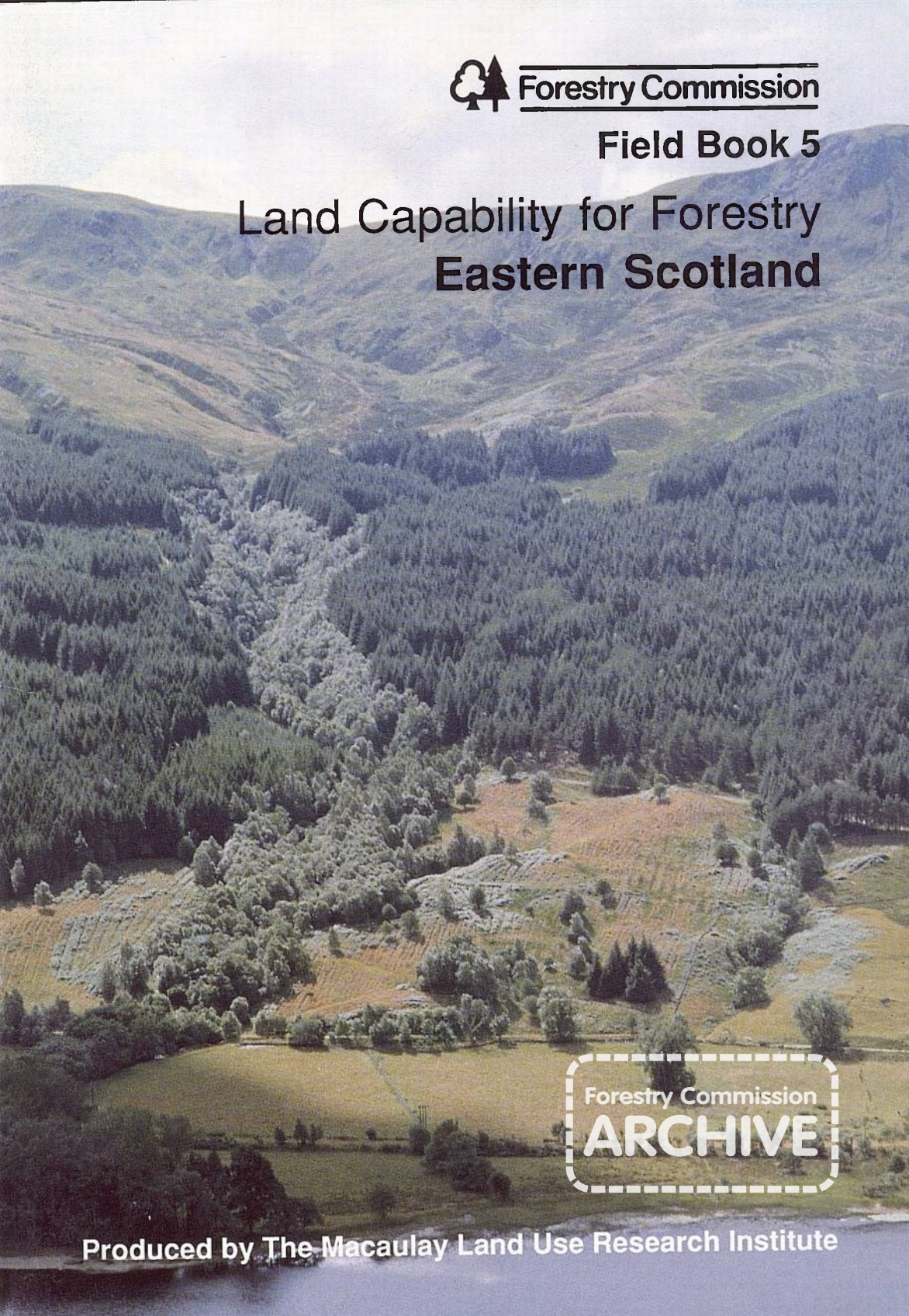
Forestry Commission

Field Book 5

Land Capability for Forestry
Eastern Scotland



Forestry Commission
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Land Capability for Forestry in Eastern Scotland

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Contents

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FRONT COVER: *Strathyre (Forestry Commission photo)*

1. The land capability classification for forestry

The land capability classification for forestry is based on an assessment of the degree of limitation imposed by the physical factors of soil, topography and climate on the growth of trees and on silvicultural practices. The principal tree species considered are those broadleaves and conifers commonly grown in Britain, and the classification assumes a skilled management level that will include cultivation, drainage, fertiliser application and weed control where these are necessary.

The principles on which the classification is based and the guidelines for assessing each type of limitation are described in *Land Capability Classification for Forestry in Britain* (Bibby *et al.* 1988).

TYPES OF LIMITATION

The classification is based on seven types of limitation, these being climate, windthrow, nutrients, topography, droughtiness, wetness and soil.

