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Wetland functional mechanisms: a synopsis of WETMECs

Science Report – SC030232/SR2

NATURAL ENGLAND

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Countryside Council for Wales

The University Of Sheffield.

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This report is the result of research commissioned and funded by the Environment Agency's Science Programme.

Published by:
Environment Agency, Rio House, Waterside Drive, Aztec West, Almondsbury, Bristol, BS32 4UD
Tel: 01454 624400 Fax: 01454 624409
www.environment-agency.gov.uk

ISBN: 978-1-84911-004-4

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Dissemination Status:
Publicly available / Released to all regions

Keywords:
Wetland, ecohydrology, ecology, hydrology, fen, bog, vegetation, WETMECs, hydrogeology

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Science Project Number:
SC030232/SR2

Product Code:
SCHO0309BPOF-E-P

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Steve Killeen

Head of Science

This document forms a supplement to the report “A Wetland Framework for Impact Assessment at Statutory Sites in England and Wales” by B.D. Wheeler and S.C. Shaw, which presents the results of investigations into the inter-relationships between water source, water quantity, water quality and vegetation type in sites supporting herbaceous wetland vegetation in lowland England and Wales. The core of the Wetland Framework is a typology of the main ecohydrological units that occur within lowland herbaceous wetlands in England and Wales, based on a synthesis of the available data and analysis results. Twenty Wetland Water Supply Mechanisms (WETMECs) have been identified and described, along with the Ecological Types that are associated with them. In combination, the WETMECs and Ecological Types define ecohydrological ‘habitats’. This document provides a synopsis of the WETMECs and their characteristics, and can be used as a stand-alone document

Contents

1 WETMECs and sub-types

Figure 1.1 is based on output from the hierarchical multivariate clustering procedure that was used to identify the WETMECs. It serves as a summary index of the WETMECs and their sub-types, and shows their inter-relationships as expressed as a one-dimensional linearization, based on cluster affinities. It also provides a crude indication of their relationship to main water sources.

Table 1.1 provides a reference list of WETMEC names; Section 2 provides a synopsis of WETMECs and Table 2.1 summarises some of the salient features of the WETMECs and their sub-types. Not all characteristics are listed, nor are variants identified, to help keep Table 2.1 within manageable proportions. This table can be used to help identify the WETMEC to which a particular area of wetland can be assigned. It must, however, be appreciated that WETMECs intergrade, both in concept and in the field, so it is to be expected that some surfaces may have characteristics that are intermediate between two (or more) WETMECs. Moreover, because WETMECs represent a simplification and conceptualisation of 'real' field circumstances, some surfaces may not correspond well to *any* WETMEC. This may be because the surface in question is ecohydrologically idiosyncratic, or because it is peripheral to the main range of wetland habitats examined and hence under-sampled.

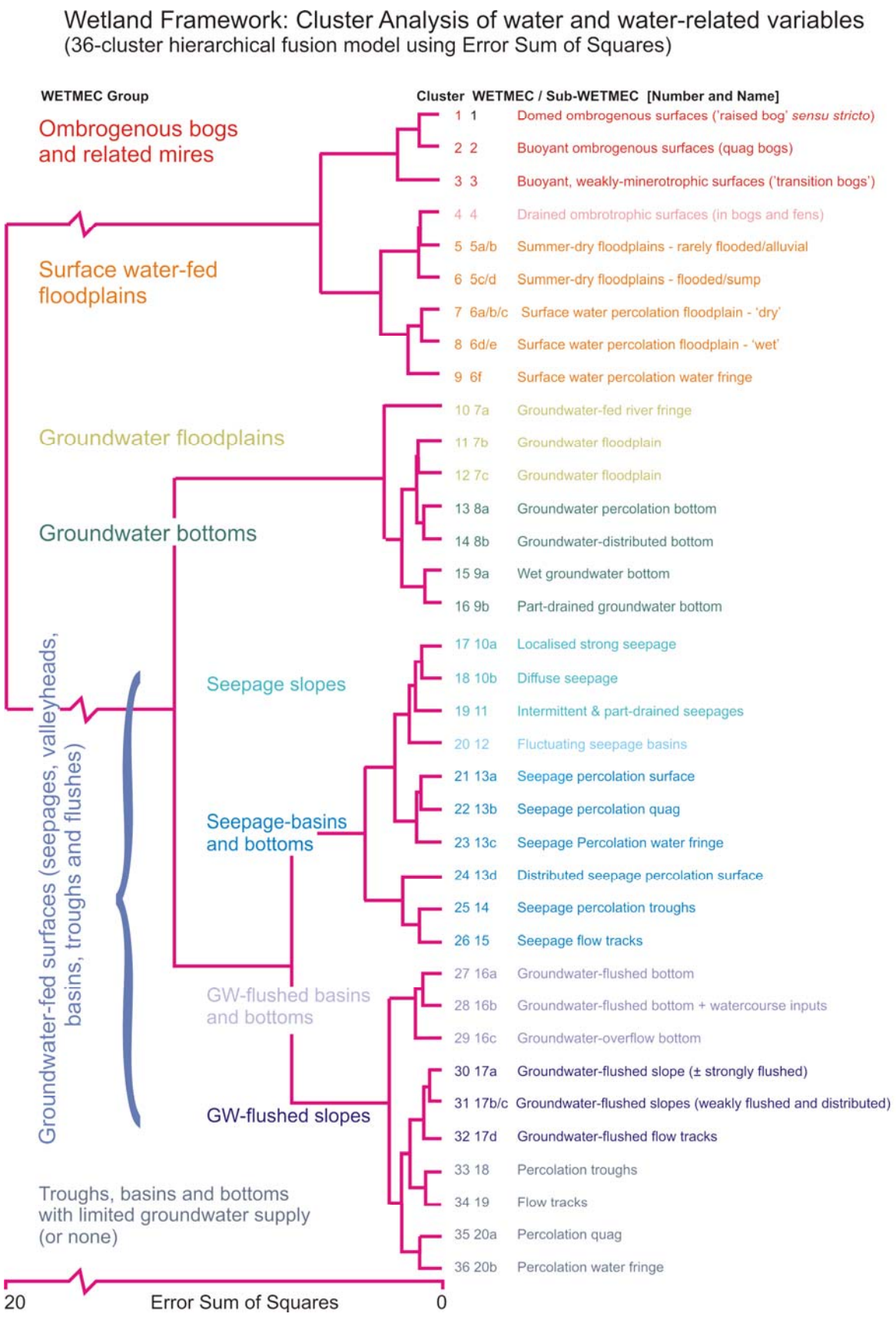


Figure 1.1 Cluster analysis (36-cluster hierarchical fusion model using Error Sum of Squares) of water and water-related variables showing derivation of WETMECs.

Table 1.1 List of WETMECs and WETMEC sub-types

WETMEC GROUP: OMBROGENOUS BOGS AND RELATED MIRES

- **WETMEC 1: Domed Ombrogenous Surfaces ('raised bog' *sensu stricto*)**
- **WETMEC 2: Buoyant Ombrogenous Surfaces (quag bogs)**
  - *WETMEC 2a: Ombrogenous Quag*
  - *WETMEC 2b: Ombrogenous Quag (GW-fed basin)*
  - *WETMEC 2c: Ombrogenous Quag (SW-fed basin)*
- **WETMEC 3: Buoyant Weakly Minerotrophic Surfaces ('transition bogs')**
  - *WETMEC 3a: Bog-Transition Quag (± closed basin)*
  - *WETMEC 3b: Bog-Transition Quag (± open basin)*
- **WETMEC 4: Drained Ombrotrophic Surfaces (in bogs and fens)**
  - *WETMEC 4a: Drained Ombrogenous Bog*
  - *WETMEC 4b: Drained Ombrotrophic Fen*

WETMEC GROUP: SURFACE WATER-FED FLOODPLAINS

- **WETMEC 5: Summer-Dry Floodplains**
  - *WETMEC 5a: Rarely-Flooded Floodplain*
  - *WETMEC 5b: Alluvial Floodplain*
  - *WETMEC 5c: Winter-Flooded Floodplain*
  - *WETMEC 5d: Floodplain Sump*
- **WETMEC 6: Surface Water Percolation Floodplains**
  - *WETMEC 6a: Solid SW Percolation Surface*
  - *WETMEC 6b: Grounded SW Percolation Quag*
  - *WETMEC 6c: SW Percolation 'Boils'*
  - *WETMEC 6d: Swamped SW Percolation Surface*
  - *WETMEC 6e: Wet SW Percolation Quag*
  - *WETMEC 6f: SW Percolation Water Fringe*

WETMEC GROUP: GROUNDWATER FLOODPLAINS

- **WETMEC 7: Groundwater Floodplains**
  - *WETMEC 7a: Groundwater-Fed River Fringe*
  - *WETMEC 7b: Groundwater Floodplain*
  - *WETMEC 7c: Groundwater Floodplain on Aquitard*

WETMEC GROUP: GROUNDWATER BOTTOMS

- **WETMEC 8: Groundwater-Fed Bottoms with Aquitard**
  - *WETMEC 8a: Groundwater Percolation Bottom*
  - *WETMEC 8b: Groundwater-Distributed Bottom*
- **WETMEC 9: Groundwater-Fed Bottoms**
  - *WETMEC 9a: Wet Groundwater Bottom*
  - *WETMEC 9b: Part-Drained Groundwater Bottom*

Table 1.1 *contd.*

WETMEC Macro-Group: GROUNDWATER-FED SURFACES

WETMEC GROUP: SEEPAGE SLOPES

WETMEC 10: Permanent Seepage Slopes

WETMEC 10a: Localised Strong Seepage

WETMEC 10b: Diffuse Seepage

WETMEC 11: Intermittent and Part-Drained Seepages

WETMEC 11a: Permeable Partial Seepage

WETMEC 11b: Slowly Permeable Partial Seepage

WETMEC GROUP: SEEPAGE BASINS AND BOTTOMS

WETMEC 12: Fluctuating Seepage Basins

WETMEC 12a: Fluctuating Seepage Basins with permanent standing water

WETMEC 12b: Fluctuating Seepage Basins with winter standing water, summer water table sub-surface or near surface

WETMEC 12c: Fluctuating Seepage Basins with shallow winter standing water, summer water table sub-surface or near surface

WETMEC 12d: Fluctuating Seepage Basins, winter 'wet', summer 'dry'

WETMEC 12e: Fluctuating Seepage Basins with winter standing water, 'dry' by early summer

WETMEC 13: Seepage Percolation Basins

WETMEC 13a: Seepage Percolation Surface

WETMEC 13b: Seepage Percolation Quag

WETMEC 13c: Seepage Percolation Water Fringe

WETMEC 13d: Distributed Seepage Percolation Surface

WETMEC 14: Seepage Percolation Troughs

WETMEC 15: Seepage Flow Tracks

WETMEC 15a: Topogenous Seepage Flow Tracks

WETMEC 15b: Sloping Seepage Flow Tracks

WETMEC GROUP: GROUNDWATER-FLUSHED BOTTOMS

WETMEC 16: Groundwater-Flushed Bottoms

WETMEC 16a: Groundwater-Flushed Bottom

WETMEC 16b: Groundwater-Flushed Bottom + Watercourse Inputs

WETMEC 16c: Groundwater-Overflow Bottom

WETMEC GROUP: GROUNDWATER-FLUSHED SLOPES

WETMEC 17: Groundwater-Flushed Slopes

WETMEC 17a: Groundwater-Flushed Slope

WETMEC 17b: Weakly Groundwater-Flushed Slope

WETMEC 17c: Distributed Groundwater-Flushed Slopes

WETMEC 17d: Groundwater-Flushed Flow Tracks

Table 1.1 *contd.*

WETMEC GROUP: TROUGHS, BASINS AND BOTTOMS WITH LIMITED, OR INDETERMINATE, GROUNDWATER SUPPLY (OR NONE)
WETMEC 18: Percolation Troughs
WETMEC 19: Flow Tracks
WETMEC 20: Percolation Basins
WETMEC 20a: Percolation Quag
WETMEC 20b: Percolation Water Fringe

2 Synopsis of WETMECs

This synopsis provides a descriptive summary of the main features of WETMECs, as derived from multivariate analyses (Figure 1.1). It should be used in conjunction with the WETMEC Summary Table (Table 2.1) and the summary and full accounts of individual WETMECs. The WETMECs are aggregated into WETMEC groups, which may themselves have some broad-scale descriptive value.

The following points should be noted:

- Individual WETMEC categories are not fully discrete entities, but can merge into one another. Some samples may therefore have characteristics that are intermediate between two or more WETMECs.
- The WETMEC groups broadly reflect the structure of the multivariate dendrogram (Figure 1.1) and have been given names that reflect their main character. However, some individual samples, or even some WETMEC sub-types, do not necessarily conform to the descriptive label.
- WETMECs are composite entities derived by multivariate classification using a wide range of characteristics. They are thus influenced by dominant features within the dataset and do not necessarily correspond exactly to variation in individual characteristics. This can cause some untidiness when allocating them to WETMEC groups. For example, within the macro-group of ‘groundwater-fed surface’ a main division is between mires fed by groundwater seepage and groundwater-flushed examples, the latter being over an aquitard. However, one of the sub-types of WETMEC 15, which is unambiguously clustered within the ‘seepage’ types, tends to occur over an aquitard, and in this respect has similarities with the ‘flushed’ types. Such ambiguities could, of course, be tidied-up, and the WETMEC classification more clearly structured, simply by relocating WETMEC 15a, but this would be at the expense of the multivariate classification and would violate some of the common features of WETMECs 15a and 15b. This problem is essentially an expression of the difficulty of trying to summarise the multi-dimensional variation of the dataset within a few clear and coherent categories.
- The names of the sub-WETMECs have been formulated to be short and self-standing and therefore do not always incorporate generic elements of the parent WETMEC name.
- GW: Groundwater; SW: Surface Water.

WETMEC Group: OMBROGENOUS BOGS AND RELATED MIRES

Includes ombrogenous surfaces that are more or less exclusively fed by precipitation (WETMECs 1 and 2), and some topogenous surfaces exposed to only weakly minerotrophic telluric (WETMEC 3) and some drained surfaces (in both bogs and fens) that are (now) mostly fed exclusively by precipitation (WETMEC 4). Although the latter has, for convenience, been grouped within the 'ombrotrophic' WETMEC group, it is of interest that the clustering dendrogram suggests that its closest affinities are with 'surface water-fed floodplains', of which it represents a particularly dry example.

WETMEC 1: Domed Ombrogenous Surfaces ('raised bog' *sensu stricto*)

Domed surfaces mostly fed exclusively by precipitation. Includes classic raised bogs and 'ridge-raised' ('intermediate' bogs), and also solid ombrogenous surfaces within basins, and residual baulks of uncut peat within some peat-cutting complexes.

WETMEC 2: Buoyant Ombrogenous Surfaces (quag bogs)

More or less flat, buoyant surfaces more or less exclusively fed by precipitation. Includes bogs in (usually small) basins (basin bogs), but also surfaces in wet depressions within some peat-cutting complexes. Sub-types reflect nature of any significant inflows of telluric water into the basins; these do not feed the mire surface but may support it, or otherwise influence the hydrodynamics of the basin as a whole.

WETMEC 2a: Ombrogenous Quag

WETMEC 2b: Ombrogenous Quag (GW-Fed Basin)

WETMEC 2c: Ombrogenous Quag (SW-Fed Basin)

WETMEC 3: Buoyant Weakly Minerotrophic Surfaces ('Transition Bogs')

More or less flat, buoyant surfaces of basins and hollows, fed in part by telluric water, but with surface largely fed by precipitation (because of buoyant character) and/or telluric water weakly minerotrophic. Sub-types relate to the apparent absence of significant water inflows/outflows in the basin, or to their presence (especially outflows)

WETMEC 3a: Bog-Transition Quag (± closed basin)

WETMEC 3b: Bog-Transition Quag (± open basin)

WETMEC 4: Drained Ombrotrophic Surfaces (in bogs and fens)

Drained, more or less solid peat surfaces, often flat, with low water tables. Precipitation is more or less exclusive water source to surface or near-surface, but in the case of WETMEC 4b this is because of disruption of former mechanisms of telluric water supply.

WETMEC 4a: Drained Ombrogenous Bog

WETMEC 4b: Drained Ombrotrophic Fen

WETMEC Group: SURFACE WATER-FED FLOODPLAINS

Includes floodplain sites in which telluric water is derived from adjoining watercourses (either by episodic flooding (WETMEC 5) or lateral flow through peat (WETMEC 6)). May be supplemented by minor rain-generated run-off or land-drainage, or groundwater outflow.

WETMEC 5: Summer-Dry Floodplains

Floodplain sites fed mainly by episodic flooding from watercourse, though some examples are uncoupled from this. Precipitation often dominates hydrodynamics and may be more or less the exclusive supply to wetland surface during summer or low-flow conditions. Sub-types largely reflect incidence of flooding and retention of surface water (such as in depressions)

WETMEC 5a: Rarely-Flooded Floodplain

WETMEC 5b: Alluvial Floodplain

WETMEC 5c: Winter-Flooded Floodplain

WETMEC 5d: Floodplain Sump

WETMEC 6: Surface Water Percolation Floodplains

Surfaces partly fed in dry conditions by lateral flow of water from proximate water bodies, through transmissive near-surface layers of peat (most usually the infill of reflooded turbaries), driven by an evapotranspiration-induced hydraulic gradient. In wet conditions hydraulic gradient may be reversed and surfaces drain towards water bodies. May also be subject to episodic inundation. Sub-types mainly relate to stability and elevation of peat surface and to degree of connection to water bodies.

WETMEC 6a: Solid SW Percolation Surface

WETMEC 6b: Grounded SW Percolation Quag

WETMEC 6c: SW Percolation 'Boils'

WETMEC 6d: Swamped SW Percolation Surface

WETMEC 6e: Wet SW Percolation Quag

WETMEC 6f: SW Percolation Water Fringe

WETMEC Group: GROUNDWATER FLOODPLAINS

A poorly defined unit containing samples from floodplain contexts, about which little information is generally available. Requires further examination, especially to establish better the relationships to 'groundwater bottoms'

WETMEC 7: Groundwater Floodplains

A poorly defined unit containing a small number of floodplain surfaces alongside groundwater-fed watercourses, with water levels apparently related to the piezometric head of the source aquifer. Degree and mechanism of any groundwater supply to adjoining mire surface is often uncertain (they are frequently located over complex, and often low-permeability, alluvial sequences). In some cases, natural hydraulic relationships between the watercourse and mire have been dislocated, especially by lowering of river levels and other forms of water management. Sub-types relate to proximity to watercourse and to apparently permeability of underlying material.

WETMEC 7a: Groundwater-Fed River Fringe

WETMEC 7b: Groundwater Floodplain

WETMEC 7c: Groundwater Floodplain on Aquitard

WETMEC Group: **GROUNDWATER BOTTOMS**

Mire surfaces in topogenous contexts (basins, troughs and former river floodplains) with some apparent groundwater supply from aquifer, either from the margins across an aquitard (WETMEC 8) or more generally across the 'bottom' (WETMEC 9). Permeability of the wetland infill is often quite low and/or groundwater head is sub-surface, so most of surface is not apparently fed by groundwater (cf. WETMEC 13), but this may support other sources, especially precipitation. Relationship of examples on (former) floodplains to 'groundwater floodplains' requires clarification (a main separating difference in the current analysis is that the depth of peat is often considerably greater in groundwater bottoms than in groundwater floodplains).

WETMEC 8: Groundwater-Fed Bottoms with Aquitard

Basins, troughs and small floodplains with (often quite deep) peat over a laterally extensive aquitard formed from the wetland infill (such as marl, gyttja) or from underlying material (such as Till), so that groundwater outflow into the mire is largely restricted to the margins. Water supply to much of the surface may be dominated by precipitation, but telluric water may be close to surface in places, especially in depressions or alongside drains. Sub-types reflect presence or absence of dykes and drains that may intercept/ distribute marginal groundwater outflows.

WETMEC 8a: Groundwater Percolation Bottom

WETMEC 8b: Groundwater-Distributed Bottom

WETMEC 9: Groundwater-Fed Bottoms

Similar to WETMEC 8, but lacking a laterally extensive aquitard (though patchy aquitards sometimes occur). Can sometimes form a zone separating WETMEC 8 from the upland margin. Many examples are now drier than was once the case, because of over-deepening of watercourses or a lowering of groundwater levels in the connected mineral aquifer. Sub-types effectively reflect degree of wetness of system. Wet examples of WETMEC 9a are transitional to WETMEC 13 and can be difficult to distinguish from this.

WETMEC 9a: Wet Groundwater Bottom

WETMEC 9b: Part-Drained Groundwater Bottom

WETMEC Macro-Group: GROUNDWATER-FED SURFACES

This macro-grouping of WETMECs includes systems that can be considered to be seepages *sensu lato*, *that is, systems where there is groundwater outflow at, or very close to, the surface, either permanently or episodically. In this respect they differ from 'groundwater bottoms' in which groundwater outflow rarely irrigates the* surface *of the wetland, though the two categories undoubtedly intergrade.*

A primary distinction is made between seepages (surfaces irrigated by direct groundwater outflow) and flushes (surfaces over aquitards fed indirectly by groundwater outflow at the margins). Seepages are subdivided broadly on topography into 'seepage slopes' (essentially soligenous systems, with shallow peat, which are typically (but not always) sloping and where the high water table is maintained primarily by groundwater outflow); and into 'seepage basins and bottoms', which are effectively rheo-topogenous systems (with a high water table maintained both by occupying topographical hollows and by groundwater outflow).

WETMEC Group: **SEEPAGE SLOPES**

Outflows of groundwater, typically on slopes but occasionally on more or less flat ground where there is water outflow. The high water table is maintained in what is essentially an unfavourable topographical context (sloping) by high rates of groundwater outflow (they are soligenous systems). Groundwater outflow varies from more or less permanent (WETMEC 10) to intermittent (WETMEC 11), though in some examples of the latter the water table is consistently sub-surface. Examples of WETMEC 12 are conceptually transitional between 'seepage slopes' and 'seepage basins'.

WETMEC 10: Permanent Seepage Slopes

Seepage surfaces developed at, and sometimes below, the point of groundwater discharge. Sub-types reflect the strength and localisation of the outflows.

WETMEC 10a: Localised Strong Seepage

WETMEC 10b: Diffuse Seepage

WETMEC 11: Intermittent and Part-Drained Seepages

Intermittent seepage surfaces, or partly drained former seepages where the water table is now consistently sub-surface. A widespread and heterogeneous unit, developed on slopes or fairly flat surfaces. Low water levels may be due to low aquifer water tables and/or to resistance to water upflow caused by a fairly low-permeability top-layer deposit (WETMEC 11b).

WETMEC 11a: Permeable Partial Seepage

WETMEC 11b: Slowly Permeable Partial Seepage

WETMEC Group: SEEPAGE BASINS AND BOTTOMS

Rheo-topogenous seepage systems developed in various topographical contexts, usually with lateral water flow, probably mainly through the surface layer, except for WETMEC 12 which is characterised by quite strong vertical water levels fluctuations, rather than lateral flow, and which is not always closely coupled to the mineral aquifer. WETMEC 13 is characteristically topogenous, whereas examples of WETMEC 14 can range from visually flat to sloping; the latter have conceptual and (often) spatial affinities with WETMEC 10. Concentrations of surface flow are particularly characteristic of WETMEC 14 (though are not exclusive to it) and form a separate unit (WETMEC 15).

WETMEC 12: Fluctuating Seepage Basins

This unit is conceptually intermediate between more or less flat 'seepage slopes' and 'seepage basins and bottoms'. In effect, it represents a WETMEC 11 mechanism within a shallow depression, where the topography permits the accumulation of surface water, which can sometimes persist year round. Sub-types are informal units that have not been derived by multivariate analyses.

WETMEC 12a: Fluctuating Seepage Basins with permanent standing water

WETMEC 12b: Fluctuating Seepage Basins with winter standing water, summer water table sub-surface or near surface

WETMEC 12c: Fluctuating Seepage Basins with shallow winter standing water, summer water table sub-surface or near surface

WETMEC 12d: Fluctuating Seepage Basins, winter 'wet', summer 'dry'

WETMEC 12e: Fluctuating Seepage Basins with winter standing water, 'dry' by early summer

WETMEC 13: Seepage Percolation Basins

Groundwater-fed basins, typically with a buoyant surface and a transmissive surface layer, often with a quite strong outflow from the basins. Water is thought to flow primarily through the surface layer. Accumulating deposits of marl and gyttja may constrain groundwater upflow and help confine outflow to the margins of the basins. Sub-types reflect buoyancy of surface and proximity to groundwater outflow.

WETMEC 13a: Seepage Percolation Surface

WETMEC 13b: Seepage Percolation Quag

WETMEC 13c: Seepage Percolation Water Fringe

WETMEC 13d: Distributed Seepage Percolation Surface

WETMEC 14: Seepage Percolation Troughs

Peat-filled troughs, more or less flat to gently sloping, fed by groundwater outflow directly from underlying deposits or flanking slopes (WETMEC 10). Water flow often becomes focussed into axial Flow Tracks (WETMEC 15). Embedded sumps may support WETMEC 13.

WETMEC 15: Seepage Flow Tracks

Water flow tracks, mostly narrow and treacherous, sourced primarily by groundwater outflow, but sometimes with a surface run-off component. May be some direct groundwater outflow (especially WETMEC 15b), but much water is derived from flanking groundwater-fed WETMECs (especially WETMECs 10 and 14). Sub-types reflect slope, topography, peat depth and permeability of underlying mineral material. As variation in these components does not entirely coincide, the two sub-types must be seen to some as composite entities.

WETMEC 15a: Topogenous Seepage Flow Tracks

WETMEC 15b: Sloping Seepage Flow Tracks

WETMEC Group: GROUNDWATER-FLUSHED BOTTOMS

Groundwater-Flushed Bottoms effectively represent a flat(-tish) version of Groundwater-Flushed Slopes and are broadly analogous to Seepage Percolation Troughs (WETMEC 14), differing primarily in being underlain by a continuous, extensive aquitard, so that groundwater outflows occur mainly at the mire margin and flow laterally across the mire.

WETMEC 16: Groundwater-Flushed Bottoms

This WETMEC is a flushed analogue of WETMEC 14, and some examples are more or less indistinguishable from this except in terms of the groundwater flushing mechanism. However, peat depth is often considerably shallower in WETMEC 16; the surfaces tend to become drier (at least in summer) with distance from the margins; and flow tracks are generally much less evident (note that flow tracks sampled all clustered within WETMEC 15). Sub-types reflect inflows from axial surface-water sources (WETMEC 16b) or disconnection from the groundwater outflow source (WETMEC 16c).

WETMEC 16a: Groundwater-Flushed Bottom

WETMEC 16b: Groundwater-Flushed Bottom + watercourse inputs

WETMEC 16c: Groundwater-Overflow Bottom

WETMEC Group: GROUNDWATER-FLUSHED SLOPES

Groundwater-Flushed Slopes are analogous to seepage slopes (WETMECs 10 and 11), differing primarily in being underlain by a continuous aquitard, so that groundwater outflows occur mainly along the top edge of the mire (as a seepage face) and flow downslope through WETMEC 17.

WETMEC 17: Groundwater-Flushed Slopes

WETMEC 17 is a distinctive but heterogeneous unit, with sub-types that are broadly comparable with seepage-based WETMECs (WETMEC 17a with 10; 17b with 11; and 17d with 15). A strong case could be made for elevating the WETMEC 17 sub-types to independent WETMEC status, but ideally these would be based on more samples than were available in the current analysis.

WETMEC 17a: Groundwater-Flushed Slopes

WETMEC 17b: Weakly Groundwater-Flushed Slopes

WETMEC 17c: Distributed Groundwater-Flushed Slopes

WETMEC 17d: Groundwater-Flushed Flow Tracks

WETMEC Group: TROUGHS, BASINS AND BOTTOMS WITH LIMITED OR INDETERMINATE GROUNDWATER SUPPLY (OR NONE)

WETMECs 18 to 20 are analogues of the groundwater-fed WETMECs 14, 15 and 13 (respectively), and differ from these primarily in groundwater supply being apparently much less important, or absent, or in some cases not known. These WETMECs mainly occur over low permeability, and surface water sources (primarily rain-generated run-off) make a proportionately greater contribution of telluric water. Because of their broad geological characteristics, it was initially thought likely that these sites received little or no groundwater, but it has since become apparent that many occupy locations where there may be groundwater outflow from a superficial aquifer in fracture systems within the rocks. The hydrological importance of such groundwater outflow is generally not known, but it may have hydrochemical effects (especially localised base enrichment) disproportionate to its quantitative contribution. A corollary of this is that in this study, few sites were found in which it was certain that groundwater outflow made no contribution to the mire.

WETMEC 18: Percolation Troughs

An analogue of WETMEC 14, recorded mainly in North-West England and Wales in valleyheads and troughs, some of which have developed over former lake basins (or from WETMEC 20), thereby obscuring the underlying basin topography. Water flow through the peat often becomes focussed into Flow Tracks (WETMEC 19).

WETMEC 19: Flow Tracks

An analogue of WETMEC 15, recorded mainly in North-West England and Wales. Most often embedded within WETMEC 18, but can occur in other WETMECs (for example, 20) or even as an independent entity.

WETMEC 20: Percolation Basins

An analogue of WETMEC 13, recorded mainly in North-West England and Wales. The status (with respect to groundwater supply) of some examples is uncertain, and some are transitional with WETMEC 13. Some have undoubtedly been dug for underlying clay and the possibility that some examples are largely artificial in origin cannot be discounted.

WETMEC 20a: Percolation Quag

WETMEC 20b: Percolation Water Fringe

Table 2.1 Summary table of WETMECs and their characteristics.

WETMEC 1	1: Domed Ombrogenous Surfaces ('Raised Bog')
Key character combination	Summer-wet, often domed surface, remote from and/or elevated well above telluric water tables; often over low-permeability deposits.
Example sites	Bowness Common, Fenns, Whixall & Bettisfield Moss, Flaxmere, Rhos Gôch Common
Landscape context	Basins or floodplains. [Accumulating peat may sometimes grow beyond limits of basins and obscure underlying topography.]
Topography	Surface typically domed, with more or less flat and sloping, elements
Summer water level and main source	Near surface. Exclusively fed by precipitation, but may be supported by telluric water.
Association with GW	Limited supply to margins of dome, or none. GW level mostly well below surface and often distant.
Association with watercourse (WC)	Most sites are isolated from WCs, but can occur alongside rivers [WC level is well below surface
Association with upslope SW	Margins may receive limited RGR or field drain supply and drains sometimes dug across dome. SW levels well below surface or distant.
Surface flooding	Small pools often occur and can expand in high rainfall conditions, but excess ppt often held within an expansible surface.
Water flow: within stand (IS); **from stand (OS)**	IS: Not visible OS: Not visible
Summer water outflow from (sub-)site	Often none obvious.
Dept of PAL	Often deep (> 4m), typically consisting of a deep layer of ombrogenous peat, usually over telluric peat.
PAL 'permeability'	Spongy surface (acrotelm) or consolidated in drained examples; over consolidated catotelm peat. Acrotelm typically very permeable
Basal substratum 'permeability'	Variable but usually low-permeability: from dense clays to sands and gravels

Abbreviations: GW = groundwater; K = hydraulic conductivity; SW = surface water; RGR = rain-generated runoff; WC = water course; WT = water table

WETMEC 2	2: Buoyant Ombrogenous Surfaces (Quag Bogs)	2a: Ombrogenous Quag	2b: Ombrogenous Quag (GW-Fed Basin)	2c: Ombrogenous Quag (SW-Fed Basin)
Key character combination	Quaking, summer-wet surface or raft elevated slightly above telluric water tables; often in basins, over potentially high or low permeability deposits.	No obvious telluric supply to basin	Some GW supply to basin (adjoining springs etc.)	Biglands Bog, Cliburn Moss, Cors y Llyn, Tarn Moss
Example sites		Cranberry Bog, Lin Can Moss, Abbots Moss	Chartley Moss, Wybunbury Moss	
Landscape context	Basins			
Topography	More or less flat – may form a very shallow dome, but this is not normally apparent.			
Summer water level and main source	Near surface. Surface thought to be fed exclusively by ppt, but supported by near-surface telluric water.			
Association with GW	Significant supply to margins in a few sites. Degree of penetration below dome is unknown. Level usually slightly (0.5 – 1 m) below surface.	Probably little	Groundwater feed to basin: penetration beneath WETMEC uncertain.	
Association with watercourse (WC)	None			
Association with upslope SW	Margins may receive RGR or field drain supply and may penetrate into dome by drains, peat diggings etc sometimes dug across dome. SW level usually slightly (0.5 – 1 m) below surface			Drains and stream feeds to basin.
Surface flooding	Small pools sometimes occur and may expand in high rainfall conditions.			
Water flow: within stand (IS);	IS: Not visible			
from stand (OS)	OS: Not visible			
Summer water outflow from (sub-)site	Often none	None	Often visible to strong flow.	Usually evident outflow except in dry conditions
Dept of PAL	Often deep (> 4m), typically consisting of a shallow layer of ombrogenous peat, usually over weakly-telluric peat.			
PAL 'permeability'	Quaking or semi-floating surface; usually over a similarly quaking, or more liquid, peat deposit. Top layer typically permeable, lower layers more variable (mid-layers sometimes very watery).			
Basal substratum 'permeability'	Variable: from dense clays to sands and gravels, but the latter often smeared with clay etc. Usually separated by a low-permeability infill or clay lining.			

Abbreviations: GW = groundwater; K = hydraulic conductivity; SW = surface water; RGR = rain-generated runoff; WC = water course; WT = water table

WETMEC 3	3: Buoyant Weakly Minerotrophic Surfaces ('Transition Bogs')	3a: Bog-Transition Quag (± Closed Basin)	3b: Bog-Transition Quag (± Open Basin
Key character combination	As [2], but surface little above influence of telluric water. [2] and [3] may both occupy the same basin, [3] as a lagg.	No obvious telluric supply to basin.	Surface water inflows
Example sites		Abbots Moss, Forest Camp, Hollas Moss	Cliburn Moss, Cors y Llyn, Tarn Moss
Landscape context	Basins		
Topography	Flat		
Summer water level and main source	Near or at surface. May receive weakly telluric water, but ppt probably a significant component of budget.		
Association with GW	Connectivity with aquifers often uncertain. Outflow likely in a few sites. In some cases may recharge aquifer. GW level often just sub-surface.		
Association with watercourse (WC)	None		
Association with upslope SW	Some sites have locally significant stream or field-drain inflow in addition to RGR.		
Surface flooding	None		
Water flow: within stand (IS); from stand (OS)	IS: Not visible OS: Not visible		
Summer water outflow from (sub-)site	Often none	None	Visible, but often weak.
Dept of PAL	Often deep (> 3m), but can be shallow		
PAL 'permeability'	Quaking or semi-floating surface; usually over a similarly quaking, or more liquid, peat deposit. Surface peat usually more permeable than the lower substrata.		
Basal substratum 'permeability'	Variable: from dense clays to sands and gravels, but the latter often smeared with clay etc. Usually separated by a low-permeability infill or clay lining.		

