measures on organic soils require 2 to 3 times the rate recommended for mineral soils, also herbicides are rapidly inactivated at normal rates due to the complexing nature of organic soils. Peatlands have some advantages over mineral

*Plate 6:*
I riesian steers grazing a ryegrass pasture on a reclaimed industrial peat bog, Clonsast, Co. OrTaly. Note the turf bank in the background *(photo BorJ m Mom)*

# APPENDIX I

## Soil profile descriptions and analytical data for organic soils derived from ombrotrophic parent materials of raised and blanket bog origin

### Profile 1 - Midland Type

| | |
|---|---|
| Location: | Clonawiny Td.Co. Westmeath Grid Ref. N: 49.52 |
| Classification: | U.S.D.A. classification Sub-group Typic Sphagnofibrist |
| Series: | Allen Series |
| Parent Material: | Ombrotrophic peat of *Sphagnum* origin |
| Vegetation: Main Species: | *Calluna* and *Sphagnum* spp. |
| Topography: | On cut edge 01 Dog - slope of 1 |
| Drainage: | Poor |
| Permeability: | Poor |
| Altitude: | 99m O.D. |
| Root Distribution: | Roots to 58 cm |

| Horizon | Depth (cm) | Description |
|---|---|---|
| Oil | 0-27 | Dark reddish brown (5YR3/4): *Sphagnum Calluna* peat; fibric; poorly humified; on washing *Sphagnum* with *Calluna* remains twigs and flower heads etc., clear wavy boundary to: |
| Oi2 | 27-58 | Dark reddish brown *(5YR3/4); Sphagnum peat;* fibric; poorly humified; on washing dark colour well preserved *Sphagnum;* clear, slightly wavy boundary to: |
| Oi3 | 58-87 | Dark reddish brown (2.5YR2/4); *Sphagnum-Calluna* peat; fibric; poorly humified; on washing dominantly dark-coloured *Sphagnum* remains; abrupt wavy boundary to: |
| Oi4 | 87-118 | Black (5YR2/1); *Sphagnum-Calluna* peat; fibric; poorly humified; on washing *Calluna* debris with *Sphagnum imbricatum* dominant and *S. cuspidatum* with *Eriophorum.* |

Table 1: Analytical data for Profile 1

| Horizon | Depth (cm) | Field Moisture <%) | Saturated Moisture (%) | Ash (%) | Rubbed I ibre (%) | Db (g/cc) | PI index | N (%) | 1 \.Ca/Mg Ratio | pH M$_2$0 | pH 0.01M CaCl2 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oil | 0-27 | 68.2 | 1548 | 3.0 | 50.0 | 0.061 | 4 | 1.50 | 5.00 | 3.42 | 2.92 |
| Oi2 | 27-58 | 77.4 | nd | 1.0 | 41.0 | nd | 7 | 1.10 | 1.28 | 3.40 | 2.76 |
| 0i3 | 58-87 | 87.5 | 1685 | 0.6 | 56.0 | 0.055 | 7 | 0.64 | 1.05 | 3.35 | 2.65 |
| 0i4 | 87-118 | 90.0 | nd | 0.6 | 64.0 | nd | 7 | 0.64 | 0.50 | 3.50 | 2.82 |

**Table 2: Macrofossil content of Profile 1**

| Horizon | Depth (cm.) | *Sphagnum spp.* | *Calluna vulgaris* | *Eriophorum spp.* | Cyperaceous debris (ombro.) | *Non-Sphagnum* mosses | *Phragmites australis* | Fen rootlets | *C. geophilum* | Seeds | Mites | Charcoal | Cyperaceous debris (minero.) | Wood debris | Heterogeneous debris | Amorphous material | Mineral matter | Recent roots |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0i1 | 0–27 | +++ | + | | | | | | | | | | | | | | | |
| 0i2 | 27–58 | +++ | + | + | ++ | | | | | | | | | | | | | |
| 0i3 | 58–87 | ++ | + | | ++ | + | | | + | | | | + | | | | | |
| 0i4 | 87–118 | ++++ | + | | ++ | | | | | | | | | | | | | |

