



**Forestry Commission**

**Field Book 6**

# Land Capability for Forestry **South-West Scotland**



**Produced by The Macaulay Land Use Research Institute**



# Land Capability for Forestry in South-West Scotland

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FRONT COVER: *Bennan (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 (oro-hemiarctic and oro-arctic climate zones over extremely exposed sites), wetness (flow-bog or flood sites), rockiness and extreme slopes.

## 2. The classes in South-West Scotland

This handbook describes the classes shown on the 1:250 000 scale land capability for forestry map Sheet 6 (South-West Scotland). The area covered amounts to 14 370 sq km. Traversed by the Highland Boundary Fault and the Southern Uplands Fault, it is divided into three main physiographic and tectonic regions, the Highlands and Islands, the Midland Valley and the Southern Uplands. The soils and land capability for agriculture have been described by Bown *et al.* (1982). In the hills and uplands, forestry has expanded greatly into former stock and sheep farming areas. There now are extensive forests in Cowal, Kintyre and Galloway.

In the lowlands, available moisture and accumulated warmth are high, but the prevailing strong winds over most of the region confine Class F1 land to sheltered river valleys. The class is absent from Kintyre and the southern Hebrides. The well-drained alluvial soils provide land where a wide range of potential species can grow well in the warm, mild climate. Land in Class F2 occurs principally in sheltered areas at low elevations in the central Midland Valley, notably north-east of Glasgow, around Kilmacolm, and in the Ayrshire river basins. Land in this class also occurs along the southern fringes of the Southern Uplands, around Thornhill, Newton Stewart and in the Castle Douglas basin. At low elevations in exposed western areas, generally having some shelter from the west, and at somewhat higher elevations in the Midland Valley and along the Solway Coast, the land is restricted to Class F3, principally by the effects of exposure. On the slowly permeable clayey soils of the Midland Valley and on the silts and clays of the carse lands around Stirling and Creebridge, surface waterlogging, only ameliorated partially by drainage, and associated low soil aeration, restrict tree root development and the land is placed in Class F4 due to the risk of windthrow. Slightly rocky or steeply sloping land, with brown forest soils and brown rankers

is placed in this class also, and the topography and shallow soils make mechanised operations difficult. Classes F5 and F6 are confined mainly to soils with peaty surface horizons and are widespread on high ground in the Highlands and Islands and the Southern Uplands and on the hills between the Ayrshire basin and the central Midland Valley. Land in these classes differs mainly in the risk of windthrow, or soil nutrient reserves as assessed from the degree of flushing. Land having topographic, climatic or droughtiness limitations is placed in Classes F5 or F6 depending on the severity of the limitation. Land of Class F7 occupies hill summits or ridge crests, where the climate, principally exposure, is harsh, and also occurs on areas of extremely rocky land, hagged peat or saltings.

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

Area: 67 sq km

Excellent climatic conditions for timber growth obtain in many sheltered valleys, most notably in the deeply dissected areas of Cowal and the Southern Uplands, in the valleys of the Clyde and the Nith, and in the Ayrshire river basins. Class F1 land comprises principally well-drained alluvial soils and brown forest soils developed on alluvial and fluvioglacial terraces. The gentle slopes are easily ploughed. Weeding may be required while the trees are young, as weed growth is rapid in these fertile soils. The good reserves of nutrients and moisture inherent in these soils and augmented by farming practice facilitate the establishment of young trees and provide conditions suitable for excellent yields from a wide range of species. Risk of windthrow is low (hazard class 2).

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

Area: 1065 sq km

Land in this class is widespread on the extensive lowlands in the central Midland Valley and Ayrshire. It occurs also in small patches widely scattered in the Southern Uplands, particularly in the Cree valley, Nithsdale and around Castle Douglas. The warm moist climate of these low-lying areas is favourable to tree growth and the land is easily ploughed.



*Plate 1. The rolling till plains of Ayrshire and the Clyde basin provide good opportunities for the growth and management of a wide range of broadleaves and conifers. Class F2, north Ayrshire. (Photo: MLURI)*

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*Plate 2. Class F3, Kintyre, suited to a wide range of conifers and to the less demanding broadleaves. (Photo: MLURI)*



Windthrow hazard class is mainly 2, with class 3 on high ground and exposed ridges. Very good yields of timber can be obtained from a relatively wide range of species.