Climate

Climate is probably the most important factor that affects afforestation in Britain and it provides the framework of the classification. The two principal elements are accumulated temperature, measured in day-degrees above 5.6°C (Birse and Dry 1970, Birse 1971) and exposure, measured in mean annual wind speeds (Birse and Robertson 1970). Rainfall is of less importance, since in Britain it is sufficient for tree growth provided the soil is capable of storing the moisture it receives. Seasonal frosts can affect tree growth and species choice, but their occurrences depend very much on the local topography.

Windthrow

The likelihood of windthrow in forests affects both forest management and timber production, since in areas of high risk, thinning is precluded and crop rotations shortened. Windthrow is likely to occur where soils with shallow rooting depths are found in combination with a high degree of exposure and high wind speeds. The assessment of risk, described by Miller (1985), is done on a point-scoring system which takes into account wind zone, elevation zone, topographic exposure and soil type. From the total score, the windthrow hazard class, of which there are six, is derived; low scores indicate a low hazard class and a low risk of windthrow.

Nutrients

Although the application of fertilisers, principally phosphorus and potassium, is part of regular forest practice, the natural availability of nutrients in the soil determines very largely the choice of species that can be grown. In organic soils, nutrient availability, related to the total content of nitrogen, phosphorus and potassium, is low except where considerable surface flushing has taken place. Mineral soils are usually more fertile, particularly those that have been used regularly for arable rotations. Their nutrient availability is related to the volume of soil available for rooting and the chemical composition of the soil parent material, those derived from acid rocks such as quartzites and granites being poorest. However, on soils developed on materials derived from basic igneous rocks, problems of poor phosphorus availability can arise, and on ultrabasic rocks, growth problems associated with high magnesium or nickel are likely.

Topography

Topography principally affects the mechanised operations necessary for the establishment and harvesting of the tree crop and the design and construction of forest roads. Slope is the major element. Two-way ploughing is generally only possible on slopes of less than 5° and trailed ploughs are mainly confined to slopes less than 18°. One-way ploughing with mounted plough reaches a limit at 35° on dry stable slopes but is less than this on wet slopes or where there is a danger of the soil layer parting

from the underlying rock and the tractor 'rafting' downhill. On irregular, rocky or bouldery topography these limits can be reduced considerably, and complete ploughing may be precluded.

Droughtiness

Droughtiness affects forestry capability in areas where soils with very low water-holding capacity, such as dune sands, occur under low rainfall. Where water is in short supply to the root, a number of problems can occur, particularly at establishment, which are partly physiological and partly nutritional. High soil moisture deficits can result in reduced yields and restrict the choice of species.

Wetness

Soil wetness is a physiological barrier to root growth and its implications for forestry are that it can lead to poor growth due to poor aeration, low soil temperatures and a restricted amount of soil exploitable for nutrients, as well as reducing tree stability and thus increasing windthrow risk, particularly in exposed upland areas. Seasonal saturation of the root zone occurs widely in surface-water gleys. Such soils, together with peats and peaty gleys, require drainage schemes. Sites which are subject to regular flooding are not suitable for afforestation.

Soil

Soil is an important factor in most of the types of limitation so far described, but in some circumstances it can be the dominant one affecting forestry capability. Shallow soils, for example, have restricted rooting depths and can be difficult to plough; trafficking on them can result in topsoil destruction. In areas where soil patterns are complex, site preparation and treatments appropriate to each soil type may not be easy and compromises will have to be reached.

THE CLASSES

Class F1. *Land with excellent flexibility for the growth and management of tree crops*

The soils are deep and well supplied with moisture, and neither climate nor site factors seriously restrict the growth of the main tree species used in Britain. A wide range of broadleaved and coniferous species can be planted.

Class F2. *Land with very good flexibility for the growth and management of tree crops*

The soils have no or only limited periods of seasonal waterlogging, but some mineral gleys may be included if, with drainage, the water-table can be controlled at depths which prevent serious waterlogging of the root system. Minor areas of shallower or wetter soils are acceptable but should not exceed 10% in total. Minor restrictions on cultivation and harvesting due to slopes or minor climatic restraints are also acceptable. Both broadleaved and coniferous species may be planted but choice is more restricted than in Class F1. In areas where available water is limited, those species with high water demand are unsuitable; in areas with water surplus soil drainage may be necessary.

Class F3. *Land with good flexibility for the growth and management of tree crops*

The soil range extends to include mineral gleys with sandy or loamy textures and flushed gleys with humose topsoils. Drainage is necessary on gley soils. Windthrow risk is not high and land management is primarily concerned with limitations imposed by drainage, sloping land or patterns of variable soils. The land is suitable for a wide range of conifers and for a restricted range of broadleaved species.

Class F4. *Land with moderate flexibility for the growth and management of tree crops*

The soils include the more fertile peaty soils and the problem mineral soils, *e.g.* gleys with clayey textures or soils with calcareous horizons.

