UK Biodiversity Action Plan
Priority Habitat Descriptions

Open Mosaic Habitats on Previously Developed Land

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Open Mosaic Habitats on Previously Developed Land

Correspondence with existing habitats

- UK BAP broad habitat: Built up areas and gardens.
- Phase 1: Quarry, Spoil, Mine, Ephemeral/short perennial, Bare Ground.
- NVC: Overall there is a poor fit to described communities and this weakness is identified in the review of coverage of the NVC communities (Rodwell *et al*., 2000). Although some components of the habitat are characterised by annual/open vegetation plant communities described in the NVC (Rodwell *et al*., 2000) others are allied to sclerotic associations better described in continental Europe. Grassland communities associated with this habitat complex include MG1–2, MG9, MG10, MG11, MG13; CG10 (Rodwell *et al*., 1992); and U1–2, whilst the scrub communities W6 and W23 are also commonly encountered (Rodwell *et al*., 1991). Complexes and mosaics can also include a range of aquatic plant communities (see Rodwell *et al*., 1995) and swamp communities (Rodwell *et al*., 1995).
- Annex I: None (Calaminarian grasslands are covered by another priority habitat proposal).
- Other: Poor fit to Shimwell (1983), but includes 3B and artificial-substrate equivalents of 7A
- The priority habitat is delimited by edaphic and other site conditions, and specific sites are likely to include elements of other priority habitats as minor components of the overall mosaic. With the specific exception of post-industrial substrates that are rich in heavy metal which would qualify as the proposed Calaminarian grassland priority habitat, sites with such mosaics will be considered as qualifying as 'open mosaic habitats on previously developed land' priority habitat.

Definition and criteria for field recognition of the habitat

The main source of evidence for this definition came from a Defra research project, Riding *et al*. (2009). Their proposed definition was very slightly amended by the inter-agency working group, in consultation with Defra and some members of their project steering group.

Each of these criteria must be met.

	Criterion
1.	The area of open mosaic habitat is at least 0.25ha in size.
2.	Known history of disturbance at the site or evidence that soil has been removed or severely modified by previous use(s) of the site. Extraneous materials/substrates such as industrial spoil may have been added.
3.	The site contains some vegetation. This will comprise early successional communities consisting mainly of stress-tolerant species (e.g. indicative of low nutrient status or drought). Early successional communities are composed of (a) annuals, or (b) mosses/liverworts, or (c) lichens, or (d) ruderals, or (e) inundation species, or (f) open grassland, or (g) flower-rich grassland, or (h) heathland.
4.	The site contains unvegetated, loose bare substrate and pools may be present.
5.	The site shows spatial variation, forming a mosaic of one or more of the early successional communities (a)–(h) above (criterion 3) plus bare substrate, within 0.25ha.

Definition: explanatory notes

The criteria are for guidance but cannot cover all potential scenarios and an element of expert judgement is therefore needed. It is assumed that the user will be able to recognise plant communities and the key component species.

1. The minimum size refers to the potential open mosaic habitat (OMH), which might be a part of a larger site containing other habitats such as woodland or developed land.

2. Disturbance refers to that resulting from major historical industrial use or development.
   2.1 Extraneous materials refer to extensive additions of spoil rather than incidental dumping of litter, broken glass, etc.
   2.2 There might be evidence of heavy metal contamination but extensive stands of Calaminarian grasslands are specifically excluded as that is a distinct Priority Habitat.