**(+) Present; (++) Frequent; (+++) Common; (++++) Abundant**

Table 3: Analytical data for Profile 2

| Horizon | Depth (cm) | field Moisture | Ash (%) | Db (g/cc) | P.I. Index | Rubbed Fibre ( %) | N (%) | Ex. Ca/Mg ratio | pH ($H_2O$) |
|---|---|---|---|---|---|---|---|---|---|
| Oal | 0-40 | 87.1 | 3.3 | 0.100 | 1 | 10 | 1.94 | 1.58 | 3.8 |
| Oa2 | 40-50 | 84.8 | 1.8 | 0.099 | 6 | 8 | 1.93 | 0.55 | 3.8 |
| Oa3 | 52-120+ | 91.3 | 2.1 | 0.093 | 7 | 8 | 1.22 | 1.39 | 4.1 |

Table 4: Macrofossil content of Profile 4

| Horizon | Depth (cm.) | *Sphagnum spp.* | *Calluna vulgaris* | *Eriophorum spi* | Cyperaceous debris (minero.) | *Non-Sphagnum* mosses | *Phragmites australis* | Fen rootlets | *C. geophilum* | Seeds | Mites | Charcoal | Cyperaceous de bris (ombro.) | Wood debris | Heterogeneous debris | Amorphous material | Mineral matter | Recent roots |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oal | 0-40 | | | | | | | | | | | | | | | ++++ | | |
| Oa2 | 40-52 | | | | +++ | | | | | | + | 4 | | | | ++++ | | |
| Oa3 | 52-120+ | | | | +++ | | | | | | | | | | | | | |

**(+) Present (++) Frequent (+++) Common (++++) Abundant.**

Table 5: Analytical data for Profile 3

| Horizon | Depth (cm) | Field Moisture (%) | Saturated Moisture (%) | Ash (%) | $D_b$ (g/cc) | Rubbed Fibre (%) | PI index | N (%) | Ex.Ca/Mg ratio | pH ($H_2O$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0a1 | 0-30 | 85.1 | 1171 | 4.2 | 0.094 | 1.0 | 0 | 2.52 | 0.6 | 4.22 |
| 0a1 | 30-60 | 90.5 | 1056 | 1.9 | 0.091 | 2.0 | 1 | 2.01 | 0.5 | 4.00 |
| 0a2 | 60-90 | 89.7 | 1077 | 3.6 | 0.094 | 2.0 | 1 | 2.01 | 0.8 | 4.10 |
| 0a3 | 90-110 | 86.2 | 872 | 5.2 | 0.102 | 6.0 | 1 | 2.38 | 1.1 | 3.70 |



Table 6: Macrofossil content of Profile 3

| Horizon | Depth (cm.) | *Sphagnum spp.* | *Calluna vulgaris* | *Eriophorum spp.* | Cyperaceous debris (minero.) | *Non-Sphagnum* mosses | *Phragmites australis* | Fen rootlets | *C. geophilum* | Seeds | Mites | Charcoal | Cyperaceous debris (ombro.) | Wood debris | Heterogeneous debris | Amorphous material | Mineral matter | Recent roots |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0a1 | 0–30 | ++ | | | | | | | + | Ju | | ++ | | ++ | ++ | ++++ | | |
| 0a1 | 30–60 | + | + | | ++ | | | | ++ | | + | + | | +++ | ++ | +++ | | |
| 0a2 | 60–90 | + | | | +++ | | | | + | | + | + | | + | ++ | ++++ | | |
| 0a3 | 90–110 | | | + | +++ | + | | | + | Ju | ++ | | | | | +++ | | |

(+) Present (++) Frequent (+++) Common (+++) Abundant. Ju = Juncus spp.