Ploughing difficulty may be encountered due to stony or shallow soils but this should not be more than 20% of the area. There is a risk of small areas of windthrow which should not be sufficiently severe to reduce rotation lengths or influence management practices. The land is suitable for many coniferous species and in places for the less demanding broadleaves.

Class F5. *Land with limited flexibility for the growth and management of tree crops*

The soils are primarily podzols, peaty gleys and peat, but where limitations are sufficiently severe to limit species selection, other soils may be included. Ploughing is possible but may be more difficult than in the previous classes. Sites in which the risk of windthrow affects management by modifying the thinning practice fall within this class. In the uplands species choice is limited to conifers, such as spruces, larches and pines, and to birch, alder or other hardy broadleaves.

Class F6. *Land with very limited flexibility for the growth and management of tree crops*

The principal limitations are adverse climate and poor soil conditions. The soils include podzols, peaty gleys and peats, and soils affected by toxicities. Sites on which the risk of windthrow effectively prevents thinning and seriously curtails the rotation length, and sites with very severe surface terrain which imposes great difficulty in ploughing or extraction, fall within this class. Species choice is limited to lodgepole pine and Sitka spruce and to amenity broadleaves such as birch and alder.

Class F7. *Land unsuitable for producing tree crops*

Land is considered unplantable if its physical characteristics preclude the growth or establishment of tree crops by normal methods. These characters include extremes of climate (orohemiarctic and oroarctic climate zones over extremely exposed sites), wetness (flow-bog or flood sites), rockiness and extreme slopes.

2. The classes in Eastern Scotland

This handbook describes the classes shown on the 1:250 000 scale land capability for forestry map Sheet 5 (Eastern Scotland). The area covered, amounting to 24 473 sq km, provides not only considerable diversity of relief but also spans an altitudinal range from sea level to 1309 m on the boulder-strewn summit plateau of Ben Macdui, within the Cairngorm massif. Lying between the Moray Firth and the Firth of Forth within the eastern watershed of the central mass of Scotland, the Grampian Highlands dominate the landscape with the rugged and deeply dissected terrain or the smooth slopes of planation surfaces providing a significant contrast to the undulating terrain of the Central Lowlands, which occupy the northern section of the much larger Midland Valley of Scotland in the south-east corner of the sheet area. Represented within the sheet are seven main physiographic regions, which are described fully in the handbook to accompany the 1:250 000 Sheet 5 (Eastern Scotland) soil and land capability for agriculture maps (Walker *et al.* 1982). The diversity of rock types, the complex glacial history, with consequent highland and lowland landforms, and soil parent materials, and the wide climatic range have, in combination, created environmental conditions which allow for the recognition of all seven land capability for forestry classes.

Within the principal lowland areas, represented by the Moray Firth Lowlands, the North-East Lowlands and the Central Lowlands, together with the low-lying straths of the Grampian and Northern Highlands, climate is the major restricting factor. Land ranges mainly from Classes F1 to F3, with the best sites in warm, sheltered areas and other classes in marginally less-favoured climates. One notable exception is the Buchan area where the substantial areas of Classes F4 and F5 land at, or near, sea level result principally from increased exposure.

Elsewhere, in hill and upland sites, where unfavourable climatic conditions result from exposure allied to temperature and related to altitude, the plantable land is in Classes F4 and F5 and, for the extensive areas of acid unflushed peat, Class F6. Within these areas, further limitations are imposed by the need for fertilisers. Mechanised operations are particularly difficult on some valley sides where restrictions result from the complex topography, which includes either singly or in combination, steep slopes, rockiness or boulderiness, or short-range soil variation.

Forestry is well established in the area, principally in the valleys and lower hillslopes of the Grampians in Perthshire, Morayshire and Nairnshire.

Class F1. *Land with excellent flexibility for the growth and management of tree crops*

