REGISTER OF PERMANENT VEGETATION PLOTS

INSTITUTE of TERRESTRIAL ECOLOGY

NATURAL ENVIRONMENT RESEARCH COUNCIL

Natural Environment Research Council

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COVER ILLUSTRATION
Taking topograph readings on a developing saltmarsh in Norfolk
(Photograph R Scott)

The **Institute of Terrestrial Ecology (ITE)** was established in 1973, from the former Nature Conservancy's research stations and staff, joined later by the Institute of Tree Biology and the Culture Centre of Algae and Protozoa. ITE contributes to, and draws upon, the collective knowledge of the 14 sister institutes which make up the **Natural Environment Research Council**, spanning all the environmental sciences.

The Institute studies the factors determining the structure, composition and processes of land and freshwater systems, and of individual plant and animal species. It is developing a sounder scientific basis for predicting and modelling environmental trends arising from natural or man-made change. The results of this research are available to those responsible for the protection, management and wise use of our natural resources.

One quarter of ITE's work is research commissioned by customers, such as the Department of Environment, the European Economic Community, the Nature Conservancy Council and the Overseas Development Administration. The remainder is fundamental research supported by NERC.

ITE's expertise is widely used by international organizations in overseas projects and programmes of research.

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PREFACE

The Ecological Data Unit (EDU) was set up within the Institute of Terrestrial Ecology (ITE) in 1984. Its purposes are to collate and make available the accumulating body of data relating to ecological change, and to promote the development of an environmental monitoring programme. The initial task of EDU is to compile registers of data holdings and of survey and monitoring activities, both within ITE and in other organizations that share a common interest in environmental resources. Attention will then be directed towards making data from these documented sources more widely available to accredited users.

Projects concerned mainly with monitoring, or having a strong monitoring component, are to be found in most of the Institute's 16 Research Programmes. Through these projects, ITE is assessing change in types of land cover and land use, in ecosystems, and in species populations. Some studies are at the national level; others are at regional or local scales. Many were begun through individuals' active research interests rather than as part of a planned monitoring programme. Inevitably, there are gaps and biases in the body of information that currently exists.

Ideally, ITE should maintain a comprehensive record of natural and man-made changes in Britain, but, in practice, this is impossible. However, surveys of biological and other environmental resources are frequently undertaken, both by ITE and by others, so that there is potential for monitoring through the careful selection of surveys to be repeated at appropriate intervals. EDU will make recommendations on the feasibility of this approach as the basis of an integrated programme of monitoring, concentrating initially upon surveys that have recorded the distribution and abundance of biological species.

The Register of Permanent Vegetation Plots is the first tangible product of EDU. It identifies numerous long-term vegetation studies that are being conducted by ITE. Many, but not all, of these will continue as a vital component of the Institute's monitoring programme. As EDU's work proceeds, further registers will be produced, covering both the range of data holdings within ITE and relevant monitoring activities by other organizations.

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1 INTRODUCTION

The register of permanent vegetation plots consists of a numbered list of permanent plots maintained by ITE. Brief details are given of the location, vegetation type and person responsible for maintaining the plots. A plot is considered permanent if observations on it have already continued, or are planned to continue, for at least 10 years. The register is supplemented by an account of the types of vegetation that are being monitored by permanent plots.

The register was sponsored by the management advisory group of ITE's Research Programme 5 (Survey and monitoring of plant and animal distributions and abundance). The purpose is to tabulate and index a part of the activity of the Institute in the field of long-term monitoring. Such a tabulation is desirable, to foster long-term awareness of who is doing what and where. This is particularly important with long-term recording programmes, because, when members of staff retire, the data need to be adequately archived, and a decision must be made as to whether to maintain the recording programme. Subsequent enquirers should be able to find out what became of the records and what has been done about maintaining the plots.

1.1 Why record vegetation in permanent plots?

Change in living systems is universal. Vegetation may appear to persist for long periods in a stable condition, but such an appearance is almost certainly deceptive. Individual plants are subject to a constant process of death and regeneration. The floristic composition of vegetation is constantly changing (Miles 1979). The classic, and often the only, way to study vegetation change is to mark out permanent plots on the ground and to make regular observations.

The time-scale of vegetation change is tolerably well suited to the plot method. Long-lived forests develop over a period of several hundred years, and do admittedly present special difficulties. Regeneration processes in forests are frequently studied by the method of the chronosequence, in which stands of differing ages are contrasted and compared. Where regeneration is triggered by repeated catastrophe, such as fire, hurricane or landslip, chronosequences are very useful. However, in many natural woodlands, including most of those in Britain, regeneration is non-catastrophic, and results from saplings filling in small to medium-sized gaps.

There are many unresolved questions, even in our much botanized woods. Why does regeneration appear so often to be episodic? Are destructive events, such as occasional strong winds, important? How much of the existing pattern can be ascribed to the effects of man, who coppiced, selected, felled, grazed livestock and planted young trees in these woods? To answer these questions for woods, we must be both patient and observant. Historical research can provide some of the answers; only time and careful observation can provide the others.

In grassland, the time-scale of vegetation change is more amenable to study. Responses to a new regime, such as cessation of grazing, may take as little as 10 years to achieve their main effect. Even so, some herbaceous perennials and many grasses have life-spans that run into decades or centuries. Slow change may well be superimposed on faster regeneration processes.

The chief value of permanent plots is that they allow us to observe changes that occur on a time-scale too large for differences otherwise to be perceived. Plots are excellent for non-destructive observation of sessile organisms such as plants. Animals, however, are more mobile, and show larger year-to-year fluctuations than most plants. Permanent plots are less satisfactory for recording them, though they can provide a useful framework for repeated census.

Soils are, in principle, also a suitable subject for monitoring by permanent plots. Soil sampling is destructive, but repeated sampling from near permanently marked positions can be very informative. Soil changes, associated with development of secondary woodland at Rothamsted Experimental Station, Hertfordshire, have been recorded over about a century. The content of organic matter and nitrogen have changed very markedly. These changes must in their turn react on the vegetation.

It is an unfortunate fact that vegetation scientists generally pay only scant attention to concomitant soil changes, and tend to treat the soil as unvarying. The rate of change in most soils is admittedly slow; but over the time-scales that are frequently necessary to make adequate observations of vegetation change, soil change may be large enough to become itself a driving force for further vegetation change.

1.2 **Description of vegetation change**

Vegetation change can be observed at many scales. At the level of the individual, growth rates, mortality and reproductive success can be assessed. This demographic approach is frequently used in forest stands, and for studying populations of annual plants. Below the level of the individual, the success of particular genetic characteristics can be studied in relation to the environment. Such studies are very time-consuming and therefore seldom made; a notable example within ITE is the examination of isozymes in the tussock-grass Agrostis curtisii in south-west Britain.

