

Vegetation Diversity Within the Federal Territory of Kuala Lumpur

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As a result of its predominantly village-based society Malaysia does not have a long historical urban tradition. Kuala Lumpur probably dates from around 1857 when large deposits of tin were discovered in the area. By the end of the nineteenth century the population was only 25,000. A major influence on the urbanisation of Kuala Lumpur was the state of emergency imposed in 1948 to suppress communist insurgency and during which people were forced to move from the countryside into urban areas where surveillance could be maintained. Following independence in 1959, when Kuala Lumpur was designated the capital of Malaysia, urbanisation proceeded apace and in 1972, in recognition of its growing status, it was declared to be a city - the second in Malaysia after Georgetown in Penang. At this time it occupied 93 square kilometres which was increased to the present 243 square kilometres following its designation as a Federal Territory. The population was 1,036,900 in 1980 and is projected to be 1,500,000 in 1990 (Dewan Bandarya Kuala Lumpur, 1984).

Man has modified considerably the former tropical forest ecosystem of the Federal Territory in the exploitation of land for timber and tin, the introduction of plantation crops, and the construction of the infrastructure for Malaysia's administrative capital and commercial centre. The indigenous vegetation has been largely replaced by a complex assemblage of urbanised plant communities. These contain some native trees, shrubs, climbers and epiphytes from the rain forest together with plants of the coast, limestone cliffs, and swamps.

Many plants in the present-day flora of Kuala Lumpur are aliens introduced directly or indirectly by man. Some are exotics planted for the decoration of parks, gardens, and roadsides; others are agricultural or horticultural plants

grown for food, and which have escaped from cultivation or which retain a foothold on abandoned smallholdings. A few species introduced as cover plants in plantations, or to provide a supplement of nitrogen to the soil, have spread to urban areas where they have gained a permanent place in the flora. Some herbaceous plants were introduced in seed stocks and have become established as weeds of cultivation; others were grown for use in traditional medicine but subsequently escaped and became incorporated into the local flora.

Interactions between the many plants from these diverse sources and the multiplicity of habitats created, modified or maintained by man have led to a considerable vegetation diversity within the Federal Territory of Kuala Lumpur. However, owing to the young age of this conurbation, its constant expansion and development, the vegetation and constituent plant species are in a state of flux and evolution. Habitats continually arise and disappear as land management changes; new species are introduced which penetrate and occasionally replace existing plant communities; some species may only survive for a short time and then vanish forever.

The objective of this study was to determine the location, diversity and extent of the urbanised vegetation types in Kuala Lumpur and to compare the plant communities they contain with those of urban green spaces in northern temperate cities.

The green space types of Kuala Lumpur

The green space within the Federal Territory consists of natural, semi-natural, managed, and abandoned areas (Table 1).

The most natural green space is the remnant lowland rain forest which, although logged in the past, has recovered partially and exhibits a rea-

Table 1. A green space classification for the federal territory of Kuala Lumpur.

A.	Natural / Semi-natural — N
1.	Forest — NF
	NFP — Primary forest
	NFM — Modified forest
	NFS — Secondary forest
2.	Scrub — NS
3.	Grassland and weed communities — NG
	NGL — Lalang (tall grass)
	NGR — Resam (ferns)
4.	Wetland — NW
	NWO — Open water
	NWV — Marsh and swamp
B.	Managed — M
1.	Forestry — MF
	MFN — Native trees
	MFI — Introduced trees
2.	Horticulture and cropland — MH
	MHM — Market gardening
	MHP — Padi
3.	Plantations of trees, palms and permanent crops — MP
	MPR — Rubber
	MPO — Oil palm
	MPC — Coconut
	MPF — Orchards
4.	Amenity grassland — MG
5.	Urban savannah — MS
6.	Water bodies — MW
	MWO — Ornamental lakes
	MWA — Aquaculture
C.	Abandoned — A
1.	Plantations of trees, palms and permanent crops — AP
2.	Horticulture and cropland — AH

sonable canopy stratification and species diversity. These are some of the best areas for wildlife within Kuala Lumpur and every effort should be made to conserve as much as possible.

Managed green space in Kuala Lumpur is used for forestry, horticulture, aquaculture, plantations and amenity purposes. Owing to the intensity of management, usually in favour of one or a few plant species, the biological diversity of these is very low.