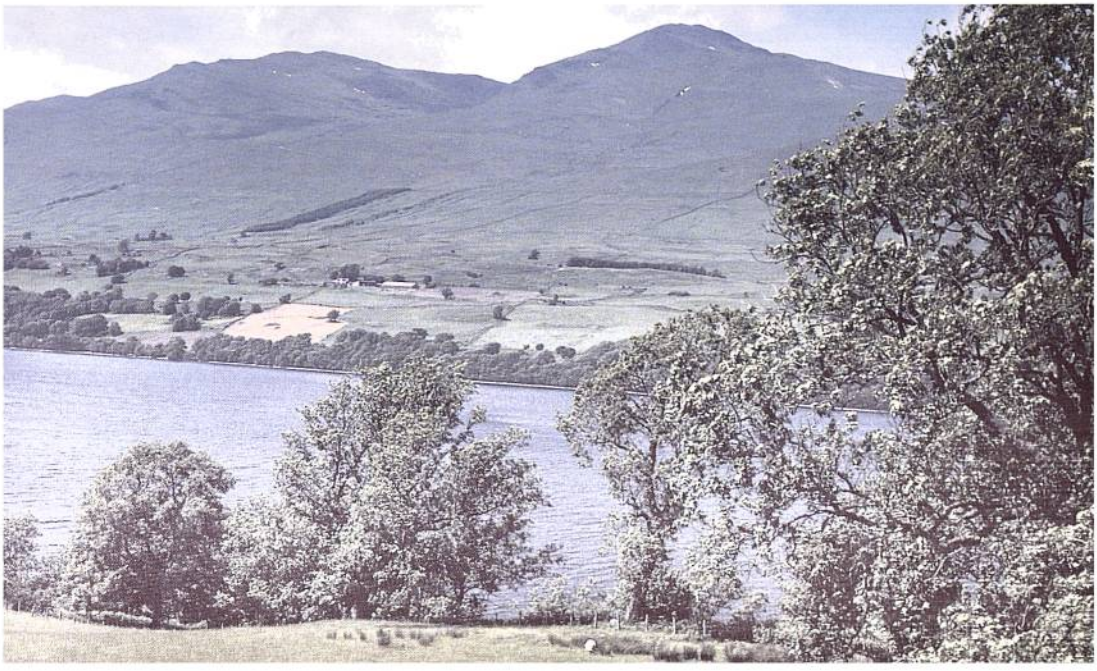
Area: 435 sq km

Land of this class occurs principally within specific localities of the Central Lowlands and the Moray Firth Lowlands. Included within the former area are sections of the Tay valley, for example between Strath Tay and Dunkeld, together with larger areas of its major tributaries, the River Earn, Pow and Dean Waters and specific localities within the lower valleys of the River Esk, Eden and Devon. Smaller areas within the Moray Firth Lowlands have a scattered distribution but are again concentrated within the major river valleys of the Spey, Lossie and Conon and on terrain adjacent to the Beauly Firth. Other policy woods and arboreta, generally of insufficient size for inclusion on the 1:250 000 map, possess some of the finest specimens of the exotic conifers in the United Kingdom; the examples on Darnaway, Relugas and Cawdor estates illustrating the past interest in arboriculture by previous owners.

All the above-mentioned areas are classed as warm, or locally fairly warm, lowlands, which are always sheltered with average wind speeds of less than 2.6 m/s. Occurring on level or gently sloping terrain, at elevations up to about 70 m, this class is characterised by deep, free-draining, mineral alluvial soils or by brown forest soils. The latter soil type is developed either on moderately coarse-textured till, with deep

Plate 1. Class F1 at Murthly Castle, Dunkeld. The amenable climate and the high nutrient status of the soils provide excellent conditions for the growth and management of a wide range of broadleaves and conifers. (Photo: MLURI)

Plate 2. Class F2 on the lower ground, near Loch Tay. On the slopes above, classes range from F3 to F7 as climate becomes progressively more limiting with altitude. (Photo: MLURI)



topsoils resulting directly from long-established agricultural practices, or on relatively stone-free raised beach deposits. All these soils have no restriction on rooting and possess a high reserve of nutrients so that any tree species grown on a commercial basis will provide high yields of timber. Ground conditions present no problem to mechanised operations.

Class F2. *Land with very good flexibility for the growth and management of tree crops*

Area: 1674 sq km

Land within this class has potential for both broadleaved and coniferous trees but the species choice is more restricted than in Class F1. The major areas are located within the Central Lowlands and the Moray Firth Lowlands, particularly the former with extensive examples in North Fife, the Kinross Basin, the Forth Lowlands and within Strathmore and Strathearn. A few small areas are confined to the sheltered glens of Central Perthshire, for example around Loch Tay, within the Tay valley between Fortingall and Strathtay and within Glen Garry, west of Killiecrankie.

Most of the land is restricted either to the sheltered, fairly warm lowlands, or to the warm lowlands where exposure is greater than in Class F1 land. In both situations, the slightly less-favourable climate, with wind speeds between 2.6 and 4.4 m/s, reduces the potential for forestry. The land occurs at low elevations, generally up to about 120 m, and has moderate or gentle slopes, although there are also areas with hummocky topography and short, steep slopes which would prevent two-way ploughing. All the soils are cultivated, with freely and imperfectly drained brown forest soils and humus-iron podzols dominant and developed in a wide range of soil parent materials including alluvium, raised beach deposits, fluvioglacial sands and gravels and till. All such parent materials provide rooting to depths well in excess of 40 cm, the only exception being till deposits near Avoch and Munlochy on the Black Isle where the cultivated podzols generally possess an indurated subsoil within 25 cm of the surface. Adequate nutrient and moisture supplies create ideal conditions for tree growth. Where soil textures are fine, for example in some estuarine alluvial deposits around Beauly and near

Elgin, poorly drained noncalcareous gleys are present but are included within this class because extensive drainage systems have the ability to control the water-table levels. Elsewhere, alluvial deposits tend to be sandy or loamy; the former group, along with those freely drained soils developed on fluvioglacial sands, may be slightly droughty.

