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Characterisation of Hydrological Protection Zones at the Margins of Designated Lowland Raised Peat Bog Sites

Ruth Goodall, Jane Poole, Kate Harris, Capita Symonds Ltd.

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**What is a Lowland Raised Bog,
and why are they important?**

Raised Bog Hydrology,

The HPZ methodology.



Witherslack Mosses



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What is a Lowland Raised Bog?



Garry Bog, Northern Ireland



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Lowland – generally near the coast or on the edges of wide floodplains.

Raised – generally convex in form, probably because peat forms at a greater rate in the centre.

Bog – mire, waterlogged peat soils. Actively forming new peat deposits.



Garry Bog, N. Ireland



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Lowland Raised Bogs are:
Ombotrophic,
(rain water fed), and
Isolated from main surface and
groundwater systems.



As a result they are
Acidic, and
Nutrient deficient environments.



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How is a LRB different from an upland blanket bog?

There's much less of it.

	Blanket Bog	Lowland Raised Bog
England	215,000 ha	500 ha
Scotland	1,060,000 ha	2,500 ha

Typically located in estuarine or floodplain locations.

Individual bogs generally have a much smaller extent.



Glasson Moss, Solway



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How is a LRB similar to an upland bog?

The vegetation communities are similar.

Rainwater fed. Acid and Nutrient poor.

Same threats – agriculture and forestry, drainage, peat extraction.





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Why are they important?



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Support a distinct array of plants and animals able to survive in hostile conditions.

Preserve paleoclimatic and archaeological records.

Intact LRB habitat is very rare in the UK and in Europe.



Blawhorn Bog



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Raised Bog Hydrology

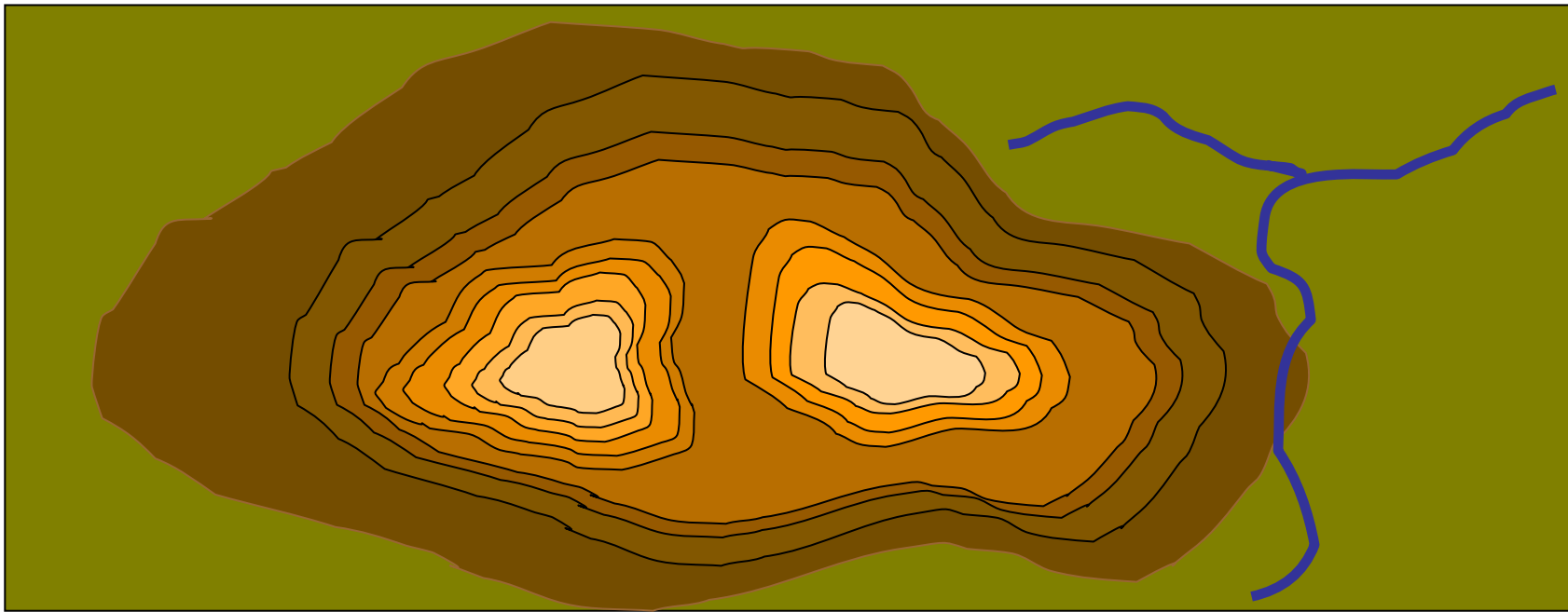
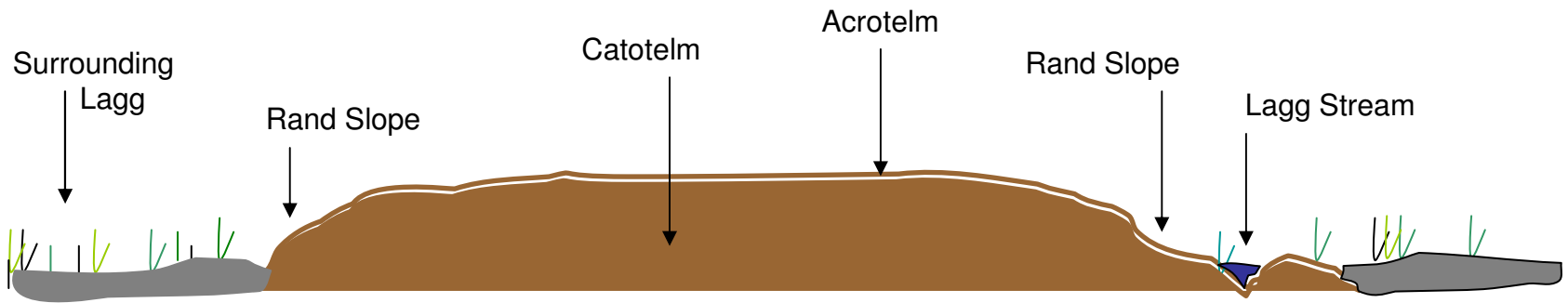