Most of the semi-natural vegetation has resulted from recolonisation following land clearance for a number of activities:

(a) Abandoned rubber plantations destined for future development but which, in the meantime, are unmanaged. Native trees often form a vegetation stratum above the rubber trees whilst the

underlayer is dominated by woody shrubs.

(b) Owing to a lack of finance and insolvencies many construction sites have been abandoned at various stages of development and these have been colonised by urban plant species.

(c) Extractive industries (sand, gravel and tin mining) have created large expanses of spoil which have been colonised by pioneer communities of fast-growing, invasive plants. Abandoned pools provide a habitat for plants of open water and swamp.

(d) formerly, derelict land was cultivated by squatters who have now moved on to permanent accommodation. These abandoned gardens and smallholdings have been colonised by intrusive species and succession is taking place to scrub and secondary forest.

The semi-natural vegetation of Kuala Lumpur displays many different stages in several successional continua from bare ground or open water to more or less permanent secondary climax communities. All of these have a visible identity, some for short periods of time only, and are recognisable by a reasonably constant and reproducible species composition.

The plant communities of Kuala Lumpur

A. Natural/semi-natural vegetation

1. Modified primary forest

These forest areas were not examined in detail in this study which concentrated on the urbanised vegetation of the Federal Territory. However, this habitat is a major contributor to the green space resource and should be investigated in detail.

2. Semi-natural vegetation

(a) The built environment

The buildings of cities and the paved areas in between provide micro-habitats for plant colonisation. The roots of some plants obtain a foothold in the nooks and crannies between stones, bricks and concrete slabs; on roofs and ledges; between paving stones; and on the sides of gutters and street drains. Although most of these plants are ephemeral, low-growing and resistant to trampling and disturbance, some are shrubs and small trees. In Kuala Lumpur the most frequently occurring plants of the built environment are the low-growing herbs *Desmodium trifolium*, *Pilea microphylla*, *Euphorbia hirta*, *Hedyotis corymbosa*, *Phyllanthus niruri*, *Portulaca conjugatum*, *Vernonia cinerea*, and *Peperomia pellucida* and the grasses *Eragrostis tenella*, *Paspalum conjugatum*, and *Sporobolus diander*. On the roofs and ledges of older buildings the most successful colonisers are figs (*Ficus* spp.), especially *F. religiosa* and *F. microcarpa*.

(b) Colonisers of cleared ground

Short-lived weedy plants make up almost 50% of the urban flora of Kuala Lumpur and many of these are pioneer invaders of bare ground. Initial colonisers include *Phyllanthus niruri*, *Tridax procumbens*, *Ageratum conyzoides*, *Borreria laevicaulis*, *Vernonia cinerea*, *Stachytarpheta jamaicensis*, *Cleome rutidasperma*, *Sida acuta*, *Cardiospermum halicacabum*, *Amaranthus*

spinosa; the low-growing, woody *Mimosa pudica*; the grasses *Eleusine indica*, *Chloris barbata*, *Cynodon dactylon*, *Ischaemum muticum*, *Eragrostis tenella*, *Paspalum scrobiculatum* and *Dactyloctenium aegypticum*; the creepers *Pueraria phasioloides*, *Merremia* spp., *Ipomoea cairica* and *Trichosanthes wallichiana*, and the sedges *Fimbristylis miliacea* and *Scleria* spp.

Some species are very localised in their habitat preferences and appear in only a few localities, for example, *Artemisia vulgaris* (a temperate urban weed which is cultivated and used in Chinese medicine); *Poa annua* (a temperate grass which occurs only in heavily trampled areas); and *Ipomoea quamoclit* (a garden escape, introduced from tropical America).

The tipping of rubbish on cleared, abandoned and even afforested or cultivated land is widespread throughout the Federal Territory and, wherever this occurs, plant colonisation soon takes place and a weed flora develops. Characteristic plants of waste tips include *Thunbergia alata*, *Cardiospermum halicacabum*, *Hyptis capitata*, *Sida acuta*, *Amaranthus spinosa*, *Cleome rutidasperma*, *Abutilon indicum*, *Urena triloba*, *Acalypha indica*, *Glochidium obscurum*, *Physalis minima*, *Celosia argentea*, *Eleusine indica* and *Lochnera rosea*.