Class F3. *Land with good flexibility for the growth and management of tree crops*

Area: 3028 sq km

This class, which has the capacity to support a wide range of conifers and a restricted range of broadleaved species, is represented primarily within the lowlands of Eastern Scotland and on the lower slopes of the adjoining foothills with some scattered examples in the sheltered straths of Central Perthshire and the Northern Highlands. In most instances, sites do not suffer from any severe impediment to forestry other than unfavourable climatic conditions. These are expressed by a tendency towards decreasing atmospheric warmth and increasing exposure acting either singly or in combination. The overall cooler conditions prevalent in the North-East Lowlands, compared with both the Central Lowlands and the Moray Firth Lowlands, (1212 day °C at 100 m in Aberdeen, 1306 at Fochabers and 1388 at Perth), is reflected by the best land for forestry within that region being assigned to this class. Even then, such land is confined to relatively sheltered sites within the Dee valley between Aberdeen and Banchory, the Don valley between Aberdeen and Inverurie, the Deveron valley and inland basins exemplified by the Howe of Alford and the Tarland basin.

In the most sheltered sites, for example within the Moray Firth Lowlands and parts of Strathspey, Class F3 land occurs at altitudes up to 180 m; elsewhere this level drops to around 150 m or around 60 m on exposed coastal areas. Class F3 land is characterised by gentle or moderate slopes and cultivated soils, many of which are developed on stony fluvioglacial deposits. Such soils are locally extensive near Ladybank in Fife, around Blairgowrie and Alyth and within the Moray Firth Lowlands and would, in dry seasons, be prone to drought, leading to difficult establishment and poor early growth. Traditionally these soils, which are also characterised by a low nutrient-retention capacity, have been planted

Plate 3. Class F4 near Huntly. Much of the Buchan area is limited by climate, particularly exposure, to a range of conifers and the less demanding broadleaves. (Photo: MLURI)

Plate 4. Class F5, Speyside. These drier, heather-covered hills in the eastern Grampians are very suitable for conifers and in places for the less demanding broadleaves. (Photo: MLURI)

Plate 5. Class F5 near Killin on flushed peat and peaty soils, with Classes F6 and F7 in the distance. (Photo: MLURI)

Plate 6. Class F6 on sand dunes at Culbin. Although the soils are droughty, nutrient-deficient and prone to wind erosion, with careful management, particularly at establishment, a relatively productive forest of pines can be obtained. (Photo: Forestry Commission)

with Scots pine rather than spruce or fir species. Elsewhere soil diversity is due mainly to differences in the water regime, this being determined partly by variation in the thickness of any water-modified drift over impermeable subsoil horizons and partly by factors such as the compaction and high clay content found within till deposits in the Central Lowlands and the presence of an indurated horizon in loamy-textured tills elsewhere. Surface relief can also influence water regimes, especially in concave or depressed sites where poorly drained mineral gleys are locally extensive. However, with an efficient agricultural drainage scheme already installed, any potential for waterlogging in spring and autumn is alleviated and therefore seldom affects forestry capability. In general, soil rooting depths exceed 40 cm providing good stability and minimising any likelihood of windthrow. A possible exception occurs in the Black Isle and the Moray Firth foothills between Strath Nairn and Dallas, where an intensely indurated subsoil occurs locally at shallower depths.

Class F4. *Land with moderate flexibility for the growth and management of tree crops*

Area: 4706 sq km

Suitable for many coniferous species and, in places, for the less-demanding broadleaved trees, this class has a widespread distribution reflecting a wider range of limitations than in the previous three classes. Accordingly, it occurs not only within lowland areas, in particular the North-East Lowlands where this class has, by far, its most widespread distribution, but also the sheltered Highland valleys of the Spey, Esk, Ardle and many others. Further locations include the foothills of the Grampians, the Sidlaws, Campsies and Ochils, together with the less extensive Saline, Benarty and Cleish hills, south-west of Loch Leven.

Within the undulating landscape of the North-East Lowlands, lying between sea level and a maximum elevation of 250 m, fairly warm to cool temperatures combine with moderate exposure to create a significant climatic limitation which precludes the widespread planting of the more demanding broadleaves. Climatic limitations also affect any moderately droughty, gravelly or sandy soils, which are widespread along river courses, and which would have otherwise been assigned to a higher class.

Over much of the Central Lowlands, land is limited to Class F4, not only by climate and windthrow risk, but also by wetness influencing tree growth and species selection. Where, on the imperfectly drained soils, there is sufficient rooting depth to reduce the risk of windthrow, the limitation imposed by increased exposure is sufficient to justify their inclusion within this class. In the case of surface-water gleys occupying gently sloping or depressed sites with little or no lateral run-off of excess water, windthrow limitations are prevalent through a combination of soil, site and climatic factors. Certain inland sites, for example the Carses of Gowrie, Earn and Stirling, experience much lower mean annual wind speed but are characterised by poorly drained soils with high silt and clay content. Despite a long history of drainage, the wetness limitation is sufficient to place the soils within this class.