In many grasslands, the structure of the turf is so complex that demographic assessment is not feasible for the whole plant community. Demographic studies have consequently tended to concentrate on populations of herbaceous plants with distinct individuals such as orchids (Wells 1981), rather than on the grass matrix in which they grow. For the community as a whole, vegetation change must be based on assessments of species abundance. Change is registered only when the composition of the vegetation alters, rather than when individuals die.

At a still more general level than assessments of species abundance, the structure of vegetation may be considered. The structure of vegetation is often as relevant to animal populations as its species composition. Unfortunately, structure is difficult to characterize, so that in most studies, other than those particularly relating to animals, it is inadequately recorded.

ITE is undertaking studies of vegetation change at all the levels mentioned. However, it can be seen from the register that permanent plots are used chiefly to assess species abundance. This is the most basic description of vegetation; a statement of the species composition and of their abundance at a locality gives a good general impression of the condition of the plants at that place.

1.3 Selection of sites for permanent plots

Most permanent plots maintained by ITE are in nature reserves. This reflects the fact that, prior to ITE being established in 1973, many members of staff were employed in research for nature conservation. Since 1973, the Nature Conservancy Council has commissioned ITE to set up many further plots for monitoring vegetation change in National Nature Reserves. Hence, plots in nature reserves predominate.

ITE's research interests now extend to many types of vegetation that are quite unsuitable for nature reserves. The register shows a particular emphasis on permanent plots on hill land and in plantation forests of the north and west. However, there are also a few plots that are not on nature reserves and are not located in the uplands.

2 TYPES OF VEGETATION MONITORED BY PERMANENT PLOTS

2.1 Lichens

Lichens, at least those growing on trees and rocks, are ideal subjects for photographic monitoring. They are colourful, slow-growing and predominantly two-dimensional in structure. Identification from photographs is relatively easy. The two monitoring programmes that record lichens from trees and rocks (Register 1, 2) are designed to relate lichen suvival and vitality to atmospheric pollution. Lichens are particularly susceptible to damage by atmospheric pollutants, and provide a sensitive integrated measure of pollutant levels (Hawksworth & Rose 1976).

Table 1. Plots with special recording of lichens

Substrate	Number in Register	Person maintaining plots	Locality
Tree boles	1	B G Bell	East-central Scotland
Rocks, walls, trees	2	D F Perkins	Anglesey, Lleyn

2.2 Coastal sites

Accreting coasts have provided many classic examples of ecological succession. Except at the earliest stages, the course of change is slow. It is normally inferred by dating past coastlines, ie by chronosequences rather than by direct observation. At present, ITE has a relatively small involvement in research on coastal vegetation. Shrub development on shingle is being monitored at Dungeness (Register 3). The spread of colonizing species is being observed in a saltmarsh at Wells in Norfolk (Register 57). Dune turf can respond markedly to variations in the grazing or mowing regime. The changing composition of dune turf is being studied after exclusion of rabbits at Holkham in Norfolk (Register 52). At Newborough Warren in Anglesey, ungrazed grassland becomes coarse and tussocky; grazing and mowing experiments (Register 62, 63) demonstrate that the successsion to coarse vegetation can rapidly be reversed by suitable management.

In addition to these observations of vegetation change, the population dynamics of a coastal vetch (Vicia lutea) are being studied at contrasting sites in Cornwall and Suffolk (Register 4, 5).

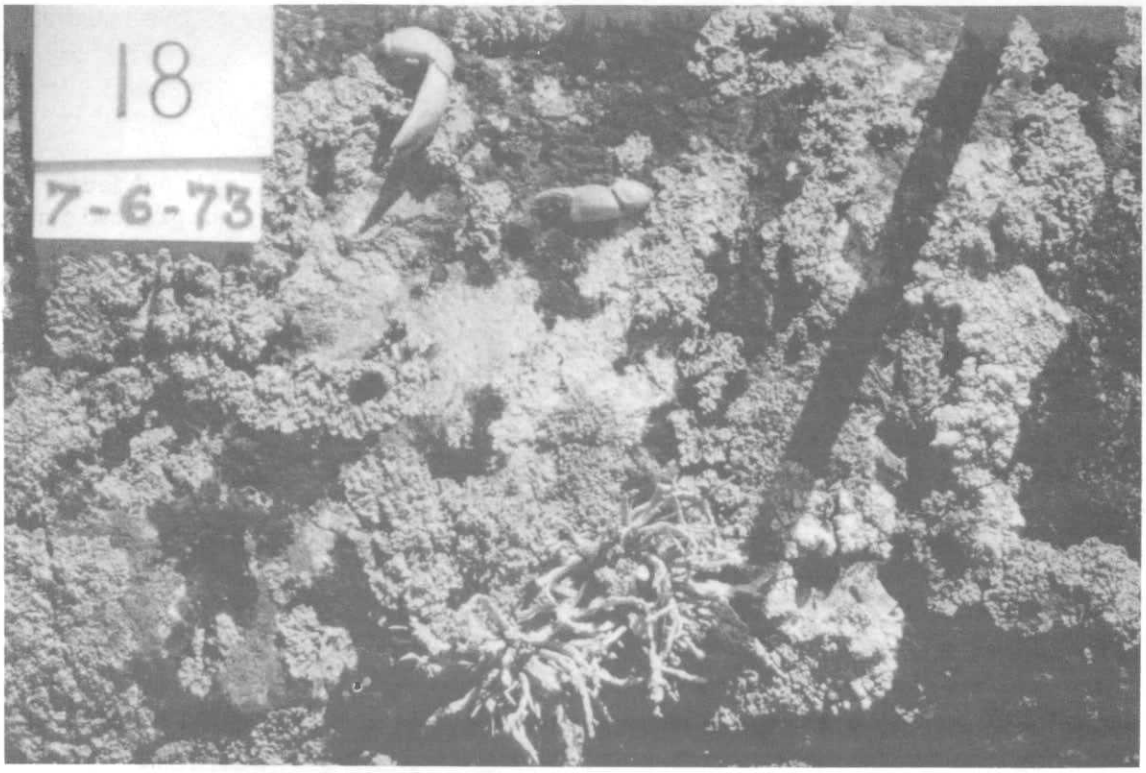

Plate 1. Example from the programme of fixed point photography used to record lichen survival and vitality (Register 2)
(Photograph R O Millar)

Plate 2. Oblique aerial view of Denge Beach, Dungeness, taken in 1948. Many of the shingle ridges, and the unique vegetation associated with them, have been destroyed by gravel extraction and the construction of two nuclear power stations (Register 3)
(Photograph Cambridge University Collection: copyright reserved)

Table 2. Coastal plots

Site type	Number in Register	Person maintaining plots	Locality
Shingle heathland	3	R M Fuller	Dungeness
Dune grassland	52	L A Boorman	Holkham, Norfolk
	62,63	D G Hewett	Newboro' Warren
Saltmarsh	57	R Scott	Wells, Norfolk
Serpentine quarry	4	C D Preston	Landewednack
Shingle coast	5	C D Preston	Suffolk

2.3 **Calcareous grassland and scrub**

Except at high altitudes, almost all British grasslands are potential woodland. They can be maintained as grasslands by a regime of grazing, burning or mowing. If the regime changes, so does the vegetation. If active management ceases, then most grasslands will begin a process of ecological succession towards woodland.