The most widespread type of Class F2 land is found in the Ayrshire river basins and around Glasgow, Drymen and Denny. Brown forest soils with gleying developed in sandy clay loam, clay loam or clay tills, occur on undulating lowlands with drumlins and till ridges, and carry intensively managed improved grassland with some arable land in the east where conditions are drier. These fine-textured soils are slowly permeable but have, in the main, underdrainage systems. Atmospheric warmth is in the highest category in Scotland, but average wind speeds are around 3.3 m/s at Paisley and possibly higher in the Irvine and Ayr valleys. Where the potential soil moisture deficit is less than 100 mm, forest development can be affected by soil wetness, principally in Ayrshire rather than further east where rainfall is relatively low. Locally, there may be a risk of windthrow, but this is never worse than hazard class 3, and in less windy areas in the central Midland Valley will be more usually hazard class 2. The terrain is gently undulating, and two-way ploughing is generally feasible, principally for weed suppression, though drainage is also important on the fine-textured soils. The soils carry good moisture reserves, the drought risk is minimal, and current agricultural management ensures mineral nutrients are plentiful.

Land with freely draining brown forest soils developed in deep fluvioglacial sands and gravels, together with local patches of alluvial soils, is widely scattered throughout the region, particularly on the Stranraer lowlands and fringes of the Southern Uplands where river valleys opening onto the Solway coastal lowlands are flanked by fluvioglacial terraces. It also occurs sporadically in the Midland Valley and in sheltered valleys on the Kintyre peninsula, Arran and in Cowal. Wind is again the principal restriction on tree growth. Level or gently sloping terrain, coupled with free natural drainage, offers no restrictions on ploughing. Adequate nutrient and moisture supplies promote both easy establishment and good growth of trees. Long dry spells in spring, however, can curtail planting or check the growth of young trees on locally stony, coarse-textured soils of relatively low water-holding capacity.

Around Newton Stewart and Gatehouse of Fleet, low-lying gently undulating ground with freely draining brown forest soils developed in loamy drifts provides excellent conditions for tree establishment, though yields are restricted slightly by exposure.

Land in the sheltered valley south of Loch Eck, where the alluvial soils comprise wet hollows and gravelly patches, has been placed in Class F2 because of limitations associated with the soil pattern.

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

Area: 1578 sq km

Class F3 land is extensive in the Ayrshire basin, the central Midland Valley and the Clyde basin at moderate (50-200 m) elevations and is widespread around the coasts on low-lying land subject to exposure, principally on the raised beaches along the Firth of Clyde, near Campbeltown and along the Solway Firth near Stranraer and on the Machars of Wigtownshire.

Although the climate is both warm and moist, especially in the lowlands along the Solway Firth, tree growth may be affected by exposure. Droughtiness and soil patterns can also give rise to problems locally. Broadly, the land in Class F3 comprises three main types.

Level or gently sloping raised beach terraces are distinctive geomorphological features in South-West Scotland and, together with gently undulating areas of fluvioglacial outwash, form the better land in Class F3. The soils are principally brown forest soils with free natural drainage developed in sands and gravels, gravels being most common in the Southern Uplands and the Highlands and Islands subregions. The principal areas are around the Firth of Clyde, in the Laggan west of Campbeltown, on the islands of Arran and Bute, in the Stranraer lowlands and in many river valleys. At the low elevations the climate is warm, and exposure is the major factor affecting tree growth. The land is easily ploughed. Locally stony land with low available soil water may be moderately droughty resulting in some loss of young trees in dry weather. Plant nutrients are adequate for tree growth though the readily permeable soils are prone to leaching. Trees can root deeply in these soils and there



*Plate 3. Strongly undulating drumlin topography along the Solway coast, restricted by climate to a range of conifers and the less demanding broadleaves. (Photo: MLURI)*

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*Plate 4. Moundy moraines with flushed peaty soils provide good conditions for conifers. Class F5, with Class F7 in the background, near Gatehouse of Fleet. (Photo: MLURI)*





*Plate 5. Class F5, Lowther Hills. The steep valley sides typical of this area of the Southern Uplands are suited to conifers and the more hardy broadleaves. (Photo: MLURI)*

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*Plate 6. Class F6 on steep rocky slopes with shallow soils above Loch Eck, Argyll, typical of many West Highland glens. Excellent tree growth is offset by difficulties with site preparation and management in these sheltered valleys. (Photo: MLURI)*



is little risk of windthrow (hazard class 3).