Abbreviations: GW = groundwater; K = hydraulic conductivity; SW = surface water; RGR = rain-generated runoff; WC = water course; WT = water table

WETMEC 4	4: Drained Ombrotrophic Surfaces In Bogs And Fens	4a: Drained Ombrogenous Bog	4b: Drained Ombrotrophic Fen
Key character combination	Surface 'dry' year round – telluric water in drains well below surface. No obvious or proximate GW sources. Often over low permeability material.	Drained bog peat at surface (naturally ombrotrophic)	Drained fen peat at surface (ombrotrophic by drainage).
Example sites		Holme Fen, Meathop Moss, Cors Erddreiniog (?)	Corsydd Erddreiniog and Nantisaf, Lakenheath Poors, Woodwalton Fen
Landscape context	Floodplains, basins or troughs.		
Topography	Flat or slightly sloping.		
Summer water level and main source	Deep below surface. Surface fed exclusively by ppt, but may be supported by telluric water at depth.		
Association with GW	GW sources may be present, but usually remote and only proximate where deep GW-fed ditches have been dug. GW level well below surface.		
Association with watercourse (WC)	May be associated with WC, but typically isolated from them; may be pump drained. Level variable, but usually uncoupled from wetland.		
Association with upslope SW	Significant in some sites, but level (usually in adjoining drains) is well below surface	Only proximate where deep SW-fed ditches have been dug.	No ombrogenous peat (but may have been removed at some sites).
Surface flooding	None		
Water flow: within stand (IS); from stand (OS)	IS: Not visible OS: Not visible		
Summer water outflow from (sub-)site	Not visible		
Dept of PAL	Often deep (> 4m)	Remnant ombrogenous peat, usually over minerotrophic deposit.	
PAL 'permeability'	Firm surface on consolidated, amorphous peat of low permeability.		
Basal substratum 'permeability'	Usually over low-permeability clays etc		

Abbreviations: GW = groundwater; K = hydraulic conductivity; SW = surface water; RGR = rain-generated runoff; WC = water course; WT = water table

WETMEC 5	5: Summer Dry Floodplains	5a: Rarely-Flooded Floodplain	5b: Alluvial Floodplain	5c: Winter-Flooded Floodplain	5d: Floodplain Sump
Key character combination	Surface often fairly summer-dry, but wet or flooded in winter. May experience episodic flooding from water courses. Peat infill 'solid' and low K (cf. [6]).	Rarely flooded (usually sites isolated from natural river-supply mechanisms.	Alluvial surface (rather than peat); often regularly flooded from adjoining watercourse	The 'typical' state; wet or flooded in winter, drier in summer. Summer wetness varies with location and year	Poorly-drained, shallow depressions which remain wet for much or all of summer.
Example sites		Wicken Fen, Woodwalton Fen	Biglands Bog, Cors Gyfelog, Drabblegate Common, Esthwaite North Fen, Wheatfen	Many Broadland sites, Cranberry Rough	Burgh Common, Catfield Fen, Cranberry Rough
Landscape context	Floodplains				
Topography	Flat				Shallow depressions or other low-lying areas.
Summer water level and main source	Often well below surface. Water supply dominated by ppt + episodic flooding and/or supply from dykes etc	Typically with particularly low summer water tables.		Summer water levels occasionally quite high where high levels are maintained in dykes.	Summer water levels often higher than other sub-types, but seasonal fluctuations can be greater.
Association with GW	Generally unimportant; may sometimes contribute to water level in dykes (which is often well below peat surface).				
Association with watercourse (WC)	Adjoins stands, either as watercourses or as dykes in connection with these. Dyke level often well below peat surface.		Mostly alongside watercourse.	High dyke water levels sometimes maintained by sluices.	
Association with upslope SW	May contribute to dyke levels, but water level in these often well below surface.				
Surface flooding	Rare or frequent (mostly winter) flooding.	Flooding absent or rare, even in winter.	Flooding often frequent, but sometimes rare (because of flood control measures etc.).	Often shallow flooded in winter, but may often be ponded-back precipitation rather than river water, or a mixture.	As [5c]
Water flow: within stand (IS); from stand (OS)	IS: Not visible OS: Not visible				
Summer water outflow from (sub-)site	Usually not visible except at times of high flow; dykes sometimes seasonally bidirectional.				
Dept of PAL	Usually deep (> 4 m), often with a particularly dense, wood-based, deposit at depth.	Often a rather 'dry', solid peat, at least near surface.	Peat enriched with alluvium or ± pure clays and silts, at least near surface.		
PAL 'permeability'	Firm, consolidated and fairly amorphous surface, generally of low permeability.		Often alluvial surface.		
Basal substratum 'permeability'	Mostly over low-permeability clays etc; alluvial deposits sometimes interlayered within the peat.				

Abbreviations: GW = groundwater; K = hydraulic conductivity; SW = surface water; RGR = rain-generated runoff; WC = water course; WT = water table

WETMEC 6	6: Surface Water Percolation Floodplains	6a: Solid SW Percolation Surface	6b: Grounded SW Percolation Quag
Key character combination	Surface usually quite wet in summer and wet or flooded in winter. Peat top-layer often loose, sometimes buoyant and mostly high K..	On 'solid' peat near watercourses. Transitional to [5]	Fairly consolidated but 'recent' top-layer; summer dry and isolated from SW sources in summer.
Example sites		Burgh Common, Strumpshaw Fen, Wheatfen	Catfield Fen, Hulver Ground, Reedham Marsh
Landscape context	Floodplains		
Topography	Flat		
Summer water level and main source	Usually slightly subsurface. Fed mainly by SW, often from dykes connected to watercourses.	WT lower than mean.	Lower than the mean.
Association with GW	Generally unimportant; may sometimes contribute to water level in dykes. Dyke level usually somewhat below surface.		
Association with watercourse (WC)	Adjoins stands, either as watercourses or watercourse-connected dykes. Dyke level usually somewhat below surface.	Often close to water bodies or connected dykes.	May be isolated from water courses and dykes by banks of 'solid' peat.
Association with upslope SW	May contribute to dyke levels, but probably mainly during winter.		
Surface flooding	Rare to frequent winter flooding.		Regular flooding, but in some sites may be largely ponded-back precipitation.
Water flow: within stand (IS); from stand (OS)	IS: Not visible OS: Not visible		
Summer water outflow from (sub-)site	Usually not visible; dykes sometimes seasonally bidirectional.		
Dept of PAL	Usually deep, often > 4 m. Peat, sometimes with thick alluvial intercalations.		
PAL 'permeability'	Spongy, sometimes quaking or semi-floating surface. Top layer of peat typically permeable, over a less permeable lower layer.	Firm, fairly consolidated peat.	Fairly consolidated, sometimes 'grounded' 'raft'.
Basal substratum 'permeability'	Most often over low-permeability clays etc. Alluvial deposits sometimes interlayered with peat. A few examples over permeable, sandy deposits		

Abbreviations: GW = groundwater; K = hydraulic conductivity; SW = surface water; RGR = rain-generated runoff; WC = water course; WT = water table

WETMEC 6 (cont.)	6d: Swamped SW Percolation Surface	6e: Wet SW Percolation Quag	6f: SW Percolation Water Fringe	6c: SW Percolation 'Boils'
Key character combination	Poorly-drained, shallow depressions with loose top-layer; remain wet for much of all of summer.	The 'typical' state: quaking or buoyant surface over rhizome mat; wet or flooded for much of year.	As [6e] but encroaching directly upon open water body.	Often unstable surface, but elevated above WT (year round). Transitional to [3]
Example sites	Berry Hall Fens, Cranberry Rough, Hall Fen, Ward's Marsh	Many Broadland sites	Barton Broad, Hoveton Broads, Esthwaite North Fen	Catfield Fen, Hickling Broad, Reedham Marshes
Landscape context				
Topography				
Summer water level and main source	High	Slightly sub-surface	High	Lower than the mean. Surface mainly fed by ppt, supported by telluric water.
Association with GW				
Association with watercourse (WC)	Can be isolated from water courses and dykes by embankments.		Directly adjoins water bodies or connected dykes.	
Association with upslope SW				
Surface flooding				Flooding absent or rare, even in winter.
Water flow: within stand (IS); from stand (OS)				
Summer water outflow from (sub-)site				
Dept of PAL				
PAL 'permeability'	Spongy or swamped, not usually obviously buoyant.	Buoyant surface	Buoyant to very buoyant surface, or swamped.	Surface fairly to very buoyant, but mostly held well above telluric water table.
Basal substratum 'permeability'				

Abbreviations: GW = groundwater; K = hydraulic conductivity; SW = surface water; RGR = rain-generated runoff; WC = water course; WT = water table

WETMEC 7	7: Groundwater Floodplains	7a: Groundwater-Fed River Fringe	7b: Groundwater Floodplain	7c: Groundwater Floodplain On Aquitard
Key character combination	Floodplains of GW-fed WCs, often rather dry. Often complex alluvial sequence with only shallow peat. Water supply and relationship to river and aquifer mostly uncertain	Alongside GW-fed rivers and irrigated by these.	On floodplain surface, often quite close to WC, and on potentially high permeability deposits.	On floodplain surface, often quite close to WC, but underlain by low permeability material.
Example sites		Bransbury Common, Greywell Fen, Tarn Moor (Sunbiggin)	Bransbury Common, Chilbolton Common, Greywell Fen	Chippenham Fen, Stockbridge Fen
Landscape context	Floodplains			
Topography	Flat			
Summer water level and main source	Generally rather low WT except by rivers. GW may be main telluric source, but this is not well established.	Summer WT can be around surface level.	Summer WT variable – can be low.	Summer WT variable – can be low except immediately alongside some dykes etc.
Association with GW	Springs and seepages mostly absent. River levels related to aquifer water table; this probably determines mire WTs, at least locally.		May receive upflow through permeable deposits. Weak seepages upslope in a few cases.	Generally no evidence for either upflow or peripheral seepages. Deep adjoining ditches may be spring fed.
Association with watercourse (WC)	On floodplains, but river levels often below mire surface in summer. Occurrence of inundation uncertain.	Directly connected to watercourse.	Often near WC, but relationship to water level not certain.	May be near WC, but relationship to water level uncertain, and possibly uncoupled
Association with upslope SW	Generally not evident.			
Surface flooding	Not known – possibly infrequent.	Some inundation likely.	May sometimes occur, but little information.	May sometimes occur, but little information.
Water flow: within stand (IS); from stand (OS)	IS: Not visible OS: Not visible	IS: Not visible OS: May have both inflow from and outflow to WC		
Summer water outflow from (sub-)site	Ditches across floodplain may drain to river, but water levels and flows are often controlled artificially.			May be outflow from GW-fed dykes and ditches, but this may be independent of mire.
Dept of PAL	Often deep alluvial sequence, but only shallow surface peat.			
PAL 'permeability'	Usually solid, amorphous peat, mostly of low permeability, but sometimes with more permeable, unconsolidated horizons.			
Basal substratum 'permeability'	Often cut into permeable rocks, but locally extensive low permeability aquitards (clays and marls) can occur in alluvial sequence.		Usually underlain by permeable deposits (e.g. gravel in hydraulic connection with Chalk aquifer).	Underlain by low permeability deposits (marls, putty chalk etc).

Abbreviations: GW = groundwater; K = hydraulic conductivity; SW = surface water; RGR = rain-generated runoff; WC = water course; WT = water table

WETMEC 8	8: Groundwater-Fed Bottoms With Aquitard	8a: Groundwater Percolation Bottom	8b: Groundwater- Distributed Bottom
Key character combination	Troughs or basins, usually on quite deep peat upon aquitard; if on floodplains, usually isolated from river. WT often below solid surface. Often marginal springs / seepages. Distinguished from [16] by topography and deeper peat.	Some lateral GW flow from margins; WT often decreases away from edge.	GW flow from margins intercepted by dykes and drains; often 'dry' except close to edge.
Example sites		Cors Goch, Cors Geirch, Newham Fen	Corsydd Eddreiniog and Nantisaf, Kenninghall & Banham Fens, Great Cressingham Fen, Upton Fen
Landscape context	Floodplains, basins, troughs and valleyheads		
Topography	Flat		
Summer water level and main source	Associated with GW outflow at margins, but penetration of this into wetland probably limited. WT often well below surface	Some (limited?) lateral flow of GW from margins. WT tends to decline away from edge.	Marginal GW outflow intercepted by dykes and distributed across / removed from wetland.
Association with GW	Aquifer episodically at, above or near surface, but WT in wetland may fall well below GW table at margins.	Marginal springs and seepages are often evident	GW in dykes often well below wetland surface, which may depend strongly on ppt.
Association with watercourse (WC)	Quite often associated with water courses but usually isolated from these, and (well) above them.		Dyke level may be determined by watercourse level or by sluices.
Association with upslope SW	May be some rain-generated run-off, but much infiltrates into ground above site, or intercepted by catchwater drains.		
Surface flooding	None		
Water flow: within stand (IS); from stand (OS)	IS: Not visible OS: Not visible		
Summer water outflow from (sub-)site	Sometimes (weak) outflow visible.		
Dept of PAL	Shallow to deep		
PAL 'permeability'	Firm, often rather amorphous, peat, mostly of moderate to low permeability.		
Basal substratum 'permeability'	Mostly over low-permeability clays and silts, and / or with prominent deposits of marl or gyttja.		

Abbreviations: GW = groundwater; K = hydraulic conductivity; SW = surface water; RGR = rain-generated runoff; WC = water course; WT = water table

WETMEC 9	9: Groundwater-Fed Bottoms	9a: Wet Groundwater Bottom	9b: Part-Drained Groundwater Bottom
Key character combination	Similar to [8] but no aquitard and marginal springs / seepages often less evident. GW supply often inferred from hydrogeological data. Distinguished from [12] by topography and deeper peat.	Fairly summer-wet, often in small areas near edge.	Typically summer-dry, sometimes 'dry' year round.
Example sites		Blo' Norton & Thelnetham Fens Cors Geirch, Limpenhoe Meadows, Poplar Farm Meadows	Hopton Fen, Pakenham Meadows, Tuddenham Turf Fen, Pashford Poor's Fen
Landscape context	Floodplains, basins, troughs and valleyheads		
Topography	Flat	Mainly near upland margins.	Much of bottom, sometimes including margin.
Summer water level and main source	Apparently GW fed, but GW WT often well below surface, sometimes because of drainage.	Near or not far below surface	WT ± consistently well below surface.
Association with GW	Aquifer may be episodically at, above or near surface, but is often low (and more or less in equilibrium with wetland WT)	Apparent seepage, sometimes localised.	
Association with watercourse (WC)	Often associated with water courses, but usually isolated from these and (well) above them.		May adjoin drains or overdeepened water courses.
Association with upslope SW	May be some rain-generated run-off, but much infiltrates into ground above site, or intercepted by catchwater drains.		
Surface flooding	None		
Water flow: within stand (IS); from stand (OS)	IS: Not visible OS: Not visible		
Summer water outflow from (sub-)site	Sometimes weak outflow visible, or seepage into drains etc within wetland.		
Dept of PAL	Shallow to deep.		
PAL 'permeability'	Firm amorphous peat, mostly of moderate permeability.		
Basal substratum 'permeability'	Mostly over sands and sandy clays. Sometimes local lenses of marl or gyttja. Usually quite permeable.		Often over sands, gravels and sandy loams.

Abbreviations: GW = groundwater; K = hydraulic conductivity; SW = surface water; RGR = rain-generated runoff; WC = water course; WT = water table

WETMEC 10	10: Permanent Seepage Slopes	10a: Localised Strong Seepage	10b: Diffuse Seepage
Key character combination	Summer-wet surface, usually sloping and shallow peat; springs / seepages usually visible, over permeable substratum.	Localised, often small, strong springs and seepages, often corresponding to variations in basal material (locally high K).	Often elongated seepages, often forming a valleyside zone (below [11]).
Example sites		Badley Moor, Cors Bodeilio, Gooderstone Common, Great Close Mire, Nantisaf, Sheringham Bog, Tarn Moor (Sunbiggin), Warwick Slade Bog	Buxton Heath, Cors Bodeilio, Holmhill Bog, Scarning & Potters Fen
Landscape context	Valleyheads and slopes		
Topography	Steep to v. gentle slopes, occasionally in more or less flat pans.	May adjoin a spring head or form a spring mound.	Often forms a broad valleyside zone.
Summer water level and main source	Just sub-surface. Primarily fed by groundwater		Generally slightly lower than 10a, but often visible or oozing.
Association with GW	GW outflow, often visible as springs or seepages. WT at or immediately below outflow.	Visible strong springs etc. Sometimes embedded within 10b	Point discharges usually not evident.
Association with watercourse (WC)	Often WC in valley bottom, but usually well below WETMEC 10, though lower slopes can sometimes be flooded.		
Association with upslope SW	May be some rain-generated run-off, but much infiltrates into ground above site, or intercepted by catchwater drains.		
Surface flooding	WT often above surface in shallow pools or runnels. Rarely flooded by SW or WC.		
Water flow: within stand (IS); from stand (OS)	IS: Often visible flow OS: Often visible flow, sometimes strong	IS: Usually visible	IS: Not visible, or only in runnels etc
Summer water outflow from (sub-)site	Typically visible, sometimes strong, outflow.		
Dept of PAL	Very shallow, often skeletal.		
PAL 'permeability'	Amorphous peat or mineral deposit of variable permeability.		
Basal substratum 'permeability'	Sands, gravels, sandy loams. Predominantly quite permeable.	Outflow associated with permeable deposits, but may be adjoined by less permeable material.	Often more uniformly permeable than 10a.

Abbreviations: GW = groundwater; K = hydraulic conductivity; SW = surface water; RGR = rain-generated runoff; WC = water course; WT = water table

WETMEC 11	11: Intermittent & Part-Drained Seepages	11a: Permeable Partial Seepage	11b: Slowly Permeable Partial Seepage
Key character combination	As [10] but WT well below surface in summer or year round; also more often on flat surfaces or in sumps. Latter are transitional to [9] but have shallower peat.	Over permeable material, with dryness determined by GW surface.	Over less permeable material, with dryness determined also by greater resistance to flow. Often smaller and more heterogeneous than [11a].
Example sites		Foulden Common, Hemsby Common, Roydon Fen, Scarning Fen	Buxton Heath, Clack Fen, Cors Nantisaf, Cors Goch, Cors y Farl, Drayton Parslow Fen, Forncett Meadows, Holly Farm Meadows, Tarn Moor (Sunbiggin)
Landscape context	Mostly valleyheads.		
Topography	Sloping to flat; occasionally sumps.	May form zones above [10b].	Sometimes more or less surrounds examples of [10a].
Summer water level and main source	Primarily fed by groundwater, but summer WT often well below surface.		
Association with GW	Aquifer episodically at or near surface, but often low in summer.		
Association with watercourse (WC)	Often not associated with watercourses or, if so, elevated (well) above WC level.		
Association with upslope SW	May be some rain-generated run-off, but much infiltrates into ground above site, or is intercepted by catchwater drains.		
Surface flooding	Rare or absent.		
Water flow: within stand (IS); from stand (OS)	IS: Not visible OS: Not visible		
Summer water outflow from (sub-)site	Not visible.		
Dept of PAL	Mostly very shallow.		
PAL 'permeability'	Amorphous peat or mineral deposit of moderate to low permeability.		
Basal substratum 'permeability'	Sands and gravels to sandy clays of moderate to low permeability. May be similar to [10] or less permeable.	Sands, gravels and sandy loams.	Sandy loams to sandy clays.

Abbreviations: GW = groundwater; K = hydraulic conductivity; SW = surface water; RGR = rain-generated runoff; WC = water course; WT = water table

WETMEC 12	12: Fluctuating Seepage Basins	12a-e
Key character combination	Small sumps with strongly fluctuating WT, often from well below surface to flooded, which may relate to aquifer levels. Like [11] but topography permits sustained inundation.	Sub-types distinguished informally based on water regime in sump.
Example sites		
Landscape context	Valleyheads and basins	
Topography	Shallow sumps (differs from [11] by having swamp / standing water for at least part of year).	
Summer water level and main source	Mainly GW fed. WT variable, depending on topography and aquifer level; fluctuates strongly	Sub-types distinguished informally based on water regime in sump.
Association with GW	Aquifer episodically at, above or near surface. Water level sometimes in (slow) equilibrium with aquifer level, but relationship sometimes obscure	
Association with watercourse (WC)	Mostly not associated with water courses, but sometimes lateral to, and above, WC.	
Association with upslope SW	Little evidence for SW inflows (except where sumps have been connected by drains).	
Surface flooding	Usually inundated episodically (some drained examples are 'dry' year round and difficult to distinguish from [11]).	
Water flow: within stand (IS);	IS: Not visible	
from stand (OS)	OS: Usually none except when water tables are very high; outflow sometimes through drains.	
Summer water outflow from (sub-)site	Usually none except when water tables are very high; outflow sometimes through drains.	
Dept of PAL	Very shallow to moderate	
PAL 'permeability'	Amorphous organic material. Variable permeability, but mostly moderate.	
Basal substratum 'permeability'	Mostly sands and gravels to sandy clays of moderate permeability; some evidence for low permeability layers in basin lining.	

Abbreviations: GW = groundwater; K = hydraulic conductivity; SW = surface water; RGR = rain-generated runoff; WC = water course; WT = water table

WETMEC 13	13: Seepage Percolation Basins	13a: Seepage Percolation Surface	13b: Seepage Percolation Quag
Key character combination	Unconsolidated (quaking / buoyant) surface in GW-fed basins and sumps etc. Similar surface to [6] but GW-fed, and to [14] but flatter and more 'water collecting'.	Ill-defined: fairly solid surface, or buoyant but v small (and often embedded within [10]).	The 'typical' state: quaking or buoyant surface over rhizome mat; wet for much of year, but often not much flooded.
Example sites		Badley Moor, Cothill Fen, Stoney Moors, Whitwell Common, Wilverley Bog	Arne Moors, Bryn Mwcog, Cors Goch, Cors y Farl, East Walton Common, Malham Moss, Parc Newydd, Shortheath Common, Silver Tarn, Smallburgh Fen, Sunbiggin Tarn and Moors
Landscape context	Basins, floodplain margins, sometimes in small depressions in valleyheads	Basins or small depressions in valleyheads..	Basins and sumps, rarely floodplain margins.
Topography	Sumps (or 'flat' areas in larger basins). Some examples in valleyheads may be embedded within slopes of [10].		
Summer water level and main source	Near surface. Mainly GW fed		
Association with GW	Springs and seepages often visible around periphery, or aquifer head at or above wetland surface.	May be embedded within seepages [10].	
Association with watercourse (WC)	Either not associated with water courses or fairly distant from them; when present, water level in WC may influence water level in basin.		
Association with upslope SW	May be some RGR, but much infiltrates into ground above site; some examples have small drain inflows.		
Surface flooding	Surface sometimes flooded (but buoyant surface often accommodates WT change)		
Water flow: within stand (IS); from stand (OS)	IS: Not visible OS: Sometimes visible outflow		
Summer water outflow from (sub-)site	Often visible outflow (in streams etc sourced by WETMEC).		
Dept of PAL	Shallow to moderate.	Mostly shallow	Often deep
PAL 'permeability'	Often quite permeable, loose, quaking or semi-floating; sometimes more 'solid'. Often in turf ponds, over more solid basal peat of lower permeability.	Solid or quaking	Loose, quaking or semi-floating
Basal substratum 'permeability'	Sands, gravels etc, but basin often with marl or gyttja.		Often thick deposits of marl or gyttja.

Abbreviations: GW = groundwater; K = hydraulic conductivity; SW = surface water; RGR = rain-generated runoff; WC = water course; WT = water table

WETMEC 13 (cont.)	13c: Seepage Percolation Water Fringe	13d: Distributed Seepage Percolation Surface	WETMEC 14: Seepage Percolation Troughs
Key character combination	As [13b] but encroaching directly upon open GW-fed water body; may also receive upslope GW outflow.	As [13b] but basins not directly GW fed (receive GW outflow distributed by the SW system).	Soft or quaking (rarely buoyant) surfaces in GW-fed valleyheads and troughs. More sloping than [13] (which may occupy sumps embedded in [14]).
Example sites	Barnby Broad, Cors Erddreiniog (Llyn yr wyth Eidion), Cors y Farl, Sunbiggin Tarn, Upton Broad	Broad Fen, Dilham, Upton Fen & Doles	
Landscape context	Basins and lake margins	Floodplain margins	Valleyheads, occasionally in troughs.
Topography			Trough
Summer water level and main source	Much water is from GW-fed water body.		Mainly GW fed. WT at or near surface for much of the year.
Association with GW	May be fed by GW outflow upslope.		High GW table (aquifer head may be well above wetland); sometimes lateral springs and seepages visible.
Association with watercourse (WC)			No water course, or remote and well below surface (may be endotelmic water-track or stream within [14]).
Association with upslope SW		Groundwater distributed by SW system. May be small SW inflows. Level in dykes often high (maintained by sluices etc).	May be some rain-generated run-off into [14], but much infiltrates into ground above site.
Surface flooding			Flooding under extreme conditions.
Water flow: within stand (IS); from stand (OS)			IS: Occasionally visible, but not normally OS: Often visible
Summer water outflow from (sub-)site			Often strong outflow.
Dept of PAL	Deep to shallow, depending on location.	Often deep	Shallow to deep.
PAL 'permeability'	Loose, quaking or semi-floating	Loose, quaking or semi-floating.	Spongy to strongly quaking; mostly quite permeable.
Basal substratum 'permeability'	May be layers of marl or gyttja.	May be thick deposits of marl or gyttja.	Often moderately permeable sands, gravels and sandy loams, but examples on deep peat may have basal clays etc of low permeability.

Abbreviations: GW = groundwater; K = hydraulic conductivity; SW = surface water; RGR = rain-generated runoff; WC = water course; WT = water table

WETMEC 15	15: Seepage Flow Tracks	15a: Topogenous Seepage Flow Tracks	15b: Sloping Seepage Flow Tracks
Key character combination	GW-fed flow paths in mires, often embedded in [14] but occasionally alone. Unconsolidated watery surface	Flattish flow paths on deep peat	Usually sloping flow paths, mostly on shallow peat and over permeable material.
Example sites	Many New Forest mires, Bicton Common, Cors Geirch, Cors Graianog, Cors Gyfelog, Folly Bog, Great Ludderburn Moss, Hartland Moor, Thursley Common etc	Many New Forest mires, Bicton Common, Thursley Common	Beeston Bog, Clayhill Bottom, Cors Geirch, Roydon Common, Stoney Moors
Landscape context	Mainly valleyheads, but in all (semi-) topogenous contexts.		
Topography	Trough. Often embedded within [14] but can be with other WETMECs or (rarely) alone.		
Summer water level and main source	Mainly GW fed. WT at surface (this, plus greater flow rates and wider topographical context, is main distinction from [14]).		
Association with GW	High GW table (aquifer head may be well above wetland); sometimes lateral springs and seepages visible.		
Association with watercourse (WC)	No water course, or remote and well below surface (WETMEC is itself an endotelmic flowpath).		
Association with upslope SW	May be some rain-generated run-off, but much infiltrates into ground above site.		
Surface flooding	Normally with surface water		
Water flow: within stand (IS);	IS: Usually visible, sometimes strong		
from stand (OS)	OS: Visible, sometimes strong		
Summer water outflow from (sub-)site	Visible, often strong.		
Dept of PAL	Usually shallow, but occasionally deep.		
PAL 'permeability'	Mostly unconsolidated and very permeable; sometimes semi-floating.		
Basal substratum 'permeability'	Often quite permeable sands, gravels and sandy loams, but some examples on low-permeability clays etc	Silts, clays and sandy clays, or sands and gravels beneath deep 'solid' peat.	Sands, gravels and sandy loams.

Abbreviations: GW = groundwater; K = hydraulic conductivity; SW = surface water; RGR = rain-generated runoff; WC = water course; WT = water table

WETMEC 16	16: Groundwater-Flushed Bottoms	16a: Groundwater-Flushed Bottom	16b: Groundwater-Flushed Bottom + Watercourse Inputs	16c: Groundwater Overflow Bottom
Key character combination	Surfaces in GW-flushed valleyheads and troughs. Often similar to [14] but over aquitard and often with thinner peat. Marginal springs / seepages often evident.	The typical form, without an associated WC (other than endotelmic flows).	Adjoins exotelmic WC – often well below surface, but sometimes floods.	GW outflow over low permeability swamped surface, sometimes delivered by GW-sourced streams.
Example sites		Dersingham Bog, Hyde Bog, Thursley Common, Winfrith Heath	Cridmore Bog, Matley Bog, Morden Bog, Retire Common, Pont-y-Spig	Benacre Broad, Leighton Moss, Rhôs Gôch Common, Westwood Marsh (Walberswick)
Landscape context	Valleyheads, broad basins and troughs.			
Topography	Flat			
Summer water level and main source	Fed mainly by marginal springs and seepages. WT usually near surface ('dry' examples transitional to [8]).			Fed by flooding from springs or GW-sourced streams. WT often at or above surface.
Association with GW	Springs and seepages along margins			
Association with watercourse (WC)	Some adjoin watercourses. WC level usually well below wetland surface, but may help regulate WT and have an episodic supply function.	No adjoining watercourses (though may have endotelmic water-tracks or drains).	Adjoining streams or drains. WT of these mostly (well) below wetland surface.	
Association with upslope SW	May be some rain-generated run-off, but much infiltrates into ground above site, or intercepted by catchwater drains.			Adjoining streams or drains; fed in part from springs.
Surface flooding	Some experience periodic, shallow winter flooding.	Normally only associated with artificial barriers	Occasional flooding from WC in wet conditions in some sites.	Regular (sometimes more or less permanent) surface flow.
Water flow: within stand (IS); from stand (OS)	IS: None visible OS: Rarely visible			
Summer water outflow from (sub-)site	Sometimes visible.	Some have quite strong outflows.	Outflows often not very obvious	
Dept of PAL	Mostly fairly shallow.			Shallow, sometimes recent, peat over aquitard.
PAL 'permeability'	Usually permeable, fresh and spongy, but less permeable where drier and more consolidated.			Loose, sometimes quaking.
Basal substratum 'permeability'	Mainly low-permeability clay, silts and sandy clays.			

Abbreviations: GW = groundwater; K = hydraulic conductivity; SW = surface water; RGR = rain-generated runoff; WC = water course; WT = water table

WETMEC 17	17: Groundwater-Flushed Slopes	17a: Groundwater-Flushed Slopes	17b: Weakly GW-Flushed Slopes	17c: Distributed GW- Flushed Slopes	17d: Groundwater-Flushed Flow Tracks
Key character combination	GW-flushed slopes (rarely flats) with thin peat over aquitard, below springs or seepage line (often narrow).	Summer-'wet' surface, sometimes with visible flow.	Summer-dry surface, without visible flow	Summer-dry surface distant from GW outflows where GW-sourced streams etc. may provide some recharge	GW-fed flow paths, often embedded in [17a/b] but occasionally alone. Unconsolidated or watery surface.
Example sites		Acres Down, Banc y Mwldan, Buckherd Bottom, Retire Common, Stoborough Heath, Ventongimps Moor, Widden Bottom	Ashculm Turbary, Cors Llyn Coethlyn, Dowrog Common, Great Candlestick Moss, Hense Moor, Retire Common,	Retire Common, The Moors (Bishop's Waltham)	Bicton Common, Buckherd Bottom, Landford Bog, Stoborough Heath, Tarn Moor, Sunbiggin, Ventongimps Moor
Landscape context	Valleyheads and hillslopes.				
Topography	Sloping (occasional pans).				Often quite strongly sloping.
Summer water level and main source	Mainly fed by (near-) surface GW flow. WT at surface when wet; can be seasonally dry.	At surface	Often undetectable	WT often well below surface	WT at, near or just above surface.
Association with GW	Usually visible springs or seepages above flush.		Seepages not always visible in dry conditions.	GW distributed by small streams which help recharge adjoining wetland. WT in streams may be well below wetland surface.	Collects near-surface flow of GW from springs or [17a/b].
Association with watercourse (WC)	May be watercourse in valley bottom, but usually well below stand surface.				WETMEC itself forms an endotelmic flow-path.
Association with upslope SW	May be rain-generated run-off.				
Surface flooding	None, but may be surface water in wetter examples in runnels etc.				
Water flow: within stand (IS);	IS: Sometimes visible	IS: Sometimes visible	IS: Not visible	IS: Not visible	IS: Usually visible where surface water occurs.
from stand (OS)	OS: Sometimes visible	OS: Visible in runnels	OS: Rarely visible	OS: Flow may be visible in streams or drains, which may either drain or recharge stand.	OS: Usually visible
Summer water outflow from (sub-)site	Often not visible in dry conditions.	Sometimes visible	Sometimes visible	Flow may be visible in outflow streams or drains.	Usually visible.
Dept of PAL	Very shallow, skeletal.				
PAL 'permeability'	Amorphous peat or clay, silts and sandy clays. Permeability correspondingly variable.				Vegetation rooted onto 'solid' material, or quaking, soft or buoyant.
Basal substratum 'permeability'	Low-permeability clay, silts and sandy clays.				