As succession proceeds the pioneer communities are frequently invaded by the tall, aggressive grass *Imperata cylindrica* which, in turn, may be replaced by scrub and secondary forest. However, if the vegetation is cut or burned *Imperata* assumes dominance and may persist for a long time.

(c) Scrub invasion

As succession proceeds, the initial colonisers are replaced by woody species, firstly forming an open-growing scrub which casts little shade, and eventually a closed-canopy secondary forest. Many of the successful woody species are nitrogen-fixing members of the Leguminosae, for example, *Aeschynomene americana*, *Mimosa invisia*, *M. pigra*, *Acacia auriculiformis* and *A. cincinnatus*. Also occurring are the ubiquitous *Melastoma malabathricum* (Straits Rhododendron) and the low-growing trees *Dillenia suffruticosa*, *Muntingia calabra*, *Piper aduncum* and *Mallotus paniculatus*.

The two principal types of secondary forest which develop over cleared soils are dominated

by *Acacia auriculiformis* and *Dillenia suffruticosa*, respectively. The reasons for the dichotomy between these are not clear. Although both species occur together frequently, *Acacia auriculiformis* appears to compete better on sites from which the topsoil has been removed, e.g. prior to building construction, whilst *Dillenia suffruticosa* predominates where there has been minimal soil disturbance following removal of the former vegetation. These processes require further investigation. Whilst *Acacia auriculiformis* may persist as a sub-climax dominant for a long time after establishment, *Dillenia suffruticosa* is replaced after relatively few years by taller trees of *Fagraea fragrans*, *Ixonanthus* spp., *Alstonia* spp. and *Eleocharis* spp. which germinate below the dense canopy, but later grow above it and cast a deep shade of which *Dillenia* is intolerant.

(d) *Wetland*

Most of the present swamp vegetation of Kuala Lumpur has been formed since the removal of the forest and excavation of the land for mineral extraction. As a consequence the Federal Territory contains a large number of water bodies and swamps associated with former tin mining operations. These vary in size from small ponds to extensive lakes, the vegetation of which depends upon the depth of water, trophic status and the length of time that has passed since they were abandoned. Many former tin mining pools have become filled with aquatic and swamp vegetation and exhibit well-defined stages of the hydrosereal plant succession.

The diversity of submerged plants in lakes and pools is generally low and consists mainly of beds of *Najas graminea*, *Enhydryas* sp. or *Chara* spp. Static and slow-flowing, eutrophic waters, especially in ditches, may be covered by dense carpets of *Lemna perpusilla* whilst shallow lake margins and ponds support abundant plants of *Nymphaea lotus*, *N. stellata* (water lilies) and *Nelumbo nucifera* (lotus). Unpolluted drainage ditches (of which there are very few in Kuala Lumpur) are often colonised by the stoloniferous *Ludwigia adscendens* or the creeping *Ipomoea aquatica*. *Phragmites karka* and *Typha angustifolia* form large stands in the shallow water around the margins of former tin mining lagoons. Of intermediate stature between the surface floating vegetation and the tall grass swamps are a large

number of communities which may be dominated by *Limnocharis flava*, *Monochoria hastata*, *Eichhornia crassipes*, *Rhynchospora* spp., *Scirpus* spp., *Eleocharis variegata*, or *Cyperus* spp. (sedges).

(e) *Damp substrates*

The vegetation of periodically inundated or waterlogged soils differs from that of well-drained substrates in the presence of aquatic and wetland plants on the former. On the fine silt of tin spoil washings, the dominant species may be the grass *Eragrostis atrovirens* accompanied by the sedges *Fimbristylis miliacea*, *F. globulosa*, *Fuirena umbellata*, *Cyperus polystachyos*, *C. digitatus* and *Rhynchospora* spp. Where the water table is at or just below the surface for most of the year, swamp plants including *Eriocaulon truncatum*, *Utricularia* spp. and *Eleocharis variegatum* occur. However, where waterlogging occurs only periodically following heavy rain, *Cyperus aromaticus* may dominate together with *C. compressus* and *Bulbostylis* spp.

(f) *Abandoned habitation*

Many former plantations and small-holdings (used for horticultural and subsistence crops) have been abandoned as the priorities for land use within the Federal Territory have been adapted to the requirements of housing and industry. Pending the commencement of building operations, many former plantations and small-holdings lie unused and contribute to the green space resource.