3. Brief descriptions of the early successional communities:
   (a) Annual communities are those comprised mainly of stress tolerant ruderals, which are short in stature and suited to low nutrient availability. Typical examples would be *Arenaria serpyllifolia*, *Centaurium erythrea*, *Linum catharticum* or *Trifolium arvense*.
   (b) Moss/liverwort communities can contain both acrocarpous (i.e. usually unbranched, tufted) and pleurocarpous (usually branched, carpeted) mosses and are usually relatively open and less luxuriant than in more mature habitats, often with bare ground present in a fine-grained mosaic. They can occur in discrete patches or interspersed in other communities such as open grassland or heathland. Common species are usually present such as the mosses *Brachythecium rutabulum*, *Dicranum scoparium* or *Hypnum cupressiforme*, and the liverworts *Lophocolea heterophylla* or *Ptilidium ciliare*.
   (c) Lichen communities are likely to occur in extensive patches or interspersed with other communities such as open grassland or heathland. Species with a range of growth forms might be present, for example foliose (leaf-like), crustose (crust) or fruticose (shrubby and branched).
   (d) Ruderal communities are those composed mainly of taller annuals, biennials or short-lived perennials and typical of slightly more nutrient-rich, or less disturbed conditions than the annual communities. Typical examples would be *Daucus carota*, *Linaria vulgaris*, *Medicago lupulina* or *Reseda luteola*.
   (e) Inundation communities are comprised of species suited to periodic, often seasonal flooding. Vegetation is usually interspersed with bare areas of mud which can have a caked surface during dry periods and can result in annuals establishing. Typical species would be *Alopecurus geniculatus*, *Juncus bufonius*, *Persicaria maculosa* or *Ranunculus flammula*.
   (f) Open grassland is comprised mainly of perennial, stress-tolerant species of short stature with patches of bare ground at very fine-grained scale and often with a significant number of annual species or lichens in the sward. Typical species would be *Festuca ovina*, *Hypochaeris radicata*, *Pilosella officinarum* or *Rumex acetosella*.
   (g) Flower-rich grassland is a more typical, mature community with fewer gaps and characterised by more robust mesotrophic forbs such as *Centaurea nigra*, *Lotus corniculatus*, *Ranunculus acris* or *Trifolium pratense*.
   (h) Heathland communities are composed mainly of dwarf shrubs, often interspersed or in mosaics with graminoids, bryophytes or lichens. On OMH they tend to have a more open structure with less plant litter and other organic matter build up on the substrate than in more typical heathlands. Typical

species include *Calluna vulgaris*, *Deschampsia flexuosa*, *Festuca ovina* or *Nardus stricta*.

3.1 Annex I shows species of vascular plant known to be associated with, but not confined to, the habitat in certain areas and/or substrates.

3.2 Other plant species associated with the particular edaphic conditions might also be present, for example ericaceous species on acidic sites. Species composition will also vary with geographic location and site age.

3.3 One of the principal reasons for the habitat being a priority is its importance for invertebrates. Many have very precise requirements for habitat 'niches' within their landscape. As well as areas of bare ground and food plants, these may be for sheltered places at various times of the year, or for rough vegetation or cover at others. At any particular site, features such as scrub may be essential to maintain the invertebrate value of the main habitat. Therefore, scattered scrub (up to 10–15% cover) may be present and adds to the conservation value of the site. Other communities or habitats might also be present (e.g. reed swamp, open water), but early successional communities should comprise the majority of the area.

4. 'Loose bare' substrate is intended to separate substrate potentially colonisable by plants from large expanses of sealed surface (concrete, tarmac, etc) where vegetation could only establish if it is broken up or heavily weathered.

4.1 Bare substrate can occur at a range of spatial scales, from unvegetated patches easily seen from a distance, to small, open spaces between individual plants within a community. On some substrates, for example coal spoil, the patches of bare ground may be 10cm across or less. A site with a wide variety of patch sizes could also qualify.

4.2 Bare substrate also implies absence of organic matter accumulation.

5. A mosaic is defined as an area where a range of contiguous plant community types occur in transition with one another, usually with ecotone habitat gradients and repeated occurrences of each community, and often at a small scale.

5.1 The mosaic could comprise either:

- a mixture of one of the habitats (a)–(c) or (e)–(h) plus bare ground together forming a mosaic;
- a mixture of two or more of the habitats (a)–(h) in a mosaic, with adjacent bare ground;
- a mixture of two or more of the habitats (a)–(h) plus bare ground together forming a mosaic.

5.2 Continuous blocks of a closed plant community greater than 0.25ha would be classified as a habitat other than OMH, although those containing very fine-grained mosaics might qualify.