Land with naturally freely draining brown forest soils developed in loamy drifts derived from basalts or greywackes and shales occurs on lower hill slopes around Milngavie and Gargunnoch, and sporadically in the lowlands north of the Solway Firth. Lying at higher elevations than the previous land type, this land has a cooler climate which exercises a major influence on species choice. The land is gently undulating, easily ploughed, and has a good supply of nutrients. The risk of windthrow is low (hazard class 2) north of Glasgow but higher (class 3) in the exposed Solway coastal lowlands. Yields are unlikely to be affected by droughtiness.

Class F3 land is also widespread and extensive in the Midland Valley and on the periphery of the Southern Uplands, comprising brown forest soils with gleying developed on clayey or loamy drifts. The principal areas are parts of central Ayrshire, the Clyde basin, high ground near Glasgow and some coastal areas in Kintyre. In Galloway, it occurs on the Rhins peninsula, the Machars lowlands and in the Castle Douglas basin. Similar land is described in Class F2, but at the higher elevations in Class F3 climatic conditions are somewhat harsher, with less warmth and increased exposure. Annual rainfall is generally high on Class F3 land and ploughing is important for drainage, particularly on the fine-textured soils of Ayrshire and the central Midland Valley, though pastures and arable land currently have underdrainage systems. There is little impediment to ploughing. Nutrient supplies are plentiful owing to current farming practice, and yields or establishment are unlikely to be affected by drought. On higher ground in Ayrshire there is some risk of windthrow (hazard class 3).

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

Area: 3086 sq km

Class F4 land occurs throughout South-West Scotland and is more extensive than Classes F1, F2 or F3. Notable occurrences are on the high ground between the Ayrshire basin and the Clyde valley, along the Solway Firth, on the Slamannan uplands and on the Stirling and Cree valley carse lands. The land occurs in a number of broad types.

The first of these is land comprising noncalcareous gleys with poor natural drainage developed in clayey, slowly permeable tills derived mainly from Carboniferous rocks. These soils are extensive in north Ayrshire, around the Ayrshire basin and around Slamannan. Rooting conditions are often poor and the incidence and severity of strong winds leads to a significant risk of windthrow (hazard class 4), particularly in Ayrshire. Similar soils occur also in the lowlands around Kilwinning where growing conditions are good, with high levels of atmospheric warmth, but species choice is likely to be affected by both risk of windthrow and soil waterlogging. The soils are readily ploughed, but drainage is necessary to alleviate the high levels of wetness in these soils. Nutrient supplies are plentiful.

Class F4 also include land where soil wetness is the major limitation and is difficult to improve in these slowly permeable clayey soils. In the central Midland Valley there is less risk of windthrow than in Ayrshire on poorly drained soils. Poor root development and associated reduction of yield are the principal limitations on this land, but the high levels of atmospheric warmth favour growth in species adapted to wet sites.

Tree growth and species choice are restricted by climatic factors on some terraces of sand and gravel with freely draining brown forest soils, exposure on the Rhins peninsula, and low temperatures on higher lying land flanking inland valleys near Strathaven and Darvel. The land is easily ploughed and in upland areas high precipitation ensures adequate soil moisture. Windthrow risk is low and soil nutrients are adequate.

Glacially eroded, slightly to moderately rocky lowlands with brown forest soils and brown rankers are widespread along the Solway coast, and well exemplified in the Borgue district of Kirkcudbrightshire. Similar land is found also in southern and central Islay and fringing Loch Fyne, though noncalcareous gleys are often an additional soil component. Much of the land occupies exposed coastal or upland areas, though sheltered areas occur near New Galloway and Crocketford. Species choice is not restricted generally by soil, but rock outcrops hinder mechanised forestry operations. In many areas of Galloway exposure restricts tree growth and tree species which can tolerate exposure will be preferred.