Abbreviations: GW = groundwater; K = hydraulic conductivity; SW = surface water; RGR = rain-generated runoff; WC = water course; WT = water table

WETMEC 18	18: Percolation Troughs	WETMEC:19: Flow Tracks
Key character combination	Like [14] but fed mainly by RGR or streams, or importance of GW not clear. May be some GW outflow from a minor, superficial aquifer.	Like [15] but fed mainly by RGR or streams, or importance of GW not clear. May be some GW outflow from a minor, superficial aquifer.
Example sites	Birk Bank Moss, Cliburn Moss, Cors Graianog, Cors Gyfelog (Gyfelog Farm and NW arm), Eycott Hill, Knott End Moss, Silver Tarn, Stable Harvey Moss	Birk Bank Moss, Bowscale Moss, Cliburn Moss, Cors Gyfelog , Cors y Llyn, Eycott Hill, Great Candlestick Moss, Knott End Moss, Stable Harvey Moss, Wybunbury Moss
Landscape context	Valleyheads, occasionally in troughs.	Mainly valleyheads, but in all (semi-) topogenous contexts.
Topography	Trough	Trough. Often embedded within [18] but can be with other WETMECs or (rarely) alone.
Summer water level and main source	Mainly SW fed, or importance of GW not clear. WT at or near surface.	Mainly SW fed, or importance of GW not clear. WT at or above surface (this, plus greater flow rates is main distinction from [18].
Association with GW	Lateral springs, and flushes sometimes visible. Minor superficial aquifer or none.	May be associated with minor superficial aquifer, or none; sometimes lateral springs and seepages visible.
Association with watercourse (WC)	No water course, or remote and well below surface (may be endotelmic water-track or stream within [18]).	No water course, or remote and well below surface (WETMEC is itself an endotelmic flowpath).
Association with upslope SW	RGR and land-drainage inflows; may contain a component of GW outflow, usually sourced (well) upslope.	RGR and land-drainage inflows; may contain a component of GW outflow, usually sourced (well) upslope.
Surface flooding	Flooding under extreme conditions, especially adjoining [19].	Normally with surface water.
Water flow: within stand (IS);	IS: Occasionally visible, but not normally OS: Often visible	IS: Usually visible, sometimes strong
from stand (OS)		OS: Visible, sometimes strong
Summer water outflow from (sub-)site	Often strong outflow.	Visible, often strong.
Dept of PAL	Shallow to deep.	Shallow to deep, depending on topographical context.
PAL ‘permeability’	Spongy to strongly quaking, of quite high permeability.	Highly permeable, unconsolidated; sometimes semi-floating.
Basal substratum ‘permeability’	Mostly over clays and silts, or presumed low-permeability bedrock.	Mostly over clays and silts, or presumed low-permeability bedrock.

Abbreviations: GW = groundwater; K = hydraulic conductivity; SW = surface water; RGR = rain-generated runoff; WC = water course; WT = water table

WETMEC 20	20: Percolation Basins	20a: Percolation Quag	20b: Percolation Water Fringe
Key character combination	Like [13] but fed mainly by RGR or streams, or importance of GW not clear. Some inflows may be sourced from GW outflows above the site.	The typical form of [20], in basins, mostly fed by water inflow from upslope	Adjoining open water and receiving water from this, which may have different provenance to upslope sources
Example sites		Cors Gyfelog , Dowrog Common, Emer Bog, Eycott Hill, Hollas Moss, Llyn y Fawnog, St. David's Airfield Heaths, Trefeiddan Moor	Betley Mere, Dowrog Common, Cors Llyn Coethlyn
Landscape context	Basins		
Topography	Flat		
Summer water level and main source	WT at or near surface, fed mainly by SR, some of which may be sourced by GW outflow.		
Association with GW	More or less confined or v. minor aquifer, or none; sometimes springs and seepages visible, usually well upslope.		
Association with watercourse (WC)	Mostly not associated with water courses.		Water body irrigates stand. Provenance of water in this may be different to any upslope sources
Association with upslope SW	RGR and land-drainage inflows. May be partly sourced by GW outflow (well) upslope.	Mostly fed from upslope telluric sources	May also receive water from upslope telluric sources
Surface flooding	Surface sometimes flooded.		Normally with surface water
Water flow: within stand (IS); from stand (OS)	IS: Not visible OS: Sometimes visible		
Summer water outflow from (sub-)site	Sometimes visible		
Dept of PAL	Shallow to deep		
PAL 'permeability'	Often highly permeable, unconsolidated, quaking or semi-floating.		Typically very unconsolidated and unstable, but may be rooted swamp rather than buoyant surface
Basal substratum 'permeability'	Mostly over clays and silts, or presumed low-permeability bedrock.		

Abbreviations: GW = groundwater; K = hydraulic conductivity; SW = surface water; RGR = rain-generated runoff; WC = water course; WT = water table

3 WETMEC characteristics, distribution and schematic cross-sections

3.1 WETMEC 1: Domed Ombrogenous Surfaces ('Raised Bog' *sensu stricto*)

3.1.1 Summary characteristics

Situation	Basins, floodplains and flats
Size	Often large (for example, above 100ha).
Location	Mostly sampled from North and West.
Surface relief	More or less domed, locally with quite steep slopes, especially near the periphery (rand); shallow pools, lawns and hummocks may provide a locally well-developed micro-topography; undulations are often associated with drainage or peat removal.
Hydrotopography	Ombrogenous.
Water: *supply*	Precipitation (perhaps supported by regional water table).
regime	Water levels naturally vary across the surface and with time, especially with rainfall patterns, but are typically relatively stable, and near-surface.
distribution	Lateral flow to margins through surface layer; some vertical flow downwards into main peat deposit.
superficial	Shallow pools, occasional soakways; sometimes drains.
Substratum	Ombrogenous peat often upon fen peat. Underlain by clays, fluvio-glacial deposits and so on.
peat depth	Typically 2–12 m.
peat humification	Usually with a shallow (0.5 m) spongy surface (acrotelm); underlying catotelm more humified and often solid, especially lower down, though some fresh horizons may occur.
peat composition	Ombrogenous peat (with *Sphagnum* spp., *Eriophorum* spp. and ericaceous shrubs) upon fen peat.
permeability	Surface layer (acrotelm) typically fairly permeable, much more so than lower layer (catotelm). Basal substratum variable, but usually low permeability.
Ecological types	Oligotrophic, acidic.
Associated WETMECs	Some examples can form a complex with various other WETMECs, especially in the peripheral lagg (if present) (such as WETMECs 15 and 19). Sometimes juxtaposed with WETMEC 2 (the latter in turf ponds).
Natural status	Natural successional state formed by both terrestrialisation and paludification. Appears to form a self-maintaining climax condition (but all examples damaged to some degree by drainage/peat cutting and so on).
Use	Conservation. Some examples provide rough grazing. More remunerative use is associated with damage and conversion to a degraded state (such as WETMEC 4).
Conservation value	Supports examples of EU priority habitat (active raised bog). Vascular plant species diversity is generally low (sometimes enhanced by damage).
Vulnerability	Direct drainage and peat extraction. Drainage of the surroundings may be detrimental in some circumstances.

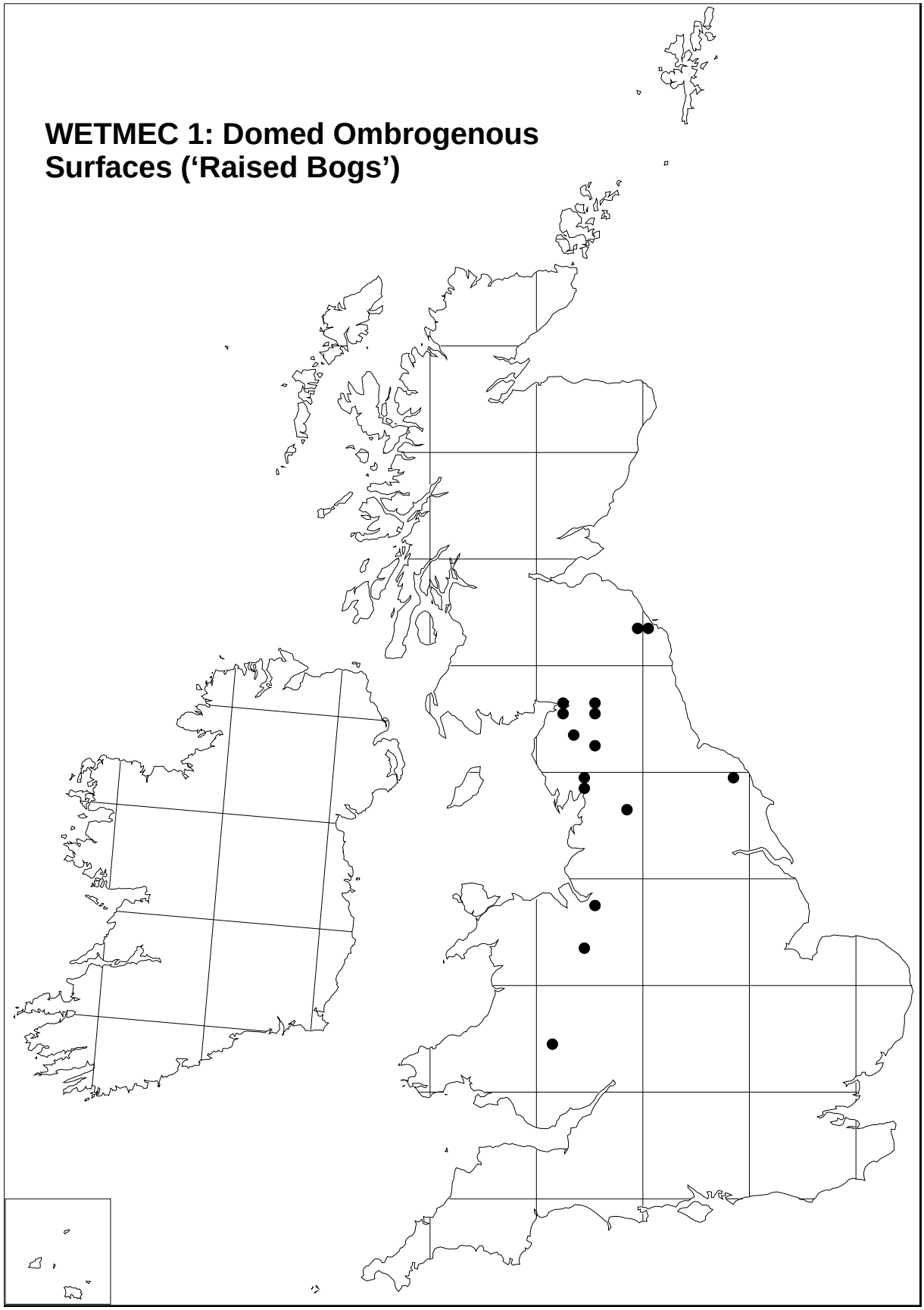


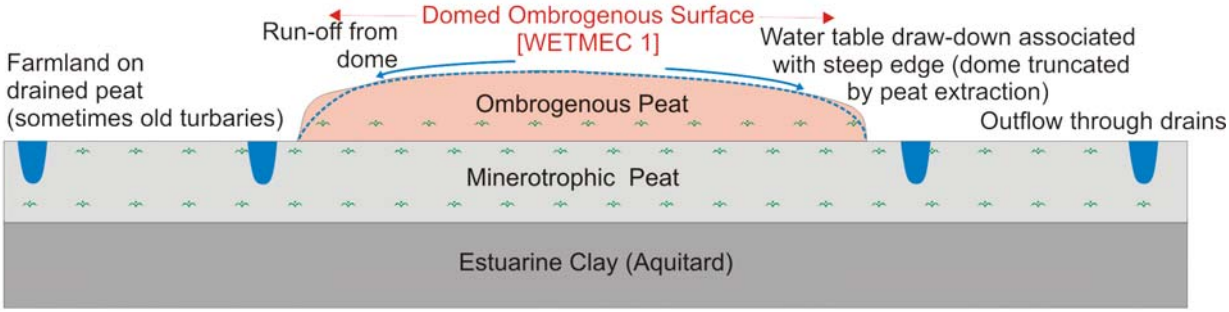
Figure 3.1 Distribution of examples of WETMEC 1 in sites sampled in England and Wales.

WETMEC 1: DOMED OMBROGENOUS SURFACES

No WETMEC sub-types have been identified for WETMEC 1, but examples vary considerably in their topographical context. Examples of this are illustrated here. The two contexts shown on this page represent the two most characteristic situations in which WETMEC 1 occurs in lowland England and Wales. The two basin contexts on the next page are quite widespread, but are less good examples of WETMEC 1 in that they have some affinities with WETMEC 2, differing mainly in the stability of the surface and solidity of the underlying infill. Some such samples of WETMEC 1 in small basins may represent partly drained examples of WETMEC 2.

WETMEC 1: ombrogenous dome on flood-plain or coastal plain
(*e.g.* Meathop Moss)

- WETMEC 1 surface is fed ± exclusively by precipitation and drains radially; shape of dome is independent of underlying topography
- dome has been truncated by turbary, creating steep dry edges and water drawdown around the periphery of the bog
- bog is surrounded by drained (minerotrophic) peat, some of which was once covered by bog peat, and which now forms farmland
- water levels in the drains can potentially affect the bog water table, but the extent to which this is the case depends on local factors (especially peat hydraulic conductivity and topography)



WETMEC 1: ombrogenous dome within drumlin field
(*e.g.* Bowness Common, Wedholme Flow)

- WETMEC 1 surface is fed ± exclusively by precipitation and drains radially to a narrow peripheral lagg
- mire was initiated in two basins, but has coalesced by growth of ombrogenous peat over the separating ridge
- dome of bog is not fully independent of underlying topography; it is not known if this represents the natural condition or is a product of subsidence and local reconformation consequent upon surface drainage

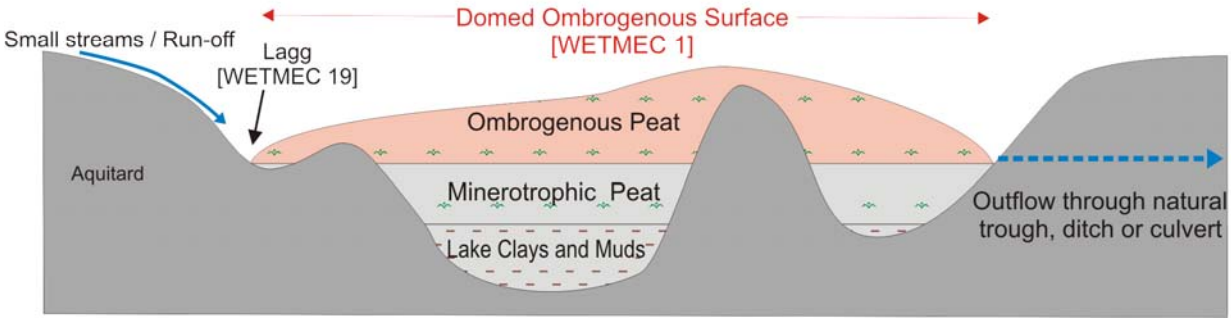


Figure 3.2 Schematic sections of a Domed Ombrogenous Surface (WETMEC 1).

3.2 WETMEC 2: Buoyant Ombrogenous Surfaces ('Quag Bog')

3.2.1 Summary characteristics

Situation	Basins.
Size	Mostly small.
Location	Mainly North and West England (including the West Midlands) and Wales
Surface relief	Shallow-domed, or more or less flat, often adjoined by a wet peripheral lagg; no real rand; shallow pools, lawns and hummocks may provide a locally well-developed micro-topography, but the surface is often largely planar, sometimes modified by peat diggings. Small examples of the WETMEC sometimes occupy peat workings within other (WETMEC 1) surfaces.
Hydrotopography	Ombrogenous.
Water: ***supply***	Precipitation, typically supported by telluric water.
regime	Water levels naturally vary to some extent across the surface and with time, especially with rainfall patterns, but are typically relatively stable and close to the surface, especially in examples with a buoyant surface.
distribution	Vertical flow downwards into peat and watery muds; possibly some lateral flow through acrotelm.
superficial	Shallow pools, occasional soakways; sometimes drains.
Substratum	Buoyant, loose ombrogenous surface upon fen peat or submerged ombrogenous peat, usually underlain by a watery mix of peat and/or muds. Often in fluvio-glacial deposits, but may be separated from these by low-permeability layers.
peat depth	Peat and/or muds typically 2 – 15 m.
peat humification	Usually with a shallow (0.5 m) spongy surface (acrotelm); underlying material often much less solid and less humified.
peat composition	Ombrogenous peat with *Sphagnum* spp., *Eriophorum* spp. and ericaceous shrubs upon fen peat, submerged ombrogenous peat or watery material.
permeability	Surface layer rather loose, but actual permeability little known; lower layers more variable but often very watery. Basin may have a low-permeability infill or clay lining separating it from underlying mineral deposit.
Ecological types	Oligotrophic, acidic.
Associated WETMECs	Some examples can form a complex with various other WETMECs, especially in the peripheral lagg (if present) (such as WETMECs 3, 15, 19). Occasionally in peat workings within, or adjoining, WETMEC 1.
Natural status	Natural successional state formed by terrestrialisation and paludification. May also occupy some turf ponds.
Use	Conservation. Usually too wet for any other use, though some sites may once have been turbaries.
Conservation value	Supports examples of EU SAC habitats 'active raised bog' and 'transition mire and quaking bog'. Vascular plant species diversity is generally rather low (and sometimes increased by damage).
Vulnerability	Drainage and nutrient enrichment (from both telluric and meteoric sources)

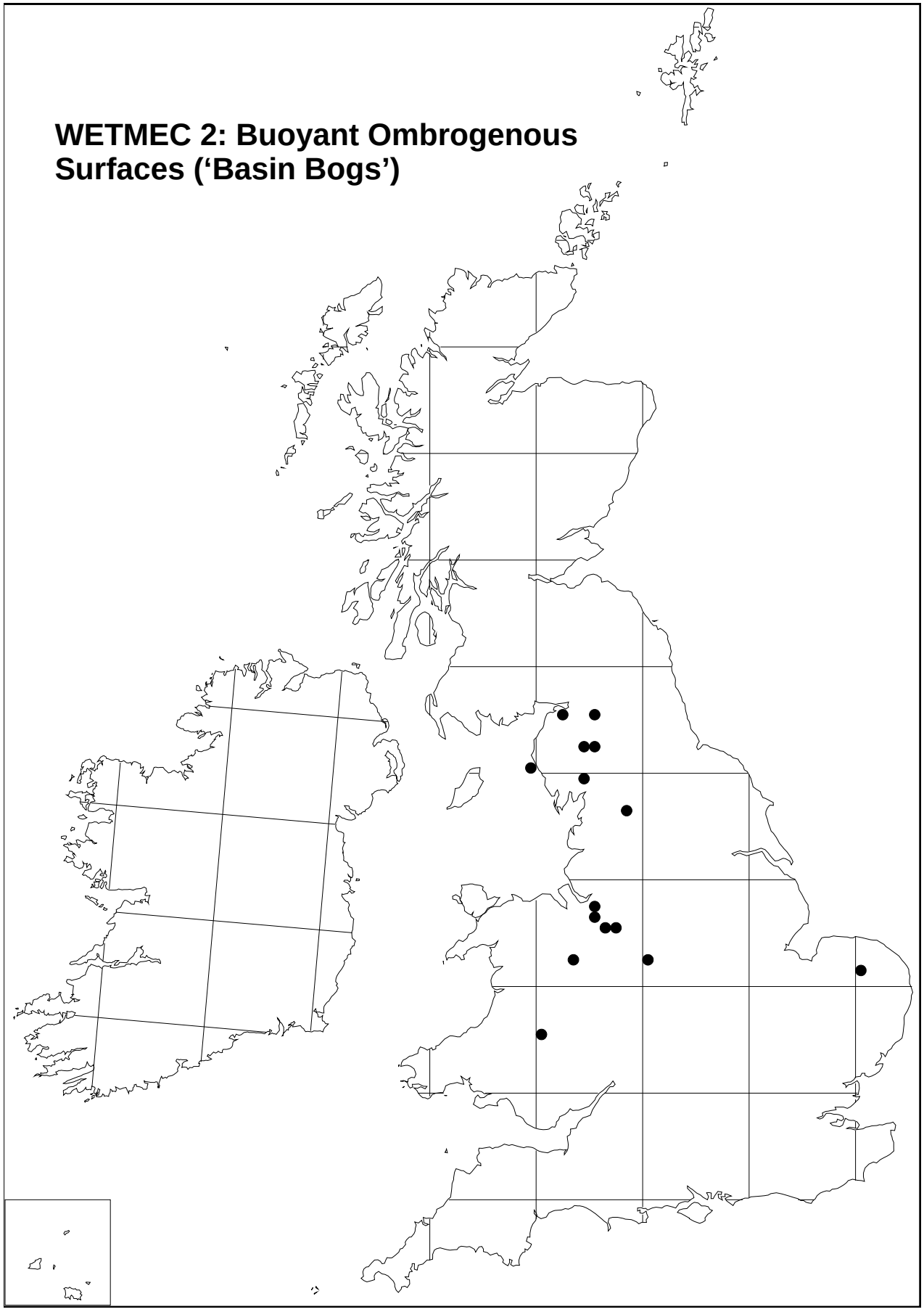


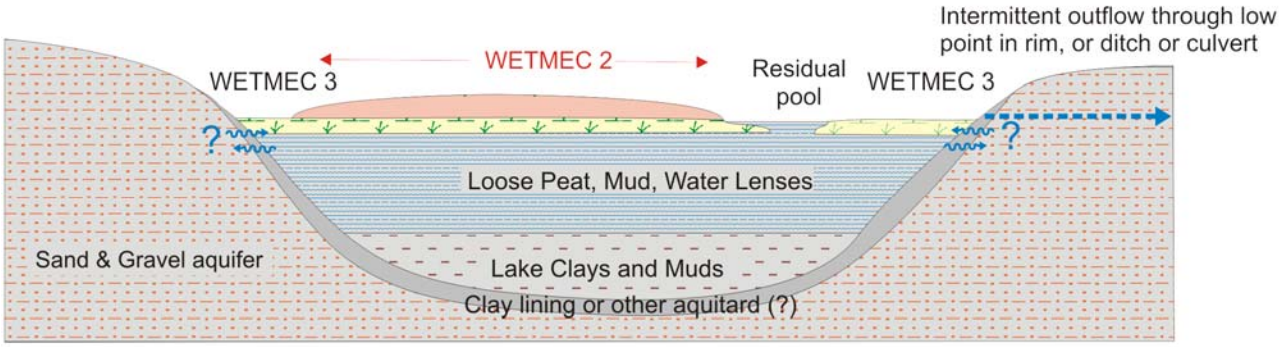
Figure 3.3 Distribution of examples of WETMEC 2 in sites sampled in England and Wales.

WETMEC 2: BUOYANT, OMBROGENOUS SURFACES

[For other examples, see WETMEC 3]

WETMEC 2a: Ombrogenous quag
(*e.g.* Abbots Moss)

- WETMEC 2 surface is fed ± exclusively by precipitation
- basin may be ± 'sealed' from aquifer (but little documented)
- magnitude, and in some contexts direction, of any water exchange with mineral aquifer is uncertain (if connected some basins may recharge the aquifer)
- the WETMEC 2 surface is hydroseral, and typically developed over WETMEC 3. [This may persist in places, and can form a lagg or proto-lagg in peripheral locations.]



WETMEC 2b: Ombrogenous quag (groundwater-fed basin)
(*e.g.* Wybunbury Moss)

- WETMEC 2 surface is fed ± exclusively by precipitation
- visible groundwater outflow from mineral aquifer into lagg water-track around part of basin (other parts may be fed just by surface run-off)
- basin may have attributes of a Seepage Percolation Basin (WETMEC 13), at least near surface and where ditched
- lower basin may be ± 'sealed' from aquifer (but little documented)
- the WETMEC 2 surface is hydroseral, and typically developed over WETMEC 3.

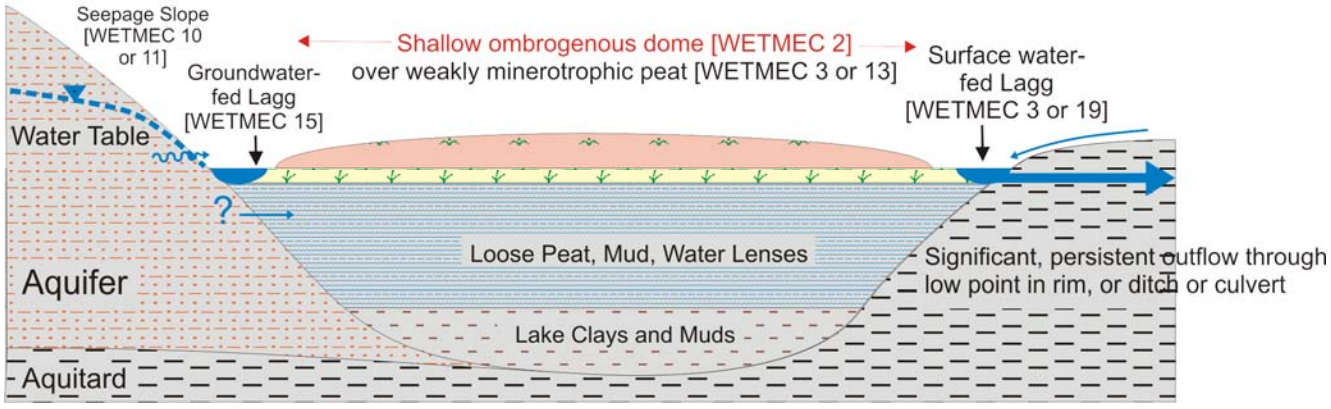


Figure 3.4 Schematic sections of Buoyant ombrogenous surfaces (WETMEC 2).

3.3 WETMEC 3: Buoyant, Weakly-Minerotrophic, Surfaces ('Transition Bogs')

3.3.1 Summary characteristics

Situation	Basins. Sometimes sumps in other wetland types or within peat workings.
Size	Mostly small (sometimes very small).
Location	Mostly sampled from north and west, including the West Midland basins.
Surface relief	Typically lawns on ± flat surfaces, sometimes grading into (often fairly deep) pools, sometimes forming swamps with 'swimming' *Sphagnum.* Can have localised, mostly low hummocks (which may provide the nuclei for development in WETMEC 2).
Hydrotopography	Weakly minerotrophic.
Water: *supply*	Precipitation with some telluric water influence.
regime	Water table generally high (mostly just sub-surface).
distribution	Uncertain. Receives some telluric water inflows but water exchange is probably generally small.
superficial	Shallow pools; sometimes inflow or outflow soakways.
Substratum	Buoyant, loose surface, usually underlain by a watery mix of peat and muds. May be underlain by lake muds. Examples in kettle holes *etc* are often in fluvio-glacial deposits *etc* but may be separated from these by low-permeability layers.
peat depth	Typically 2 – 15 m of peat and / or muds
peat humification	Usually with a shallow spongy surface; underlying material often less solid and less humified.
peat composition	Typically dominated by *Sphagnum* spp., *Eriophorum* spp. upon loose peat or watery material.
permeability	In most sites the surface peat is loose and buoyant but actual permeability little known; lower layers more variable but often very watery. Basin may have a low-permeability infill or clay lining separating it from underlying mineral deposit.
Ecological types	Oligotrophic, acidic.
Associated WETMECs	Some examples can form a complex with various other WETMECs, especially WETMEC 2. Can form a lagg around WETMEC 2 with limited flow of telluric water.
Natural Status	Natural successional state formed by terrestrialisation. May also occupy some turf ponds.
Use	Conservation. Usually too wet for any other use, though some sites were once turbaries.
Conservation Value	Supports EU SAC habitat ('transition mire and quaking bog'), though species diversity is generally rather low (and sometimes increased by damage).
Vulnerability	Drainage and nutrient enrichment (from both telluric and meteoric sources).

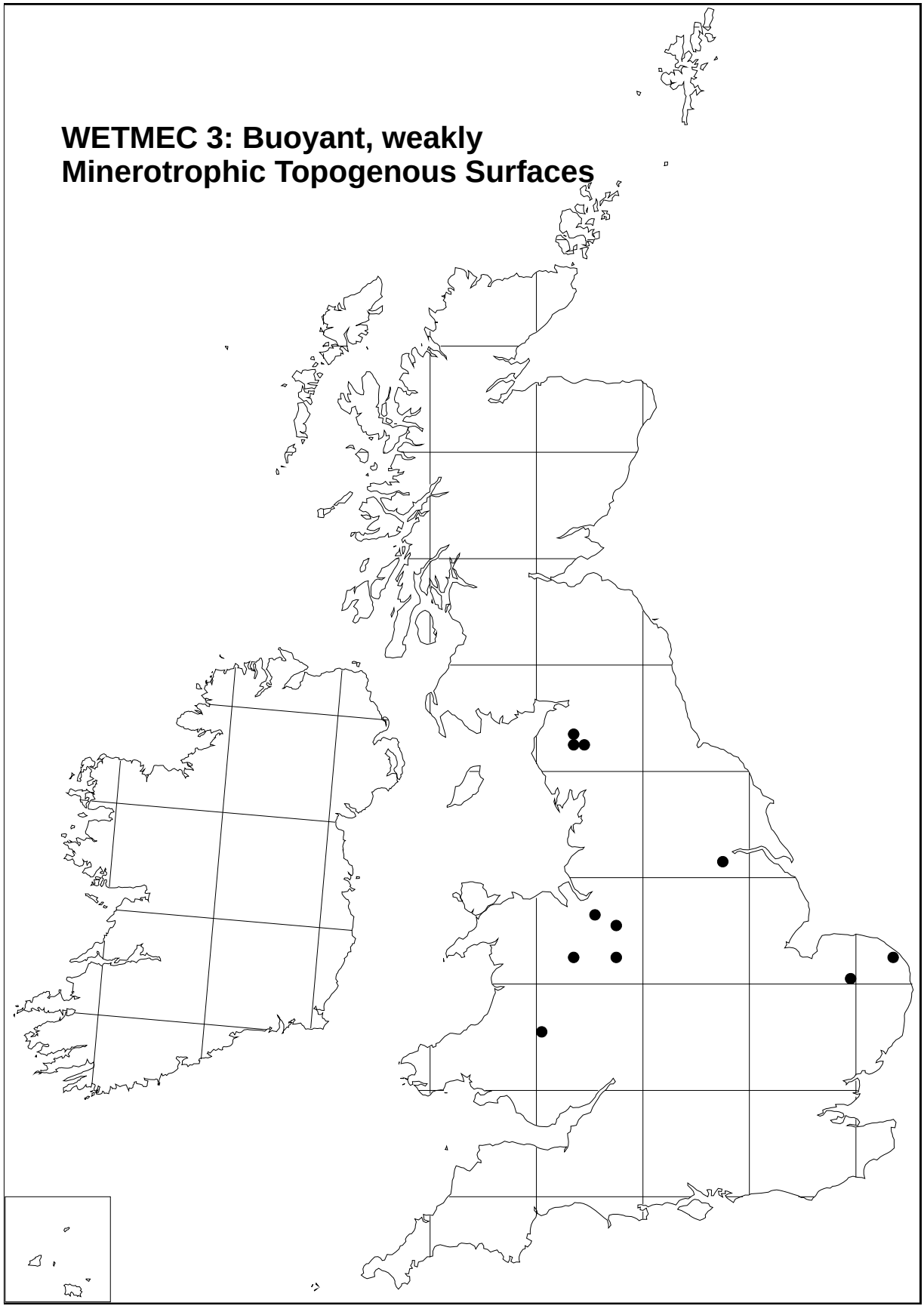


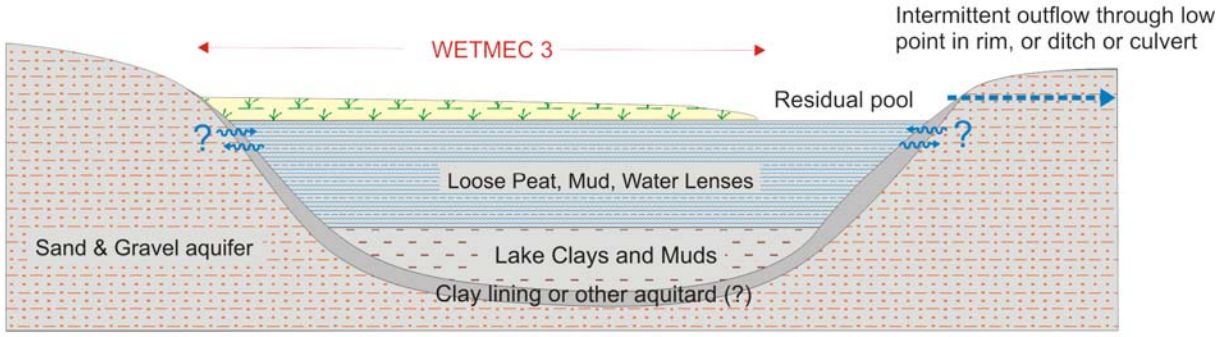
Figure 3.5 Distribution of examples of WETMEC 3 in sites sampled in England and Wales.

WETMEC 3: BUOYANT, WEAKLY MINEROTROPHIC SURFACES

[For other examples, see WETMEC 2]

WETMEC 3a: Bog-transition quag (± closed basin)
(*e.g.* Forest Camp)

- WETMEC surface is probably fed primarily by precipitation
- basin may be ± 'sealed' from aquifer (but little documented)
- magnitude and in some contexts direction of any water exchange with mineral aquifer is uncertain (if connected some basins may recharge the aquifer)
- the buoyant surface is hydroseral, over either a natural pool or reflooded turbaries



WETMEC 3b: Bog-transition quag (± open basin)
(*e.g.* Tarn Moss)

- WETMEC surface is probably fed primarily by precipitation
- streams and rain-generated run-off make a significant contribution to the water balance, though this supply may sometimes be channelled through WETMEC 3 as a soakway (WETMEC 19) (not illustrated)
- may be minor, local groundwater outflow into basin from sand lenses in Till
- the buoyant surface is hydroseral, over either a natural pool or reflooded turbaries

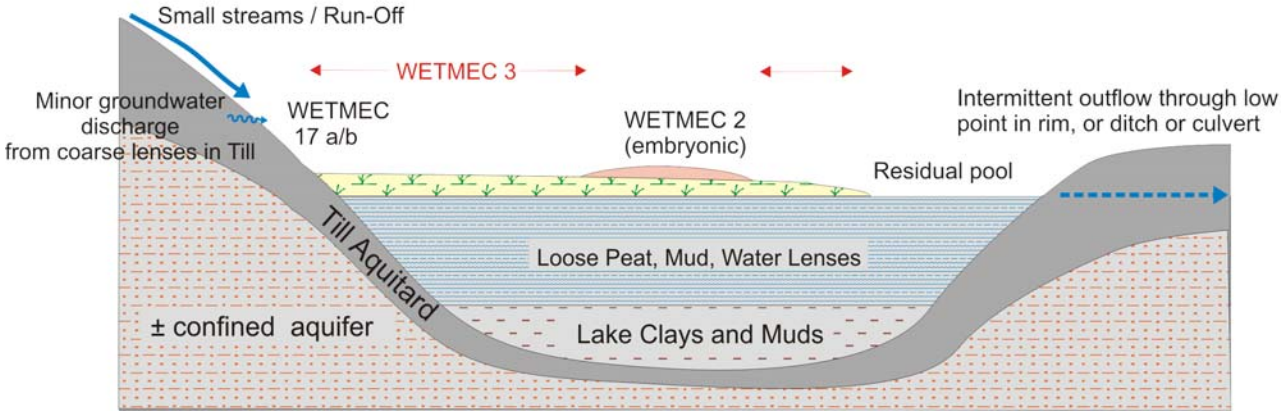


Figure 3.6 Schematic sections of Buoyant, weakly-minerotrophic, topogenous surfaces (WETMEC 3).