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Under natural Conditions:

The only input is rainfall

The only output is due to overflow (Lagg Stream)

The peat mass is very wet and mostly waterlogged.



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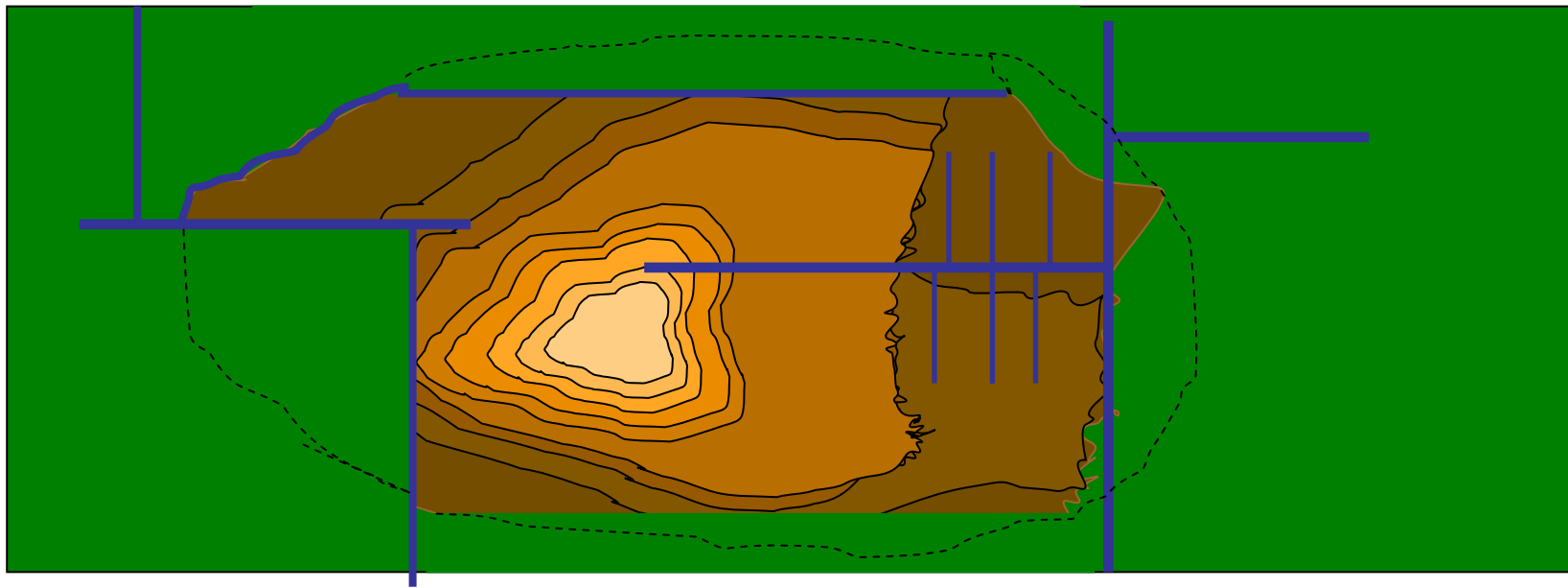
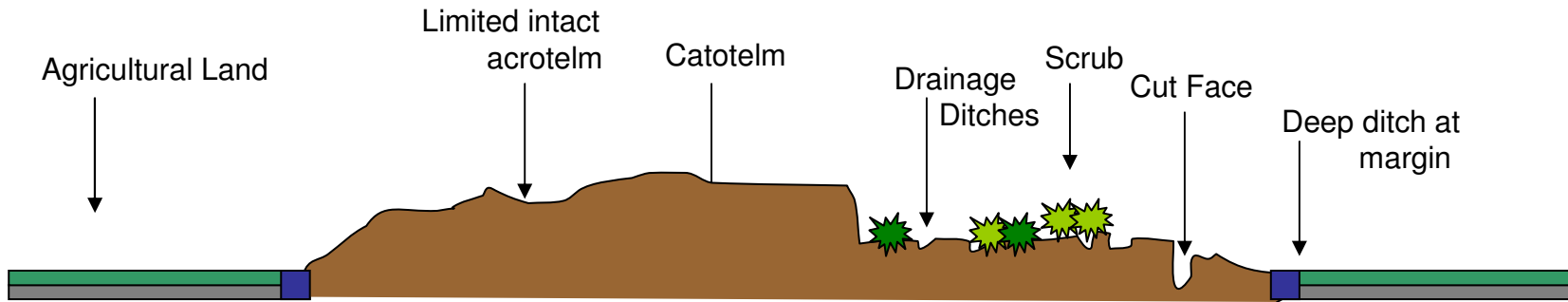


Of the activities that lead to LRB deterioration many are linked to hydrology.

Peat removal for fuel or horticulture	Cut edge results in water loss from the main peat mass	Drying out
Drainage ditches within the peat mass (for agriculture or extraction)	Ditches provide flow route and accelerate water loss.	Drying Out
Vegetation changes – eg. Rhododendron, birch scrub.	Increased levels of transpiration from the bog surface.	Drying Out
Improved drainage in land around the bog, (agriculture).	Drying of land around may increase water loss from the bog.	Drying Out