Background Information

The information in this section comes from the submission to the BAP species and Habitats review in 2006–07 (http://jncc.defra.gov.uk/PDF/UKBAP_Species-HabitatsReview-2007.pdf). It has been edited.

These are generally primary successions, and as such unusual in the British landscape, especially the lowlands. The vegetation can have similarities to early/pioneer communities (particularly grasslands) on more 'natural' substrates but, due to the edaphic conditions, the habitat can often persist (remaining relatively stable) for decades without active management (intervention). Stands of vegetation commonly comprise small patches and may vary over relatively small areas, reflecting small-scale variation in substrate and topography.

Plant assemblages are unusual, selected by propagule supply as well as site conditions (Ash *et al*. (1991) for several waste types, Shaw (1994) on Pulverized Fuel Ash (PFA)). The habitat supports a range of notable vascular plant, moss and lichen species. These often include species declining in the wider countryside such as *Ophrys apifera*, *Gymnadenia conopsea* (alkaline wastes), *Epipactis youngiana* (acid waste), *Osmunda regalis* (acid sandstone quarries), *Peltigera rufescens* (lime waste, PFA), *Cladonia pocillum* (calcareous wastes), *Diploschistes muscorum* (PFA) and a UK BAP priority liverwort, *Petalophyllum ralfsii* (PFA). Exotic plant species, which are well adapted to the prevailing environmental conditions, are a characteristic component of associated plant assemblages.

Invertebrate faunas can be species-rich and include many uncommon species (Eyre *et al*., 2002, 2004). Between 12% and 15% of all nationally-rare and nationally-scarce insects are recorded from brownfield sites, which will include many post-industrial examples (Gibson, 1998; Jones, 2002) (see below). Exotic plants provide for an extended flowering season and, with the floristic and structural diversity of the habitat mosaic, contribute to the value of the habitat for invertebrates (see Bodsworth *et al*., 2005).

Some areas are important for birds that are primarily associated with previously developed or brownfield land, such as little ringed plover (in 1984 97% of LRP nests in England were in 'man-made' habitats), as well as more widespread, but UK BAP priority species, including skylark and grey partridge. The habitat provides secure breeding and feeding areas commonly absent from land under agricultural management.

The heterogeneity within the habitat mosaic reflects chemical and physical modification by former development or previous industrial processes, including the exposure of underlying substrates and the tipping of wastes and spoils. Features such as ditches, other exposures, spoil mounds and even the relicts of built structures provide topographical heterogeneity at the macro- and micro-scale. Sealed surfaces and compaction add further variation and contribute to the modified hydrology of such habitats resulting in areas of impeded and accelerated drainage. Stochastic factors also have a significant influence in shaping the habitat.

Edaphic conditions for this habitat are severely limiting on plant growth. Examples are substrates with extreme pH, whether alkaline (e.g. chemical wastes) or acid (e.g. colliery spoils); deficiency of nitrogen (PFA), or available phosphate (highly calcareous Leblanc waste, blast furnace slag and calcareous quarry spoil); or water-deficient (dry gravel and sand pits). Other typical situations where such conditions arise include disused quarries, former railway sidings, extraction pits and landfill sites.

The habitat is concentrated in urban, urban fringe and large-scale former industrial landscapes, especially in the lowlands, though more isolated examples can be found on previously developed land in more remote rural areas.

References

Ash, H.J., Gemmell, R.P. & Bradshaw, A.D. (1991) The introduction of native plant species on industrial waste heaps: a test of immigration and other factors affecting primary succession. *Journal of Applied Ecology*, **31**, 74–8.

Bodsworth, E., Shepherd, P. & Plant, C. (2005) Exotic plant species on brownfield land: their value to invertebrates of nature conservation importance. Peterborough, English Nature.

Eyre, M.D., Luff, M.L. & Woodward, J.C. (2002) Rare and notable Coleoptera from post-industrial and urban sites in England. *Coleopterist*, **11**, 91–101.

Eyre, M.D., Luff, M.L. & Woodward, J.C. (2004) Beetles (Coleoptera) on brownfield sites in England: an important conservation resource? *Journal of Insect Conservation*, **7**, 223–231.