*Plate 7. Classes F6 and F7, Cowal. Opportunities for forestry in the higher hills of the Southern Uplands are restricted by low nutrient availability and by climate to conifers such as Sitka spruce and lodgepole pine. The haggard peat is unsuitable for forestry. (Photo: MLURI)*

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*Plate 8. Rocky hills with crags and scree, common in Cowal, Kintyre, Jura and Arran, are not suitable for afforestation. Class F7, Beinn and Oir, Jura. (Photo: MLURI)*



Steep, smooth non-rocky slopes with brown forest soils developed in readily permeable colluvial drifts are of widespread but mainly local occurrence in the Southern Uplands and on Arran. Similar land is more extensive in South-East Scotland (Sheet 7) but in this area is well seen in the Lowther Hills and on the steep scarp east of Stranraer. Trees are readily established and, in the sheltered valleys, growth and final yields will be excellent, especially at low elevations. Mechanised operations are restricted on the steep slopes, though the principal aim of cultivation is weed suppression rather than drainage. Trees will root well in the free-draining loamy soils and in the generally sheltered situations risks of windthrow are very low (hazard class 1). Nutrient supplies are adequate and drought risk is minimal.

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

Area: 3891 sq km

Class F5 land is widespread and extensive in South-West Scotland, where it occurs principally on peaty soils in the hills and uplands. Conditions are suited to a wide range of conifers, with limited potential for hardy broadleaves. There are a number of land types.

Gently undulating to steep land comprising peaty gleys and peat with some peaty podzols is extensive in Class F5, principally in the Highlands and Islands and Southern Uplands. Risk of windthrow is generally high (hazard class 5). Often characterised by vigorous, tussocky *Molinia caerulea* growth and subject to flushing, the land has adequate nutrients for the less-demanding coniferous species best suited to these wet soils. Extensive tracts are already forested on Kintyre and in Knapdale, south Argyll, and the hills of Cowal where sheltered valleys favour tree growth. In a broad area of this land in southern Carrick and northern Wigtownshire, flushing is somewhat variable, becoming less as altitude increases and gives way to unflushed Class F6 land on shedding ridge crests. Locally in this area, widely scattered drumlins with brown forest soils occur with intervening deep flushed peat channels. These areas are represented on the 1:250 000 scale land capability for forestry map as Class F5/4, the peat land being Class F5 and the brown forest soils Class F4.

Further east, particularly in the Lowther Hills and locally in sheltered valleys in the Southern Uplands, hill slopes are steeper, surface run-off is more rapid, and peat development is largely confined to ridge crests and cols. The soils are principally peaty podzols with some peaty gleys and peat. The steep slopes preclude two-way ploughing and the peaty podzols commonly have iron pans which restrict rooting depth but can be ruptured by deep tining. The sites are generally sheltered and escape the high wind-runs of coastal areas. Windthrow hazard class is generally 2 or 3. Nutrient supplies are adequate. Steep or moderately steep upper hill slopes, with brown forest soils, occurring to the east of Sanquhar are placed in Class F5 above about 300 m elevation, due to the effects of exposure and low average temperatures.

Moderately rocky land with brown forest soils and brown rankers, and subject to topographic limitations more severe than on similar land in Class F4, occurs locally on the Kintyre peninsula, southern Bute and near Dalbeattie and Kirkcudbright. Trees grow readily on the freely drained mineral soils, but outcropping rock hampers mechanised operations. Windthrow risk is low except where soils are shallow.

Along a number of valleys west of Moniaive in the Southern Uplands, concave slopes have a diversity of land types and soils, ranging from receiving slopes with flushed gleys to steeper, often bouldery, slopes carrying brown forest soils. Soil and topographic patterns restrict species choice.

Class F5 also includes very exposed coastal localities and low-lying hills close to the sea. Encompassing a range of soil types, it is exemplified by the narrow strips along the western seaboard of the Rhins peninsula and the Machars lowlands and occurs sporadically on Islay and Jura. Land on Craigenlee Fell above Stranraer with brown forest soils with gleying is subject to similar restriction to tree growth. High average wind speeds increase the risk of windthrow (hazard class 5).