Apart from climate, which continues to be the principal limitation, factors affecting forestry in the foothills and valley sites are those determined by local variation in soil and topography. On rounded hills and valley sides, for example around Huntly and Keith, slopes are smooth and long with cultivated podzols predominant on the lower slopes and noncalcareous gleys and humus-iron podzols on the non-rocky summits. A considerable proportion of the land has been planted in recent years. Sites near Balquhidder, alongside Loch Tay and between Pitlochry and Dunkeld have steep slopes which, together with occasional rock outcrops and/or surface boulders, create topographic irregularities affecting mechanised forestry operations. Because of the variety of sites a wide range of species is possible, with the more sheltered sites, particularly those with deep, stone-free soils developed in colluvial material, having potential for broadleaved species. Within the hummocky moraines in valley sites, for example in Glen Dochart, topography is the major influence on soil pattern with free-draining podzols dominant on mounds, and gleys, with some peat, in the hollows. Again the variety of sites would permit a range of species, but the relative proportion of each soil type is highly variable. Irrespective of the land types a high proportion of these soils is not cultivated so that nutrient availability will depend on the soil parent material and fertilisation will sometimes be necessary. There are large areas where the vegetation is dominated by heather, which could cause check to spruce during early growth.

Plate 7. Class F6 on deep unflushed blanket bog near Dalwhinnie. On this type of land the opportunities for forestry are limited by low nutrient availability to conifers such as Sitka spruce and lodgepole pine. (Photo: MLURI)

Plate 8. Class F7, Coire an-t Sneachda, Cairngorms. Extremely rocky and bouldery land is unsuitable for the production of tree crops. (Photo: MLURI)

Class F5. *Land with limited flexibility for the growth and management of tree crops*

Area: 4162 sq km

In this land limitations are such that only a limited species choice, dominated by conifers, is possible. It occurs primarily in the valleys and foothills of the Grampian Highlands and on the higher ground and coastal fringe of the North-East Lowlands. Less extensively, it is found in the Sidlaw and Ochil Hills and in areas of coastal links.

Unfavourable climate is the dominant limitation, particularly on moderately to steeply sloping, non-rocky terrain with free-draining podzols as the dominant soil. Such soils, along with most of the brown forest soils, are generally cultivated. In the Aberfeldy area and relatively sheltered areas of the Ochil Hills, Class F5 land extends to about 400 m; elsewhere this level fluctuates considerably in response to local conditions, dropping to around 300 m in the Sidlaws, and 250 m both in the Glenlivet and Glen Rinnes areas of the Grampian foothills, and in the lower Spey valley near Newtonmore and Kingussie. With sufficient local shelter, excellent stands of conifers, including some exotic species, can be grown, for example around Ardverikie House on Loch Laggan. In contrast, increasing exposure seriously affects tree growth, and therefore restricts species choice.with the broadleaved trees growing at, or very near, the north and east coast, often showing severe crown distortion with a consequent loss of leaf area.

Uncultivated humus-iron podzols and, at higher elevations, peaty podzols, occupy a substantial land area of moundy terrain within mid and upper Strathspey around Abernethy and Rothiemurchus, and gentle and strong slopes within foothills and uplands fringing the Grampian Highlands. Nutrient levels are low and require to be supplemented by fertilisers. Since much of this land is heather moor, check in young spruce crops may occur. Although the planting of more hardy broadleaves is confined to the most sheltered sites, a wide range of conifers is possible. While yields of timber may be less than on some examples of Class F6 land, management options are greater.

Planting and harvesting operations are affected by topographic limitations on steep and strongly sloping terrain where surface

irregularities result both from short-range variation in slope and the presence of rock outcrops and boulders. Confined mainly to valley sides, this land type is locally widespread in Achray Forest, land near Comrie and Killin and between Strathconon and Inverness and within the middle reaches of the Spey valley where the soils are almost entirely free draining but vary considerably in depth. Brown rankers are associated with areas of outcropping rock but deeper colluvial soils occupy lower slopes or localised depressions where rockiness is less. These latter sites, providing the microclimate is ideal and the shelter adequate, are suitable for broadleaved species.

Poorly drained soils with a surface organic horizon (peaty gleys, peaty alluvial soils and the more fertile peats) have also been included within this class. They occupy both depressed sites and the lower concave slopes of foothills. To achieve satisfactory tree growth, ploughing and drainage are necessary, together with the application of fertiliser.

Links and sandy, sometimes calcareous, raised beach deposits, for example at Culbin, Roseisle, Tentsmuir and Barry Links, experience drought limitations and are generally impoverished of nutrients. Short-range soil variation relevant to the presence of old buried horizons or a high water-table may often occur (Gauld 1981) and allow for increased species choice.