## APPENDIX II

## Soil profile descriptions and analytical data for man modified peat soils derived from ombrotrophic and minerotrophic parent materials

### Profile 4 - Raised bog, man-modified

| | |
|---|---|
| Location: | Castletown Moor Td. Co. Meath<br>Grid Ref. N: 80.79 |
| Classification: | U.S.D.A. classification Great Group Medihemist |
| Series: | Gortnamona |
| Parent Material: | Ombrotrophic peat of *Sphagnum* origin |
| Vegetation: Main Species | *Dactytis gtomerata* (Cocksfoot),<br>*Filipendula ulmaria* (Meadow Sweet)<br>*Urtica dioica* (Nettle) |
| Topography: | Flat |
| Elevation: | 97m O.D. |
| Root distribution: | Good in Oap, moderate in Oel |

| Horizon | Depth (cm) | Description |
|---|---|---|
| Oap | 0-33 | Black (5YR2/1); sapric; no plant remains visibl structure; well humified; much marling carried out, egg shells at 30 cm; abrupt smooth boundary to: |
| Oel | 33-59 | Black (5YR2/1); hemic; well humified; fine strong sub-angular structure; very few plant remains; abrupt smooth boundary to: |
| Oe2 | 59-80 | Strong brown (5YR5/8) turning rapidly black on exposure to (5YR2/1); greasy; cyperaceous; peat hemic; very small amount of peat exudes between the fingers on squeezing. |

## **Profile 5 - Blanket** bog - Atlantic type - man-modified

| | |
|---|---|
| **Location:** | **Dooagh, Achill Island, Co. Mayo**<br>**Grid Ref. F 60.05.** |
| **Classification:** | **U.S.D.A. classification Sub-Group Euic Medisaprist** |
| **Series:** | **Gweesalia** |
| **Parent Material:** | **Ombrotrophic peat of cyperaceous origin** |
| **Vegetation:** | **Old Pasture** |
| **Topography:** | **Mat** |
| **Elevation:** | **15 m. O.D.** |

| Horizon | Depth (cm) | Description |
|---|---|---|
| Oap | 0-25 | Black (5YR2/I); sapric; well humified; moderat crumb structure; no plant remains recognisable; abundant recent roots; abundant sand grains (sea sand additions); clear smooth boundary to: |
| Oa2 | 25-45 | Black to dark reddish brown (5YR 2/1.5); sapric; moderately well humified; less than one third of peat material passes through fingers on squeezing; few recent roots; plant residues, heterogeneous leaf, rootlet and amorphous material, occasional twig and many fine charcoal fragments; clear smooth boundary to: |
| Oa3 | 45-74 | As above with more fibres exposed on the profile face. |
| Oa4 | 74+ | Dark reddish brown (5YR3/3) going to dark reddish brown (5YR2/2) on exposure; sapric; weak fibres; greater than two thirds of peat material passes through fingers on squeezing; strong smell of sulphides; plant residues, very fine twigs, bark and leaf fragments, some rootlet debris, much fine charcoal. |

**Profile 6 - Fen - man modified**

| | |
|---|---|
| Location: | Wood town Td., Co. Westmeath<br>Grid Ref. N: 49.52 |
| Classification: | U.S.D.A. classification Sub-Group Terric Medisaprist |
| Series: | Banagher |
| Parent Material: | Minerotrophic neat fWoody-fen) |
| Vegetation. Mam Species: | *filipendula ulmaria* (Meadow bweet), *Juncus effusus* (Soft Rush), *Holcus lanatus* (Yorkshire Fog), *Festuca rubra* (Red Fescue) |
| Topography: | Flat |
| Drainage: | Good |
| Permeability: | Moderate |
| Elevation: | 96m O.D. |
| Root Distribution: | Common in surface horizon, decreasing with depth. |

| Horizon | Depth (cm) | Description |
|---|---|---|
| Oap | 0-14 | Very dusky red (2.5YR2/2): peat; sapric; fine to medium strong crumb structure; moist friable; very well humified; strong root mat; clear smooth boundary to: |
| $Oa_2$ | 14-29 | Black (5YR2/I); peat; sapric; massive structure breaks to sub angular pieces; moist friable; very well humified; on washing, dark reddish brown amorphous lumps with finely fragmented woody debris, strong staining of supernatant water: clear smooth boundary to: |
| $Oa_3$ | 29-52 | Black (5YR2/I); peat; sapric; massive structure; well humified; on washing, finely fragmented woody debris with amorphous lumps; clear gradual boundary to: |
| IAI | 52-55 | Weak red (2.5YR4/2): peaty loam; massive structure; well humified; wet sticky and slightly plastic;clear smooth boundary to: |
| IC | 55+ | Greyish brown (2.5Y5/2); stony loam; pale brown (10YR6/3); common, coarse, faint mottles; massive coherent structure; wet plastic; vigorous effervescence. |