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

Area: 3024 sq km

Extensive in the hills and uplands, Class F6 land comprises a variety of terrain and soil types suitable for the less-demanding conifers. Locally there are also areas of brown forest soils generally suitable for a wider range of species and having better yield potential but restricted to Class F6 by rockiness and slope. In the uplands, climatic constraints, poor nutrient supplies or windthrow hazard are the principal restrictions on tree production and, in the lowlands, problems are associated with steep slopes, or drought risk on raw, very coarse-textured soils.

The most extensive type of Class F6 land in South-West Scotland comprises uplands with peaty soils, but it differs somewhat in nature in each of the three physiographic regions. In the Highlands and Islands, the southern Hebrides, Kintyre and Cowal, the land comprises slightly to moderately rocky uplands with peaty gleys and peats developed on drifts derived from Dalradian rocks. On this higher, strongly shedding land, signs of strong flushing are less clear than on the lower slopes (Class F5) carrying similar soils. In the Midland Valley, high ground exemplified in the rounded hills and undulating uplands around Muirkirk and Darvel is underlain by basaltic lavas or sandstones and deep peat is the dominant soil type. In the Southern Uplands weakly flushed peaty soils are developed in granitic drifts in the hills south-west of Loch Doon, and in drifts derived from greywackes in the hills south-west of Sanquhar. The land is generally easy to plough and trees easily established, but species choice is restricted by the wet, nutrient-poor soil conditions. Over much of this land, windthrow risk is high (hazard class 6), especially in exposed western areas. On this higher-lying land, atmospheric warmth is low and, even where wind speeds are low, tree growth is slow. Available nutrients on these unflushed peaty soils are low and application of fertiliser is generally necessary, especially at establishment and until canopy closure.

Lowland unflushed peat bogs form local but distinctive elements in the landscape and occur widely throughout South-West Scotland. Poor nutrient supplies and waterlogging are the main restrictions to species choice. However, the land is generally easy to plough and trees are

established readily. The risk of windthrow is high (hazard class 5 or 6) in exposed western areas such as Islay, but generally less near Stirling and in the Cree valley.

Strongly or steeply sloping rocky terrain with brown forest soils and brown rankers, which is widespread in Knapdale, is very difficult, and sometimes impossible, to plough, but on which a wider choice of species is possible. Locally, steep rocky slopes are also widely scattered in the Southern Uplands and form the prominent scarp north of the carse land at Stirling.

Coastal dune systems are locally extensive on Islay beside Laggan Bay and Loch Gruinart near Machrihanish and at the head of Luce Bay in Wigtownshire. The raw, windblown sands have low organic matter content, excessively free drainage, and poor moisture- and nutrient-holding capacities. The risk of drought is very high and is likely to affect young trees during establishment.

*Class F7. Land unsuitable for producing tree crops*

Area: 825 sq km

Class F7 comprises a diversity of land unsuitable for forestry because of constraints of climate, soil or terrain.

In South-West Scotland exposure and lack of warmth on the high hill and mountain summits are the principal limitations to afforestation. Wind is often the major factor and the altitude at which its effects become critical to tree growth ranges widely in different locations. On Islay, planting is generally limited to land below 230 m altitude but this rises across Kintyre and Arran to about 300 m on the hills above Largs. In the Southern Uplands, the westerly winds are moderated by the land mass of Ireland and on the high summits far inland the upper limit of planting can be 450 to 550 m depending on local landforms and shelter.

Land having severe topographic problems associated with very steep or very rocky ground or areas of severely eroded peat where ploughing is restricted to less than 50 per cent of an area is also unplantable. Local pockets of land suitable for planting, but without mechanical cultivation, may be identified.

Land subject to tidal inundation and comprising saline gleys (saltings), where excessive wetness and salinity preclude tree growth, occurs at the mouth of the River Cree.

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LAND CAPABILITY FOR FORESTRY

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

|                       | F1  | F2  | F3   | F4   | F5   | F6   | F7    | built<br>-up | total<br>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    |

SOUTH-WEST SCOTLAND

|                       | F1  | F2   | F3   | F4    | F5    | F6    | F7    | built<br>-up | total<br>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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