Grassland regimes are often unstable and irregular. Railway verges (Register 51; Sargent 1984), which are intermittently affected by fire and deposition of ballast, are perhaps the most unstable kind of grassland. Roadside verges (Register 58, 59; Parr 1983) generally have a more stable regime of management, but the regime will vary from time to time, according to the dictates of the local authority.

Grazing regimes are generally more stable and predictable. However, with the decline of sheepwalk and reduction of rabbit populations, regularly grazed permanent calcareous grassland has become scarce in lowland Britain. If grazing is light, many scrub species invade (Register 13, 14), an uncommon but notable one of which is juniper (Juniperus communis) (Register 15). Where the vegetation is mown, scrub cannot develop, but the frequency of mowing can affect the composition of the herbage (Register 18). Grazed chalk grassland is a classic habitat for British orchids; ITE has monitored populations of three species for many years at two sites (Register 16, 17; Wells 1981).

High-altitude calcareous flushes at Moor House National Nature Reserve in the Pennines (Register 6) are a marked contrast. The land is still maintained as sheepwalk. If sheep are excluded from experimental plots, the grassland does not revert to woodland. Nevertheless, in the absence of sheep, the vegetation changes markedly in composition.

Table 3. Calcareous grassland and scrub

Site type	Number in Register	Person maintaining plots	Locality
Railway verges	51	C M Sargent	Various localities
Roadside verges	58,59	T W Parr	Cambridgeshire
Chalk grassland	13	L K Ward	Aston Rowant
	16,18	T C E Wells	Knocking Hoe
	17	T C E Wells	Totternhoe Knolls
Juniper scrub	15	L K Ward	Porton Down
Scrub on limestone	14	L K Ward	Castor Hanglands
Calcareous flushes	6	R Marrs	Moor House

2.4 Acid and neutral grassland and scrub

Most of the calcareous grasslands studied by ITE are in the lowlands; all but one of the acid grasslands are in upland sheepwalk. Here, there is little tendency to scrub invasion. Indeed, the object of interest for one series of plots (Register 7) is the decline of hawthorn (Crataegus monogyna scrub in Snowdonia. Hawthorn is widespread on the lower slopes of many hills in Snowdonia, but young trees are virtually absent; presumably the numbers of sheep are now too large for effective regeneration.

At two upland sites (Register 8, 9), monitoring continues after sheep have been experimentally excluded for 25 years. Vegetation changes have been large, but have not been produced by invasion of new species. Rather, they have been produced by re-adjustments in the abundance of the existing species (Rawes 1981; Hill 1983). At Ennerdale in the Lake District (Register 54), vegetation change is being observed after a transfer of land from Sitka spruce plantation back to sheepwalk. On Snowdon (Register 10), a plot that had been used for a study of montane grassland in the context of the International Biological Programme (Perkins et al. 1978) is being monitored in the longer term for further change.

Acid and neutral grassland are being investigated at two lowland sites (Register 11, 12) that formerly supported populations of the large blue butterfly (Maculinea arion). Also in the lowlands, amenity grassland is being studied in Milton Keynes (Register 53), and grass beside railway verges at numerous localities (Register 51).

Wet grassland is the subject of two studies. At Thriplow in Cambridgeshire, permanent grass is being recorded annually in a fen that has been cleared of scrub (Register 60). At North Wyke in Devon, the effects on wet grassland of various agricultural pactices are being studied in collaboration with the Grassland Research Institute (Register 61).

Plate 3. Scrub succession from chalk grassland at Aston Rowant NNR after 14 years' exclosure (Register 13)

(Photograph L K Ward)

Plate 4. General view of Agrostis/Festuca and Nardus grassland study site in Snowdon (Register 10)

(Photograph D F Perkins)

Table 4. Acid and neutral grassland and scrub

Site type	Number in Register	Person maintaining plots	Locality
Acid grass	11	J A Thomas	Hembury, S Devon
Neutral grass	12	J A Thomas	Tidna valley, Cornwall
	53	L A Boorman	Milton Keynes
	60	J O Mountford	Thriplow, Cambs
	61	J O Mountford	North Wyke, Devon
Upland grass	7	J E Good	Snowdonia
	8	M O Hill	Snowdonia
	9	R Marrs	Moor House
	10	D F Perkins	Snowdonia
	54	J K Adamson	Ennerdale
Railway verges	51	C M Sargent	Various localities

2.5 **Heathland, moorland and birch scrub**

Heaths and moors have a tendency, like grassland, to revert to trees. On heaths, the process of reversion is less steady than in grassland, and is likely to be arrested by fire. Indeed, with a suitable fire regime, recolonization by trees may be prevented completely, so that heather (Calluna vulgaris) moors can be effectively permanent. Nevertheless, many moors are naturally invaded by birch scrub. The effect of birch (Betula spp.) in improving heathland soil has been much studied by ITE (Miles 1981). Vegetation and soil changes are being followed, both in an extensive series of plots in northern Britain, and in designed experiments in which heather is replaced artificially with birch, or vice-versa (Register 25-27).

Invasion by birch is not confined to heaths on mineral soil; birch also invades peat bogs if these are disturbed and begin to dry out (Register 34, 35). Upland blanket bogs, on the other hand, are less likely to be invaded by trees, though they are often strongly affected by management. ITE is continuing in the observation of long-term effects of differing burning and grazing regimes at Moor House National Nature Reserve (Register 21-23; Rawes 1983). Changes in moorland vegetation are also being studied on Rhum (Register 24) and in north-east Scotland (Register 28; Welch 1984). In both of these studies, the emphasis is on effects of grazing by ruminants.

In addition to ITE's widespread observations on moorlands in the north, vegetation plots have been devoted to autecological studies on southern heaths (Register 19, 20).