3.4 WETMEC 4: Drained Ombrotrophic Surfaces (in bogs and fens)

3.4.1 Summary characteristics

Situation	Mostly in topogenous locations, mainly sampled from floodplains.
Size	Large to small.
Location	Widespread, but mainly sampled from East Anglia.
Surface relief	Flat to gently sloping, but with some undulations associated with drainage.
Hydrotopography	Ombrotrophic.
Water: *supply*	Precipitation (perhaps supported by regional water table).
regime	Summer water table deep below surface. Likely to fluctuate according to rainfall and efficiency of drainage.
distribution	Vertical flow downwards into peat; some lateral flow.
superficial	None, other than in drains
Substratum	Ombrogenous peat upon fen peat, or fen peat now fed only by rainfall.
peat depth	0.7 – 5 m in examples examined.
peat humification	Surface strongly decomposed and well humified, May be less humified below this, with some fresh horizons, but basal peats often rather solid and humified, or replaced by lake deposits.
peat composition	Ombrogenous peat with *Sphagnum* spp., *Eriophorum* spp. and ericaceous shrubs upon fen peat, or fen peat composed of brushwood, *Cladium mariscus* and so on.
permeability	Wetland and basal substrata probably generally of low permeability.
Ecological types	Base-poor, oligotrophic to base-rich, eutrophic.
Associated WETMECs	None.
Natural status	A much-drained surface but retaining some form of semi-natural habitat. [Many drained peatlands elsewhere have disappeared through past peat extraction and conversion to farmland or forest].
Use	Conservation and amenity.
Conservation value	Ombrogenous surface is usually highly impoverished, and may support birch wood rather than bog plants. Insome cases (such as Holme Fen) the birch wood may have some conservation and amenity value, but not as a wetland. Some former fen surfaces support a wide range of plant species, especially wet-grassland types.
Vulnerability	Some examples could be drained more effectively, or converted more comprehensively to agriculture and so on. Spontaneous colonisation by trees, which can occur readily, can accentuate the low summer water tables by increasing interception and evapotranspiration losses.

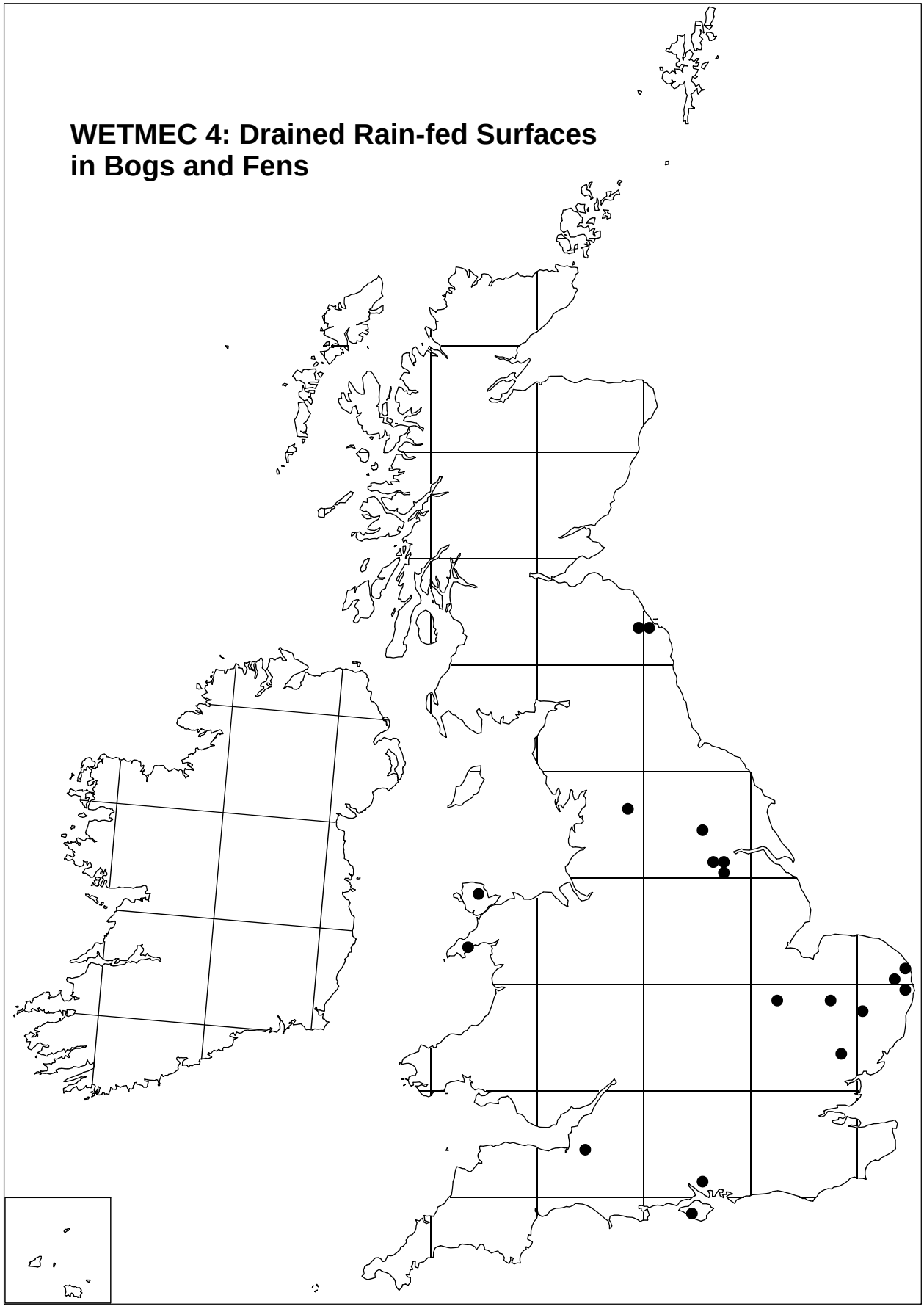
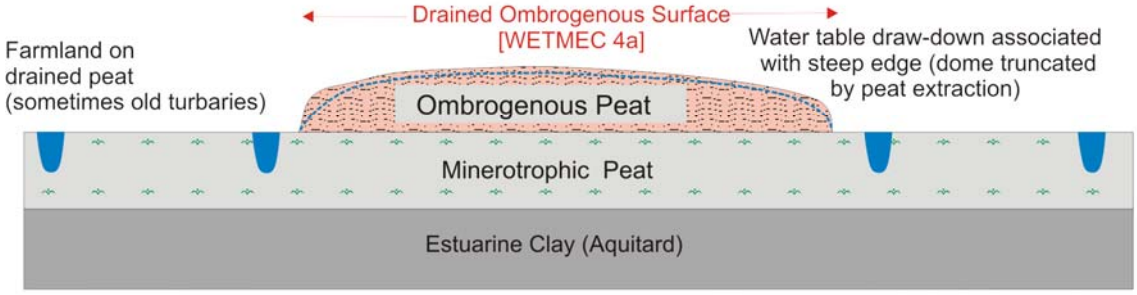


Figure 3.7 Distribution of examples of WETMEC 4 in sites sampled in England and Wales.

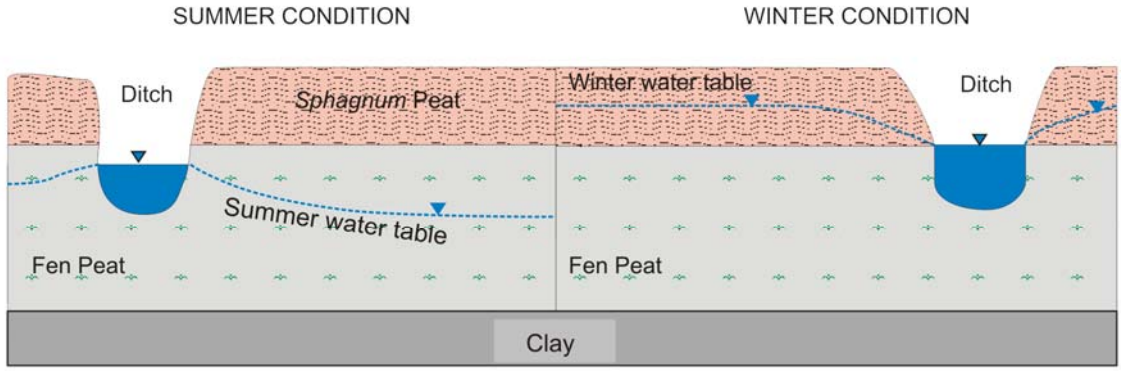
WETMEC 4a: Drained ombrogenous bog

(*e.g.* Holme Fen)

- surface of remnant bog is elevated above surrounding drained peatland
- surface is fed exclusively by precipitation
- residual dome may be directly drained (not shown), but even without surface drainage the summer water table may be consistently well below the surface; this may be caused by draw-down associated with the margins and because the uppermost peat has impaired hydroregulation function (especially low specific yield)



WETMEC 4a: Drained ombrogenous bog - seasonal relationship to water table



WETMEC 4b: Drained ombrotrophic fen

(*e.g.* Woodwalton Fen)

- surface of residual wetland is slightly elevated above the surrounding drained and subsided peat
- no groundwater source. Surface water may be maintained at quite high level in adjoining dykes, but these generally have limited influence in lateral recharge of the adjoining peat, which is often well humified and dense, and WETMEC 4 surface is fed mostly only by precipitation
- flooding with surface water may occur occasionally, but is not a consistent component of the annual water budget and may have nuisance value (a) by import of nutrients and silt; (b) by creating unusually wet conditions (especially in contexts where evacuation of the flood water is slow)
- bog is surrounded by drained (minerotrophic) peat, some of which was once covered by bog peat, and which now forms farmland
- water levels in the drains can potentially affect the bog water table, but the extent to which this is the case depends on local factors (especially peat hydraulic conductivity and topography)

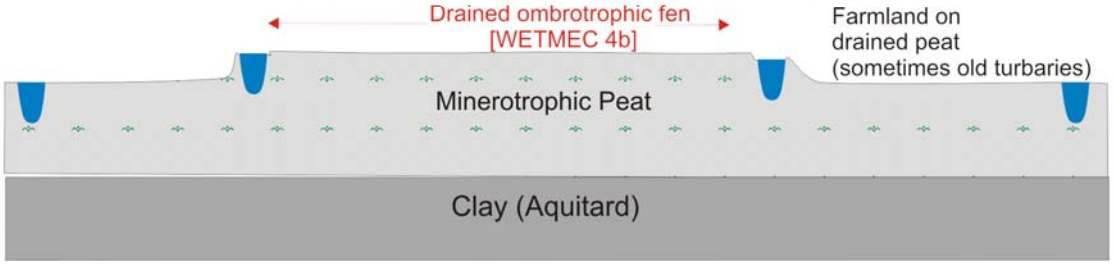


Figure 3.8 Schematic sections of Drained Ombrotrophic Surfaces (in Bogs and Fens) (WETMEC 4).

3.5 WETMEC 5: Summer ‘Dry’ Floodplains

3.5.1 Summary characteristics

Situation	Floodplains.
Size	Usually large (more than 10 ha).
Location	Mainly sampled from East Anglia, but fairly widespread.
Surface relief	Flat and generally fairly even (except for vegetation tussocks and so on).
Hydrotopography	Topogenous.
Water: ***supply***	Surface water (mainly from rivers) and rainfall.
regime	Mean summer water level typically relatively low (–25 cm), but flooded in winter/spring.
distribution	Episodic flooding from rivers or ponded-back rain water.
superficial	Some examples are adjoined by lakes or rivers. Dykes often dissect the unit. The examples sampled here do nousually include streams, ox-bow lakes and so on (which can occur in this wetland unit elsewhere), or pools.
Substratum	Deep peat, sometimes intercalated with mineral layers (such as estuarine clay), and sometimes with deposits of alluvium.
peat depth	Mostly deep (3–6 m) except near upland margins.
peat humification	Uppermost layer is usually quite solid and well humified. Underlying peat varies in humification, but basal peats are typically thick, strongly humified and solid.
peat composition	Variable. Uppermost layers generally reed, sedge or brushwood peat. Basal layers usually dense brushwood peats. These may be continuous upwards to the surface layer, or may be replaced or interrupted by bands of fresher herbaceous (reed or sedge) peats, or by layers of alluvial material or estuarine deposits.
permeability	Wetland infill and basal substrata have generally low-permeability characteristics.
Ecological types	Ranges are mainly from base-rich–sub-neutral, eutrophic–mesotrophic, depending mainly on water source and substratum characteristics.
Associated WETMECs	Often in association with WETMEC 6, but this is sometimes the only WETMEC in entire sites. Occasionally seepages can occur at the adjoining upland margin, most usually WETMEC 11.
Natural status	Some examples are more or less natural, but others have been much modified by drainage and peat removal.
Use	Mostly former sedge and litter fens. Some examples may have been grazed. Many former examples have been converted to farmland.
Conservation value	Mesotrophic examples may support Eu-Molinion vegetation (EU SAC Habitat).
Vulnerability	Some examples affected by nutrient enrichment, some by drying (drainage or attempts to exclude enriched water), some by base-depletion (lack of river flooding). Highly susceptible to scrub encroachment.

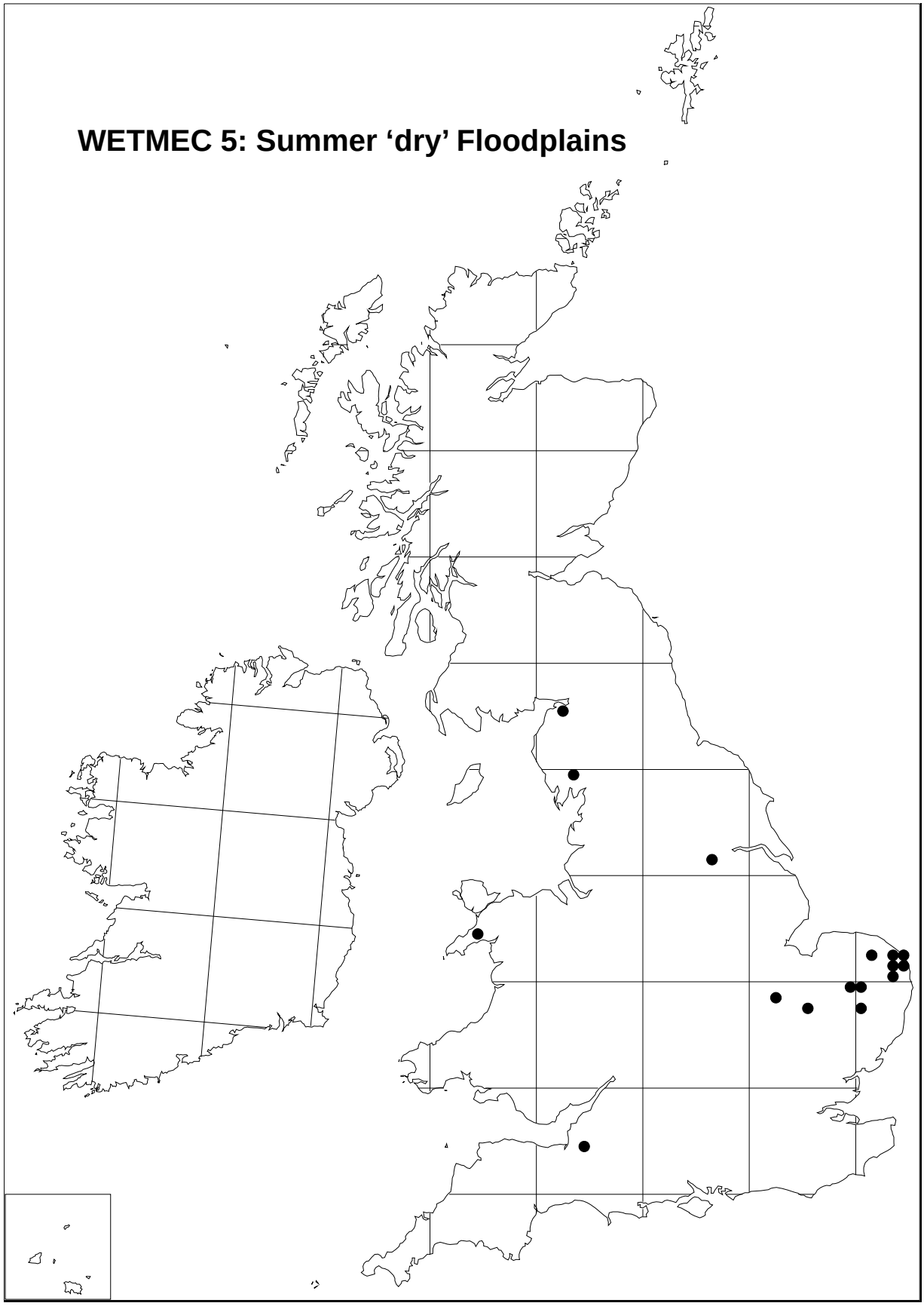


Figure 3.9 Distribution of examples of WETMEC 5 in sites sampled in England and Wales.

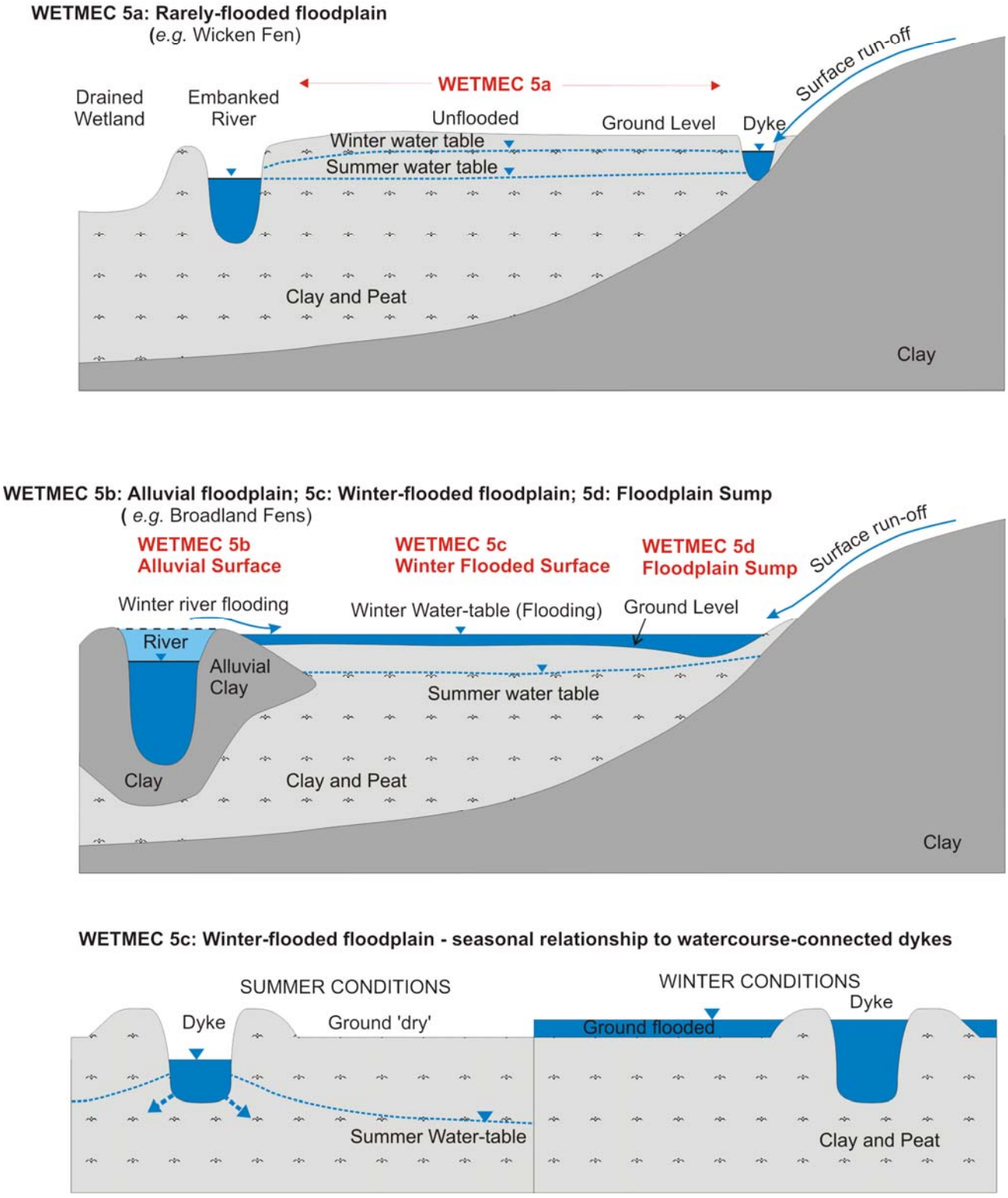


Figure 3.10 Schematic sections of Summer 'Dry' Floodplains (WETMEC 5).

3.6 WETMEC 6: Surface Water Percolation Floodplains

3.6.1 Summary characteristics

Situation	Mostly river floodplains (also rarely in some basins or valleyheads).
Size	From narrow water fringes to large areas of fen (some units of >10 ha).
Location	Predominantly associated with the Norfolk Broadland, but scattered elsewhere.
Surface relief	Flat and generally even (except for vegetation tussocks and so on).
Hydrotopography	Rheo-topogenous.
Water: *supply*	Surface water (from adjoining or connected watercourses).
regime	Relatively high and fairly stable water tables (slightly sub-surface), especially where on a buoyant raft. Sometimes flooded.
distribution	Episodic flooding and surface / shallow sub-surface flow.
superficial	Some examples are adjoined by open water or contain pools. River and/or dykes often in close proximity, but not part of unit.
Substratum	Deep peat, sometimes intercalated with mineral layers (such as estuarine clay).
peat depth	Typically deep (3–6 m) except near upland margins.
peat humification	Upper layer is loose and fresh, often hydroseral. May be underlain by deep peat, varying in humification and consolidation. Basal peats are typically strongly humified and solid.
peat composition	Variable. Loose upper layers generally reed, sedge or moss peat (mainly hypnoid mosses, but some *Sphagnum*). Basal layers are usually dense brushwood peats. These may be continuous upwards to the loose surface layer, or may be replaced or interrupted by bands of fresher herbaceous (reed or sedge) peats (or clay).
permeability	The surface layer of peat is typically loose and fairly unconsolidated, formed over a less permeable lower layer. Most deposits are floored by a basal layer of low-permeability clays and silts, but a few examples have more permeable sandy deposits and so on.
Ecological types	Range from base-rich–base-poor, eutrophic–oligotrophic, depending mainly on groundwater source and substratum characteristics. Most examples are base-rich/sub-neutral and eutrophic/mesotrophic.
Associated WETMECs	Occurs almost always in association with Summer-Dry Floodplains (WETMEC 5) (in Broadland is often separated from rivers and land margins by these).
Natural status	Most examples have been created within Type 5 WETMECs by peat extraction, but natural examples can occur (mainly open water fringes).
Use	Mostly former peat workings. Often support top-quality reedbeds (some are mown for sedge), but such usage has ceased in many examples.
Conservation value	Important mainly for mesotrophic sedge beds (EU SAC Habitat), and reedbeds (mainly birds and invertebrates).
Vulnerability	Main threat to most examples is dereliction and hydroseral succession. The latter is associated with consolidation or acidification of the loose surface.

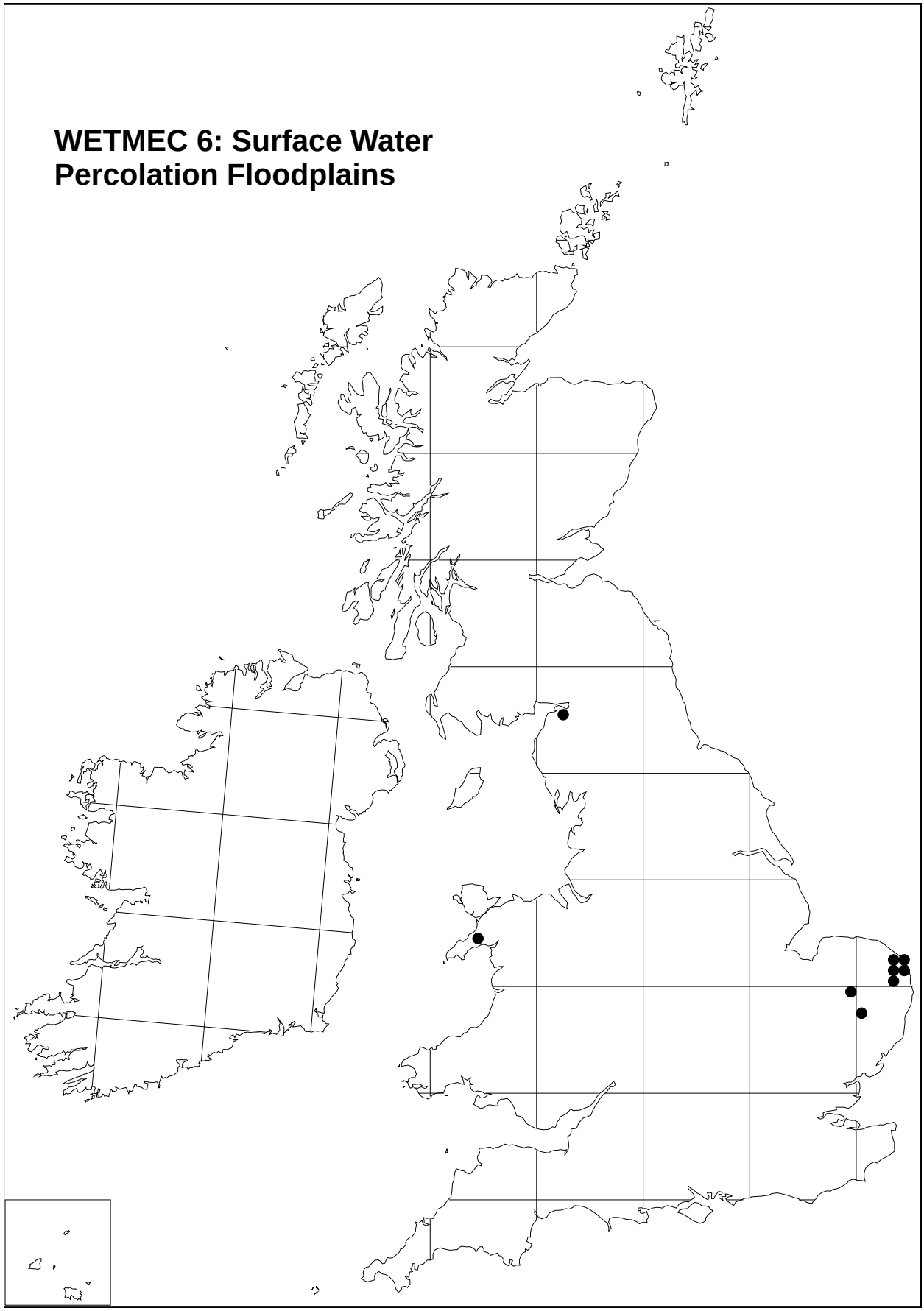


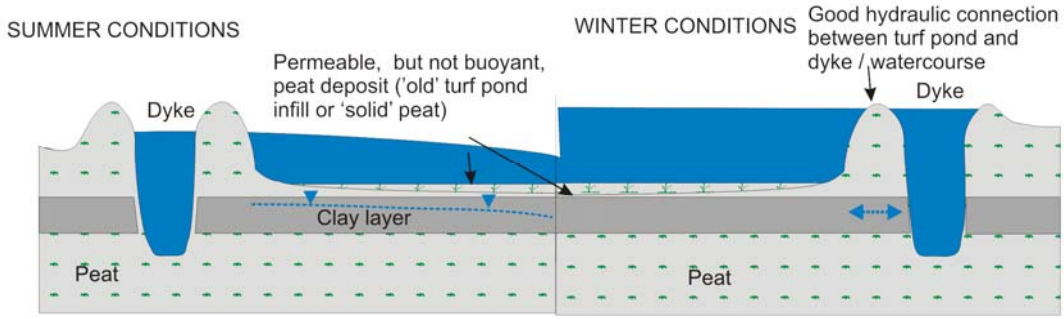
Figure 3.11 Distribution of examples of WETMEC 6 in sites sampled in England and Wales.

WETMEC 6: SURFACE WATER PERCOLATION FLOODPLAINS

WETMEC 6a: 'Solid' surface-water percolation surfaces

(*e.g.* Burgh Common, Strumpshaw Fen, Wheatfen)

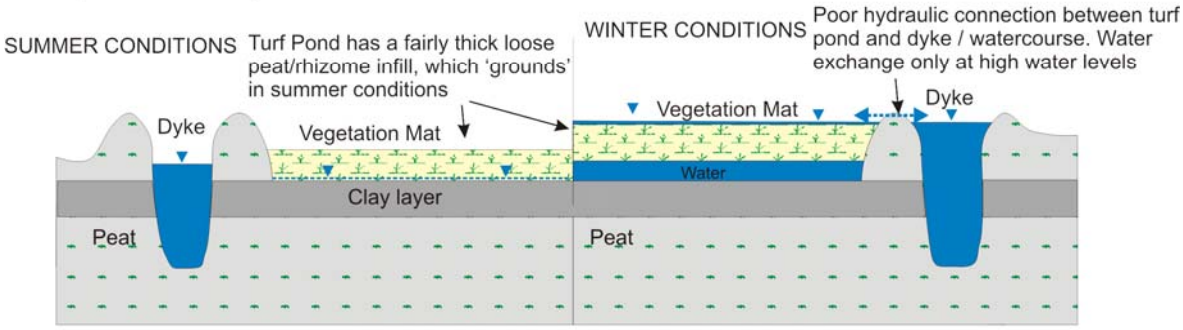
- peat alongside dyke is either 'solid' or an old turf pond infill; does not form a buoyant mat, but is relatively permeable
- when there is free hydraulic connection with adjoining dykes, associated with high summer dyke levels, water table in peat can be quite high in summer, though declining with distance from the dyke
- in winter water table is near surface, or surface is shallow flooded
- represents a state transitional between other examples of WETMEC 6 and examples of WETMEC 5
- clay layers within the peat may form local aquitards, and may be laterally extensive



WETMEC 6b: Grounded surface water percolation quag

(*e.g.* Catfield Fen, Hulver Ground, Reedham Marsh)

- turf pond infill alongside dyke tends to become summer 'dry' and water table is low
- this is because (a) the infill is old, thick and 'grounded' and/or (b) there is poor hydraulic connection between the dyke and the turf pond, with little recharge by surface water in summer conditions when dyke levels are low
- in winter water table is near surface, or surface is shallow flooded and the infill may then be buoyant or expand with the rising water level



WETMEC 6c: Surface water percolation 'boils'

(*e.g.* Catfield Fen, Heater Swamp, Hickling Broad)

- turf pond infill is buoyant or expansible and its surface is usually above the water table; the surface is thus consistently 'dry' even though the water table is not necessarily low
- hydraulic connection with dyke system is usually good, helping to maintain a fairly high absolute water table (*i.e.* not relative to the peat surface)
- vegetation surface is fed mainly by precipitation, and this type is transitional to WETMEC 3 (within which some examples were clustered)

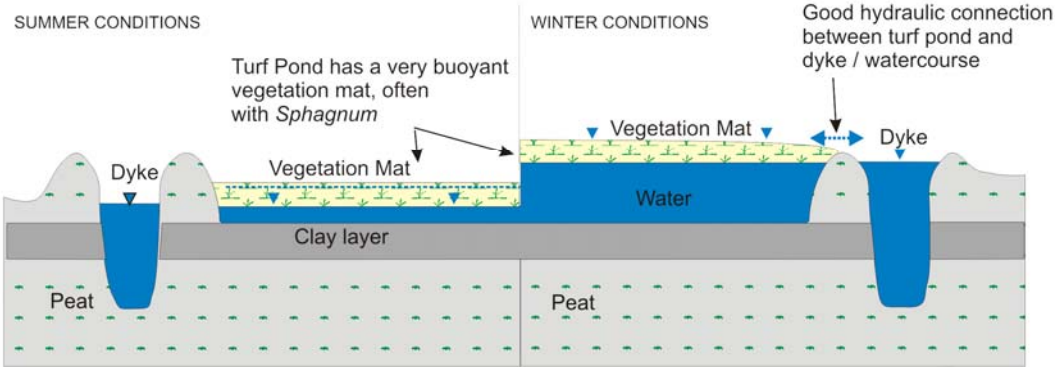


Figure 3.12 Schematic sections of Surface Water Percolation Floodplains (WETMEC 6).

3.7 WETMEC 7: Groundwater Floodplains

3.7.1 Summary characteristics

Situation	River floodplains; small floodplains in valleyhead sites.
Size	Small bands alongside watercourses to quite large areas of fen (> 10 ha).
Location	Sampled mainly from Southern England, but also elsewhere.
Surface relief	Even (appears more or less flat, but gently slopes to river or outfall).
Hydrotopography	Rheo-topogenous.
Water: *supply*	Groundwater; river levels may determine mire water tables, at least locally.
regime	Many examples are fairly summer-dry; wetter if in a hollow or in receipt of groundwater outflow from above. Usually only occasionally flooded.
distribution	Into peat body; dykes.
superficial	Normally absent, except where pools occur in embedded peat pits, and in depressions directly adjoining watercourses. May be dissected by small streams or dykes.
Substratum	Peat over variable deposits (such as clays, silts, marl, gravels). Peat sometimes has bands of marl but not normally much other mineral material, though silt layers occur in some riverside locations.
peat depth	Usually shallow (< 1 m).
peat humification	Upper peat often strongly oxidised. Where present, deeper layers can be much less humified, and sometimes only loosely consolidated, though sometimes with a very solid, black, basal peat.
peat composition	Variable and difficult to determine when well oxidised. Upper layers may be sedge, reed or brushwood peat. When present, unconsolidated lower layers may have swamp species, including *Equisetum fluviatile.*
permeability	Peat mostly of low permeability, but sometimes with more permeable, unconsolidated horizons. Basal substratum variable; mostly of low permeability.
Ecological types	All examples were more or less base-rich, and ranged from oligotrophic to eutrophic.
Associated WETMECs	Often the main/only WETMEC. Sometimes with seepages (WETMECs 10 and 11) on adjoining slopes and feeding into WETMEC 7.
Natural status	Many sites are fairly summer-dry. Often not clear to what extent this is a consequence of groundwater abstraction or manipulation of watercourse levels. Many are probably modified, to some degree.
Use	Unmanaged or grazed. Some formerly used for peat excavation.
Conservation value	Mesotrophic, base-rich sites can support *Molinia caerulea–Cirsium dissectum* fen meadow (M24) or close relative (*Cladio-Molinietum*) (sometimes included within site designation as a SAC features). Patches of M9 occur in a few wet depressions and S24/S25 alongside some watercourses. Occluded drains may support wet fen plants.
Vulnerability	Some sites already damaged by direct and indirect drainage and peat cutting. Vulnerable both to groundwater abstraction and manipulation of water levels in adjoining watercourses. Dereliction and scrub colonisation can occur rapidly in the absence of management.

