WETLAND COMMUNITIES
ECOLOGY of FENS, MIRES and BOGS

The literature on wetland habitats is full of confusion and inconsistency in the use of terminology. Indeed this is why the the noncomittal term **wetland** has been used as a general term in this course, for it avoids the varied conotations associated with some other terms which have sometimes been used in this broad way. Faced with the same problem, Derek Ratcliffe in the Nature Conservation Review (1977) chose to use the term **peatlands** in a similar all encompassing way, but as some wetland communities are developed over mineral rather than organic substrates that term is not used here. However, it is not only the choice of a general term that poses problems, for the definition and classification of the wetland communities themselves is also in a somewhat confused state. This is partly because terms like bog, fen, mire, and moor have been used with both a wide, often colloquial, but in any event poorly defined way and at the same time used to convey precise scientific meaning, indeed on occasions the same term has been used to cover two, equally precise, but different scientific meanings. It is also because definition and classification has been based on a range of criteria (floristic composition, site hydrology, site topography, water chemistry & nutritional status, and peat structure) used either separately, or in some combination. So at the outset it is necessary to define some of our terms of reference and the conventions that shall be applied in this course.

If initially we consider divisions based on watertable height relative to the ground surface, and on the dominant life forms of the plants three main categories emerge.

1. OPEN WATER: free water including both, more or less stagnant water bodies such as lakes and ponds, and moving water in rivers and streams. The vegetation if that term can be used with any justification, is very open and most of the plants are true hydrophytes with their perenating bud below the water surface. Some of these species may have both emergent leaves and flowering shoots, some floating leaves, with or without submerged leaves, some submerged leaves only, some may be rooted in the substrate and some may be non-rooting aquatics submerged all the year round.

2. SWAMPS: ground/substrate permanently or seasonally submerged, but with relatively dense vegetation cover above the water surface. True hydrophytes occur where the mean summer water table depth never falls below 30cm, but if it falls below 50cm partial hydrophytes and some helophytes become predominant, many of the plants of these life form categories have emergent leaves. Such swamps are almost always restricted to a zone adjoining open water: indeed 1. & 2. are best thought of as aquatic communities whereas the next category is better regarded as terrestrial.

3. DRIER SWAMPS: Here the water table is rarely if ever above the substrate surface, though rarely far below. Although dominated by helophytes, some hemicryptophytes and some partial hydrophytes may be important, but the vegetation surface is always closed. Again drier swamps are often spatially related to wetter types and in turn to open water in a topgraphically determined zonation: a TOPOGENOUS MIRE. In Britain, however, these drier swamps are known as FEN, a term that is difficult to apply in a scientific sense because it is also used in a wider colloquial sense as virtually synonymous with the term topogenous mire above: ie. to signify all three zones from open water to dry swamp. Nevertheless these topogenous mire/fen complexes are characterised by a more or less concentric topographically determined zonation following the water table gradient round enclosed basins, or hollows. Here a high and relatively stagnant water table dependant on the shape of the topography allows the accumulation of a ground peat surface that is level or imperceptively sloping and where there is little or very impeded lateral water movement.

The floristic composition of the types of swamp community and of the aquatic communities depends on the nutrient content of the water, so we speak of species rich and species poor facies for situations that share the same site and hydrological conditions, but differ in nutrition. Whether species rich, or species poor, however, the zonation which characterises these topogenous mires allow two interpretations. On the one hand they may be interpreted as STATIC zonations which merely reflect a more or less static gradient in water table and associated properties. Alternatively, they can be regarded as DYNAMIC in the sense that the zones are successionally related - the classic concept of the HYDROSERE. Although conceptually valid this latter interpretation is difficult to apply in practice for it requires that sites comparable topographically and nutritionally, but at different stages in the succession are compared. Now this is difficult to do convincingly in the UK because most hydroseres began at about the same time in the post glacial (Flandrian) period and are often therefore at about the same stage. The alternative is to reconstruct the stages through which particular hydroseres have passed by the interpretation of the stratigraphy of the accumulated peat. The nutrition of the community takes on a renewed signifcance in such hydroseral models, for the natural progression of the autogenic succession is in the direction of increasing acidity as the growing peat surface becomes progressively isolated from the nutritional effect of ground and soil water and more and more dependant on rainwater nutrition.