Table 5. Heathland, moorland and birch scrub

Site type	Number in Register	Person maintaining plots	Locality
Birch on bog	34, 35	J M Sykes	Kirkconnell, Rusland
Birch on moor	25-27	J Miles	N E Britain
Blanket bog	21-23	R Marrs	Moor House
Heathland	20	A J Gray	Hartland Moor
Heather moor	19	S B Chapman	Hartland Moor, New Forest
	28	D Welch	N E Scotland
Moorland, various	24	J Miles	Rhum

2.6 **Coniferous woodland and plantation forestry**

From before the formation of the old Nature Conservancy (1949) to the present day, afforestation of moors, heaths and uplands has continued to transform our countryside. ITE has been monitoring these changes at numerous locations (Register 29-31, 33, 36, 39, 53, 56). The earliest and most extensively studied site is in the Gisburn Block of Bowland Forest (Register 39). Observations by members of staff of Merlewood Research Station date from 1955. The site is being used for intensive ecological studies as well as long-term monitoring, and is planted with mixtures of tree species, as well as pure stands. Sitka spruce (*Picea sitchensis*) is absent. Complementary to the Gisburn experiment is a programme of intensive monitoring at Stonechest (Register 36), recording effects of afforestation with pure stands of important commercial conifers, such as Sitka spruce and Japanese larch (*Larix leptolepis*).

Vegetation change in planted forests begins as soon as grazing livestock are excluded (Hill 1979). It is most rapid at the time when the crop canopy closes, but continues throughout the life of the crop. Long-buried seeds germinate freely at the time of clear-felling; many of these seeds will have persisted from before the time when the canopy of the crop closed. The pattern of revegetation after clearance is being studied by permanent plots at two localities (Register 32, 54).

Not all coniferous woodland is planted. Scots pine (*Pinus sylvestris*) is actively invading raised bogs at Kirkconnell Flow and Rusland (Register 34, 35), producing marked changes in the vegetation. By contrast, regeneration of native Scots pine is often poor in established pinewoods, and is being monitored by ITE at two sites (Register 37, 38).

Finally, there are two studies of vegetation change in amenity plantations, one on colliery waste, the other in a new town (Register 31, 53).

Plate 5. Birch invasion of peat bog at Kirkconnell Flow (Register 34)

(Photograph J M Sykes)

Plate 6. Native pinewood study ar ea at Tyndrum (Register 37)

(Photograph J M Sykes)

Table 6. Plots in coniferous woodland or in plantations

Stand type	Number in Register	Person maintaining plots	Locality
Sitka spruce	29,30	E D Ford	S Scotland
	36	J M Sykes	Stonechest
	32,33	M O Hill	Beddgelert, Caeo
Other forestry	33	M O Hill	Caeo
	36	J M Sykes	Stonechest
	39	A H F Brown	Gisburn
	57	A H F Brown	Belmore Forest
Pine on bog	34,35	J M Sykes	Kirkonnell, Rusland
Native Scots pine	37,38	J M Sykes	Tyndrum, Shieldaig
Amenity trees	31	J E Good	Various opencast mines
	53	L A Boorman	Milton Keynes

2.7 **Indigenous broadleaved woodland**

Although vegetation changes in woodland are normally slow, they can be rapid where there is new colonization by trees, and very rapid if there is coppicing or clear-felling. Colonizing birchwood on moors and bogs has been considered above (Section 2.5). Lowland coppice is the subject of only one ITE monitoring study, but the wood in question (Register 46) shows considerable diversity, including a part that is still managed as coppice and a part that is reverting to high forest.

The majority of woodland monitored by ITE is in nature reserves in the north and west of Britain. Woods converted to nature reserves normally cease to be used for timber production. Management concentrates on control of grazing and removal of exotics, such as Rhododendron ponticum. Almost all woodland nature reserves have been created over the last 40 years, so they are still at an early stage of adjustment to the new regime. The composition both of the tree canopy and of the ground flora is changing steadily. Observations on an acid oakwood in North Wales (Register 40, 42) indicate that tree regeneration in the past was spasmodic, and that trees were deliberately selected to maintain a canopy of pure oak (Quercus petraea). Prolonged lack of management of these woods will eventually produce large changes; but several hundred years may elapse before these take their full effect.

Outside North Wales, ITE maintains an extensive programme of vegetation monitoring, both in calcareous ashwood and in acid oakwood (Register 41, 43-45, 47-50). At many of these sites, the planned interval between records is 10 years, and only the base-line observations have yet been made. These observations represent an investment in the future comparable to planting a forest. Results from the next two decades will be, as it were, the first thinnings. The real harvest will come in 50 or 60 years.

Table 7. Indigenous broadleaved woodland

Site type	Number in Register	Person maintaining plots	Locality
Acid oakwood	40	J E Good	Ffestiniog valley
	41	A D Horrill	Grizedale
	42	M W Shaw	Ffestiniog valley
	43-45	J M Sykes	Keskadale, Cree, Roudsea
Lowland coppice with standards	46	J M Sykes	Hales Wood
Mixed woodland	47	J M Sykes	Meathop Wood
Calcareous ashwood	45	J M Sykes	Roudsea Wood
	48	J M Sykes	Glasdrum
	49	J M Sykes	Rodney Stoke
	50	J M Sykes	Colt Park
Birch on bog	34,35	J M Sykes	Kirkconnell, Rusland
Birch on moor	25-27	J Miles	N E Britain

2.8 **Aquatic vegetation**

Plots used for monitoring submerged macrophytes in Loch Leven were not permanently marked. Approximately located positions on transects were used instead. Macrophyte sampling has now been discontinued. However, surveillance of the plant plankton (for which permanent plots cannot be defined) continues. Indeed, the plankton community in Loch Leven is perhaps the most intensively recorded plant community of all those studied by ITE.

Table 8. Aquatic vegetation

Site type	Number in Register	Person maintaining plots	Locality
Freshwater loch	55	A E Bailey-Watts	Loch Leven

Plate 7. First winter after coppicing, Hales Wood (Register 46)

(Photograph J M Sykes)

Plate 8. Oblique aerial view of aquatic vegetation in Loch Leven, mainly Potamogeton and Characeae (Register 55)

(Photograph A E Bailey-Watts)