Gibson, C.W.D. (1998) *Brownfield: red data. The values of artificial habitats have for uncommon invertebrates*. Peterborough, English Nature.

Jones, R. (2002) Brown can be beautiful. *Urbio*, **2**, 12–13.

Rodwell & Cooch (1997) Red Data Book of British Plant Communities. Unpublished report to WWF.

Riding, A., Critchley, N., Wilson, L. & Parker, J. (2009) *Definition and mapping of open mosaic habitats on previously developed land: Phase 1 Final Report*. ADAS UK Ltd, December 2009. Available from: http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=16067&FromSearch=Y&Publisher=1&SearchText=open mosaic habitats&SortString=ProjectCode&SortOrder=Asc&Paging=10#Description [Accessed 20 July 2010].

Rodwell, J.S., Dring, J.C., Averis, A.B.G., Proctor, M.C.F., Malloch, A.J.C., Schaminee, J.N.J. & Dargie, T.C.D. (2000) Review of coverage of the National Vegetation Classification. *JNCC Report*, No. 302. Peterborough, JNCC. Available from: http://jncc.defra.gov.uk/page-2312 [Accessed 20 July 2010].

Shaw, P. (1994) Orchid woods and floating islands – the ecology of fly ash. *British Wildlife*, **6**, 149–57.

Shimwell, D.W. (1983) *A conspectus of urban vegetation types*. Manchester, School of Geography, University of Manchester.

ANNEX 1: CHARACTERISTIC SPECIES

NOTE: these are provisional working lists, from February 2010. As more sites are surveyed and mapped, more up-to-date lists are likely to beco me available. Please check the UK BAP website http://jncc.defra.gov.uk/page-5155 for up-dates.

Species	Common Name	Southern	N. England	Scotland	S. Wales colliery sites	Thames area (species important for invertebrates)
Achillea millefolium	Yarrow					x
Agrimonia eupatoria	Agrimony					x
Agrostis vineale	Brown Bent				x	
Aira caryophyllea	Silver Hair-grass				x	
Aira praecox	Early Hair-grass				x	
Anthemis arvensis*	Corn Chamomile				x	
Anthemis cotula*	Stinking Chamomile				x	
Anthyllis vulneraria	Kidney Vetch					x
Arctium lappa*	Greater Burdock				x	
Arctium minus	Lesser Burdock				x	
Armeria maritima	Thrift					x
Artemisia absinthium*	Wormwood	x			x	
Artemisia verlotiorum*	Chinese Mugwort	x				
Artemisia vulgaris*	Mugwort	x	x	x		
Aster novi-belgii*	Confused Michaelmas-daisy	x	x	x		
Atriplex patula	Common Orache				x	
Atriplex prostrata*	Spear-leaved Orache				x	
Ballota nigra*	Black Horehound				x	
Barbilophozia floerkei	Common Pawwort				x	
Beta vulgaris	Beet				x	
Blackstonia perfoliata	Yellow-wort	x	x			
Calluna vulgaris	Heather				x	
Campanula glomerata	Clustered Bellflower					x
Campanula rotundifolia	Harebell					x
Carduus crispus	Welted Thistle				x	
Carduus nutans	Musk Thistle				x	
Carduus tenuiflorus	Slender Thistle				x	
Carex arenaria	Sand Sedge				x	
Carex otrubae	False Fox-sedge				x	
Carex pilulifera	Pill Sedge				x	
Catapodium rigidum	Fern-grass				x	
Centaurea cyanus	Cornflower				x	
Centaurea nigra	Common Knapweed	x	x	x		x
Centaurium erythraea	Common Centaury	x	x			
Centranthus ruber*	Red Valerian					x
Cerastium fontanum	Common Mouse-ear	x	x	x		
Chaenorhinum minus*	Small Toadflax				x	
Chenopodium album	Fat-hen				x	