The unofficial squatter kampungs are characterised by the presence of much greenery including food plants (e.g. *Colocasia esculenta*, *Alocasia macrorrhiza* and *Manihot esculenta*), fruit trees (especially banana, papaya, mango and rambutan), and decorative species (such as orchids and bouganvillea). Small market gardens are commonly associated with these villages. Following the transference of the local population to "improved" housing elsewhere, the squatter buildings are demolished and the areas left derelict until future development is carried out. In the interim, many of the economic species persist but these are mostly overgrown by invasive creepers, e.g. *Mikania cordata*, *Ipomoea cairica*, and *Merremia* spp. Scrub and secondary forest eventually develop with the establishment of *Mallotus paniculatus*, *Piper aduncum*, *Macaranga* spp., and *Terminalia catappa*.

B. Managed green space

There are two categories of managed green space - commercial and amenity. The former includes plantations of commodity plants such as rubber, oil palm and coconut and orchards of fruit trees. Amenity green space consists of open, frequently mown grassland of various types and urban savannah with low density plantings of non-native trees.

1. Amenity grassland

The vegetation of amenity grasslands varies according to the composition of the original grass source (usually turf), characteristics of the soil (especially water content and humidity near the surface), and the frequency of mowing. Most of the amenity grasslands of Kuala Lumpur are cut frequently and the grass sward cropped closely to the ground. Under these conditions few other species apart from the dominant grasses can survive and dicotyledonous plants are few. The commonest amenity grass is *Axonopus compressus* which is widely planted on lawns, roadsides, in parks, and urban savannah. Where trampling pressure is high, e.g. playing fields, this species is largely replaced by the coarse, wiry grasses *Chrysopogon aciculatus* and *Sporobolus diander*. In some situations where a fine-leaved turf is required *Zoysia matrella* is planted. Under a less intensive cutting regime a selection of weedy species occur within the grass sward including *Tridax procumbens*, *Ageratum conyzoides*, *Vernonia cinerea*, *Oxalis borrelieri*, and *Desmodium trifolium*. In humid situations, some ferns, e.g. *Pteris vittata* and *Adiantum latifolium*, and the club-moss *Selaginella ciliaris* may be additional components of the vegetation.

2. Wetlands

Managed wetlands occur throughout the Federal Territory and are either ornamental ponds, often with banks that are edged or lined with concrete, or they may be used for fishing or aquaculture. Good examples of the former are to be found in the Lake Gardens and Titiwangsa parks.

3. Ornamental plants

Since colonial times over 300 non-native plants have been introduced into Kuala Lumpur (Latiff, 1986). The majority of these are ornamental trees, shrubs and herbs of parks, gardens, and roadsides.

Native species such as *Pterocarpus indicus*, *Casuarina equisetifolia*, and *Cinnamomum iners* have also been planted. In the Federal Territory popular parkland and roadside trees include *Eugenia grandis*, *Samanea saman*, *Ficus benjamina*, *Pterocarpus indicus*, *Albizia falcata*, *Acacia auriculiformis*, *Cocos nucifera*, *Cinnamomum iners*, *Peltophorum pterocarpum*, *Spathodea campanulata*, and *Milletia atropurpurea*. Ornamental plants play an important role in improving the city environment by providing shade and aesthetic appeal, and by ameliorating the damaging effects of air and noise pollution. In the older parts of Kuala Lumpur, mature trees of *Samanea saman* grace the roadsides and parks. These magnificent trees, with their spreading, dome-like crowns, not only provide extensive shade, but are also habitats for epiphytic ferns and orchids, creepers, and strangling figs. Although other trees such as *Elaeis guineensis* also support epiphytes, none have the same propensity for this as *Samanea saman*. The commoner epiphytic ferns include *Drynaria quercifolia*, *Asplenium nidus*, *Davallia denticulata*, *Drymoglossum piloselloides*, *Pyrrhosia longifolia*, and *Microsorium punctatum*. *Platyserium coronarium* and *Ophioglossum pendulum* occur less frequently.

Plant species of the federal territory of Malaysia

The habitat preferences of the species encountered in the survey are summarised in Table 2. The flora of Kuala Lumpur contains many plants introduced from other parts of the world at different times in its short history and the origins of these are indicated in Table 3.