Table 11: Analytical data for Profile 6

| Horizon | Depth (cm) | Field Moisture (%) | Saturated Moisture (%) | Ash (%) | Rubbed Fibre (%) | Db (g/cc) | PI index | N % | Ex.Ca/Mg ratio | pH $H_2O$ | pH 0.01M $CaCl_2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oap | 0-14 | 68.3 | 219 | 40.0 | 7.0 | 0.370 | 0 | 1.95 | 28.4 | 5.70 | 5.05 |
| Oa2 | 14-29 | 78.2 | nd | 22.5 | 0.0 | nd | 1 | 2.00 | 47.8 | 6.38 | 5.74 |
| Oa3 | 29-52 | 80.2 | 468 | 18.7 | 0.0 | 0.184 | 1 | 2.30 | 42.6 | 6.32 | 5.88 |

Table 12: Macrofossil content of Profile 6

| Horizon | Depth (cm.) | *Sphagnum spp.* | *Calluna vulgaris* | *Eriophorum spp.* | Cyperaceous debris (ombro.) | *Non-Sphagnum* mosses | *Phragmites australis* | Fen rootlets | *C. geophilum* | Seeds | Mites | Charcoal | Cyperaceous debris (minero.) | Wood debris | Heterogeneous debris | Amorphous material | Mineral matter | Recent roots |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oap | 0–14 | | | | | | | | | | | | | | | +++ | +++ | ++ |
| Oa2 | 14–29 | + | | | | | | | | | | | | | | ++++ | | |
| Oa3 | 29–52 | | | | | | | | | | | | | | ++++ | ++ | + | |

(+) Present; (++) Frequent; (+++) Common; (++++) Abundant

## NOTES ON ANALYTICAL DATA TABLES

Saturated Moisture (%)-Moisture content at saturation: Unit weight at saturation expressed as the weight of water per unit weight of oven dry soil on a percentage basis.

Db-bulk density at saturation: Dry weight of peat divided by saturated volume.

P.I.-pyrophosphate index: The solubility of the organic fraction in a solution of sodium pyrophosphate indicates the degree of oxidation or humification (Mackenzie and Dawson, 1962, A study of organic soil horizons using electrophoretic techniques J. Soil Sci. 13 160-166). Colour index expressed on the Munsell Notation using value-chroma e.g. 10YR6/3 = P.I. 3.

Horizon designators (Soil Survey Staff, 1975).

| | |
|---|---|
| Oi | Horizon designation for fibric materials which are the least decomposed of all soil organic materials. The root word L. *fibra* - fibre, with the connotative element *I* |
| Oe | Horizon designation for hemic materials intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric materials. The root word Gr. *hemi* - half, with the connotative element *e.* |
| Oa | Horizon designation for sapric materials, the most highly decomposed of organic materials. The root word Gr. *sapros* - with the connotative element *a.* |

## GLOSSARY OF TERMS

**Bog:** A peat-covered or peat-filled area, usually refers to peatland supporting, in its natural condition, oligotrophy vegetation.

**Cut-away:** Bogs cut for fuel and where 30 cm or less of peat remains.

**Cut-over:** Bogs from which peat has been cut leaving more than 30 cm of peat *in situ.*

**Diatomite:** A deposit of the siliceous cell walls of diatoms.

**Dy:** Acid substance, rich in colloidal humus with live organisms or evidence of these rare or absent. Also known as humic peat, peat mud.

**Eutrophic:** Peat forming environment where water is rich in nutrients.

**Fen:** Peatland of high ash content formed under the influence of base-rich groundwater.

**Fibrist:** U.S. classification, suborder of Order Histosols. High content of undecomposed plant fibres. Bulk density less than 0.1 g/cc.

**Gyttja:** See Sapropel.

**Hemist:** U.S. classification, suborder of Order Histosols. Intermediate degree of plant fibre decomposition. Bulk density 0.1 to 0.2 g/cc.