Class F6. *Land with very limited flexibility for the growth and management of tree crops*

Area: 4564 sq km

Within this class, tree growth and species choice, the latter being principally lodgepole pine and Sitka spruce, are affected by a number of limitations including, either singly or in combination, climate, poor soil conditions due to shallowness or lack of nutrients, and topographic irregularities. The most extensive areas lie within the foothills and valley systems of the Grampian and Northern Highlands at altitudes which vary according to local conditions. For example, long-established, successful plantations are present near Loch Ossian despite the difficult growing conditions prevailing around 350 m, whereas in the Trossachs, the Ochil Hills and

upper Deeside and Atholl areas, this land class extends to 500 m, occasionally up to 530 m on very sheltered slopes.

Land with climatic limitations imposed by cool, exposed conditions is widespread within the Ochil Hills, the upper Angus glens and Grampian foothills, for example around Glenlivet and Strathavon, where humus-iron podzols, with occasional brown forest soils, are developed in moderately coarse-textured drifts on gentle to steep, non-rocky slopes. The high degree of exposure is responsible for this class being recognised at, or near, sea level along the eastern coastal fringe of Buchan. Apart from the need to plough to improve rooting conditions or to suppress heather growth, the uncultivated soils present few management problems.

With increasing altitude, climatic conditions are allied to thickening organic topsoils but wetter conditions also prevail in the west so that peaty podzols, peaty gleys and peat are widespread in the Grampian and Northern Highlands. Such soils are confined to terrain with slopes up to 15° and morainic deposits with short-range soil and slope variation. They require drainage and deep ploughing or subsoil disruption to create suitable rooting conditions. Fertilising is required to maintain satisfactory growth, with the unflushed peats in the east requiring the highest rates. In contrast, towards the west, flushing, in respect of the higher rainfall, is more common and provides additional nutrients so that pure spruce crops may be grown.

Although there are obvious affinities with Class F5 land on steep, rocky terrain, substantial areas, for example in Glen Lyon, Glen Dochart, Glen Urquhart and upper Deeside around Balmoral, differ by having a higher proportion of rock at, or near the surface, and most soils have a peaty topsoil. Although peaty podzols and peaty rankers occur on the rocky knolls, the peaty gleys and peat associated with hollows or beneath spring lines are locally extensive. Excluding peat, soils tend to be shallow, but soil depth may vary over short distances. Such complicated variation in topography, soil depth and drainage limits mechanised forestry operations. Immediately post-war extensive areas were planted without mechanised ground preparation, but satisfactory stands of timber have resulted.

Two further land types, one of which is the high dunes around Culbin, Balmedie, Barry and Tentsmuir, are also included within this class. Although such areas are now stabilised through the specialised technique of 'thatching', only a limited species range dominated by Corsican pine can be supported in soils which are droughty and exceedingly low in nutrients. Undulating lowland sites and valley sides and hills with magnesian soils developed on ultrabasic or locally basic drifts are confined to parts of Aberdeenshire, for example on Green Hill, near Strathdon. Such sites are characterised by phosphate uptake problems which produce a check in tree growth immediately after tree establishment.

Class F7. *Land incapable of producing timber crops*

Area: 5559 sq km

Confined primarily to the Grampian and Northern Highlands with one notable exception, of very limited extent, being the very exposed coastal fringe of Buchan, between Rattray Head and Cruden Bay, Class F7 land has limitations which make forestry impractical.

Class F7 land consists of exposed summits and plateaux, essentially within the subalpine and alpine soil zone, with either climatic or topographic limitations. Generally located on non-rocky, gentle or steep slopes, terrain experiencing cold and very exposed climatic conditions lies within the North-East Grampians, including Ben Rinnes, the Hills of Cromdale and the Ladder Hills southwards into the Cairngorm and Gaick plateaux and subsequently into the South-West Grampians around Breadalbane and Ben Vorlich. Within these areas tree growth becomes progressively stunted, as conditions deteriorate. Although the highest surviving natural tree line lies around 600 m in Glen Einich, commercial forestry will seldom exceed 500 m and drops to much lower levels on very exposed hills, for example Bennachie and the Hill of Fare immediately west of Aberdeen, despite the possibility for forestry in sheltered sites immediately beneath such summits. Any local shelter will, therefore, play a significant role in determining the precise altitudinal limit for forestry.

Intermingled with the previous land type are areas of very rocky and bouldery land with shallow and stony soils. Across most of the

Monadhliath plateau and parts of the North-East Grampians the peat mantle is severely hagged and such terrain is also included within Class F7.