The largest group of urbanised plants in the Federal Territory are pioneer, weedy species. One hundred and thirty of these were recorded, comprising almost 40 per cent of the total urban flora encountered in this investigation. In addition, there are 52 (16 per cent) wetland plants (open water and swamp) and 37 (12 per cent) forest species. Of the 268 species identified, 190 are native to Malaysia (70 per cent), while 78 (30 per cent) are introduced. Of these introductions, 47 (60 per cent) originated from tropical South America, 12 from Africa (15 per cent) and 11 from Asia (14 per cent). Only four (5 per cent) are of temperate origin - two from Europe and

Table 2. Habitat preferences of the urban plants of the federal territory of Kuala Lumpur (some species have been allocated to more than one category).

<i>Habitat Type</i>	<i>No.</i>	<i>%</i>
forest	37	12
scrub	24	8
tall grassland	6	2
low grassland	16	5
pioneer, weedy species	130	41
gardens	2	1
open water	9	3
swamp/damp ground	43	13
climbers	15	5
built environment	6	2
epiphytes	10	3
cultivated areas/roadsides	8	2
ferns	3	1
ornamental borders	8	2
		100

Table 3. Origin of plants in the federal territory of Kuala Lumpur (some species have been allocated to more than one category).

	<i>No.</i>
Native Malaysian	190
Tropical South American	47
African	12
Mainland Asia (inc. India)	11
South Pacific	8
West Indies	6
European	2
North American	2

two from North America.

Vegetation synopsis

The green space classification provides an overview of the wildlife habitats within the Federal Territory. However, more detailed information is required before an adequate assessment can be made of existing wildlife resources. Towards this end, a "Synopsis of Vegetation Types" for the Federal Territory was prepared. This is based upon physiognomic (structural) attributes of the vegetation combined with details of the species which occur together regularly under similar environmental conditions (Shimwell, 1983). This scheme was adapted to the conditions prevailing in Kuala Lumpur based upon the field experience gained in the urban green survey. However, the

synopsis will require progressive modification and refinement in the light of future investigations of the vegetation of the Federal Territory.

The preparation of the synopsis was carried out simultaneously with the field surveying of the sites which were identified on the aerial photographs during the mapping procedure. The synopsis, which is summarised in Appendix 1, will form the basis of future detailed site descriptions and evaluations.

The importance of urban green space in Kuala Lumpur

A National Seminar on Urban Green Space in the Federal Territory of Kuala Lumpur was held at the University of Malaya in August 1989 the principal objectives of which were to:

1. describe the techniques of surveying, mapping and evaluation of green space in urban areas in Malaysia.

2. analyse the ecological, social, administrative and strategic planning factors involved in Urban Green Space provision.

3. discuss future policies and strategies for promoting Urban Green Space conservation.

In its concluding session the conference made the following recommendations:

1. Measures should be taken to increase the area and quality of urban green space and to promote a diversity of the natural ecosystem. Policy makers and planners should identify and remove constraints on urban green space provision.

2. An inventory should be taken to ascertain the present provision of urban green space as the first step in proper urban environment planning. This inventory should be built up to become a comprehensive data bank on urban green space.

3. Larger financial and human resource allocations should be provided for urban environmental conservation, rehabilitation and management.

4. Environment laws and regulations relating to urban green space should be reviewed and efficiently enforced to ensure against loss or deterioration of quality.

5. An integrated approach, involving regular formal linkages between relevant planning/development agencies, is necessary in urban green space planning and provision to optimise the impact of programmes and conserve resources.

6. Policy and planning bodies for urban green space provision should be established at a high level to ensure that the subject is given appropriate recognition within the context of development.

7. Public panels on which legal authorities, professionals, NGOs and enforcement agencies will also sit should be set up to review urban green space provision.

8. Plans of action for urban green space conservation and management should be formulated and implemented at the local and national levels.

9. A strategy should be developed to encourage and assist private landowners to maintain, enhance or expand urban green space through incentive programmes or legislative control.

10. The functional values of urban green space

should be further investigated to determine the full socio-economic contribution of these areas. These values can be used in planning and prioritisation of green space protection and enhancement measures.

11. Awareness materials should be developed to enhance the understanding amongst policy makers and the public of the value of urban green space.