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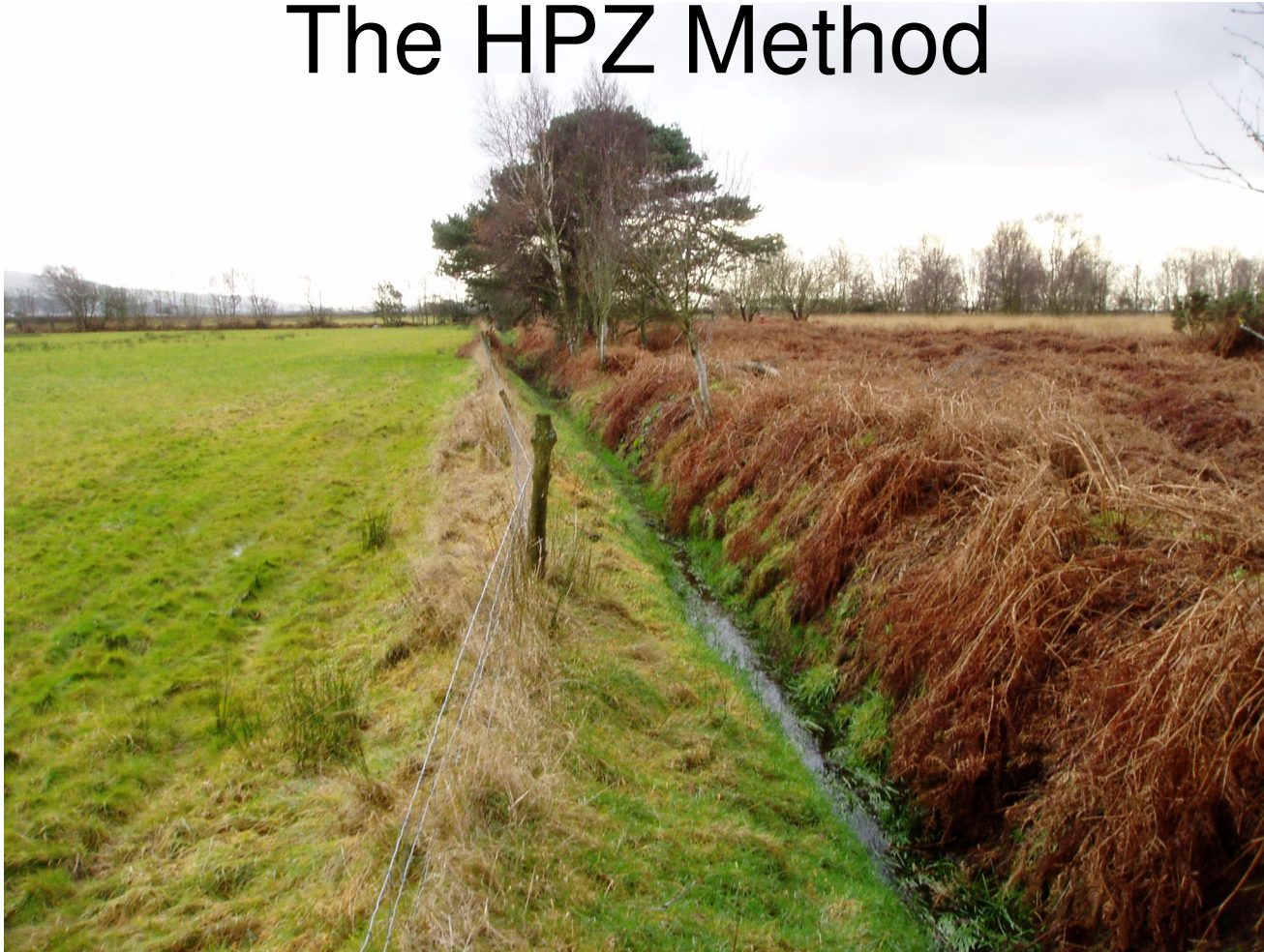
Drying out results in a loss of the specialist vegetation, a consequent slowing in the rate of active peat formation and colonisation of the bog surface by species typical of drier habitats – heather, bracken etc.



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The HPZ Method



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JNCC Report No 365

May 2005

Aim

“to provide the UK nature conservation bodies.....with a scientific report that provided a set of generic guiding principles for making reasoned judgements about the limits of hydrological influence within and around a body of peat recognised as a lowland raised peat bog site in order to assist with the targeting of conservation and restoration management work”.



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The HPZ method

- Focuses on the needs of designated sites,
- Recognises that many SSSI are delimited based on the area of “good” remaining bog habitat and are remnants of larger past wetland complexes.
- Recognises that peat bog hydrology is niche, not widely studied and that data is sparse.



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Initial desk study identified that 2/3 of designated LRB site boundaries reviewed were delimited by a drain.



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HPZ methodology uses an analytical model of drawdown to a drain.



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The methodology is simple, has wide applicability and in particular can be applied without need for complex data.