**Histosol:** See peat.

**Limnic:** Inorganic and organic deposits formed below water level.

**Machine peat:** Industrial fuel peat produced by an automatic excavator which cuts from a vertical face, macerates and extrudes the peat on to a drying area with a 60 m-long spreading arm which also segments the spread peat into sods.

**Mesotrophic:** See eutrophic. Base status of waters intermediate between eutrophic and oligotrophic.

**Minerotrophic:** Refers to peatlands with water percolating through them and carrying nutrients into the peatland from outside sources. These mires typically have waters in which the predominant anion is HCO3 and the predominant cation is $Ca^{++}$.

**Milled peat:** Peat in a crumb or powder form when air-dried to approx. 50% moisture. The mean particle size will vary with machinery and peat type.

**Milling:** Peat winning operation by tractor-powered milling drums with a series of steel pins approximately 30 mm long on the outer surface. The pins scarify the surface, the new layer is harrowed to increase the drying rate and at approx. 50% moisture the crop is ridged and harvested.

**Mire:** Wetland ecosystem where peat accumulates.

**Mire complex:** Group of mires occurring in a region.

**Moss peat: (horticultural)** A peat product containing over 75% Sphagnum mosses,

**Oligotrophic:** Peat forming environment where water is lacking nutrients.

| | |
|---|---|
| Ombrogenous, Ombrotrophic: | Refers to peatlands dependent on precipitation for water and nutrients. These mires typically have waters whose predominant anion is SO4" and predominant cation $H^+$. |
| Organic soil: | See peat. |
| Paludification: | Peat forming environment where water-table levels are high without, however, forming open water. |
| Peat soil: | Organic soil material saturated with water for prolonged periods, or artifically drained, with 30'; or more organic matter if the mineral fraction has no clay, or proportional intermediate organic matter contents if the clay fraction is intermediate.<br>For land to be classed as peatland, the depth of the organic soil material, excluding the thickness of the plant layer, must be at least 45 cm on undrained land and 30 cm on drained land. |
| Peatland: | Generic term to include all classes of peat-covered terrain. |
| Saprist: | U.S. classification, suborder of Order Histosols. High content of plant materials so decomposed that original plant structures cannot be determined, bulk density more than 0.2 g/cc. |
| Sapropel: | freshwater mud laid down in clear water of neutral or alkaline reaction, rich in water-plant, algal and animal remains. |
| Shell marl: | A calcareous limnic deposit formed in fresh water lakes by *Charophyceae* (Stoneworts) permeated by variable quantities of shells of fresh water molluscs. |
| Telmatic: | Organic deposits formed between low and high water levels. |
| Topogcnous: | Development controlled by topography. |

# References

Anon. 1921. Commission of Enquiry into the Resources and Industries of Ireland.
Anon. 1939. Land Use Maps of Northern Ireland, H.M.S.O., Belfast.
Anon. 1956. Peat Bog Survey of Northern Ireland. H.M.S.O., Belfast.
Anon. 1973. 'Report on Peat'. Future utilization of peatland in Ireland. Agric. Sci. Assoc, Dublin, 11 Op.
Anon. 1969. Utilization of cut-over peatland. An Poras Taluntais. Dublin, 108p.

Barry, T. A. 1954. Some considerations affecting the classification of the bogs of Ireland and their peats. Int. Peat Symp., Dublin.
Barry, T. A., Carey, M. L. and Hammond, R. F. 1973. A survey of cut-over peats and underlying mineral soils. Bord na Mona, Cnoc Dioluin Group. An Foras Taluntais/Bord na Mona, Dublin, 143p.
Bellamy. D.J. 1972. Templates of peat formation. Proc. 4th Int. Peat Congr., Helsinki 4: 7 18.
Bellamy, D. J. and Moore, P. D. 1973. Peatlands. Elek Science, London, 221 p.
Bog Commissioners 1810-1814. Survey Reports.