3 ITE REGISTER OF PERMANENT VEGETATION PLOTS

3.1 Index of people who maintain permanent plots

Person	Number in Register	Location	Vegetation type
Adamson, J K	54	Ennerdale	Upland grass
Bailey-Watts, A E	55	Loch Leven	Submerged macrophytes
Bell, B G	1	E-C Scotland	Lichens
Boorman, L A	52	Holkham, Norfolk	Dune grass
	53	Milton Keynes	Newly planted woodland
Brown, A H F	39	Gisburn	Planted trees, upland grass
	56	Belmore Forest	Forest plantation
Chapman, S B	19	New Forest, Hartland Moor	Heather
Ford, E D	29,30	S Scotland	Sitka spruce
Fuller, R M	3	Dungeness	Shingle heath
Good, J E G	7	Snowdonia	Hawthorn, upland grass
	31	Wales to Scotland	Restored opencast colliery
	40	Ffestiniog valley	Acid oakwood
Gray, A J	20	Hartland Moor	Regenerating heathland
Hewett, D G	62,63	Newborough Waren	Dune grassland
Hill, M O	8	Snowdonia	Upland grass
	32	Beddgelert Forest	Sitka spruce
	33	Caeo Forest	Sitka spruce, other conifers
Horrill, A D	41	Grizedale	Acid oakwood
Marrs, R H	6	Moor House	Calcareous flushes
	9	Moor House	Upland grass
	21-23	Moor House	Blanket bog
Miles, J	24	Rhum	Moorland, various
	25-27	N E Britain	Heather, birch
Mountford, J O	60	Thriplow, Cambs	Wet grassland
	61	North Wyke, Devon	Wet grassland
Parr, T W	58,59	Cambridgeshire	Roadside verge
Perkins, D F	2	Anglesey, Lleyn	Lichens
	10	Snowdonia	Upland grass
Preston, C D	4	Landewednack, Cornwall	Disused serpentine quarry
	5	Havergate Island, Shingle Street, Suffolk	Shingle
Sargent, C M	51	Various	Railway grass
Scott, R	57	Wells, Norfolk	Saltmarsh
Shaw, M W	42	Ffestiniog valley	Acid oakwood

Person	Number in Register	Location	Vegetation type
Sykes, J M	34	Kirkconnell Flow	Pine/birch on bog
	35	Rusland Moss	Pine/birch on bog
	36	Stonechest	Sitka spruce, other conifer
	37,38	Tyndrum, Shieldaig	Native Scots pine
	43,44	Keskadale, Wood of Cree	Acid oakwood
	45	Roudsea Wood	Acid oakwood, calc ashwood
	46	Hales Wood	Coppice with standards
	47	Meathop Wood	Mixed deciduous wood
	48	Glasdrum	Ash/hazel on calcareous soil
	49,50	Rodney Stoke, Colt Park	Ash on carboniferous limestone
Thomas, J A	11	Hembury, S Devon	Acid grassland
	12	Tidna valley, Cornwall	Neutral grassland
Ward, L K	13	Aston Rowant	Chalk grassland, scrub
	14	Castor Hanglands	Limestone grassland, scrub
	15	Porton Down	Juniper scrub
Welch, D	28	N E Scotland	Heather moor
Wells, T C E	16,18	Knocking Hoe	Chalk grassland
	17	Totternhoe Knolls	Chalk grassland

3.2 Index of localities

Locality	No. in Register	Person	Habitat
1. SOUTHERN AND MIDLAND ENGLAND			
Aston Rowant	13	L K Ward	Chalk grassland, scrub
Castor Hanglands	14	L K Ward	Limestone grass, scrub
Dungeness	3	R M Fuller	Shingle heathland
Hales Wood	46	J M Sykes	Coppice-with-standards
Hartland Moor	19	S B Chapman	Heather
	20	A J Gray	Regenerating heathland
Havergate Island	5	C D Preston	Coastal shingle
Hembury, S Devon	11	J A Thomas	Acid grassland
Holkham, Norfolk	52	L A Boorman	Dune grassland
Knocking Hoe	16,18	T C E Wells	Chalk grassland
Landewednack	4	C D Preston	Disused serpentine quarry
Milton Keynes	53	L A Boorman	Planted woodland
New Forest	19	S B Chapman	Heather
North Wyke, Devon	61	J O Mountford	Wet grassland
Porton Down	15	L K Ward	Juniper scrub
Rodney Stoke	49	J M Sykes	Calcareous ashwood
Shingle Street	5	C D Preston	Coastal shingle
Thriplow, Cambs	60	J O Mountford	Wet grassland
Tidna, Cornwall	12	J A Thomas	Neutral grassland
Totternhoe Knolls	17	T C E Wells	Chalk grassland
Wells, Norfolk	57	R Scott	Saltmarsh
2. NORTHERN ENGLAND			
Colt Park	50	J M Sykes	Calcareous ashwood
Ennerdale	54	J K Adamson	Upland grassland
Gisburn	39	A H F Brown	Planted forest
Grizedale	41	A D Horrill	Acid oakwood
Keskadale	43	J M Sykes	Acid oakwood
Meathop Wood	47	J M Sykes	Mixed woodland
Moor House	6	R H Marrs	Calcareous flushes
	9	R H Marrs	Upland grassland
	21-23	R H Marrs	Blanket bog
Northumberland	31	J E G Good	Restored opencast colliery
Roudsea Wood	45	J M Sykes	Acid oakwood, calcareous ashwood
Rusland Moss	35	J M Sykes	Pine/birch on bog
Stonechest	36	J M Sykes	Sitka spruce, other conifer
Yorkshire, South	31	J E G Good	Restored opencast colliery
Yorkshire, North	25	J Miles	Heather, birch

Locality	No. in Register	Person	Habitat
3. WALES			
Anglesey	2	D F Perkins	Lichens
Beddgelert Forest	32	M O Hill	Sitka spruce
Caeo Forest	33	M O Hill	Sitka spruce, other conifers
Ffestiniog valley	40	J E G Good	Acid oakwood
Ffestiniog valley	42	M W Shaw	Acid oakwood
Lleyn	2	D F Perkins	Lichens
Newborough Warren	62,63	D G Hewett	Dune grassland
North Wales	31	J E G Good	Restored opencast
Snowdonia	7	J E G Good	Upland grass, hawthorn
	8	M O Hill	Upland grass
	10	D F Perkins	Upland grass
South Wales	31	J E G Good	Restored opencast
4. SCOTLAND			
Craggan	26,27	J Miles	Heather, birch
Cree, Wood of	44	J M Sykes	Acid oak
Delnalyne	26	J Miles	Heather, birch
East Scotland	25	J Miles	Heather, birch
East-central Scotland	1	B G Bell	Lichens
Eskdalemuir	30	E D Ford	Sitka spruce
Garve	27	J Miles	Heather, birch
Glasdrum	48	J M Sykes	Ash/hazel
Greskine	29	E D Ford	Sitka spruce
Kerrow	26	J Miles	Heather, birch
Kirkconnell Flow	34	J M Sykes	Pine/birch on bog
Lanark	31	J E G Good	Restored opencast
Loch Leven	55	A E Bailey-Watts	Submerged macrophytes
North-east Scotland	28	D Welch	Heather moor
Rhum	24	J Miles	Moorland, various
Shieldaig	38	J M Sykes	Native pine
Tyndrum	37	J M Sykes	Native pine
5. IRELAND			
Belmore Forest	56	A H F Brown	Forest planation
6. VARIOUS			
Railway verges	51	C M Sargent	Grassland