If these topogenous categories of wetland community are dependant on climate, topography and substrate geology in concentrating runoff, through and base flow into depressions and for the base status of that water, then the next three categories are dependant on different conditions of waterlogging and represent two distinct types of wetland.

4. SOLIGENOUS MIRES: Here the wetness of the ground is maintained by slow lateral gravitational seepage of water through the substrate or the peat. Such sites are common in the wetter north and west of Britain, but they do occur in the south as in the valley ("bogs") mires of the New Forest in Hampshire. Topography is still the main determining factor but there is usually some slope, with the high water table resulting not from the concentration of water as in a topogenous mire, but by sustained, though slow flow through the site usually along some definable drainage or seepage line; hence soligenous. As the moving water flowing through the substrate is more oxygenated and hence decomposition is more effective in soligenous mire sites, the depth of peat accumulation is usually less than in topogenous mires, although there are considerable similarities in peat types. Floristically too there are similarities with species poor and species rich facies reflecting differences in the base status of the water supply. Soligenous mires can occur at a variety of scales with, for example small scale features like montane rills and wet flushes falling into this category.

5. OMBROGENOUS MIRES (BOGS): In these situations the high stagnant water table and the accumulation of peat depends not so much on the concentration of drainage into a topographic hollow or into a drainage line, but rather on a high precipitation input and a low evapotranspiration loss. Topography is still important, but its role is to retard runoff from the site, rather than to concentrate runoff from other sites. Because the only source of water is from the atmosphere such habitats are termed OMBROGENOUS, and are of consistently low base status as they are dependant on for the most part on the ionic content of rain water. Under such wet and acid conditions organic matter decomposition and the rate of accumulation of unhumified acid peat comparably rapid. Wetlands of these types are known as BOGS in Britain and there are two kinds: CLIMATIC or BLANKET BOG (MIRE) and RAISED BOG (MIRE).

The first covers all flat and gently sloping ground wherever climatic conditions are such as to keep the surface of the ground permanently wet and hence initiate peat

growth. The latter, however, can occur outside areas of such a climatic regime, and represent a possible late stage in the autogenic succession of topogenous mires. When the growing peat surface in the centre of such mires is raised to a level where it is isolated from any nutritional effect of soil water draining into the site its nutrition becomes dependant on rainwater and acidification of the environment ensues, decomposition rates reduce, peat accumulation increases, and peat type changes fron FEN to BOG peat. The result is the centre of the peat surface grows faster than the margins which remain influenced by oxygenated moving soil water and hence by faster decomposition rates. These margins then form a 'steep' slope separating a domed bog plane from a marginal 'lagg' depression - hence the phrase RAISED BOG or mire. Although the transition from fen to bog peat is associated with natural development of the vegetaion succession, in the postglacial period this change in peat stratigraphy in many sites seems to have been correlated, partially at least, with climatic deterioration and a wetter peat surface, thereby encouraging renewed upward growth.

Although the categories of wetland community that have been described above are determined mainly by the hydrology of the site, a major contributary factor has been the nutritional status of the site, and particularily of the water influencing the site. This influence is recognised by the use of the terms OMBROTROPHIC nutrition to denote those situations where such nutrition is dominantly rainwater, and MINEROTROPHIC where mainly soil/substrate water nutrition. Rainwater nutrition is of course always base defficient or OLIGOTROPHIC, whereas soil water nutrition is very variable depending on the influence of the geology and other characteristics of the catchment from which drainage water is derived. Accordingly it may be OLIGOTROPHIC, MESOTROPHIC, or EUTROPHIC, meaning poorly, average or well nourished respectively, and associated with gradients of floristics and of species diversity which we have been hinted at above by reference to species poor and species rch facies of topogenous and of soligenous mire.