Chenopodium bonus-henricus*	Good-King-Henry				x		
Chenopodium ficifolium*	Fig-leaved Goosefoot				x		
Chenopodium hybridum*	Maple-leaved Goosefoot				x		
Chenopodium polyspermum*	Many-seeded Goosefoot				x		
Chenopodium rubrum	Red Goosefoot				x		
Chrysanthemum segetum*	Corn Marigold				x		
Cichorium intybus*	Chicory	x	x	x	x		
Clinopodium acinos	Basil Thyme					x	
Clinopodium vulgare	Wild Basil					x	
Conium maculatum*	Hemlock	x	x	x			
Conyza canadensis*	Canadian Fleabane	x					
Conyza sumatrensis*	Guernsey Fleabane	x					
Crepis biennis	Rough Hawk's-beard	x	x		x		
Crepis capillaris	Smooth Hawk's-beard	x	x	x	x		
Dactylorhiza praetermissa	Southern Marsh-orchid	x	x				
Daucus carota* ssp. *sativus*	Carrot	x	x				
Deschampsia flexuosa	Wavy Hair-grass	x	x		x		
Dianthus armeria	Deptford Pink					x	
Dianthus deltoides	Maiden Pink					x	
Diplotaxis tenuifolia*	Perennial Wall-rocket	x					
Dipsacus fullonum	Wild Teasel				x		
Echium vulgare	Viper's-bugloss	x	x	x		x	
Equisetum arvense	Field Horsetail	x	x	x			
Erica cinerea	Bell Heather				x		
Erigeron acer	Blue Fleabane	x	x			x	
Erodium cicutarium	Common Stork's-bill					x	
***Euphrasia* spp.**	Eyebright	x	x				
Festuca ovina	Sheep's-fescue				x		
Filago minima	Small Cudweed				x		
Filago vulgaris	Common Cudweed				x		
Galega officinalis*	Goat's-rue	x					
Galeopsis bifida	Bifid Hemp-nettle				x		
Galeopsis speciosa*	Large-flowered Hemp-nettle				x		
Galeopsis tetrahit	Common Hemp-nettle				x		
Galium verum	Lady's Bedstraw					x	
Geranium molle	Dove's-foot Crane's-bill					x	
Glaucium flavum	Yellow Horned-poppy					x	
Gnaphalium uliginosum	Marsh Cudweed				x		
Helianthemum nummularium	Common Rock-rose					x	
Hieraceum aurantiacum*	Fox-and-cubs					x	
Hieracium sabaudum	Autumn Hawkweed	x	x				
Hypericum perforatum	Perforate St John's-wort	x	x	x		x	
Hypochaeris radicata	Cat's-ear	x	x	x			
Juncus inflexus	Hard Rush	x	x	x			

Kickxia elatine*	Sharp-leaved Fluellen				x	
Kickxia spuria*	Round-leaved Fluellen				x	
Knautia arvensis	Field Scabious					x
Lactuca serriola*	Prickly Lettuce				x	
Lactuca virosa	Great Lettuce				x	
Lamium amplexicaule*	Henbit Dead-nettle				x	
Lamium hybridum*	Cut-leaved Dead-nettle				x	
Lathyrus latifolius*	Broad-leaved Everlasting-pea					x
Leontodon autumnalis	Autumn Hawkbit					x
Leontodon hispidus	Rough Hawkbit					x
Lepidium ruderale*	Narrow-leaved Pepperwort	x				
Leucanthemum vulgare	Oxeye Daisy					x
Linaria purpurea*	Purple Toadflax	x	x			x
Linaria repens*	Pale Toadflax	x	x		x	
Linaria vulgaris	Common Toadflax	x	x	x	x	x
Linum catharticum	Fairy Flax	x	x	x		
Lophozia ventricosa	A liverwort				x	
Lotus corniculatus	Common Bird's-foot-trefoil				x	x
Lotus glaber	Narrow-leaved Bird's-foot-trefoil	x				
Malva moschata	Musk-mallow					x
Marrubium vulgare*	White Horehound				x	
Matricaria matricarioides	Pineapple Weed	x	x	x		
Matricaria recutita*	Scented Mayweed				x	
Medicago lupulina	Black Medick	x	x	x		x
Medicago sativa	Lucerne	x				
Melilotus altissimus*	Tall Melilot	x	x			
Melilotus officinalis*	Ribbed Melilot	x	x			
Mentha arvensis	Corn Mint				x	
Misopates orontium*	Weasel's-snout				x	
Nardus stricta	Mat-grass	x	x			
Odontites vernus	Red Bartsia	x	x	x		
Oenothera spp.*	Evening Primrose	x	x			
Ononis spinosa	Spiny Restharrow					x
Onopordum acanthium*	Cotton Thistle				x	
Ophrys apifera	Bee Orchid	x	x			
Origanum vulgare	Wild Marjoram					x
Orobanche minor	Common Broomrape				x	
Parentucellia viscosa	Yellow Bartsia				x	
Picris echioides*	Bristly Oxtongue	x	x		x	
Picris hieracioides	Hawkweed Oxtongue	x	x			
Pilosella officinarum agg	Mouse-ear-hawkweed				x	x
Pilosella praealta*	Tall Mouse-ear-hawkweed	x				
Plantago coronopus	Buck's-horn Plantain				x	
Plantago lanceolata	Ribwort Plantain	x	x	x		
Plantago media	Hoary Plantain					x
Poa compressa	Flattened Meadow-grass				x	
Primula veris	Cowslip					x
Prunella vulgaris	Selfheal					x
Ptilidium ciliare	Ciliated Fringewort				x	