3.3 Register of plots

The following abbreviations are used in the register:

BR	British Rail	LNR	Local Nature Reserve	RSPB	Royal Society for the Protection of Birds
Dbh	Diameter at breast height	NCC	Nature Conservancy Council	sq m	square metre
EFG	Economic Forestry Group	NNR	National Nature Reserve	SSSI	Site of Special Scientific Interest
IBP	International Biological Programme	OD	Ordnance Datum	±	with and without

Person and project	Vegetation type (and treatments)	Locality & altitude	What is monitored	No. of plots	Plot size	No. of subplots per plot	Started	Last recorded	Time (yr) betwn rcds	Comments
1 B G Bell ITE 526	Lichens on ash tree boles	150 localities in East Central Scotland; alt various	Lichen growth	2 trees at each loc	20 x 14 cm	1	1982	1985	½	Photographic monitoring of of permanent marked quadrats
2 D F Perkins ITE 160	Lichens	Anglesey, Lleyn	Lichens % cover, growth rates	150	16 x 20 cm	1	1970	1983	1	Permanently marked on rock outcrops, walls and trees
3 R M Fuller ITE 703 (originally J C E Hubbard)	Shingle heathland	Dungeness c 3 m OD	Plot: vegn outline, shrub outline, general distribn other spp	1 plot	50 sq m	Map to 10 cm resol'n	1957	1982	8 (out-lines)	Outlines easily repeated; general distribution diagrammatic.
			Transects: spp and % cover	4 tran-sects	1 km	200 x 1 sq m	1966-9	1982	14	Transects readily repeated
4 C D Preston ITE 742	Herbaceous veg & scrub, disused serpentine quarry	Landewednack, The Lizard, W Cornwall c 30 m alt	<u>Vicia lutea</u>, associated vegn, number of plants and fruit pods	2	2.25 sq m	36	1978	1984	1	
5 C D Preston ITE 742	Shingle, with or without turf	Havergate Is & Shingle Street, Suffolk, 2-5 m alt	(as above)	3	2.25 sq m	36	1981-2	1984	1	1 plot on RSPB reserve

Person and project	Vegetation type (and treatments)	Locality & altitude	What is monitored	No. of plots	Plot size	No. of subplots per plot	Started	Last recorded	Time (yr) betwn rcds	Comments
6 R H Marrs ITE 776	Calcareous flushes ± sheep	Moor House	All vegetation including, bryophytes, lichens	1	c.500 sq m	2	1972	1983	10	See comments under Number 21
7 J E G Good ITE 463	Grassland and hawthorn scrub	3 localities in Snowdonia uplands	Numbers of hawthorns, spatial distribution, age, size, ground vegn	3	½-5 ha	12	1977	1982		Timing between records not yet established
8 M O Hill (Originally R E Hughes)	Upland grass, with and without sheep grazing	Snowdonia, various places, 350-450 m alt	All vegetation, including bryophytes	9	360 sq m	12	1958	1984	1-2	NCC collaboration on NNR only 2 plots under obs since 1981
9 R H Marrs ITE 776	Upland grass, with and without sheep grazing	Moor House	All vegetation, including bryos and lichens	5	c.500 sq m	2	1955-67	1976-8	10	See comments under Number 21
10 D F Perkins	Grassland, grazed by sheep	Snowdonia, 100-1000 m alt	All plants and various chemical attributes	30	0.02-1.0 ha	1	1963	1973	10	
11 J A Thomas ITE 400	Slightly acid grassland on shales	Hembury, S Devon, on edge of Dartmoor	Vegn structure, spp with more than 5% cover in some years, Thymus, Ulex, grass, ants	3	1 x 30 m	30	1973	1980	1-2	
12 J A Thomas ITE 400	Neutral grassland	Tidna Valley, N Cornish coast	(as above)	8	1 x 30 m	15 1 x 1 m	1972	1979	1-2	
13 L K Ward ITE 243	Chalk grassland succession to scrub after grazing, burning, rotavation	Aston Rowant NNR, Oxon, 150 m alt	All spp flowering plants per plot; domin in 2 1 x 1 m quadrats per plot	16	12 x 10 m	2 1 x 1 m	1969	1982	1	All scrub individuals recorded 1969-81

Person and project	Vegetation type (and treatments)	Locality & altitude	What is monitored	No. of plots	Plot size	No. of subplots per plot	Started	Last recorded	Time (yr) betwn rcds	Comments
14 L K Ward ITE 296	Limestone and damp grassland going to scrub	Castor Hanglands NNR, Northants	All spp flowering plants per plot; all spp per transect & woody plants as indivs in each m; dominant plants in each m	10 will rise to 13 in 1985	50 x 50 m	4 transects/ plot 25 x ½ m	1973 (first plot cut)	1984	plots 1, transects 2	Monitoring of a rotational succession scheme a new scrub plot cut every year and succession studied; concrete posts and buried metal markers
15 L K Ward ITE 296	Juniper scrub	Porton Down, Hants	Juniper population; ages, mortality aspects of pathology	2	1 ha	1	1980	1984	½	Continues about 10 yrs; individuals tagged
16 T C E Wells ITE 225	Chalk grassland, grazed at discretion of site owner - usually cattle	Knocking Hoe NNR, Beds, approx 90 m alt	Population dynamics of _Spiranthes spiralis_	1	77 x 12 m	17	1962	1984	1	See _J. Ecol_ 1967 _55_, pp 83-99
17 T C E Wells ITE 225	Chalk grassland, grazed by sheep; intermittent scrub clearance	Totternhoe Knolls LNR, Beds, 110 m alt	Population dynamics of _Aceras_, _Herminium_	11	-	-	1966	1984	1	See '_The biological aspects of rare plant conservation_, ed H Synge, 1981, pp 281-295
18 T C E Wells ITE 228	Chalk grassland, cut 1,2,3 or 0 (control) times per yr	Knocking Hoe NNR, Beds, 90 m alt	Dry mass of cut vegetation: number of inflorescences of _Zerna erecta_	24	5 x 2 m	2	1968	1984	1	Herbage assessment by dry weight of individual component species approx every 5 yrs