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4. Areas of land capability for forestry classes in Scotland by district and region (sq km)

	F1	F2	F3	F4	F5	F6	F7	built -up	total land	water
Shetland Islands	0	0	0	0	0	76	1352	5	1433	37
Orkney Islands	0	0	0	0	0	101	868	7	976	34
Western Isles	0	0	0	0	0	451	2444	3	2898	189
ISLANDS	0	0	0	0	0	628	4664	15	5307	260
Caithness	0	0	0	3	215	1303	247	8	1776	30
Sutherland	0	0	79	149	219	2923	2491	4	5865	212
Ross & Cromarty	34	242	250	206	298	1208	2724	14	4976	197
Skye & Lochalsh	0	7	7	96	426	1026	1127	2	2691	39
Lochaber	4	31	23	155	980	1110	2149	16	4468	180
Inverness	21	94	138	126	474	727	1194	15	2789	122
Badenoch & Strathspey	0	0	6	150	383	647	1131	0	2317	49
Nairn	11	28	88	60	73	120	38	4	422	3
HIGHLAND	70	402	591	945	3068	9064	11101	63	25304	832
Moray	24	123	337	365	491	519	336	36	2231	13
Banff & Buchan	0	0	12	817	572	105	8	14	1528	5
Gordon	0	0	48	1087	609	318	148	4	2214	7
City of Aberdeen	0	0	15	81	20	4	0	64	184	2
Kincardine & Deeside	3	24	168	606	435	469	840	5	2550	17
GRAMPIAN	27	147	580	2956	2127	1415	1332	123	8707	44
Angus	38	184	657	174	229	321	403	25	2031	14
City of Dundee	0	22	112	34	12	6	0	49	235	1
Perth & Kinross	264	480	685	591	622	1120	1447	27	5236	126
TAYSIDE	302	686	1454	799	863	1447	1850	101	7502	141
Kirkcaldy	0	101	79	21	1	0	0	46	248	3
North East Fife	21	212	329	129	38	17	1	11	758	3
Dunfermline	2	138	73	44	2	8	0	35	302	5
FIFE	23	451	481	194	41	25	1	92	1308	11
West Lothian	0	71	83	114	70	19	1	65	423	5
City of Edinburgh	0	80	21	19	17	8	1	115	261	3
Midlothian	7	18	81	74	81	57	11	29	358	3
East Lothian	29	258	125	96	105	67	7	27	714	3
LOTHIAN	36	427	310	303	273	151	20	236	1756	14

	F1	F2	F3	F4	F5	F6	F7	built -up	total land	water
Tweeddale	0	6	16	118	278	348	128	5	899	5
Ettrick & Lauderdale	0	42	171	212	322	469	128	11	1355	11
Roxburgh	60	116	236	286	445	345	41	11	1540	8
Berwickshire	129	190	208	155	141	49	3	1	876	4
BORDERS	189	354	631	771	1186	1211	300	28	4670	28
Clackmannan	17	37	12	31	4	27	25	7	160	1
Stirling	13	273	192	363	315	535	464	21	2176	69
Falkirk	2	93	27	95	14	1	0	59	291	3
CENTRAL	32	403	231	489	333	563	489	87	2627	73
Argyll & Bute	2	97	204	733	2137	1989	1306	30	6498	116
Dumbarton	4	60	42	47	145	80	57	37	472	54
City of Glasgow	3	23	2	5	0	0	0	165	198	3
Clydebank	0	0	2	3	10	4	0	16	35	1
Bearsden & Milngavie	0	1	5	7	2	0	0	21	36	1
Strathkelvin	0	73	12	21	6	8	21	23	164	2
Cumbernauld & Kilsyth	0	18	14	32	11	10	5	13	103	2
Monklands	0	22	8	81	25	0	0	28	164	4
Motherwell	2	17	19	49	25	0	0	60	172	3
Hamilton	8	14	39	26	2	0	0	42	131	2
East Kilbride	0	14	30	111	21	85	0	24	285	1
Eastwood	0	14	18	23	26	18	0	16	115	3
Renfrew	0	58	43	67	26	16	9	89	308	6
Inverclyde	0	14	16	35	33	22	8	30	158	4
Clydesdale	4	21	124	265	420	403	66	19	1322	10
Cunninghame	0	27	114	202	192	116	163	64	878	7
Kilmarnock & Loudoun	4	45	96	115	24	66	0	23	373	2
Cumnock & Doon Valley	1	19	86	224	116	311	25	18	800	5
Kyle & Carrick	10	128	183	243	378	288	39	48	1317	21
STRATHCLYDE	38	665	1057	2289	3599	3416	1699	766	13529	245
Wigtown	0	89	227	403	712	219	52	11	1713	17
Stewartry	3	84	199	419	617	283	61	5	1671	20
Nithsdale	12	210	181	311	320	326	52	21	1433	9
Annandale & Eskdale	15	151	265	338	397	313	57	17	1553	9
DUMFRIES & GALLOWAY	30	534	872	1471	2046	1141	222	54	6370	55
SCOTLAND	747	4069	6207	10217	13536	19061	21678	1565	77080	1703

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