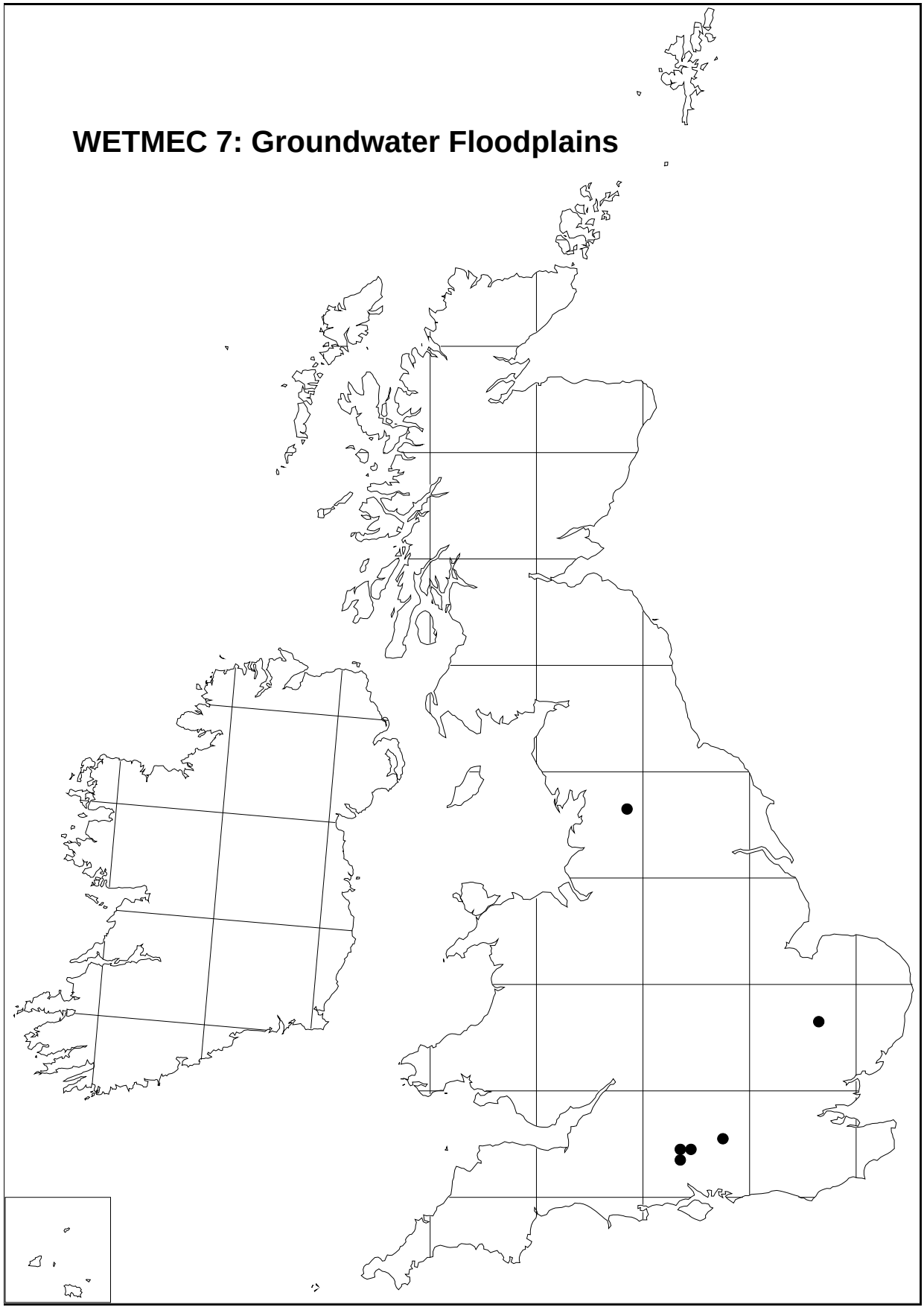


Figure 3.13 Distribution of examples of WETMEC 7 in sites sampled in England and Wales.

3.8 WETMEC 8: Groundwater-Fed Bottoms with Aquitard

3.8.1 Summary characteristics

Situation	Mostly floodplains, valleyhead troughs and basins.
Size	Small examples in basins to large areas of fen (> 10 ha).
Location	Most examples were recorded in East Anglia and North Wales.
Surface relief	Even (usually appears more or less flat, but can slope to watercourse, outfall and so on).
Hydrotopography	Rheo-topogenous (part-drained).
Water: ***supply***	Groundwater.
regime	Water table can be well below surface but variable, depending on topography and drainage.
distribution	Into peat body; dykes.
superficial	Normally absent, except where pools occur in embedded peat pits. Dykes and ditches can dissect WETMEC.
Substratum	Fairly consolidated peat; sometimes has bands of marl but not normally much other mineral material, though silt layers can occur alongside rivers.
peat depth	Sometimes shallow but usually deep (2–3 m). Peat may be interlayered with, or overlay, lake muds, marls, silts and (occasionally) estuarine clays.
peat humification	Upper peat often strongly oxidised. Underlying deposit varies in humification, but generally quite dense.
peat composition	Variable. Upper layers can be sedge–moss peat (mainly hypnoid mosses), but may also be sedge, reed or brushwood peat. Herbaceous peat can be quite thick. Basal peats are often dense brushwood peats.
permeability	Peat variable, but mostly probably of moderate to low permeability. Basal substratum generally of low-permeability clays and silts.
Ecological types	Range from base-rich to base-poor, eutrophic to oligotrophic, depending mainly on groundwater source and substratum characteristics. Most examples were base-rich/sub-neutral and mesotrophic.
Associated WETMECs	Can be the main/only WETMEC. Sometimes separated from the upland margin by WETMEC 9 and, occasionally, WETMEC 13. Can grade into WETMEC 4 on more elevated surfaces away from the influence of dykes and so on. Adjoining slopes may support WETMECs 10 and 11.
Natural status	Many sites have become rather dry, usually through direct or indirect drainage. Some may once have been referable to WETMEC 13.
Use	Some are unmanaged, others lightly grazed. Some may have been used for peat excavation. Some, perhaps many, have been converted to farmland, at least in part.
Conservation value	Mesotrophic, base-rich sites can support *Molinia–Cirsium dissectum* fen meadow (M24) (sometimes included within site designation as a SAC feature), or close relative (*Cladio-Molinietum*). A few places have patches of rather dry M9. Occluded dykes may support wet fen or swamp plants.
Vulnerability	Sites already somewhat or considerably damaged. Possible threat is further drying (improved drainage). Dereliction/scrub colonisation can occur rapidly in the absence of management. Some suggestion of nutrient enrichment by tip leachate or agricultural inwash in a few sites.

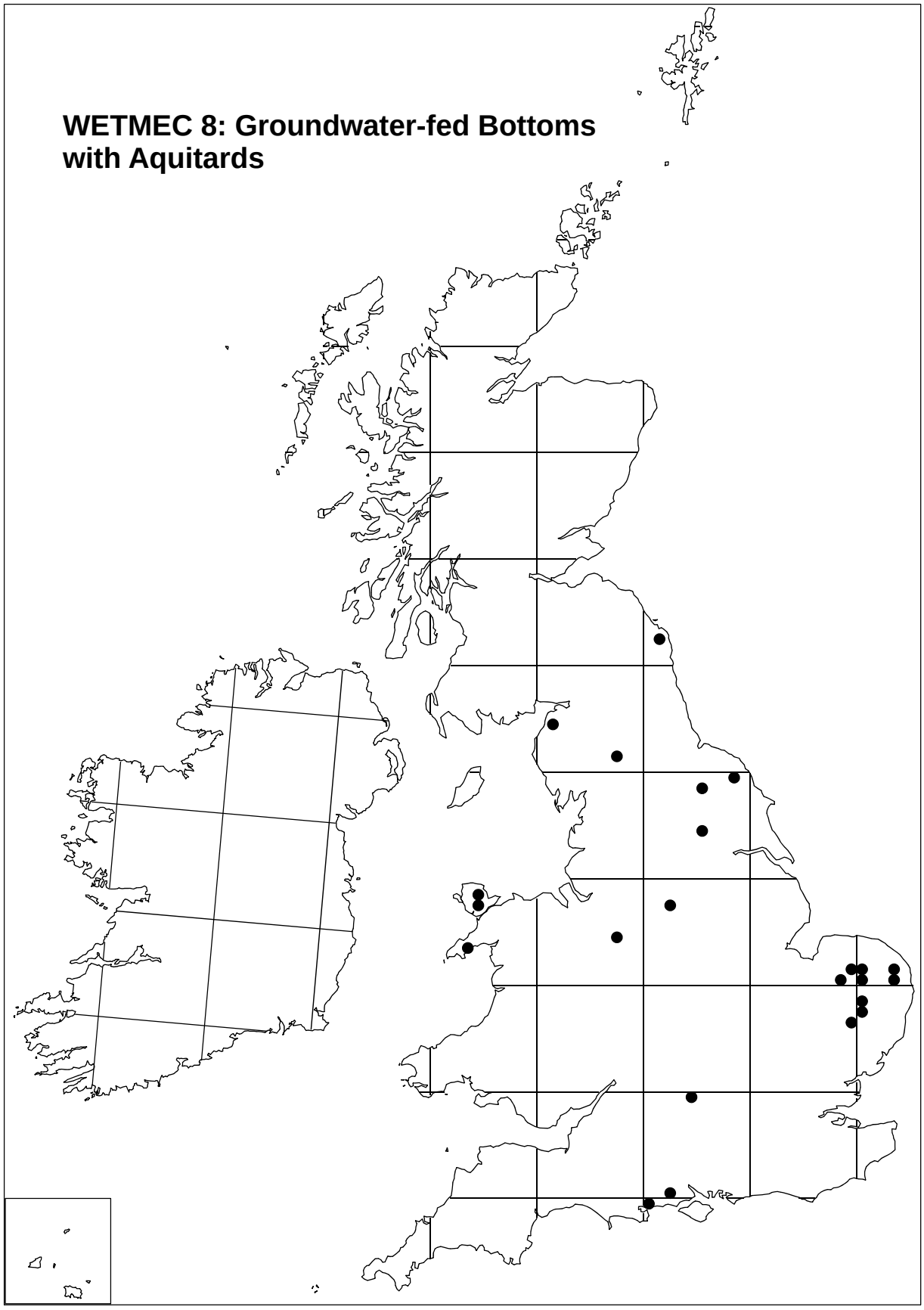


Figure 3.14 Distribution of examples of WETMEC 8 in sites sampled in England and Wales.

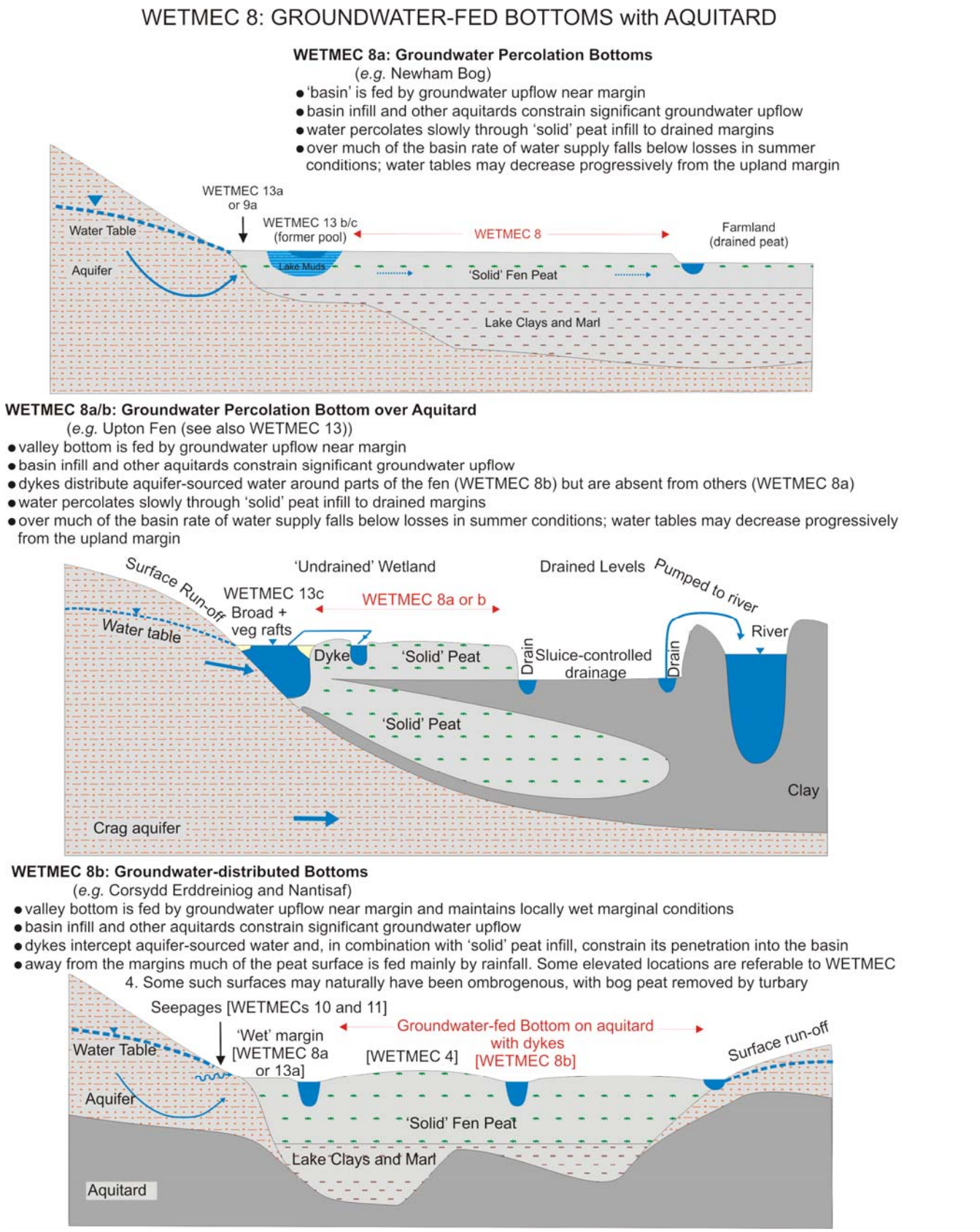


Figure 3.15 Schematic sections of Groundwater-Fed Bottoms with Aquitard (WETMEC 8).

3.9 WETMEC 9: Groundwater-Fed Bottoms

3.9.1 Summary characteristics

Situation	Valleyhead basins, river floodplains (margins).
Size	Tiny examples in basins to quite large areas of fen (> 10 ha).
Location	Most examples recorded from East Anglia, but probably quite widespread.
Surface relief	Even (appears more or less flat, but gently slopes to river or outfall).
Hydrotopography	Rheo-topogenous (part-drained).
Water: ***supply***	Groundwater.
regime	Summer water table often low, but higher where in a depression.
distribution	Into peat body; dykes.
superficial	Normally absent, except where pools occur in embedded peat pits. Dykes can dissect WETMEC.
Substratum	Fairly consolidated peat. Peat sometimes has bands of marl but not normally much other mineral material, though silt layers may occur in some riverside locations.
peat depth	Sometimes shallow but often deep (2–3 m).
peat humification	Upper peat often strongly oxidised. Underlying deposit varies in humification; often more strongly humified and solid than the surface layers, but not as much as in many examples of WETMEC 8.
peat composition	Variable, and sometimes difficult to determine. Upper layers can be sedge–moss peat (mainly hypnoid mosses), but may also be sedge, reed or brushwood peat. Herbaceous peat is sometimes quite thick. In floodplains, basal peats are often dense brushwood peats.
permeability	Variable, but apparently mostly of moderate permeability. Basal substratum usually quite permeable (rich in sands and gravels, with a variable silt component).
Ecological types	Range from base-rich to base-poor, eutrophic to oligotrophic, depending mainly on groundwater source and substratum characteristics. Most examples are base-rich/sub-neutral and mesotrophic.
Associated WETMECs	Often the main/only WETMEC. May form a narrow band along the upland margin, separating this from WETMEC 8.
Natural status	Many sites rather dry, usually due to direct or indirect drainage.
Use	Some are unmanaged, others grazed. Some may have been used for peat excavation. Some may have been converted to farmland, at least in part.
Conservation value	Mesotrophic, base-rich sites can support *Molinia caerulea–Cirsium dissectum* fen meadow (M24) (sometimes forming a SAC feature), or close relative. Patches of (rather dry) M9 or M13 occur in a few places. Occluded dykes may support wet fen plants or sometimes, a good development of aquatic species.
Vulnerability	Sites already partly or considerably damaged. Possible threat of further drying (some sites would be amenable to agricultural improvement). Dereliction and scrub colonisation can occur rapidly in the absence of management.

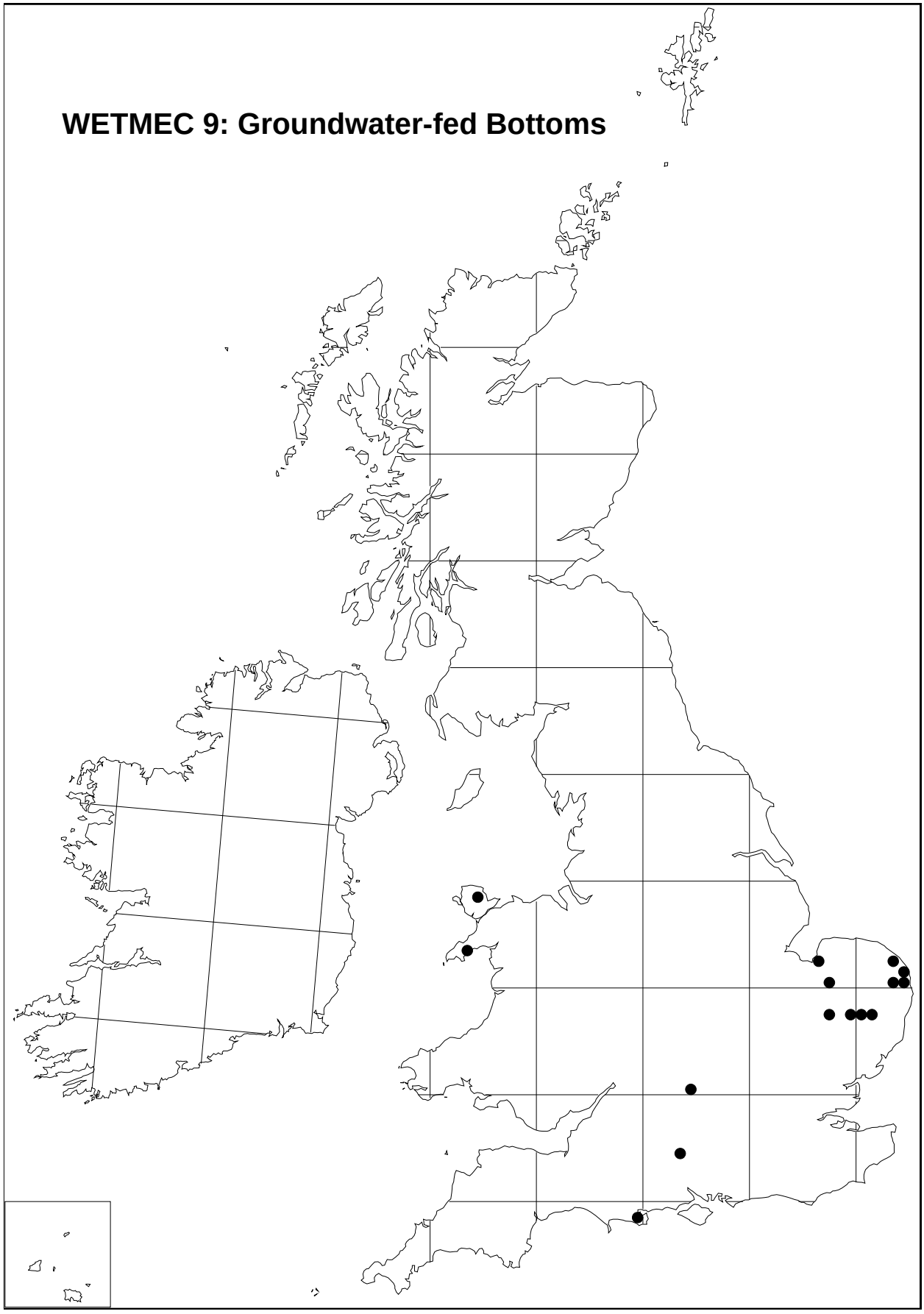


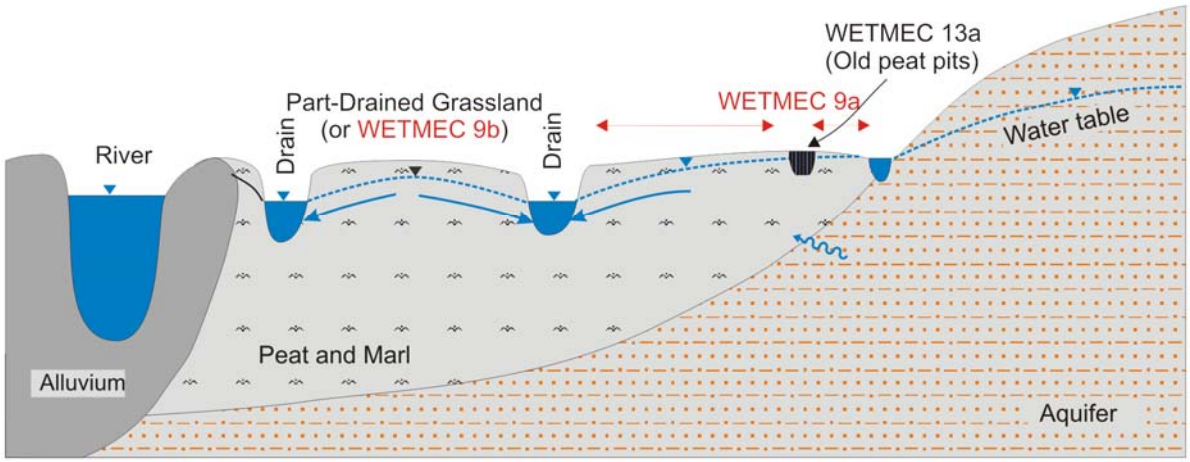
Figure 3.16 Distribution of examples of WETMEC 9 in sites sampled in England and Wales.

WETMEC 9: GROUNDWATER-FED BOTTOMS

WETMEC 9a: 'Wet' Groundwater Bottoms

(*e.g.* Thelnetham Fen)

- valley bottom is fed by groundwater
- highest water tables occur along upland margin, where hollows (old peat workings) can support locally very wet conditions
- partial drained of valley bottom and low river levels result in lower water tables away from the upland margin, and in some cases these areas support farmland
- marl layers within the peat may form local aquitards, but are not laterally extensive



WETMEC 9a: 'Wet' Groundwater Bottoms

(*e.g.* Poplar Farm Meadows)

- valley bottom is pump-drained and no longer normally receives episodic river flooding
- margin is fed by groundwater, where there appears to be localised upflow
- alluvial clays close to the river help to confine the aquifer locally and, when drained, provide a firm surface suitable for livestock

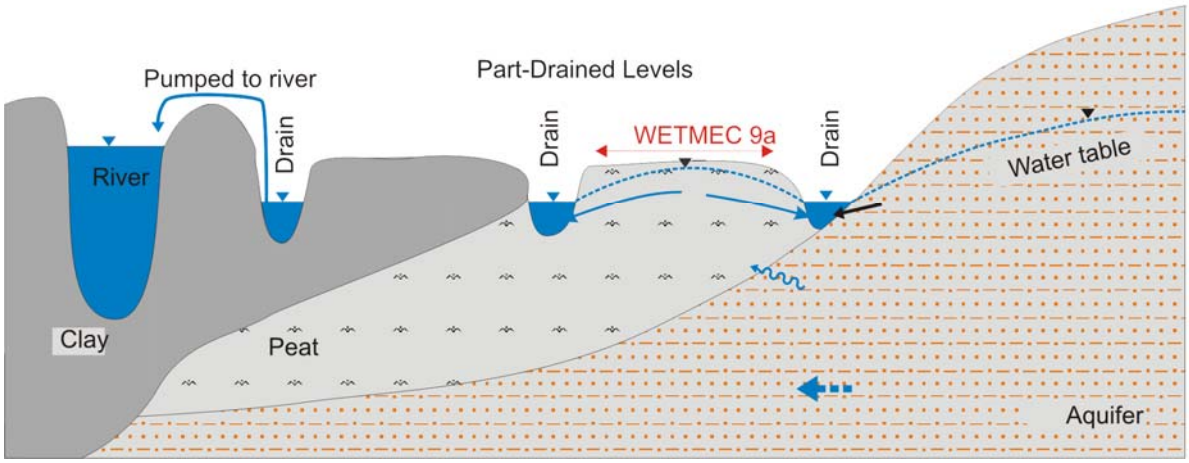


Figure 3.17 Schematic sections of Groundwater-Fed Bottoms (WETMEC 9).

3.10 WETMEC 10: Permanent Seepage Slopes

3.10.1 Summary characteristics

Situation	Mainly valleyheads (a few hillslopes, and sloping margins of floodplains and basins).
Size	Typically very small (< 1 ha, sometimes < 0.01 ha).
Location	Widespread in lowland England and Wales.
Surface relief	Usually sloping. Sometimes form small spring mounds. May have channels and hollows formed by spring flow.
Hydrotopography	Soligenous.
Water: *supply*	Groundwater (from semi-confined or unconfined bedrock or drift aquifers), issuing in springs and seepages.
regime	Consistently high water tables (just sub-surface), with water usually visible or oozing under foot, often coupled with considerable flow.
distribution	Upward or lateral flow through substratum, surface flow in runnels.
superficial	Sometimes have small, shallow pools; runnels are frequent.
Substratum	Mineral-enriched peat or thin, strongly organic mineral soils, often with sand, silt, marl or tufa. Basal substratum usually sand and gravel.
peat depth	If present, usually < 50 cm.
peat humification	Often strongly decomposed and humified except in some *Sphagnum*-dominated, base-poor examples.
peat composition	Sometimes too decomposed to identify many macrofossils, but examples can contain much hypnoid moss peat, sedge peat and brushwood peat, with *Sphagnum* peat in some base-poor examples.
permeability	Soils of variable permeability. Basal substratum normally apparently permeable.
Ecological types	Range from base-rich to base-poor, eutrophic to oligotrophic, depending mainly on groundwater source, but in some instances influenced by underlying substratum.
Associated WETMECs	Most often found with Intermittent and Part-Drained Seepages (WETMEC 11), occasionally adjoining Seepage Percolation Basins (WETMEC 13). WETMECs frequently found downslope include WETMECs 8, 9, 14, 15 and 16. Less often on slopes above or adjoining WETMECs 5, 6 and 7.
Natural status	Many examples have been partly disturbed (peat removal, part drainage) but water supply mechanism is essentially natural.
Use	Examples usually have no usage or are grazed; a few are mown (for conservation). Some examples (including oligotrophic types) are closely associated with intensive agriculture on adjoining land. Can be difficult to drain effectively, but some examples have been converted into farmland.
Conservation value	Oligotrophic examples, base-rich to base poor, generally support vegetation types of high value and are included in a number of SAC sites.
Vulnerability	Main threats include: dereliction; reduction of groundwater level through drainage or groundwater abstraction; agricultural enrichment.

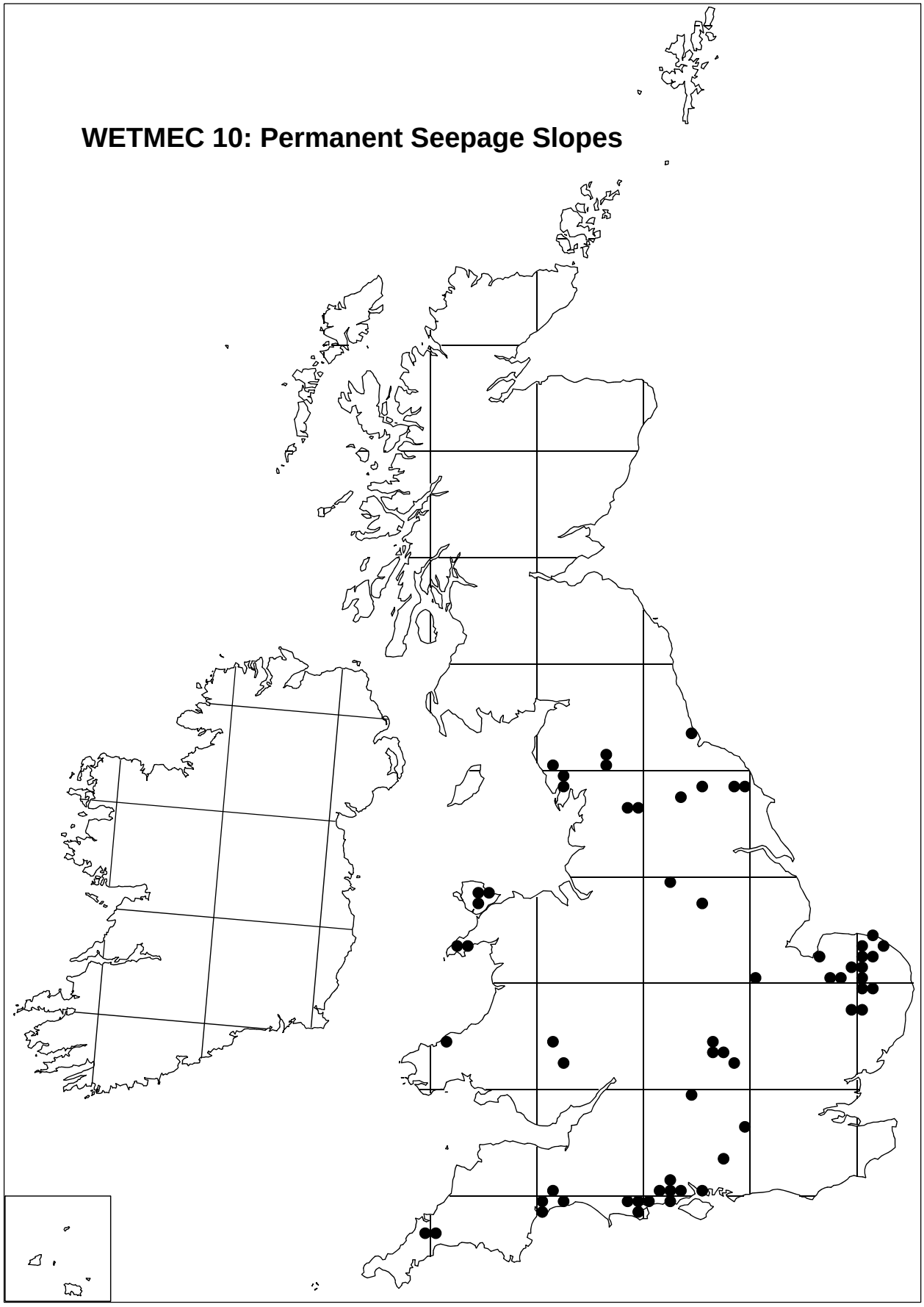
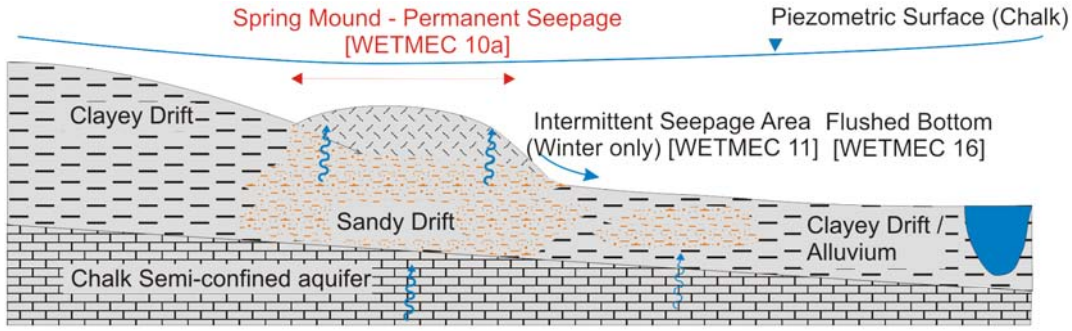


Figure 3.18 Distribution of examples of WETMEC 10 in sites sampled in England and Wales.

WETMEC 10: PERMANENT SEEPAGE SLOPES
[see also WETMEC 11]

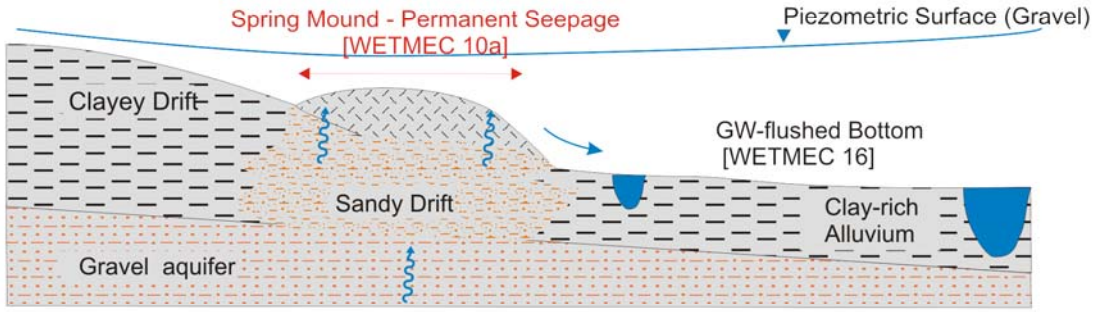
WETMEC 10a: Localised strong seepages
Semi-confined, artesian, e.g. Badley Moor

- strong upflow associated with formation of a (tufa-based) spring mound
- outflow trickles downslope across a low permeability deposit (sometimes percolating through a shallow peat 'aquifer')
- valley floor may contain lenses of more permeable material, which support intermittent groundwater upflow



WETMEC 10a: Localised strong seepages
Semi-confined, artesian Drift minor aquifer, e.g. Clack Fen, Drayton Parslow Fen

- strong upflow associated with formation of a spring mound (inwashed silt and sand)
- outflow trickles downslope across a low permeability deposit (sometimes percolating through a shallow peat 'aquifer')
- interceptor drain often dug along base of seepage to help create a 'dry' valley bottom



WETMEC 10a: Localised strong seepages
Strong gravitational outflow, *e.g.* Sutton Fen

- strong outflow associated with flow paths in aquifer
- outflow trickles downslope across a low permeability deposit (sometimes percolating through a shallow peat 'aquifer')
- interceptor drain may be dug along base of seepage to help create a 'dry' valley bottom

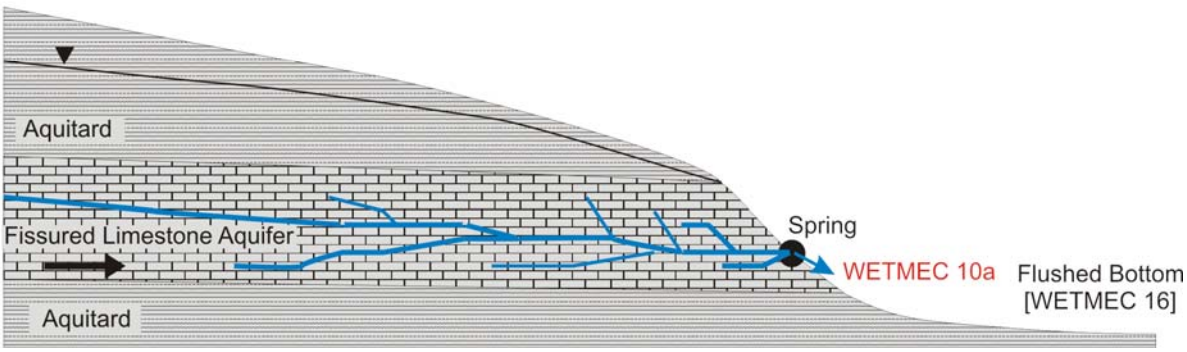


Figure 3.19 Schematic sections of types of Permanent Seepage Slopes (WETMEC 10).