Person and project	Vegetation type (and treatments)	Locality & altitude	What is monitored	No. of plots	Plot size	No. of subplots per plot	Started	Last recorded	Time (yr) betwn rcds	Comments
19 S B Chapman	*Calluna* heath	New Forest Hartland Moor 815 m alt	Demographic survey of *Gentiana pneumonanthe*; performance, loss, and establishment of plants	4	100 sq m	1	1977	1982	1	One plot at each of 4 sites
20 A J Gray	Regenerating heathland (burnt 1976)	Hartland Moor NNR, Dorest	Inviduals of *Agrostis curtisii*, diameter, flowering performance	1	40 sq m	Total area monitored in 10 cm mesh grid	1977	1984	1	Continues for next 5 yrs; other species recorded every 3-5 years
21 R H Marrs ITE 776	Eriophoretum ± sheep grazing	Moor House	All vegetation, bryophytes and lichens	2	c 500 sq m	2	1966	1980	10	These and other Moor House plots to be put into a 10 yr sampling rotation
22 R H Marrs ITE 776	Blanket bog ± sheep grazing	Moor House	All vegetation, bryophytes and lichens	1	c 500 sq m	2	1971	1971	20	See comments under Number 21
23 R H Marrs ITE 776	Blanket bog, with 0 burn, 10 yr burn, 20 yr burn; ± sheep grazing	Moor House	All vegetation, bryophytes and lichens	4	60 x 90 m	7	1961	1982	10	Site burnt over 1954; some plots with 3 x 2 experimental design, plus untouched controls
24 J Miles	Grassland, heath, bog, grazed by red deer and cattle	Island of Rhum, 7-250 m alt	Vegetation	37	100 sq m	4 of 1 sq metre 48 of 100 sq cm	1972-3	1980	Not fixed	Miles is consultant for NCC project on NNR; subplots located to 1 cm but not permanently marked

Person and project	Vegetation type (and treatments)	Locality & altitude	What is monitored	No. of plots	Plot size	No. of subplots per plot	Started	Last recorded	Time (yr) betwn rcds	Comments
25 J Miles ITE 90	*Calluna* heath and birchwood	13 upland sites on eastern side of Britain between 54° and 58° latitude	Vegetation and soil	117	40 to 375 sq m	3 for vegn records	1974-6		10	
26 J Miles ITE 90	Heather moor planted with birch (long-term experiments)	Delnalyne 430 m Craggan 370 m Kerrow 200 m	Vegetation and soil	42	144 to 256 sq m	5 for vegn records	1978	1982-5	Not fixed	Grid refs NJ189175, NJ197325, NH325295
27 J Miles ITE 90	Birch woodland felled and planted with heather (long-term experiments)	Craggan 280 m Garve 160 m	Vegetation and soil	24	144 sq m	5 for vegn records	1979	1982-5	Not fixed	Grid refs NJ190323, NH404595
28 D Welch ITE 92	Grassy heather moorland	20 sites in N E Scotland, 91-700 m alt	Cover % of higher plants, bryophytes and lichens; height and growth of *Calluna*	20	1 ha	8	1969-70	1983-4	2-3	8 plots last recorded 1974-6; 12 still in active use and visited at least twice a year for records of dung, standing crop and *Calluna* utilization
29 E D Ford ITE 246	Sitka spruce planted 1962	Greskine Forest NT016045, 355 m alt	Dbh of trees on 3 soil types	3	100-900 sq m	1	1974	1982	1	These plots have shown how competition between trees manifests itself in dbh increment

Person and project	Vegetation type (and treatments)	Locality & altitude	What is monitored	No. of plots	Plot size	No. of subplots per plot	Started	Last recorded	Time (yr) betwn rcds	Comments
30 E D Ford ITE 773	Sitka spruce respacing expt; 4 treatment levels on each of 3 sites	Eskdalemuir EFG property, 200-400 m alt	Dbh and tree heights	3	40 x 40 m	16	1981	1982	1	Project only scheduled to last 5 yr, but continuation in some form is anticipated
31 J E G Good ITE 360	Restored open-cast coal sites, field trials of selected clones of tree spp	Lanark, Northumberland, S Yorks, N Wales (2), S Wales (3)	Height and spread	7	30 x 30 m	300	1976-81	1984	1	Originally contracted with NCB Opencast Exeutive
32 M O Hill ITE 625	Sitka spruce, cleared 1978, replanted 1979; brash removed on 1 plot	Beddgelert Forest, North Wales, 300 m alt	All vegetation	2	900 sq m	4	1976	1984	1	Other vegetation plots were set up nearby during 1984
33 M O Hill (Originally E W Jones)	Conifer forest on brown earth, originally planted 1931-41	Caeo Forest, South Wales, 200-400 m alt	All vegetation	60	200 sq m	1	1944	1976	30	Plots not permanently marked; located on forest stock maps to about 20 m
34 J M Sykes ITE 454	Pine/birchwood on peat bog	Kirkonnell Flow NNR, Kirkcudbrightshire, 10 m alt	All vegetation and tree dbh & height	159	200 sq m	1	1972 (veg) 1974 (trees)	1972 (veg) 1979 (trees)	10	Plots on 100 m regular grid; water tables recorded 1971-82
35 J M Sykes ITE 454	Pine/birchwood on peat bog	Rusland Moss NNR, Cumbria, 10 m alt	All vegetation, tree dbh, tree height	104	4 sq m	1	1971	1976	10	Plots on 50 m regular grid
36 J M Sykes ITE 9	Sitka spruce, J Larch, hybrid larch, w hemlock planted 1972	Stonechest, Cumbria, 180-265 m alt	All vegetation, tree height, birds, small mammals	139	200 sq m	1	1972	1983	3	Birds and small mammals monitored annually; plots on 100 m regular grid

Person and project	Vegetation type (and treatments)	Locality & altitude	What is monitored	No. of plots	Plot size	No. of subplots per plot	Started	Last recorded	Time (yr) betwn rcds	Comments
37 J M Sykes ITE 549	Native Scots pine, fenced	Tyndrum, Perthshire, 200 m alt	All vegetation; tree seedlings marked and measured on 2.1 km transect	25	4 sq m	1	1976	1984	5	
38 J M Sykes ITE 549	Native Scots pine, following fire in 1974	Shieldaig, Wester Ross, 100-200 m alt	All vegetation; tree seedlings counted	20	200 sq m	1	1974	1980	5	
39 A H F Brown ITE 367	Upland grass, subject to afforestation by 4 tree spp, pure and mixed	Gisburn Block of Bowland Forest, 275 m alt	Vegetation	33	0.2 ha	30 (5 quadrats x 6 subquadrats)	1955	1982	4	Joint expt with FC; limited future (5 yr) owing to windthrow; 33 plots derive from 11 treatments, 3 plots per treatment
40 J E Good ITE 463	Oakwood on acid soil; slight grazing	Coed Cymerau, Ffestiniog valley, N Wales	Tree and sapling height, dbh, age; cover of ground vegetation	60	5x5 m	1	1982	1982	Not fixed	
41 A D Horrill	Oakwood on acid soil; grazed by deer	Satterthwaite Wood, Grizedale, 150 m alt	All vegetation, including bryophytes	1	25 x 25 m	10	1972	1978	10	
42 M W Shaw	Oakwood on acid soil; ungrazed	Ffestiniog valley, North Wales, 150 m alt	Tree and sapling dbh; relative light intensity	1	1 ha	100	1963	1980	17	NCC collaboration on NNR *
43 J M Sykes ITE 454	Oakwood on acid soil; grazed and ungrazed	Keskadale, Cumbria, 425 m alt	All vegetation and marked tree seedlings in enclosure	35	4 sq m	1	1972	1983	2	