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Appendix 1: Synopsis of vegetation types in the federal territory of Kuala Lumpur, Malaysia

1. Communities of the built environment: rocks, walls, metalised surfaces, paved areas, and roofs.
 - 1A Terrestrial carpets of small, acrocarpous (upright and tufted) mosses, usually less than five cm tall, or of spreading, flat, thalloid liverworts, or incrustations of terrestrial green algae; flowering plants are absent or sparse.
 - 1B Fragmentary stands of ferns and flowering plants in crevices, ledges, walls and roofs.
2. Transient communities of disturbed substrates dominated by short-lived species which are replaced quickly by communities of other groups as succession proceeds
 - 2A Low-growing, ephemeral species of gardens, ornamental borders, roadsides and refuse tips.
 - 2B Communities of derelict sites on brick rubble, cinder, fuel ash, tin tailings, railway ballast.
 - 2C Communities of mud and silt around reservoirs, sewage beds, tin mining slurry pond deltas and periodically inundated sites.
 - 2D Communities of land recently disturbed for landscaping, road construction, house building, etc.
3. Rank, perennial, tall grass and tall herb communities 0.7-3.0 metres tall; and creepers or climbers with indefinite growth
 - 3A communities dominated by tall, coarse grasses and tall herbs on unmown and unmanaged habitats, ranging from wet to dry, often along riversides or around ponds and subject to frequent flooding.
 - 3B Communities dominated by tall, gregarious native grasses and/or tall herbs.
 - 3C Communities dominated by introduced herbaceous species.
4. Low, perennial grass, grass-herb and fern-dominated communities
 - 4A Semi-natural grasslands on a variety of substrates dominated by one or more species of low-growing (<70 cm), fine-leaved grasses.
 - 4B Intensively managed, frequently mown, amenity grasslands and weedy, perennial herb-grass communities of man-made habitats.
 - 4C Communities dominated by introduced or native, low-growing (>70 cm), gregarious, stoloniferous or rhizomatous, grasses, herbs, ferns or creepers.
5. Scrub vegetation of thickets, hedges and ornamental borders dominated by woody shrubs less than five metres in height
 - 5A Low-growing scrub (<3 m) with a more or less open canopy.
 - 5B Tall scrub (>3 m) of later successional stages on cleared ground or forest edge.
 - 5C Scrub of introduced, evergreen and deciduous shrubs in managed ornamental situations, abandoned small-holdings; or naturalised on waste, marginal and derelict land.
6. Forest greater than five metres in height with a more or less closed canopy; and urban savannah with an open canopy
 - 6A Primary forest with tallest trees over 20 metres tall, containing a good representative selection of native trees, shrubs, climbers and epiphytes.
 - 6B Modified primary forest which has been extensively logged; poorly stratified and without a layer of emergents; a more or less closed canopy has re-established.
 - 6C Secondary forest developed on land from which the original forest was clear-felled.
 - 6D Epiphyte and climbing plant communities of natural and semi-natural forest and ornamental trees.
 - 6E ornamental woodland and avenues of trees in streets, parks, cemeteries and other landscaped areas.
 - 6F Managed urban savannah in which the ground layer is dominated by large expanses of mown amenity grassland (4B).
7. Aquatic plant communities
 - 7A Free-floating, surface or submerged plant species in static or slow-flowing waters.
 - 7B Bottom-rooted, submerged, floating-leaved or emergent communities in static or slow-flowing waters.
 - 7C Communities of creeping plants growing over the surface of open water ; with leaves and inflorescences emergent above the water but the stems of which may or may not be immersed.
8. Emergent tall swamp vegetation
 - 8A Reedbeds dominated by tall grasses (up to 3 m) (e.g. *Phragmites karka* and *Typha latifolia*), in permanently wet swamps, where the water table is at or above the surface throughout the year.
 - 8B Swamp communities dominated by a variety of tall, linear- or broad-leaved monocotyledonous plants usually in permanently wet situations and within which there are more or less

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- monodominant stands of other swamp species.
- 8C Tall sedge marsh dominated by medium-sized (75-150 cm) rhizomatous members of the Cyperaceae.
9. Low-growing swamps and marshes
- 9A Miscellaneous low-growing (<70 cm), species-poor swamps dominated by herbaceous and graminoid plants.
- 9B Frequently inundated, or shallow water, sedge and grass swamps in which the water level is at or above the surface for most of the year.
- 9C Vegetation of damp, frequently waterlogged, rain-filled depressions in other vegetation types (especially of groups 2B, 2D, 3B, 4C, 5A, and 5B).
- 9D Fern-dominated marshes.
- 9E Umbellifer stands of shallow ponds and marshes.