3.11 WETMEC 11: Intermittent & Part-Drained Seepages

3.11.1 Summary characteristics

Situation	Mainly valleyheads (a few hillslopes), sometimes margins of floodplains or basins.
Size	Often small (< 1 ha), but some quite large examples occur.
Location	Widespread, but mostly sampled from Eastern and Southern England.
Surface relief	Most sloping, some more or less flat. Sometimes with channels and hollows formed by spring flow.
Hydrotopography	Soligenous.
Water: ***supply***	Groundwater (from semi-confined or unconfined bedrock or drift aquifers).
regime	Water table variable but well below surface in summer or year round.
distribution	Upward or lateral flow through substratum, sometimes flow in seasonal runnels.
superficial	Some examples have shallow temporary pools and seasonal runnels; some are crossed or bordered by water-filled drains or dykes.
Substratum	Mineral-enriched peat or thin, strongly organic mineral soils, often with sand, silt, marl or tufa. Basal substratum may be sand and gravel (with variable amounts of silt), sometimes clay, tufa and marl.
peat depth	If present, usually shallow (< 50 cm). Deeper examples are usually in part-drained locations (and transitional to other WETMECs, such as 8 and 9).
peat humification	Usually strongly decomposed and well humified.
peat composition	Often too decomposed to identify many macrofossils, but examples can contain much hypnoid moss peat, sedge peat and brushwood peat, with *Sphagnum* peat in some base-poor examples.
permeability	Soils and basal substratum vary from quite high to low permeability.
Ecological types	Range from base-rich to base-poor, eutrophic to oligotrophic, depending mainly on groundwater source and substratum characteristics.
Associated WETMECs	Has been recorded in association with numerous other groundwater-fed WETMECs but is particularly found alongside, or above, Permanent Seepage Slopes (WETMEC 10). Can be the only WETMEC in some sites.
Natural status	Sometimes uncertain, but many examples have been partly disturbed (peat removal, part drainage); water supply mechanism may be natural or a product of (part-) drainage and so on.
Use	Examples usually have no usage or are grazed (sometimes for conservation). Some examples (including oligotrophic types) are closely associated with intensive agriculture on adjoining land. Some have been drained and converted into agricultural land.
Conservation value	Oligotrophic examples, base-rich to base poor, are generally of high value and include a number of SAC habitats.
Vulnerability	Main threats include: dereliction; further reduction of groundwater level through drainage or groundwater abstraction; agricultural enrichment.

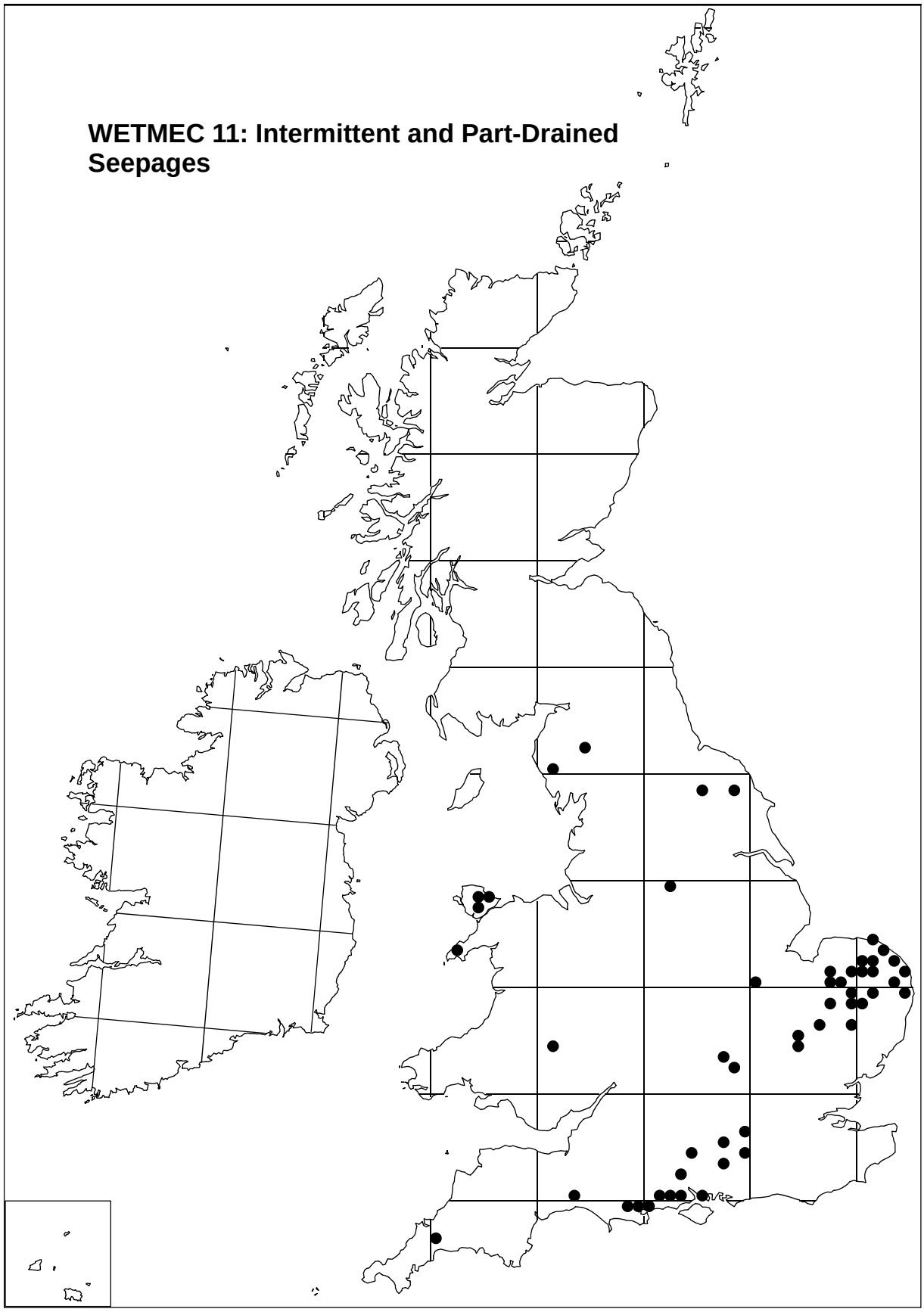
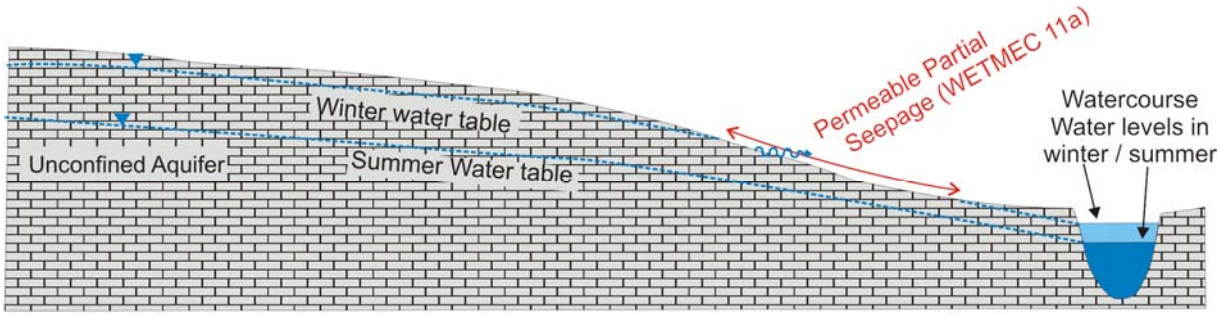


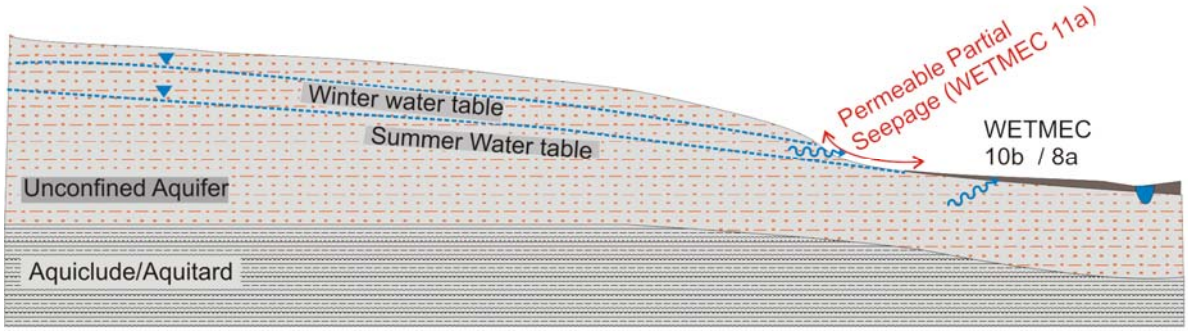
Figure 3.20 Distribution of examples of WETMEC 11 in sites sampled in England and Wales.

WETMEC 11: INTERMITTENT & PART-DRAINED SEEPAGES
[see also WETMEC 10]

WETMEC 11a: Permeable Partial Seepages
(*e.g.* Bunwell Common Aslacion)
- mire developed entirely over a permeable substratum
- winter outflow of groundwater on valley slopes, but ± permanently shallow sub-surface elsewhere
- watercourse level provides an important control on the water table, and some sites appear to have been permanent seepages (WETMEC 10b) prior to deepening of watercourse channels



WETMEC 11a: Permeable Partial Seepages
(*e.g.* Beeston Bog)
- mire developed entirely over a permeable substratum, but with aquitard at depth
- winter-only outflow of groundwater along much of valley slopes, but with ± permanent seepages along the bottom of the slopes in at least some locations
- water level in valley bottom reflects aquifer level



WETMEC 11a: Permeable Partial Seepages
(*e.g.* Thursley Common)
- winter outflow of groundwater on valley slopes
- some summer-water outflow at junction between permeable material and local aquitard, with local development of a permanent seepage face on the lower slopes
- summer water outflow supplies a valley-bottom mire, developed mostly over an aquitard

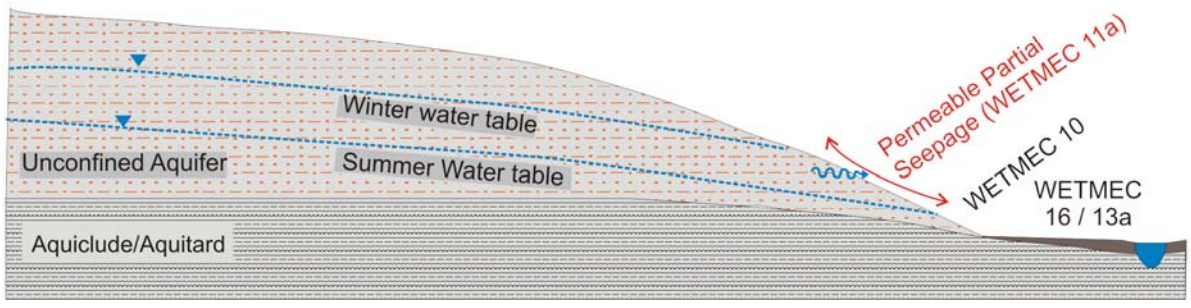


Figure 3.21 Schematic sections of types of Intermittent & Part-Drained Seepages (WETMEC 11).

3.12 WETMEC 12: Fluctuating Seepage Basins

3.12.1 Summary characteristics

Situation	Either in valleyheads or as small basins within drier ground (sometimes part of a 'pingo field').
Size	Typically small (< 1 ha), but some larger, coalesced examples occur.
Location	Most examples were in Eastern England.
Surface relief	Shallow basins, often with (shallow) standing water for some or all of the year, or filled with almost flat, more or less even accumulations of unflooded peat.
Hydrotopography	Topogenous, shallow basins.
Water: ***supply***	Groundwater (from semi-confined or unconfined bedrock or drift aquifers). In some cases aquifers may be small and local. Some basins have small surface water inflows.
regime	Water table is variable depending on topography and aquifer level; fluctuates strongly.
distribution	Upward or lateral flow into basin, perhaps sometimes seasonal outflow from the basin. Some basins may show little water exchange with the aquifer and there may not be a strongly dominant direction of water flow.
superficial	Shallow pools with fluctuating water surface. Sometimes a seasonally or permanently sub-surface water table.
Substratum	Shallow peat and organic material, sometimes over thin lake muds. Base may be a sand, silt, or clay-like material.
peat depth	If present, mostly shallow (< 50 cm).
peat humification	Usually well-humified and rather amorphous, but occasional exceptions.
peat composition	Few data available. *Carex* peat is a main component in some basins.
permeability	Hydroseral infill may be quite permeable, but many deposits are more consolidated. Basal substratum varies from sandy material to clay.
Ecological types	Range from base-rich to acidic, eutrophic to oligotrophic, depending on groundwater source, substratum characteristics and, in some cases perhaps, small surface water inflows.
Associated WETMECs	Basins may be adjoined (or surrounded) by Intermittent And Part-Drained Seepages (WETMEC 11), but some occur as isolated units. Permanent Seepage Slopes (WETMEC 10) and Seepage Percolation Basins (WETMEC 13) occasionally occur in the same sites as WETMEC 12.
Natural status	Basins are late-glacial landscape features, but the status of their contents is uncertain. Peat *may* have been removed from many sites. Some have been modified by drainage and perhaps by a reduction of aquifer levels.
Use	Mostly too wet to have any substantial use, though some are partially grazed. A few may once have been cleared and used for fish ponds.
Conservation value	Well-developed vegetation zonation is notable in some sites; tend to be quite species-poor but may support SAC habitats. Some rare inverts.
Vulnerability	Threats may include: dereliction and hydroseral succession, reduction of GW level through drainage, GW abstraction and perhaps evapotranspiration; a few may be vulnerable to enrichment from small surface water inflows.

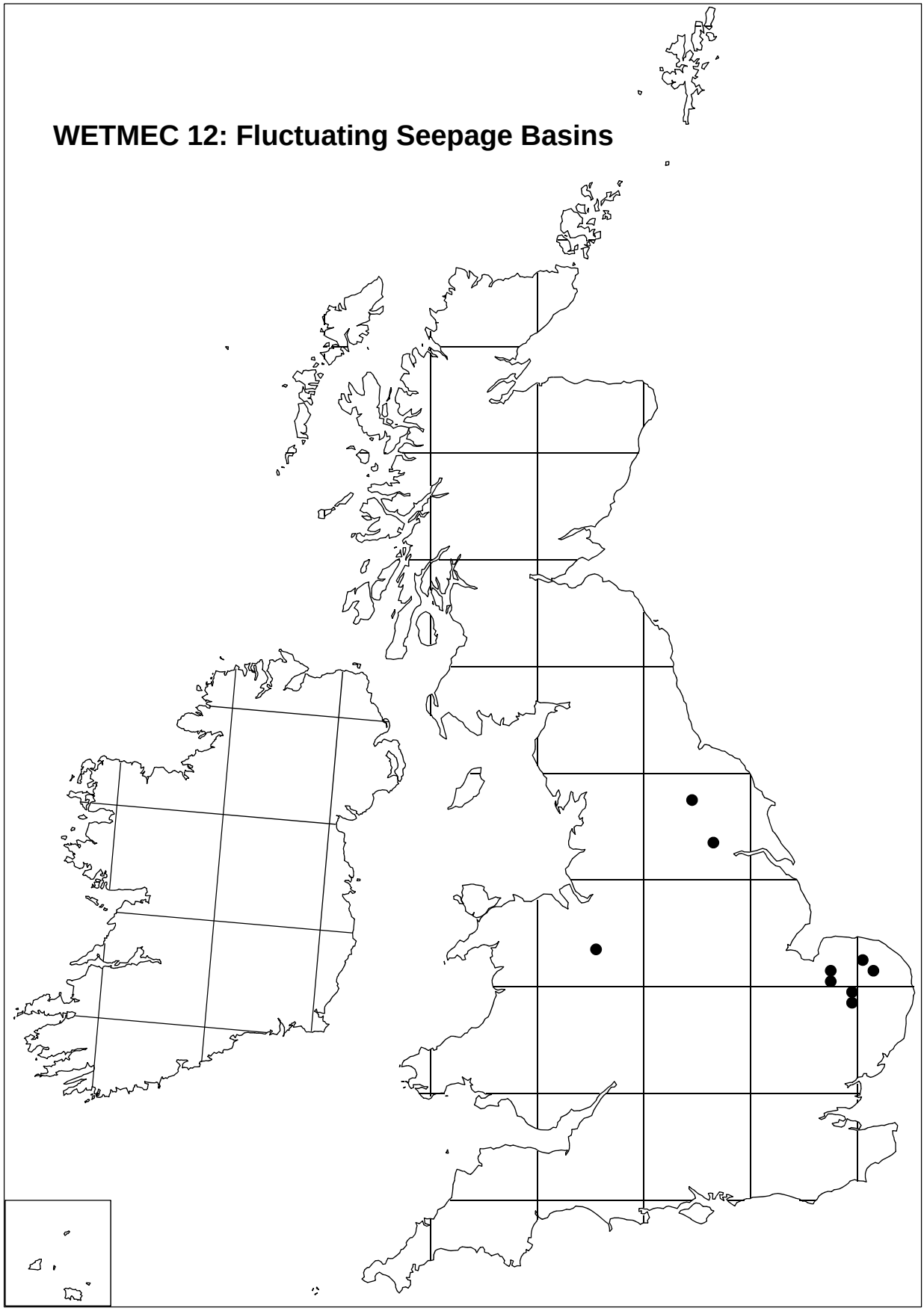


Figure 3.22 Distribution of examples of WETMEC 12 in sites sampled in England and Wales.

WETMEC 12: Fluctuating Seepage Basin
(*e.g.* Foulden Common)

- water level in 'basin' is essentially an expression of the level of the water table in the aquifer, and fluctuates with this
- basins may have no natural surface inflows and outflows, or the outflow has been dug (or deepened)
- the degree to which basins dry out depends partly on their depth in relation to the aquifer water table - deeper examples may have some permanently open water, except in exceptional conditions.
- some basins may be situated upon low permeability material so their water table is not always immediately responsive to fluctuations in the groundwater table.

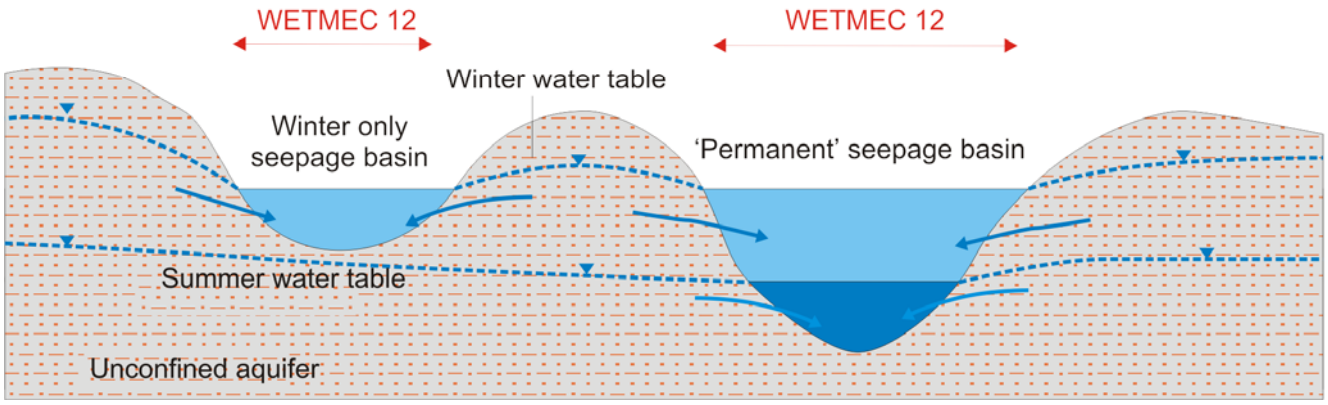


Figure 3.23 Schematic section of a Fluctuating Seepage Basin (WETMEC 12).

3.13 WETMEC 13: Seepage Percolation Basins

3.13.1 Summary characteristics

Situation	Basins, valleyhead basins, river floodplains (mostly margins), soligenous seepages (rare and very small).
Size	Mostly small (<10 ha) basins; some tiny examples embedded in seepages.
Location	Widespread in survey area, but generally uncommon.
Surface relief	Even (appears more or less flat, but gently slopes to river or outfall).
Hydrotopography	Rheo-topogenous.
Water: *supply*	Groundwater.
regime	Water table typically near surface, especially where the surface is buoyant, but can be quite variable.
distribution	Upflow or lateral near-surface flow.
superficial	May contain shallow pools or adjoin a groundwater-fed water body.
Substratum	Unconsolidated muds or peat (sometimes over lake marl). Peat sometimes has bands of calcite but not normally much other mineral material. Sometimes floored by a sandy deposit, but mostly underlain by silts/clays.
peat depth	Sometimes shallow but often deep (2–4 m).
peat humification	Upper layer is buoyant or loose and fresh, often a hydroseral infill. Underlying peat varies in humification. Where present, thick basal peats are typically strongly humified and solid.
peat composition	Variable. Loose upper layers most typically herbaceous–moss peat (mainly hypnoid mosses, or *Sphagnum* in less base-rich contexts), but may also be sedge, reed or brushwood peat. Moss peat is sometimes quite thick. In floodplains, basal peats are often dense brushwood peats.
permeability	Surface layer mostly of high to moderate permeability. Basal substrata often of moderate to low permeability.
Ecological types	Range from base-rich to base-poor, eutrophic to oligotrophic, depending mainly on groundwater source and substratum characteristics. Most examples are base-rich/sub-neutral and eutrophic/mesotrophic.
Associated WETMECs	May be adjoined by WETMEC 10 or WETMEC 11 sites on marginal slopes. Tiny examples are sometimes embedded within seepages. In floodplains, can grade riverwards into WETMEC 5 or WETMEC 6 sites.
Natural status	Some Seepage Percolation Basins appear to be more or less natural, but many examples are associated with reflooded turbaries.
Use	Many are former peat workings. A few support top-quality reedbeds. Some are unmanaged. Some former examples have been converted to farmland, at least in part.
Conservation value	Important mainly for oligotrophic/mesotrophic semi-floating vegetation (SAC habitat) and reedbeds (mainly birds and invertebrates).
Vulnerability	Main threat to some floodplain examples has been indirect drainage (river deepening), but also vulnerable to reduction in groundwater supply. Many examples are subject to dereliction and hydroseral succession. The latter can be associated with consolidation or acidification of buoyant surfaces.

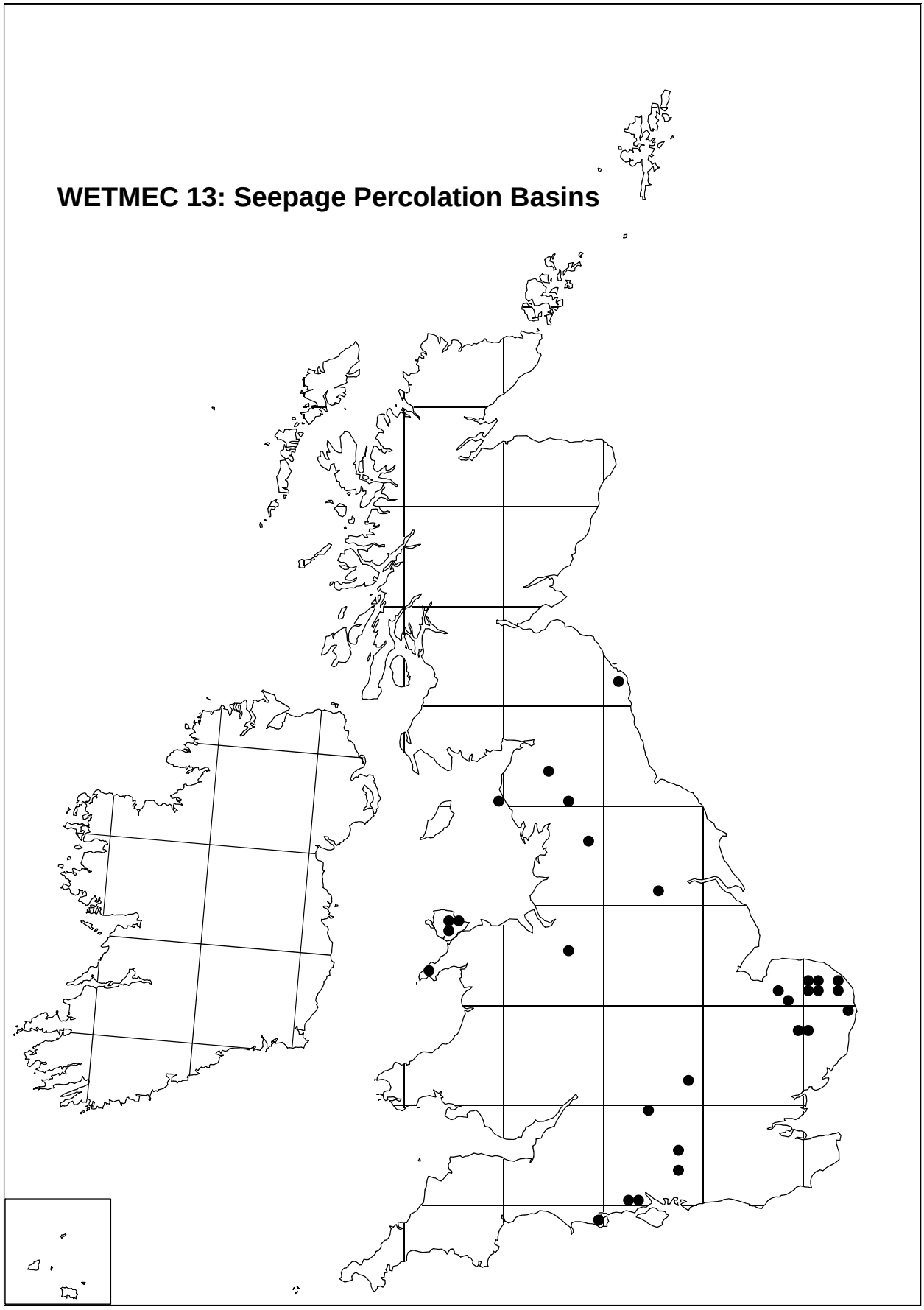


Figure 3.24 Distribution of examples of WETMEC 13 in sites sampled in England and Wales.

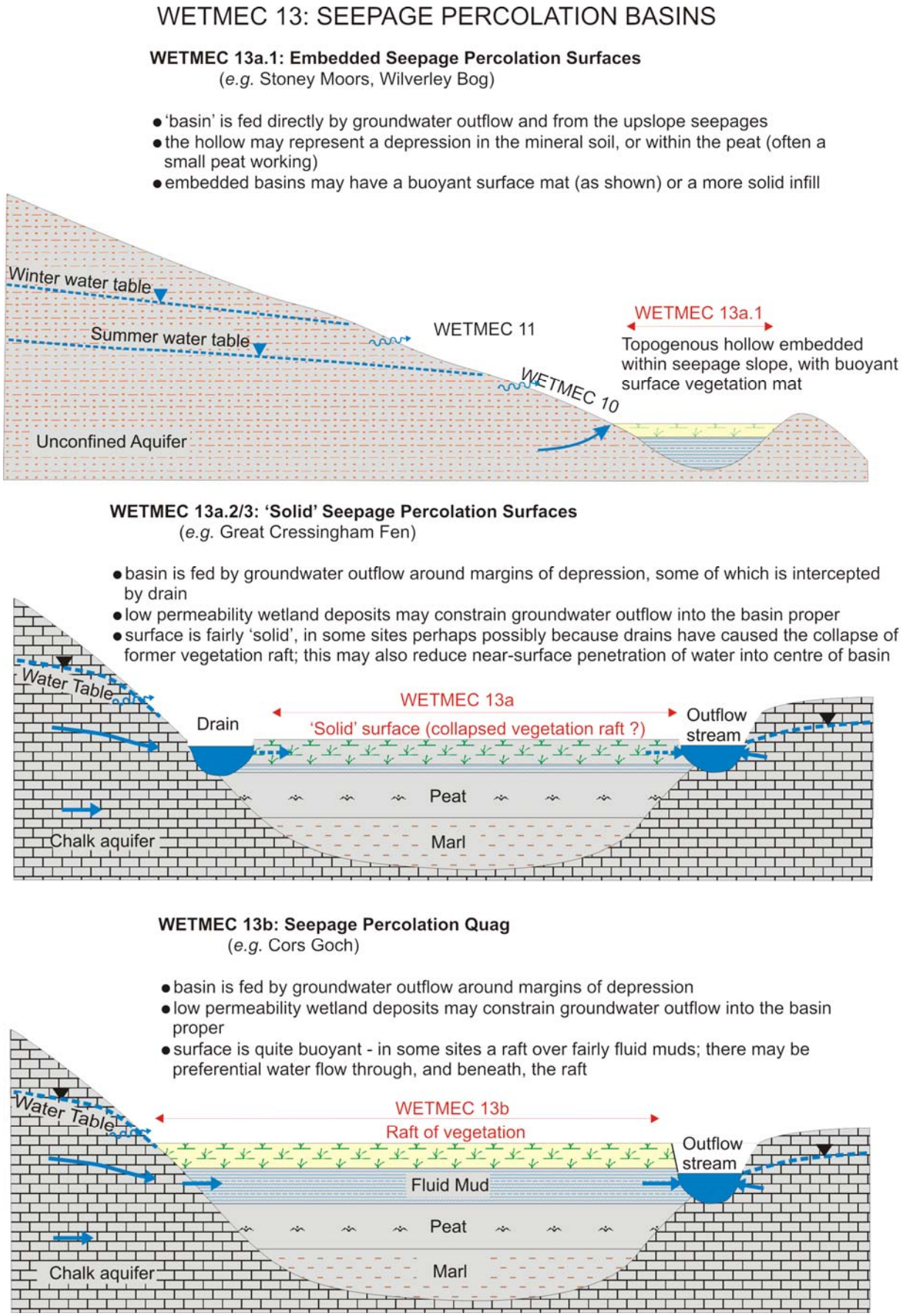


Figure 3.25 Schematic sections of types of Seepage Percolation Surface and Seepage Percolation Quag (WETMEC 13).

3.14 WETMEC 14: Seepage Percolation Troughs

3.14.1 Summary characteristics

Situation	Mostly valleyheads, some troughs, basins and floodplain margins. Occasionally in (large) former peat workings.
Location	Quite widespread. Most examples from Southern England (especially New Forest), but also from East Anglia, Wales and elsewhere.
Size	Flattish mire expanses, gently sloping down the length of broad valleyhead bottoms.
Surface relief	Mostly more or less flat surface (sometimes sloping), in narrow to broad flats and troughs, with a spongy, sometimes quaking surface.
Hydrotopography	Rheo-topogenous.
Water: ***supply***	Groundwater springs and seepages, often outflow from an adjoining groundwater-fed WETMEC. Often some surface water inflow, but probably of little significance to summer water levels.
regime	Consistently wet, with water table at or near the surface for much of the year.
distribution	Longitudinal flow along trough, with some lateral inflow from flanks; probable upflow in some cases.
superficial	Small pools and, sometimes, small water channels.
Substratum	Soft upper layer, most often underlain by a more consolidated surface. Basal material ranges from sands and gravels to silts and clays.
peat depth	Variable; typically < 2 m, but some deeper examples.
peat humification	Usually with a shallow (0.5 m) spongy surface; underlying peat, when present, usually more humified and often solid, especially lower down.
peat composition	Mostly monocot or *Sphagnum* peat. Wood peat in some examples.
permeability	Upper peat variable, but mostly quite permeable. Basal substratum mostly with moderate permeability characteristics.
Ecological types	Oligotrophic, acidic to eutrophic, sub-neutral.
Associated WETMECs	Mostly flanked by other WETMECs, especially WETMEC 10 (upslope) and 15 (downslope); sometimes drains into sumps with WETMEC 13.
Natural status	Many examples appear to form a natural persistent state, but the role of grazing in preventing tree colonisation is uncertain.
Use	Conservation. Light grazing. Some occupy former turbaries.
Conservation value	Species diversity is generally rather low, partly because of the intrinsically small species richness of base-poor mires, but has quite a large species total and includes some nationally uncommon species; may support an SAC habitat.
Vulnerability	Direct and indirect drainage. Groundwater enrichment.