Pulsatilla vulgaris	Pasqueflower					x
Ranunculus acris	Meadow Buttercup					x
Ranunculus bulbosus	Bulbous Buttercup					x
Reseda lutea	Wild Mignonette	x	x	x		x
Reseda luteola*	Weld	x	x	x		
Rumex acetosa	Common Sorel				x	
Salvia pratensis	Meadow Clary					x
Sanguisorba minor	Salad Burnet					x
Saponaria officinalis*	Soapwort	x	x	x		
Scabiosa columbaria	Small Scabious					x
Scrophularia nodosa	Common Figwort				x	
Senecio squalidus*	Oxford Ragwort	x	x	x		
Silene vulgaris	Bladder Campion	x	x	x		x
Spergularia rubra	Sand Spurrey				x	
Tanacetum vulgare	Tansy				x	
Teucrium scorodonia	Wood Sage				x	
Thymus polytrichus	Wild Thyme				x	x
Thymus serpyllum	Breckland Garden					x
Tragopogon pratensis	Goat's-beard	x	x	x	x	
Trifolium arvense	Hare's-foot Clover	x	x	x		x
Trifolium campestre	Hop Trefoil	x	x	x	x	x
Trifolium dubium	Lesser Trefoil	x	x	x		
Trifolium hybridum*	Alsike Clover	x	x	x		
Trifolium medium	Zigzag Clover	x	x	x		
Trifolium micranthum	Slender Trefoil				x	
Trifolium pratense	Red Clover	x	x	x		
Trifolium scabrum	Rough Clover				x	
Trifolium striatum	Knotted Clover				x	
Trisetum flavescens	Yellow Oat-grass	x	x	x		
Tussilago farfara	Colt's-foot	x	x	x	x	
Vaccinium myrtillus	Bilberry				x	
Valerianella carinata*	Keeled-fruited Cornsalad				x	
Valerianella locusta	Common Cornsalad				x	
Verbascum nigrum	Dark Mullein	x			x	x
Verbascum thapsus	Great Mullein				x	
Veronica agrestis*	Green Field-speedwell				x	
Vicia cracca	Tufted Vetch	x	x	x		
Vicia hirsuta	Hairy Tare	x	x	x		
Vicia tetrasperma	Smooth Tare	x				
Vulpia bromoides	Squirreltail Fescue				x	
Vulpia myuros*	Rat's-tail Fescue				x	

*introduced species of lower biodiversity value but still characteristic of OMH sites. Species lists from Riding *et al*. (2009) (*Open Mosaic Habitats on Previously Developed Land, site identification guide* December 2009 ADAS UK Ltd). Sources of information about status: species represented in columns 2–4 – ADAS 2009 as above; other vascular species – status from BSBIs New Atlas CD-ROM, species always introduced in Wales (col 5) or in England (col 6).