Person and project	Vegetation type (and treatments)	Locality & altitude	What is monitored	No. of plots	Plot size	No. of subplots per plot	Started	Last recorded	Time (yr) betwn rcds	Comments
44 J M Sykes ITE 454	Oakwood on acid soil; occasional unofficial sheep grazing	Wood of Cree, Kirkcudbrightshire, 20-100 m alt	All vegetation; tree dbh	55	200 sq m	1	1974	1974	10	Plots on 100 m regular grid
45 J M Sykes ITE 454	Oakwood on acid soil and ashwood on limestone; ungrazed	Roudsea Wood NNR, Cumbria 15-30 m alt	All vegetation; tree dbh and exact location on a subsample	80	200 sq m	1	1978	1978	10	Plots on 100 m regular grid
46 J M Sykes ITE 454	Lowland oak-hornbeam-hazel coppice-with-standards on clay; ungrazed	Hales Wood NNR, Essex, 115 m alt	All vegetation	33	200 sq m	1	1978	1978	10	Plots on 50 m regular grid
47 J M Sykes ITE 454	Mixed woodland (oak, ash, birch, hazel) on brown earth over carb limestone; un-grazed	Meathop Wood, Cumbria, 20-50 m alt	All vegetation; tree dbh and exact location on a subsample	76	200 sq m	1	1978	1978	10	Plots on 50 m regular grid
			Tree dbh only	100	100 sq m	1	1967	1982	5	Old IBP site
48 J M Sykes ITE 454	Ash-hazelwood on calcareous soil; ungrazed	Glasdrum NNR, Argyll, 100-250 m alt	All vegetation	71	200 sq m	1	1974	1974	10	Plots on 100 m regular grid
49 J M Sykes ITE 454	Ashwood on carb limestone	Rodney Stoke NNR, Somerset, 60-250 m alt	All vegetation; tree dbh	105	200 sq m	1	1978	1978	10	Plots on 50 m regular grid
50 J M Sykes ITE 454	Ashwood on limestone pave-ment; ungrazed	Colt Park NNR, Yorkshire, 40 m alt	All vegetation	25	200 sq m	1	1978	1978	10	Plots on 50 m regular grid

Person and project	Vegetation type (and treatments)	Locality & altitude	What is monitored	No. of plots	Plot size	No. of subplots per plot	Started	Last recorded	Time (yr) betwn rcds	Comments
51 C M Sargent ITE 743	Railway verge grasslands	40 localities throughout BR; stratification includes altitude	Flowering plants and bryophytes; numbers and % cover of woody spp	80	121 sq m	5	1982	1985	1	Plots within easy travelling distance of six ITE stations
52 L A Boorman ITE 374	Dune grassland	Holkham, North Norfolk, 3 m alt	Sward composition	6	4 sq m	100	1972	1983	5	Rabbit exclosures
53 L A Boorman ITE 707	Grassland and planted woodland	Milton Keynes	Herbaceous vegn	150	4 sq m	1	1982	1983	1	Herb colonization of newly planted woodland; recording planned to run 10 years
54 J K Adamson ITE 625	Former forest and acid upland grassland	Ennerdale, Cumbria, 300 m alt; NY195120	Vegetation and soils	6	200 sq m	1	1982	1983	1	4 plots in former Sitka spruce plantation, 2 plots formerly adjacent grassland; all marked with aluminium posts
55 A E Bailey-Watts ITE 497	Submerged macrophytes	Loch Leven, 103 m alt	Macrophytes	19	See comments	2	1966	1978	c 7	Sampling is on basis of transects several hundred metres long
56 A H F Brown ITE 417 (originally R Helliwell)	Newly afforested grassland	Belmore Forest nr Fermanagh/ Cavan border, Northern Ireland	All vegetation	12	1 ha	10 of size 1 sq m	1978	1978	c 5	Only base-line survey done; next survey overdue

Person and project	Vegetation type (and treatments)	Locality & altitude	What is monitored	No. of plots	Plot size	No. of subplots per plot	Started	Last recorded	Time (yr) betwn rcds	Comments
57 R Scott ITE 69	Saltmarsh	Wells, Norfolk 3 m alt	Spatial distribution of species in plots	4	80 sq m	60	1972	1982	c. 5	Recording was yearly till 1977; one plot has been lost
58 T W Parr ITE 467 (originally J M Way)	Roadside verge, 19 management treatments	Ickleton, Cambs, 20 m alt	All vegetation except bryophytes	80	36 sq m	1	1965	1982	1	Management treatments discontinued 1982
59 T W Parr ITE 467 (originally J M Way)	Roadside verge, 19 management treatments	Keyston, Cambs,	All vegetation except bryophytes	80	36 sq m	1	1965	1982	1	Management treatments discontinued 1982
60 J O Mountford ITE 718	Mixed fen of wet grassland, cleared of scrub and subsequently irrigated	Thriplow, Cambs, 21 m alt	All vegetation; height and composition; shoot frequency in transects	15 12	1 sq m 1 x 6 m	1 1	1957	1984	1	Collaboration with NCC on 5 ha SSSI; plots recorded by G Crompton 1957-73, re-started by ITE 1983
61 J O Mountford ITE 718	Wet grassland, with and without drainage, reseeding and added nitrate	North Wyke, Devon, 130 m alt	All vegetation; height and composition	12	1 ha	8	1983	1984	1	Experiment initiated by Grassland Research Institute; other features including productivity and nitrate loss are also measured

Person and project	Vegetation type (and treatments)	Locality & altitude	What is monitored	No. of plots	Plot size	No. of subplots per plot	Started	Last recorded	Time (yr) betwn rcds	Comments
62 D G Hewett ITE 78	Dune grassland, 16 management treatments with various times and intensities of sheep grazing	Newborough Warren NNR, Anglesey	All vegetation; species frequency and cover; turf heights	32	0.3 ha	12 (each 4 sq m)	1978	1984	2	Grazing experiment in collaboration with NCC
63 D G Hewett ITE 78	Dune grassland, 5 management treatments, mown 0-5 times pa	Newborough Warren NNR, Anglesey	Species frequency	50	5 x 5 m	40 (each 100 sq cm)	1970	1983	2	Mowing experiment in two 5 x 5 latin squares

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