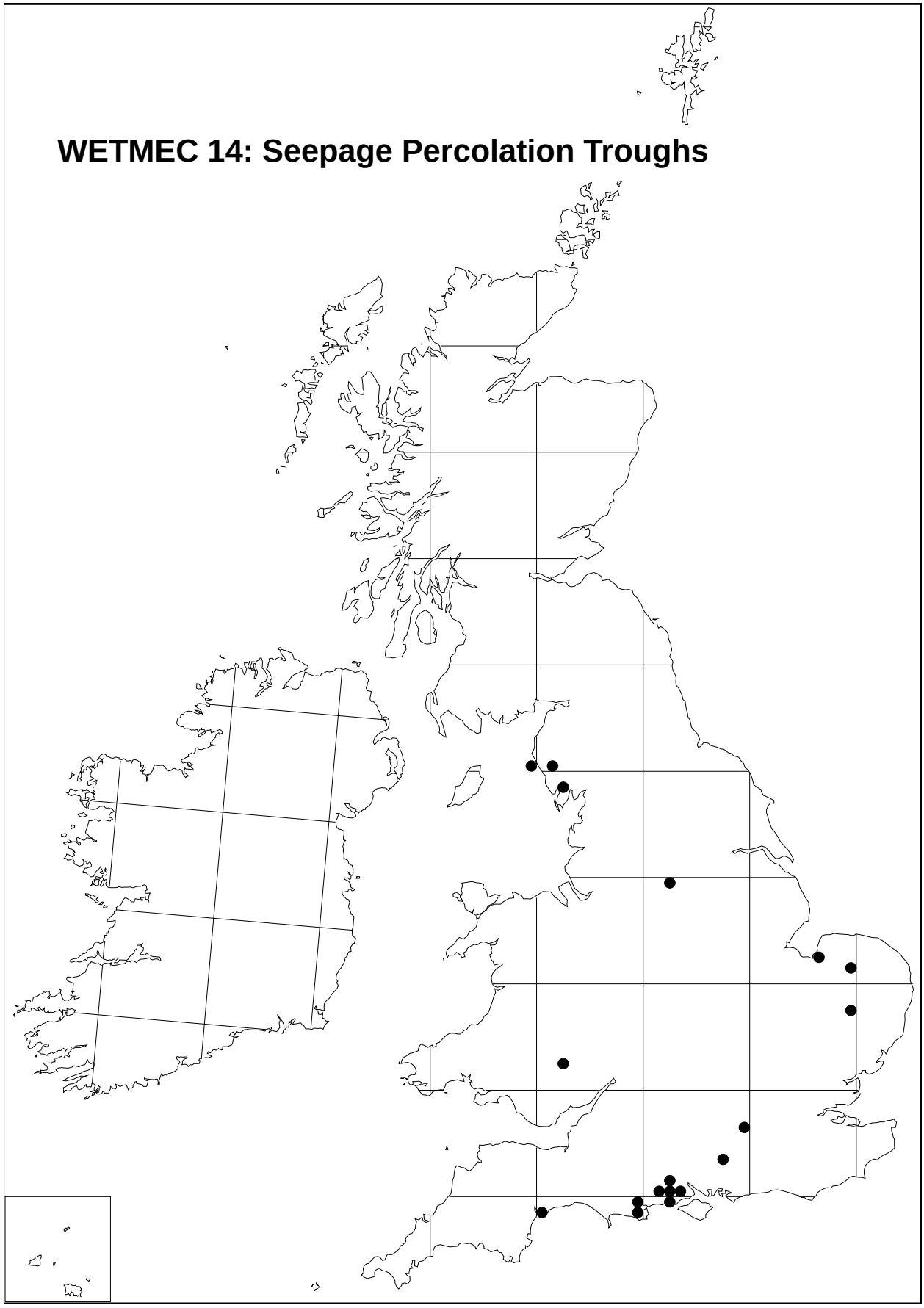
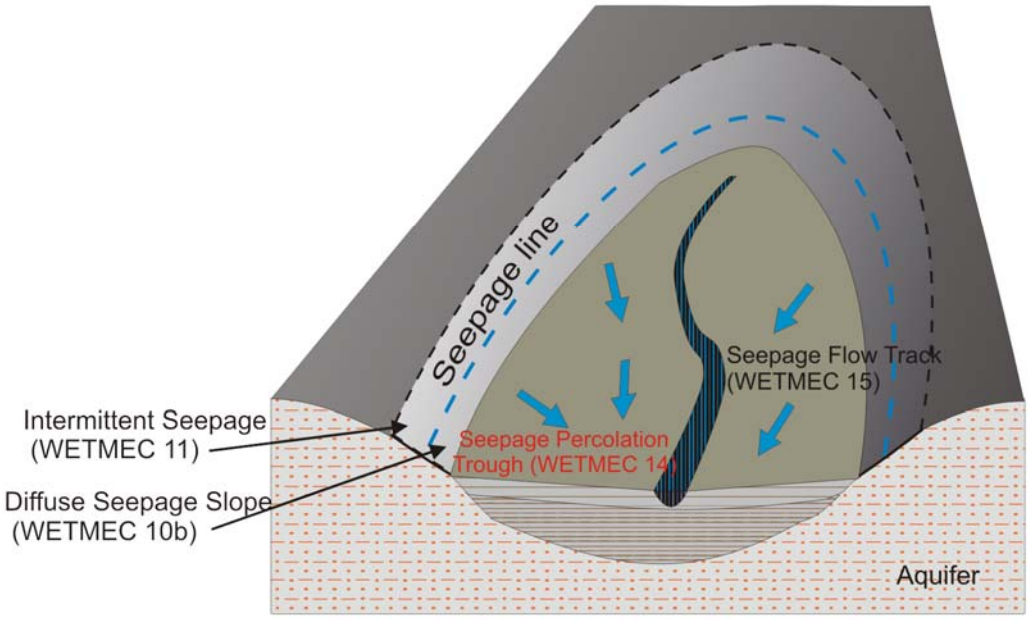
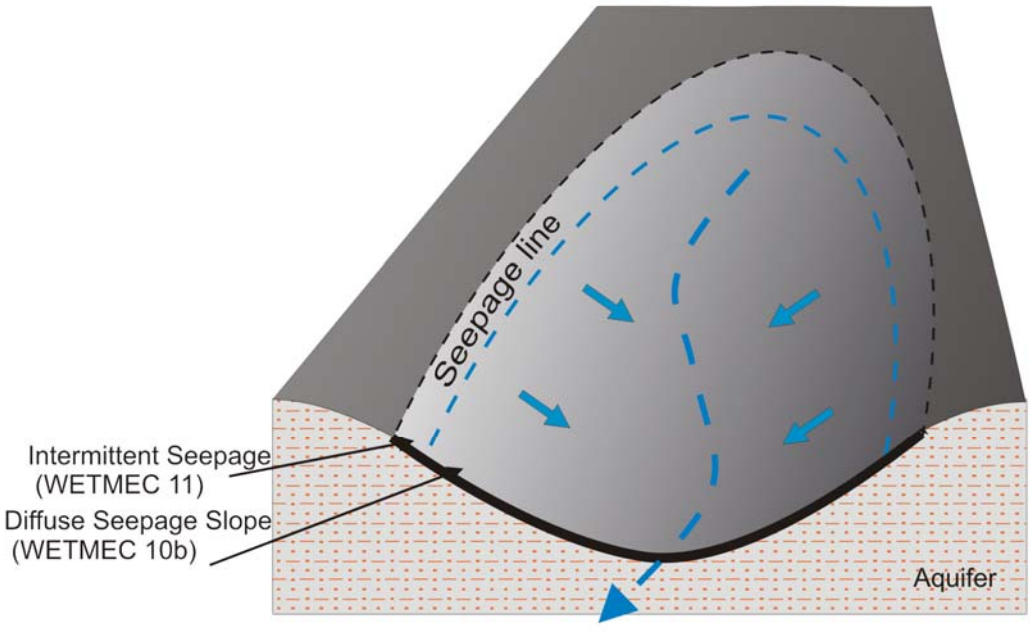


Figure 3.26 Distribution of examples of WETMEC 14 in sites sampled in England and Wales.

WETMEC 14: SEEPAGE PERCOLATION TROUGHS



(a) Peat filled valleyhead Seepage Percolation Trough. Example shown has loose peat surface (through which most water flow probably occurs) over denser peat, but in other examples almost all the infill may be 'loose'. Other examples may also have a basal aquitard with constrained groundwater upflow.



(B) Valleyhead trough with the Seepage Percolation and Soakway components absent or poorly developed (*e.g.* Scarning Fen). Some of these valleyheads *may* represent former examples of Seepage Percolation Troughs (a), which have been drained and stripped of much of their peat infill.

Figure 3.27 Schematic representation of Seepage Percolation Troughs (WETMEC 14).

3.15 WETMEC 15: Seepage Flow Tracks

3.15.1 Summary characteristics

Situation	Mostly valleyheads, some troughs, basins and groundwater-fed laggs (of raised bogs). Some examples in peat workings.
Location	Quite widespread. Most examples from Southern England (especially New Forest), but also from East Anglia, Wales and elsewhere.
Size	Usually fairly narrow linear features, < 20 m width to > 1 km length.
Surface relief	Narrow flats and troughs, soakways with a (often buoyant) more or less continuous vegetation mat, water tracks with much open water. Often with a visible slope.
Hydrotopography	Rheophilous.
Water: *supply*	Groundwater, partly *via* adjoining WETMECs; often some surface water.
regime	Water table consistently at (or just above) surface.
distribution	Longitudinal flow along trough, with some lateral flow from flanks; possibly upflow in some cases. Water flow often visible.
superficial	Water channels, sometimes braided or otherwise mosaiciform, in the case of water tracks.
Substratum	Most often a buoyant surface (water and liquid muds, sometimes over more solid peat) but sometimes more consolidated. Basal material ranges from sands and gravels to silts and clays.
peat depth	Typically shallow (< 1 m), but some deeper examples.
peat humification	Usually with a shallow (0.5 m) spongy or semi-floating surface (soakways) or open water (water tracks); any underlying peat may be semi-liquid, but can be more humified and often quite solid, especially lower down.
peat composition	Mostly monocot or *Sphagnum* peat. Wood peat in some examples.
permeability	Uppermost peat usually with high permeability characteristics, but may be more consolidated further down. Basal substratum variable, but mostly with moderate to low permeability characteristics.
Ecological types	Oligotrophic, acidic to eutrophic, base-rich.
Associated WETMECs	Mostly flanked by other WETMECs, especially WETMEC 14 or 10 (sometimes 17). Sometimes drains into sumps with WETMEC 13.
Natural status	Many examples appear to form a natural persistent state, but some are in occluded drains or flooded peat workings.
Use	Conservation. Generally too wet for easy access. Some occupy former turbaries.
Conservation value	Species diversity is generally rather low but has quite a large species total and a number of nationally uncommon species; examples may support SAC habitats. Sometimes provides a relatively base-rich element within otherwise base-poor mires.
Vulnerability	Direct drainage. Damming can pond back water and adversely affect this and flanking WETMECs. May be affected by changes in groundwater quality.

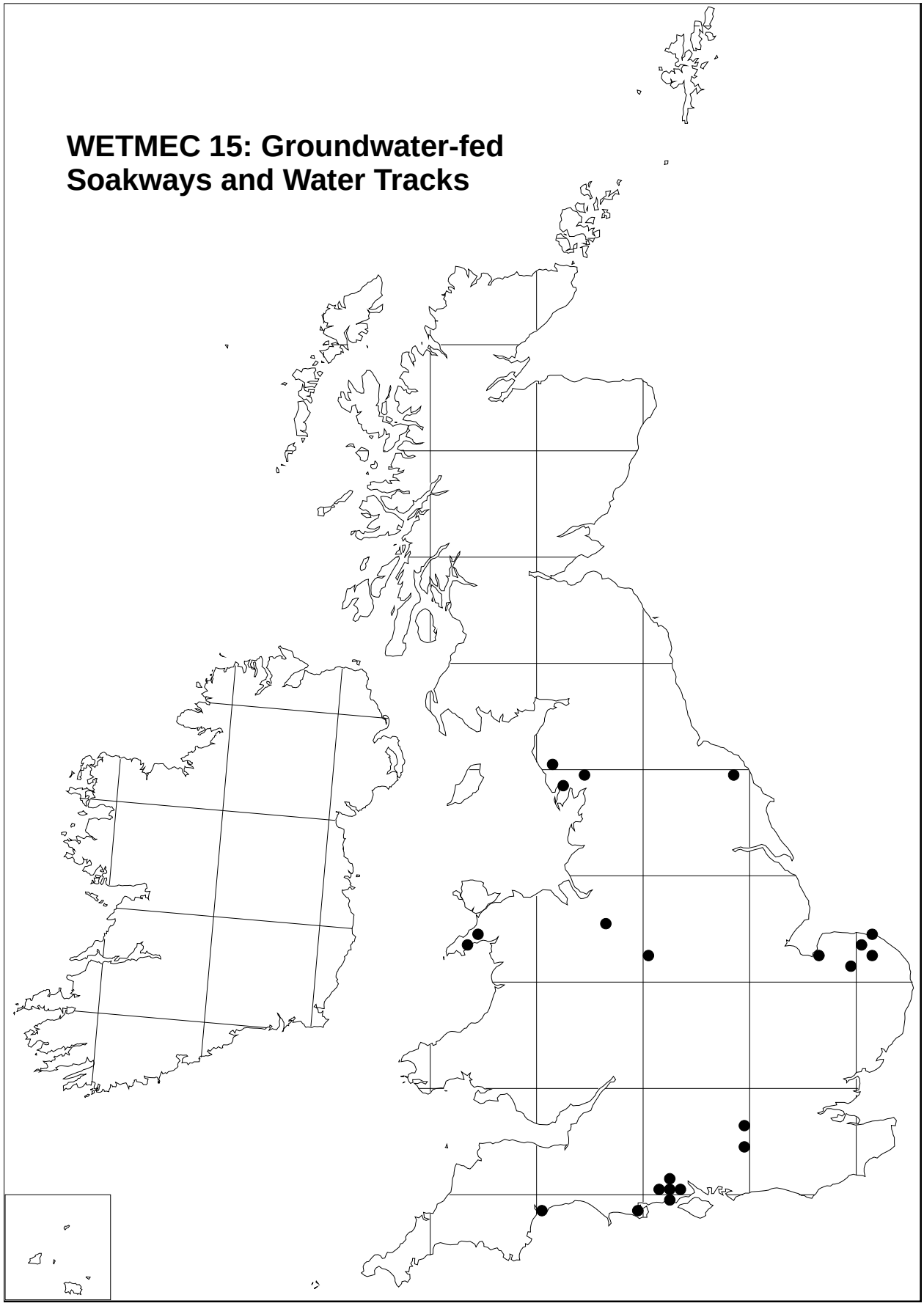


Figure 3.28 Distribution of examples of WETMEC 15 in sites sampled in England and Wales.

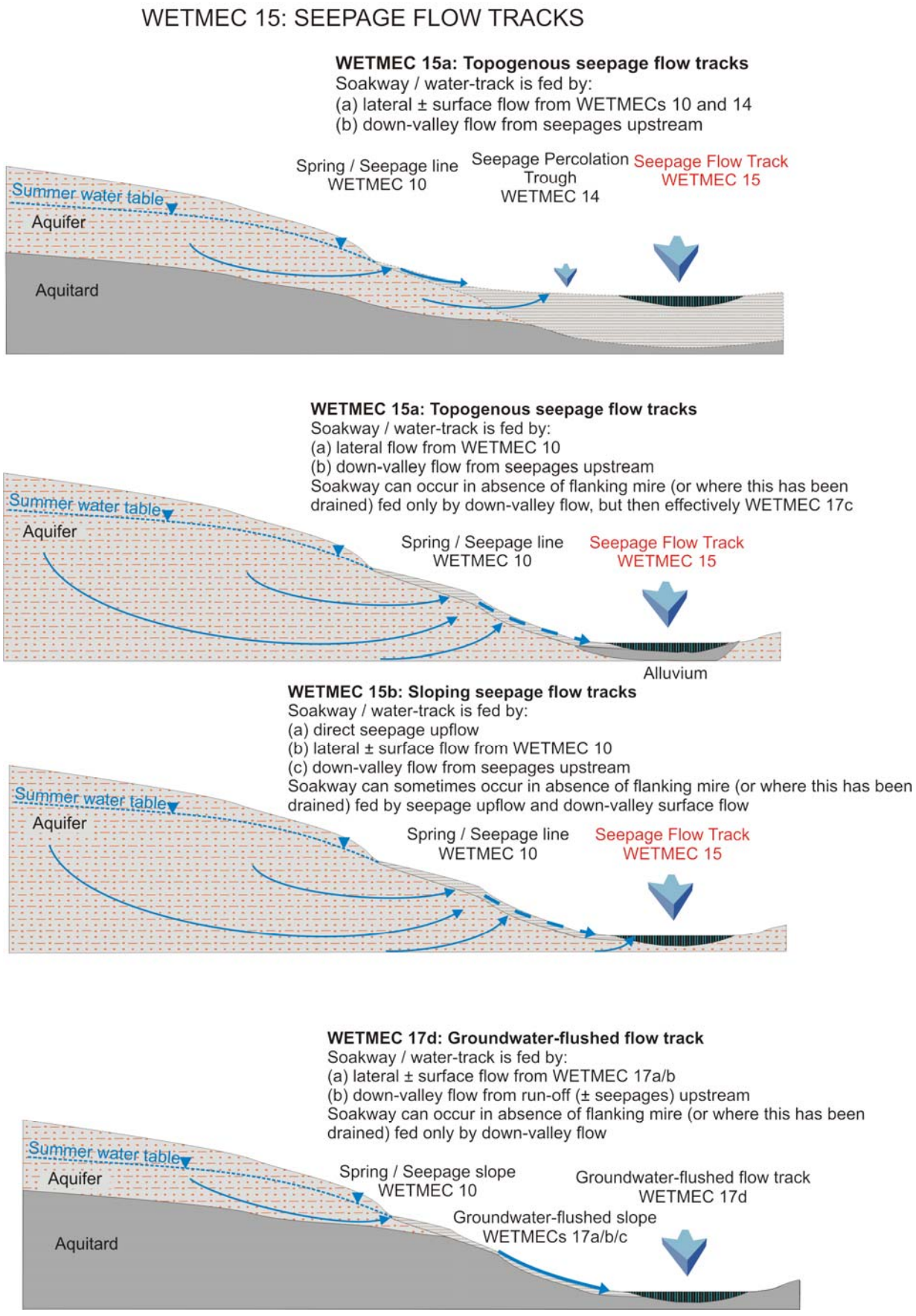


Figure 3.29 Schematic sections of types of Seepage Flow Tracks (WETMEC 15).

3.16 WETMEC 16: Groundwater-Flushed Bottoms

3.16.1 Summary characteristics

Situation	Majority in valleyheads, some in troughs, basins, floodplains and coastal plains.
Location	Most examples are from Southern England, but also from East Anglia, Wales and elsewhere. More widespread than WETMEC 14.
Size	Small (< 1 ha) to very large (> 120 ha – Leighton Moss), flattish mire expanses, on narrow-broad valleyhead bottoms, basins and flats.
Surface relief	Narrow to broad flats and troughs, sometimes with a spongy, occasionally quaking, surface.
Hydrotopography	Rheo-topogenous.
Water: ***supply***	Springs and seepages, sometimes from an adjoining WETMEC. Often some surface water inflow, but probably of little significance to summer water levels.
regime	Summer water table can be low, but often near surface, and sometimes above surface.
distribution	Longitudinal flow along trough, with some lateral inflow from flanks; no evidence for groundwater upflow.
superficial	Small pools and, sometimes, small water channels in wetter examples, sometimes with evident flow tracks (WETMEC 15).
Substratum	Soft upper layer, sometimes underlain by a more consolidated surface, or solid upper layer of PAL. Basal material typically silts and clays.
peat depth	Generally fairly thin (mean = 1 m), but some deeper examples.
peat humification	Shallow (0.5 m) spongy surface, often little humified when present; underlying peat, when present, usually more humified and often solid, especially lower down.
peat composition	Variable: mostly monocot or *Sphagnum* peat, but amorphous in some examples. Wood peat in some examples.
permeability	Peat permeability characteristics are very variable. Basal substratum has low-permeability characteristics.
Ecological types	Oligotrophic, acidic to eutrophic, base-rich.
Associated WETMECs	Mostly flanked by other WETMECs, especially WETMEC 10, 11 or 17 (upslope) and 15 (downslope).
Natural status	Some examples *may* form a natural persistent state, but others depend on grazing to keep their character.
Use	Conservation. Light grazing. Some occupy former turbaries.
Conservation value	Species diversity is often fairly low, either because of the intrinsically small species richness of base-poor mires or because many base-rich examples are quite productive and rank. However, may support examples of SAC habitats.
Vulnerability	Direct and indirect drainage. Groundwater enrichment.

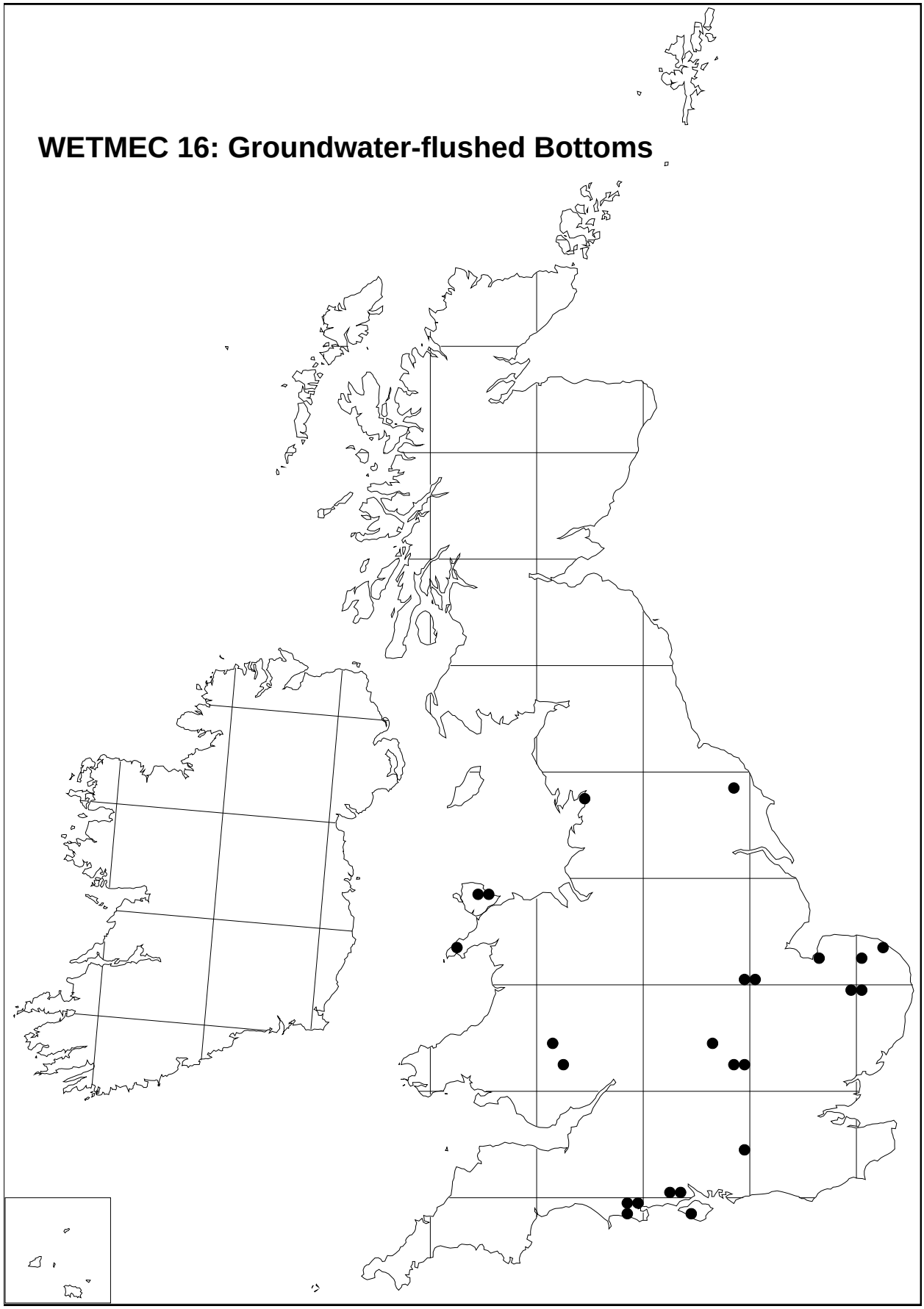
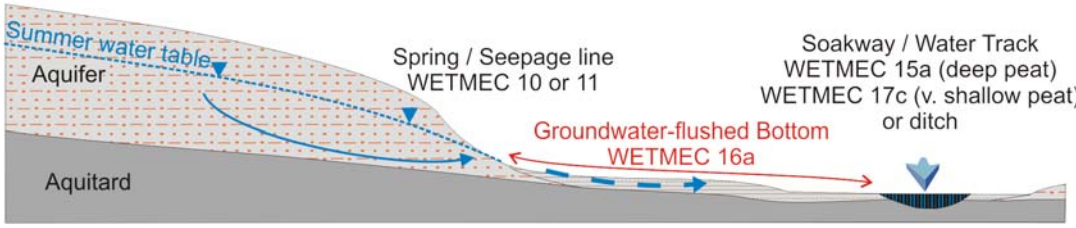


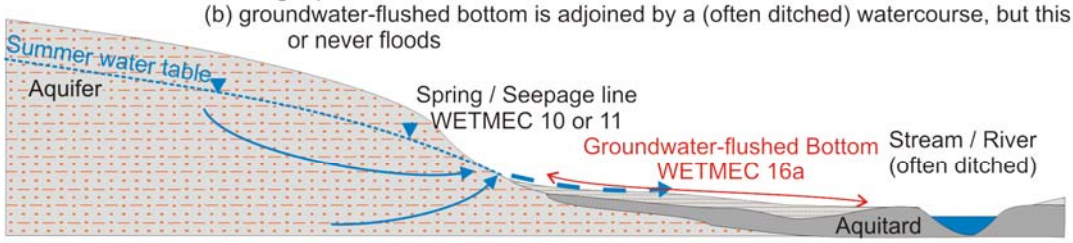
Figure 3.30 Distribution of examples of WETMEC 16 in sites sampled in England and Wales.

WETMEC 16: GROUNDWATER-FLUSHED BOTTOMS

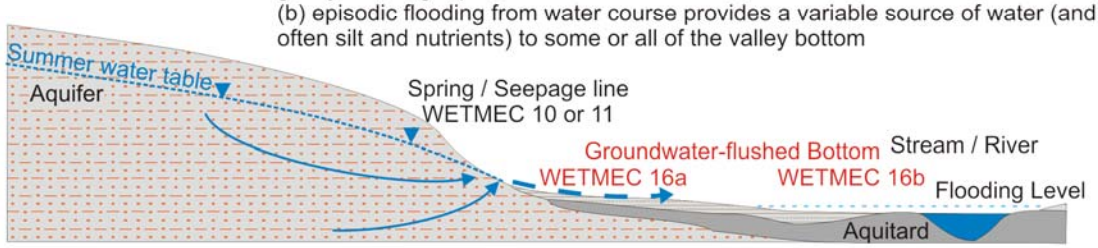
WETMEC 16a: Groundwater-flushed Bottom
(*e.g.* Dersingham Bog, Thursley Common)
(a) lateral flow from seepage line (sometimes with band of WETMEC 10) across gently-shelving aquitard
(b) water flow may collect to form a soakway or water track, or into a drain



WETMEC 16a: Groundwater-flushed Bottom
(*e.g.* Syresham Marshy Meadows)
(a) lateral flow from seepage line (sometimes with band of WETMEC 10) across gently-shelving aquitard
(b) groundwater-flushed bottom is adjoined by a (often ditched) watercourse, but this rarely or never floods



WETMEC 16b: Groundwater-flushed Bottom + Watercourse inputs
(e.g. Cridmore Bog)
(a) lateral flow from seepage line (sometimes with band of WETMEC 10) across gently-shelving aquitard
(b) episodic flooding from water course provides a variable source of water (and often silt and nutrients) to some or all of the valley bottom



WETMEC 16c: Groundwater-overflow Bottom (*e.g.* Rhôs Gôch Common)
(a) lateral (sometimes drained) flow from seepages (sometimes with band of WETMEC 10) and springs is distributed into valley-bottom and flats
(b) telluric water supplyis mainly outflowing groundwater but valley bottom is essentially disconnected from the seepage system
(c) wet valley-bottom conditions are maintained by high rates of water supply and by natural or artificial constraints on surface water outflow
(d) combination of condition is particularly associated with gross disturbance of valley bottom (the WETMEC 16c area at Rhôs Gôch may once have been raised bog, removed by turbary

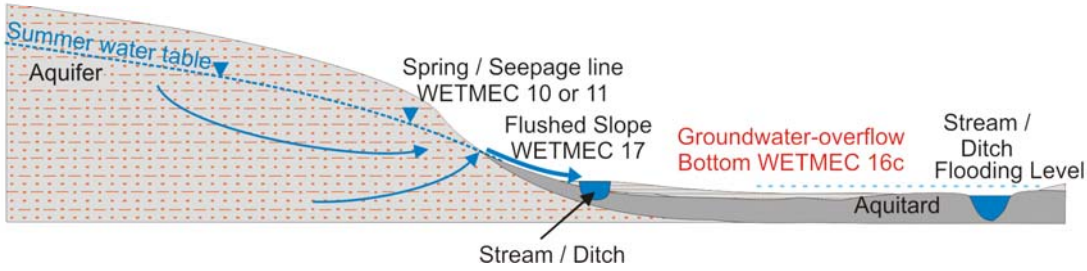


Figure 3.31 Schematic sections of types of Groundwater-Flushed Bottoms (WETMEC 16).

3.17 WETMEC 17: Groundwater-Flushed Slopes

3.17.1 Summary characteristics

Situation	Mainly valleyheads, some hillslopes, and the margins of a few troughs and basins.
Location	Widely distributed, but often as small units with other WETMECs.
Size	Typically very small (< 1 ha, sometimes < 0.01 ha).
Surface relief	Usually sloping, sometimes quite steeply. May have channels and hollows formed by water flow.
Hydrotopography	Soligenous.
Water: *supply*	Groundwater, sometimes with significant rain-generated run-off.
regime	Water table at surface when wet; can be seasonally dry.
distribution	Downslope-flow over aquitard from groundwater outflow at top of slope; surface flow in runnels or small water tracks.
superficial	Sometimes has small, shallow pools; active runnels are frequent.
Substratum	Shallow peat, mineral-enriched peat or strongly organic mineral soils, typically over stiff clays or silts.
peat depth	If present, usually < 50 cm, but up to 2 m at the base of some troughs and basins.
peat humification	Often strongly decomposed and humified except in some *Sphagnum*-dominated, base-poor examples.
peat composition	Often too decomposed to identify many macrofossils, but examples can have monocot peat and brushwood peat, with *Sphagnum* peat in some base-poor examples.
permeability	Surface layer can have very variable permeability characteristics; basal substratum mostly of low permeability.
Ecological types	Range from oligotrophic to eutrophic, base-poor to base-rich, depending mainly on groundwater source, but in some instances influenced by underlying substratum.
Associated WETMECs	May be found in association with permanent seepages (WETMEC 10) and, sometimes, Intermittent and Part-Drained Seepages (WETMEC 11). Can feed down into valley bottoms, especially with WETMEC 16.
Natural status	Some examples have been partly drained, but water supply mechanism is essentially natural. Some may have been subject to peat removal.
Use	Conservation. Examples usually have no other usage or are grazed as rough pasture.
Conservation value	Oligotrophic examples, base-rich to base poor are generally of high value and examples are included in a number of EU SAC sites.
Vulnerability	Main threats include: dereliction, reduction of groundwater supply through drainage or interception, agricultural enrichment.

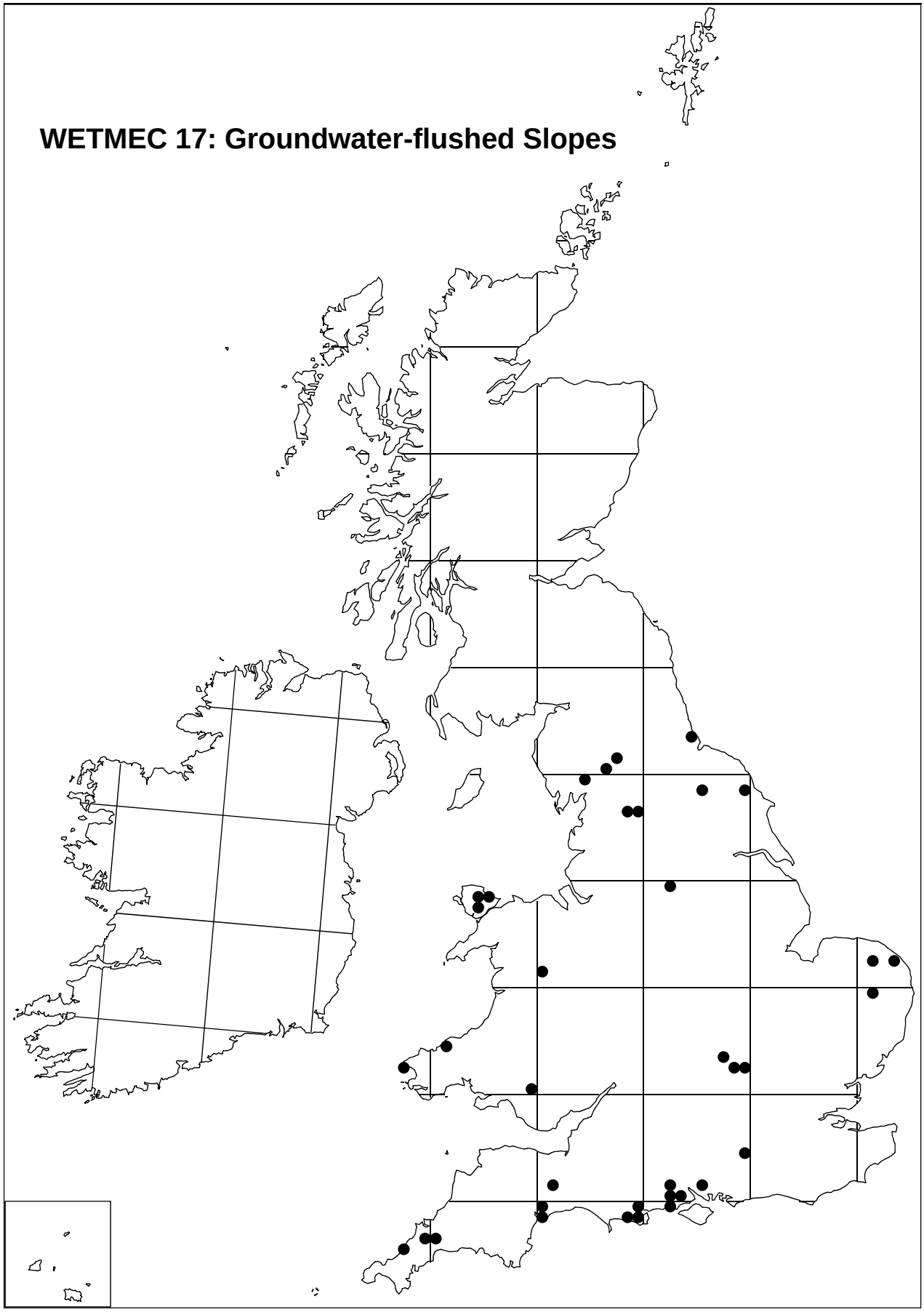


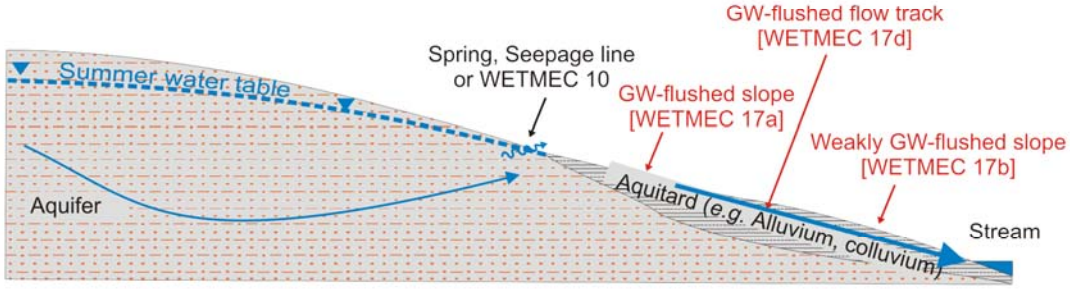
Figure 3.32 Distribution of examples of WETMEC 17 in sites sampled in England and Wales.