Carey, M. L. 1970. Survey of sub-peat mineral soils. An Foras Taluntais, Dublin.
Carey, M. L. and Hammond, R. F. 1970. The soils beneath the midland peats. Irish For. 27: 23-26.
Cole, A. J. 1976. Special problems of cattle production on Midland peat. Farm and Food Research. Vol. 7, No. 2, 28-31, An Foras Taluntais, Dublin.
Collins, D. P. 1961. The establishment of grass-clover swards on bogland by surface seeding. Ir. J. agric. Res. 1: 21-29.
Conry, M. J. 1972. Pedological evidence of man's role in soil profile modification in Ireland. Geoderma 2: 139-146.
Conry, M. J., Hammond, R. F. and O'Shea, T. 1970. Soils of Co. Kildare, An Foras Taluntais, Dublin.
Cooke, J. 1970. Bog reclamation and peat development in Co. Kildare. J. Co. Kildare Arch. Soc. 14: 576 625.
Cruickshank, J. G. 1970. Soils and pedogenesis in the north of Ireland. Irish Geographical Studies, Ch. 5, 89-104, University of Belfast.

I inch. T I 1971. Soils of Co. Clare. An Foras Taluntais. Dublin.
1 inch, T. I . 1978. Soils of Co. Westmeath. An Foras Taluntais. Dublin.
flood, H. 1970. Milled peat production. Irish Engineers Supplement, 23-27.

Galvin, L F. 1972. Reclamation of Irish peats for agricultural development. 4th Int. Peat Congr., Helsinki, 3: 425-434.
Godwin. H. 1956. The Hi«=">rv of the British Flora. Cambridge University Press
Ciencrai ;>oii Map ol Ireland, 1969; First Edition, compiled Dy M. J. Gardiner, An Foras Taluntais, Dublin.
General Soil Map of Ireland. 1980; Second Edition, compiled by M. J. Gardiner and T. Radford, An Foras Taluntais, Dublin.

Hammond. R. F. 1965. Survey sub-peat mineral soils Ballydermot LuUymore Complex. An 1 oras Taluntais, Dublin (unpublished)
Hammond, R. F. 1968. Studies in the development of a raised bog in central Ireland. Proc. 3rd Int. Peat Congr., Quebec.

Jessen, K. 1949. Studies in late Quaternary deposits and flora-history of Ireland. Proc. R. Ir. Acad. 52B: No. 6, p. 85 290.

Kiely, J. 1974. Soil Map of West Mayo. An I oras Taluntais. Dublin.

MacNaeidhe. F. 1976. Field crops grow well on cut-over Midland peat. Farm and Food Research, Vol. 7, No. 3, 64-66. An I oras Taluntais, Dublin.

Mannion, J. and Callaghan, J. 1976. Farming in a peatland area. University College, Dublin.

Moore, J. J. 1962. Die regionale Verteilung der Moore Irlands. Proc. 8th Int. Congr. Soc. Univ. Peat and Moorland Res., Bremen.

Mitchell, G. F. 1976. The Irish Landscape. Collins, London, 240p.

O'Muirgheasa, N. 1978. The future of long rotation forestry on Midland peat, Symp. Ir. Soc. Agr. & Land Use, Tullamore, 29-36.

Osvald, H. 1949. Notes on the vegetation of British and Irish mosses. Acta phytogeogr.Suec. 26.

Power, J. D. 1970. Sod peat, Irish Lngineer Supplement, 31-33.

Rice, S. L. 1970. Moss peat production, Irish Engineer Supplement, 38-39.

Smith, A. G., Pearson, G. W. and Pilcher, J. R. 1971. Belfast radiocarbon dates III. Radiocarbon 13: 103-125.

Soil Survey Staff, 1974. Soil Taxonomy U.SD.A.-S.C.R. Agriculture Handbook No. 436, Washington D.C 754 p.

Tansley, A. G., 1939. The British Islands and Their Vegetation. Cambridge University Press, 2 Vols., 930 p.

Von Post, L. 1937. The geographical survey of Irish bogs. Irish Nat. J. 6: 210-227.

Walsh, M. 1975. County Leitrim Resource Survey, Part 1. Grazing Capacity, Forestry Potential and Soils. An loras Taluntais, Dublin.

Webb, D. A. 1977. An Irish Mora, 6th rev. ed. Dundalgan Press, Dundalk.