WETMEC 17: GROUNDWATER-FLUSHED SLOPES

[See also WETMEC 15]

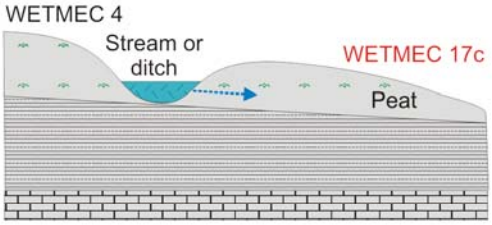
WETMEC 17: Groundwater-flushed Slopes
(*e.g.* Stoborough Heath, Ventogimps Moor)

- groundwater outflow at junction between aquifer and aquitard generates springs and seepages, sometimes with a significant (but usually small) area of WETMEC 10
- outflow water flows downslope over aquitard, usually with only a thin peat layer to form WETMEC 17a
- outflow water may become focussed into a soakway or water track (WETMEC 17d), which sometimes occupies a shallow, eroded gully within the slope
- as water becomes focussed into a soakway, or otherwise dissipated downslope, the lower parts of the mire may be drier than the upper parts (WETMEC 17b, or wet heath or wet grassland)
- water level of the stream does not necessarily influence the water table of the flushed slope



WETMEC 17c: Distributed Groundwater-flushed Slopes
(*e.g.* The Moors, Bishop's Waltham, Retire Common)

- groundwater outflow at junction between aquifer and underlying aquitard feeds into spring streams and / or ditches
- in suitable locations (*e.g.* Part-drained sites with a winding stream or a ditch across the slope), there may be potential for downslope recharge of the surface layers from the stream / ditch
- the importance of this mechanism is not known, and depends critically on hydraulic gradients and conductivities: in many cases the surface may be fed ± exclusively by precipitation, and one sample from Bishop's Waltham was clustered into WETMEC 4
- in principle, with sufficiently high permeabilities, this mechanism could support WETMEC 17a but all examples clustered into this unit had low water tables.



Conceptual diagram of part of Bishops Waltham Common (Hants)

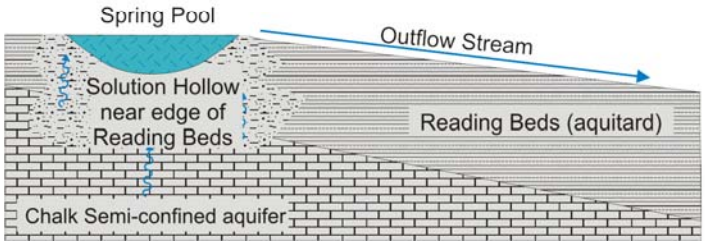


Figure 3.33 Schematic sections of types of Groundwater-Flushed Slopes (WETMEC 17).

3.18 WETMEC 18: Percolation Troughs

3.18.1 Summary characteristics

Situation	Mostly valleyheads, some troughs and basins.
Location	Most samples are from Wales and Cumbria (in areas of fairly high rainfall).
Size	Small to quite large, flattish mire expanses, gently sloping along the length of broad valleyhead bottoms and troughs.
Surface relief	Narrow to broad flats and troughs, with a spongy, sometimes quaking surface. Mostly on more or less flat or gently sloping areas.
Hydrotopography	Rheo-topogenous, sometimes over overgrown topogenous basins.
Water: ***supply***	Probably mainly rainfall and surface run-off. Some groundwater inflow may occur, but generally not visually obvious and quantitative importance is not known and difficult to assess.
regime	Summer water table mostly at or near surface (sometimes slightly above).
distribution	Longitudinal flow along trough, with some lateral inflow from flanks, both upslope and, in some cases, probably from adjoining soakway. Visible flow not normally apparent.
superficial	Some small pools and, sometimes, small water channels.
Substratum	Soft or spongy upper layer, most often underlain by a more consolidated surface, and sometimes by gyttja. Basal material typically either solid material or silts and clays.
peat depth	Variable: typically > 1.5 m, but some shallow examples.
peat humification	Usually with a shallow (0.5 m) spongy surface; underlying peat, when present, usually more humified and often solid, especially lower down.
peat composition	Mostly monocot or *Sphagnum* peat near surface. Underlying peat is mostly either monocot or wood peat.
permeability	Upper peat variable, but mostly with quite high permeability characteristics. Lower deposits and basal substratum mostly with fairly low permeability characteristics.
Ecological types	Oligotrophic, base-poor to eutrophic, sub-neutral.
Associated WETMECs	Usually flanked by WETMEC 19 along drainage axes; sometimes drains into sumps with WETMEC 20.
Natural status	Some examples may form a natural persistent state, but the role of grazing in preventing tree colonisation is uncertain. More base-rich examples are susceptible both to acidification and tree colonisation.
Use	Conservation. Light grazing. Some occupy former turbaries.
Conservation value	Species diversity is generally rather low, partly because of the intrinsically low species richness of base-poor mires, but WETMEC has quite a large species total with some nationally uncommon species and may support examples of SAC habitats.
Vulnerability	Direct drainage. Surface water enrichment.

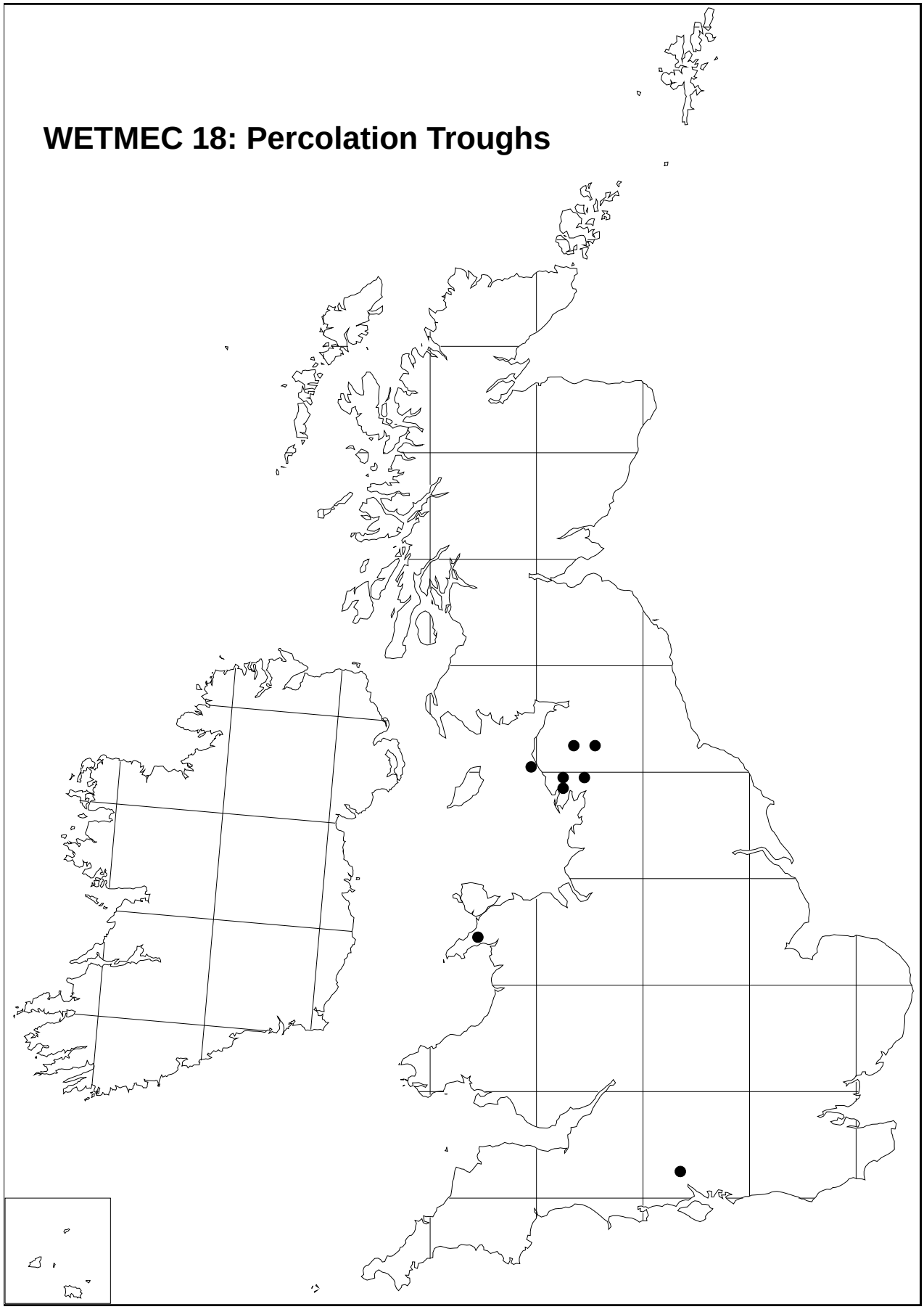
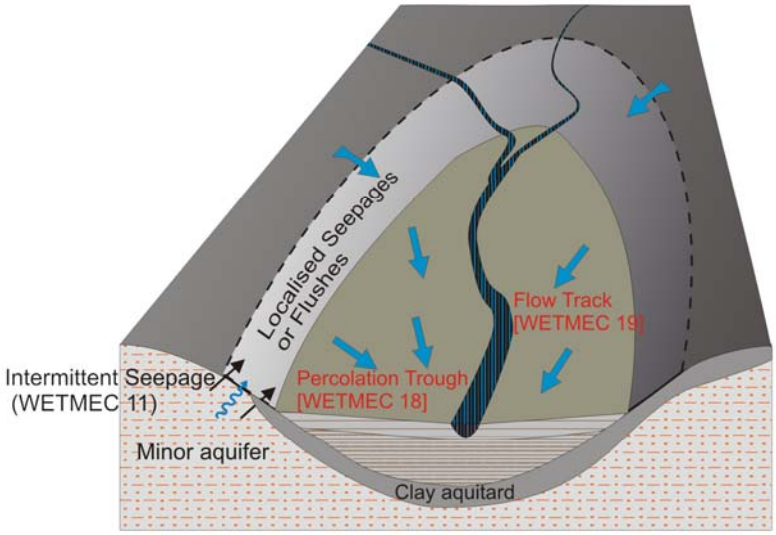


Figure 3.34 Distribution of examples of WETMEC 18 in sites sampled in England and Wales.

WETMEC 18: PERCOLATION TROUGHS and
WETMEC 19: FLOW TRACKS

Peat filled Valleyhead Percolation Trough and Flow Track
(*e.g.* Birk Bank Moss)

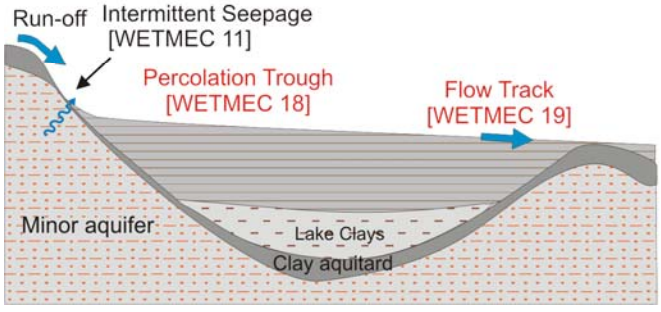
- significant inputs from rain-generated run-off and precipitation
- importance of groundwater outflow uncertain, but probably small, either because of limited supply from a minor aquifer, or because of top-layer aquitards
- exotelmic stream inflow may produce some lateral recharge of flanking mire, especially during flooding episodes, but water course largely acts as a drain
- flow through trough may be focussed into a series of small subsidiary runnels, soakways and water tracks (not illustrated) or occurs by lateral percolation through loose surface peat and vegetation
- shallow gradient helps retain water
- some valleyhead percolation troughs are former lake basins which have developed into troughs by accumulation of peat up to and above the lip of the original basin



Peat-filled Valleyhead Percolation Trough and Water Track over lake basin (longitudinal section)
(*e.g.* Stable Harvey Moss)

- main details, as above
- part of system illustrated is a former lake basin which has undergone terrestrialisation to a peat-covered surface (probably initially WETMEC 19)
- under the influence of continued water inflows peat has accumulated above the natural lip of the basin to form a gently sloping surface which appears as a valleyhead trough

Longitudinal Section



Transverse Section

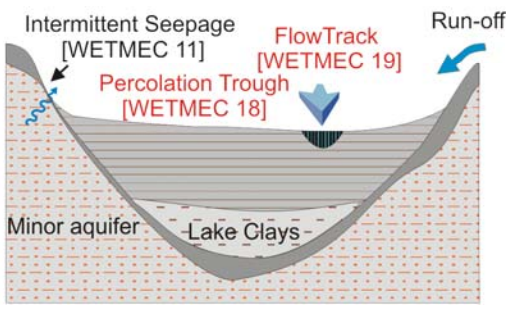


Figure 3.35 Schematic sections of types of Percolation Troughs (WETMEC 18) and Flow Tracks (WETMEC 19).

3.19 WETMEC 19: Flow Tracks

3.19.1 Summary characteristics

Situation	Mostly valleyheads, some troughs and basins.
Location	Most examples are from Wales and Cumbria.
Size	Usually fairly narrow linear features (around < 30 m to > 0.5 km length).
Surface relief	Narrow flats and troughs, soakways with an (often buoyant) more or less continuous vegetation mat, water tracks with much open water. Often with a perceptible slope.
Hydrotopography	Rheophilous, but sometimes over overgrown topogenous basins.
Water: ***supply***	Probably mainly rainfall and surface run-off. Some groundwater inflow may occur, but generally not visually obvious and quantitative importance is difficult to assess.
regime	Summer water table typically at or above surface.
distribution	Longitudinal flow along trough in preferential flow paths, with some lateral flow from flanks.
superficial	Water channels, sometimes braided or otherwise mosaiciform in water tracks. Surface water usually visible.
Substratum	Most often water and liquid muds over more solid peat, but sometimes with a more consolidated surface. Sometimes underlain by gyttja. Basal material typically low permeability, either solid material or silts and clays.
peat depth	Typically > 2.5 m, but some shallower examples.
peat humification	Usually with a shallow (0.5 m) spongy or semi-floating surface (soakways) or open water (water tracks); underlying 'peat' may be semi-liquid, but can be more humified and often quite solid, especially lower down.
peat composition	Mostly monocot or *Sphagnum* peat. Wood peat in some examples.
permeability	Upper layers mostly with high-permeability characteristics, over less permeable middle–lower layers. Basal substratum with low-permeability characteristics.
Ecological types	Oligotrophic, base-poor to eutrophic, sub-neutral.
Associated WETMECs	Mostly flanked by other WETMECs, especially WETMEC 18. Sometimes drains into sumps with WETMEC 20.
Natural status	Many examples appear to form a natural persistent state, but some are in occluded drains or flooded peat workings.
Use	Conservation. Generally too wet for easy access. Some occupy former turbaries.
Conservation value	Species diversity is generally rather low but has a large species total with a number of nationally uncommon species, and may support examples of SAC habitats. May provide a relatively base-rich element within otherwise base-poor mires.
Vulnerability	Direct drainage. Damming can pond back water and affect this and flanking WETMECs. Surface water enrichment.

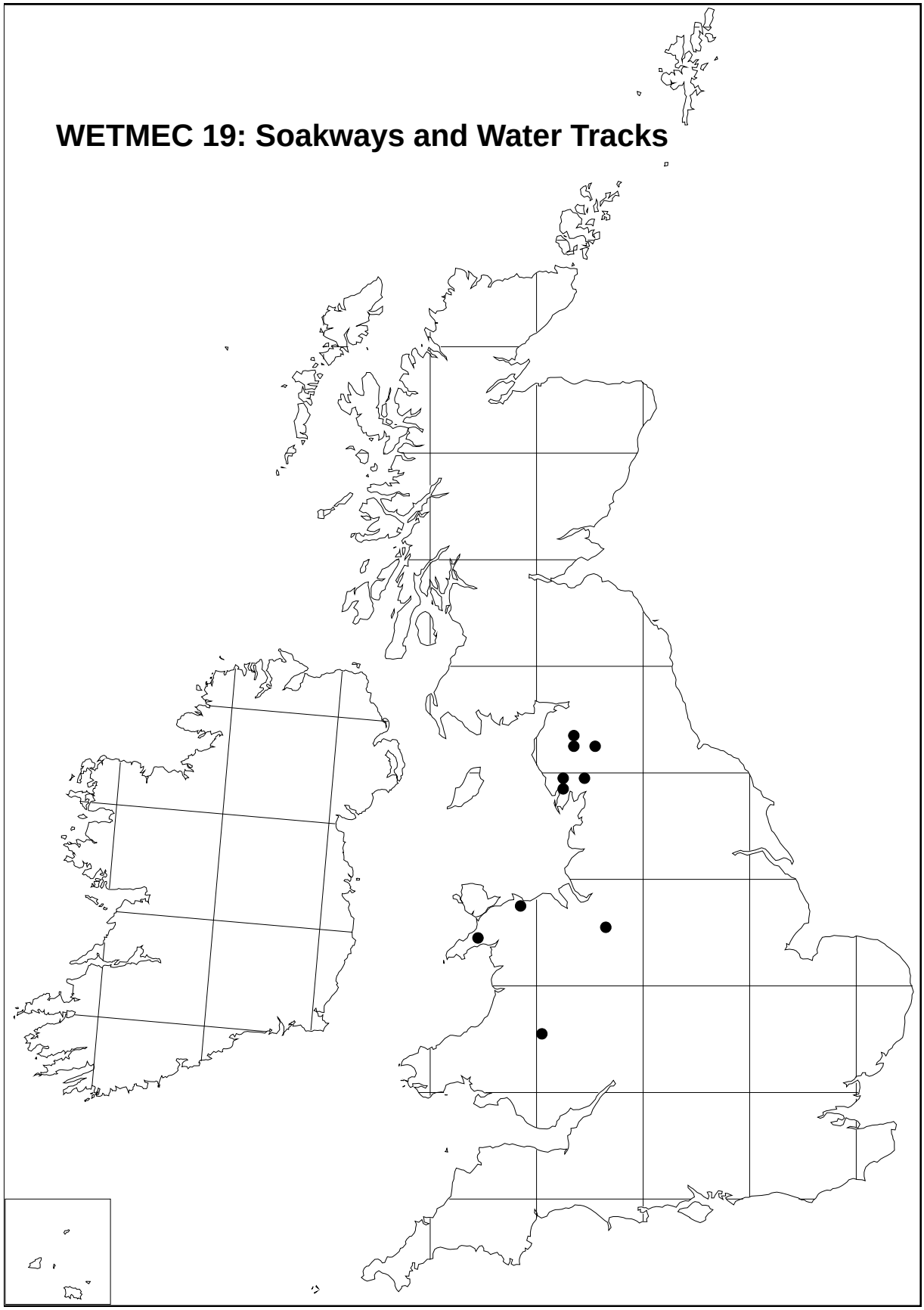


Figure 3.36 Distribution of examples of WETMEC 19 in sites sampled in England and Wales.

Schematic sections showing WETMEC 18 and 19 are provided in Figure 3.33.

3.20 WETMEC 20: Percolation Basins

3.20.1 Summary characteristics

Situation	Basins, valleyhead basins and troughs.
Size	Tiny examples in small basins, through narrow hydroseral fringes to modest areas of fen (10 ha).
Location	Mostly sampled from NW England and Wales, but may be more widespread.
Surface relief	Even (appears more or less flat, but gently slopes to river or outfall).
Hydrotopography	Rheo-topogenous.
Water: ***supply***	Surface water, possibly some groundwater.
regime	Summer water table usually at or near the surface.
distribution	Mainly surface/near-surface flow.
superficial	May contain shallow pools or adjoin a small lake or watercourse.
Substratum	Unconsolidated muds or peat (sometimes over gyttja). Basal material usually a stiff clay or silt.
peat depth	Mostly fairly shallow (< 2 m) but sometimes quite deep (2–5 m).
peat humification	Upper layer is buoyant or loose and fresh, often a hydroseral infill. Underlying peat, if present, varies in humification. Sometimes little material between the surface layer and basal clays.
peat composition	Variable. Loose upper layers typically herbaceous–moss peat (hypnoid mosses or *Sphagnum*), but may also be monocot or brushwood peat.
permeability	Upper layers mostly have high-permeability characteristics, over less permeable middle/lower layers. Basal substratum of low permeability.
Ecological types	Range from oligotrophic, sub-neutral/base-poor to eutrophic/hypertrophic, sub-neutral depending mainly on substratum characteristics and enrichment of surface water. Most examples are base-rich/sub-neutral and eutrophic/mesotrophic.
Associated WETMECs	May adjoin Groundwater-Flushed Slopes (WETMEC 17). Some examples are embedded within Percolation Troughs (WETMEC 18) and may be fed, or crossed, by a soakway (WETMEC 19).
Natural status	Some are more or less natural hydroseral units, but many seem to be associated with turbaries or former clay diggings.
Use	Conservation. Light grazing. Some are unmanaged. Some occupy former turbaries or clay workings.
Conservation value	Important mainly for oligotrophic/mesotrophic semi-floating vegetation (SAC habitat “transition mire …”).
Vulnerability	Main threat to some examples has been direct drainage. Some are much enriched by surface water inflows (dissolved nutrients and silt deposition). Some are subject to dereliction and hydroseral succession. The latter can be associated with consolidation or acidification of buoyant surfaces.

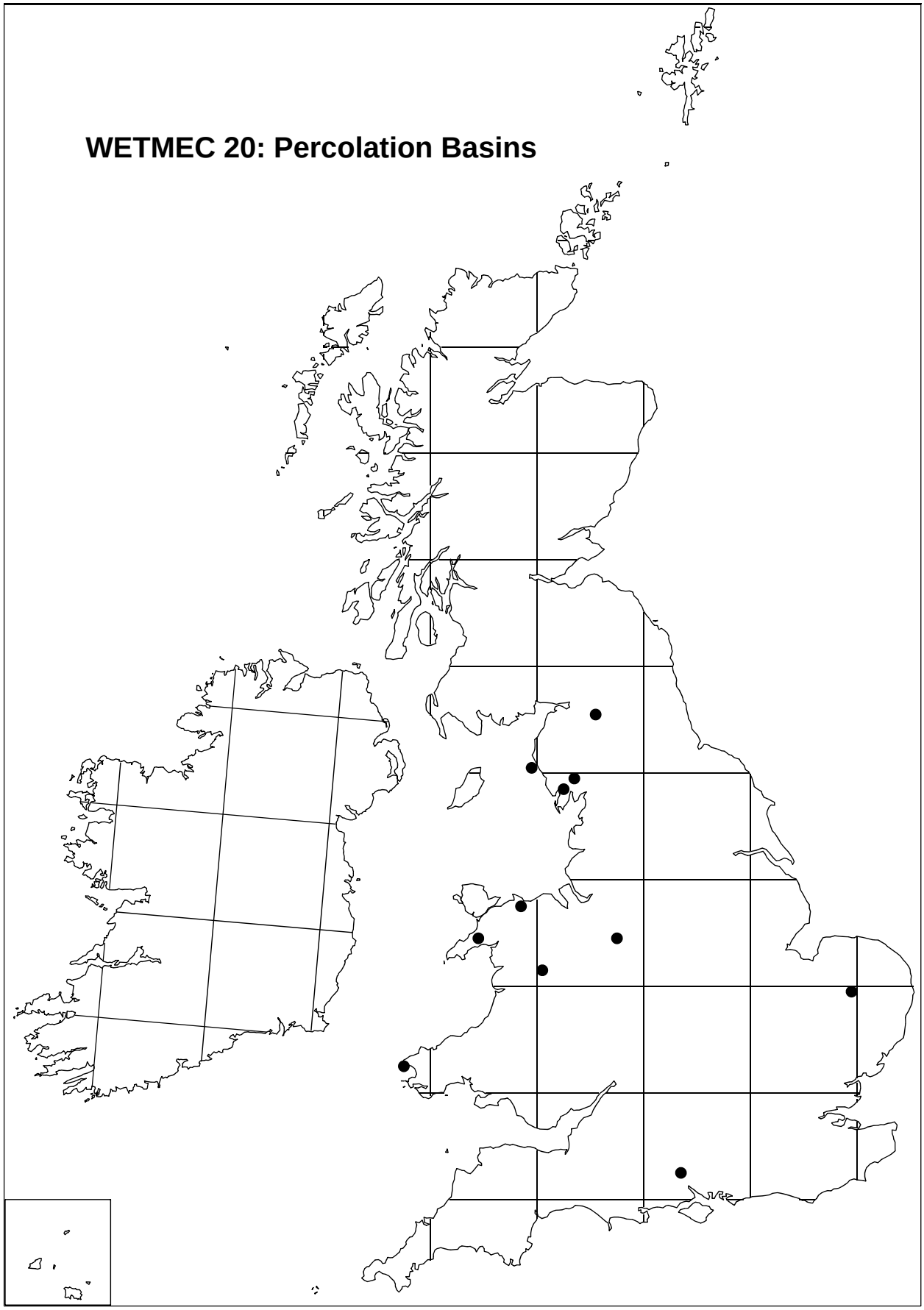
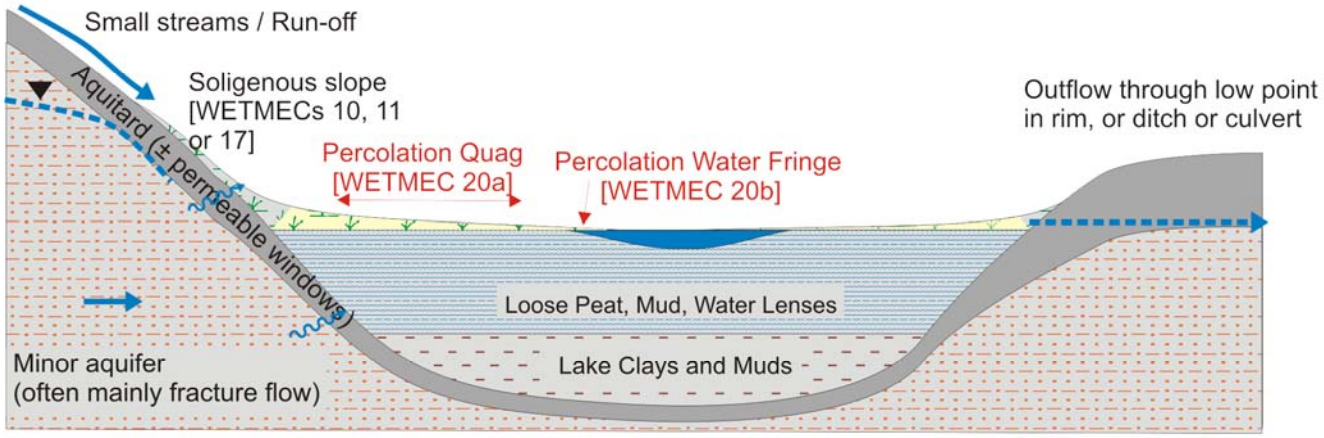


Figure 3.37 Distribution of examples of WETMEC 20 in sites sampled in England and Wales.

WETMEC 20: Percolation Basin
(*e.g.* Cors Llyn y Coethlyn)

- basin surface fed by significant surface drainage (streams and run-off)
- basin separated from underlying (usually minor) aquifer by (Till *etc.*) aquitard
- may be some groundwater outflow through windows in aquitard, giving rise to 'wet' conditions on the basin slopes (mire, wet heath, wet grassland *etc.*)
- wetland infill probably also acts as a local aquitard, constraining significant upflow directly into the basin



WETMEC 20: Percolation Basin
(*e.g.* Dowrog Common, Trefeiddan Moor)

- basin surface fed by some surface drainage (streams and run-off)
- basin separated from underlying (usually minor) aquifer by (Till *etc.*) aquitard
- some groundwater outflow originates around the lip of the aquitard and gives rise to 'wet' conditions on the basin slopes (mire, wet heath, wet grassland *etc.*)

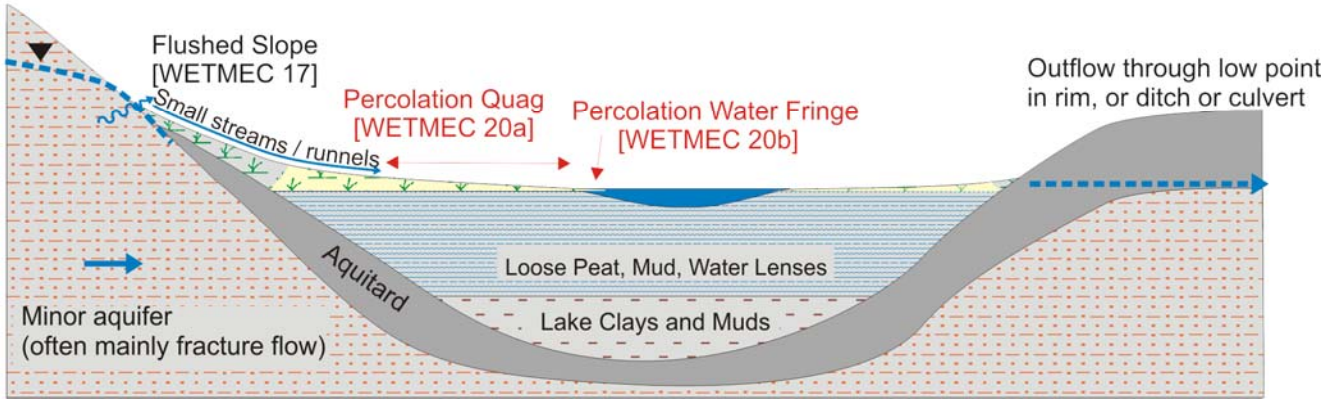


Figure 3.38 Schematic sections of Percolation Basins (WETMEC 20).

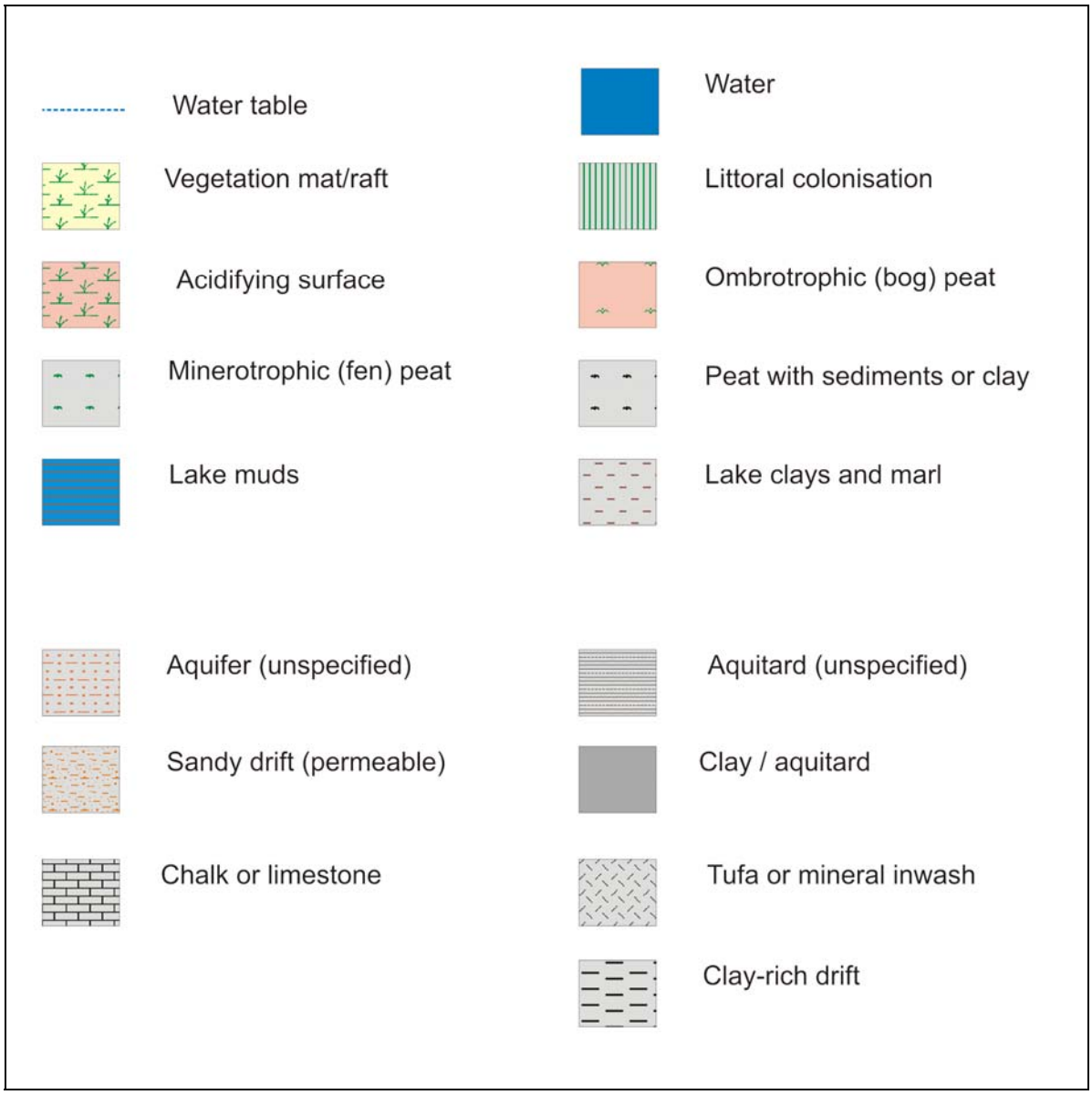


Figure 3.39 Key to schematic sections illustrating different WETMEC types.

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Published by:

Environment Agency
Rio House
Waterside Drive, Aztec West
Almondsbury, Bristol BS32 4UD
Tel: 0870 8506506
Email: enquiries@environment-agency.gov.uk
www.environment-agency.gov.uk