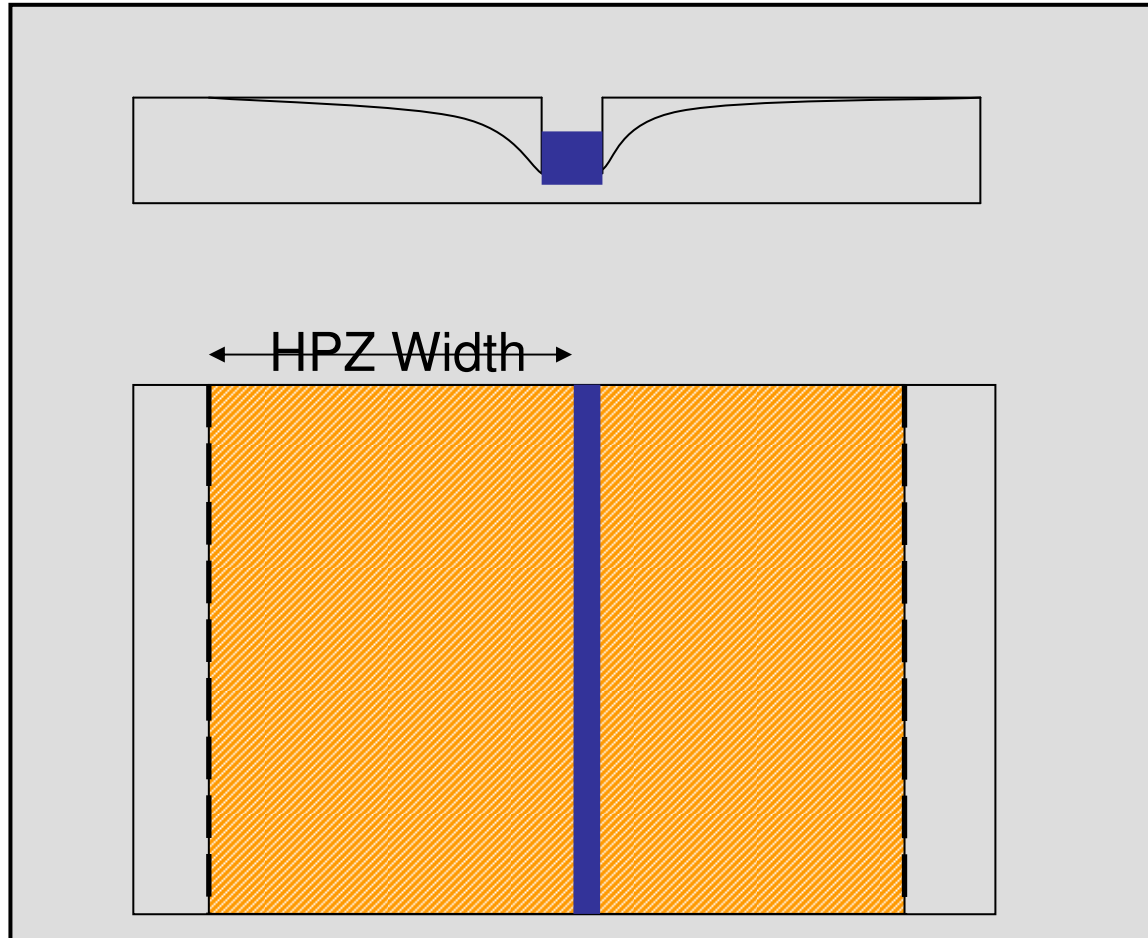


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Key Variables

1. Infiltration in the HPZ
2. Hydraulic Conductivity in the HPZ,
3. Unconfined Hydraulic Head in the HPZ,
4. Water Level in ditch,
5. Head at the boundary and ditch depth,
6. Flow in the positive direction
7. Distance of ditch from boundary.





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The method gives the zone of influence attributable to a drain, or hypothetical drain, and allows calculation of the zone within which artificial drainage is likely to influence water levels in the bog.

A number of significant simplifying assumptions are made.



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The methodology relies on available data sets to define key variables.

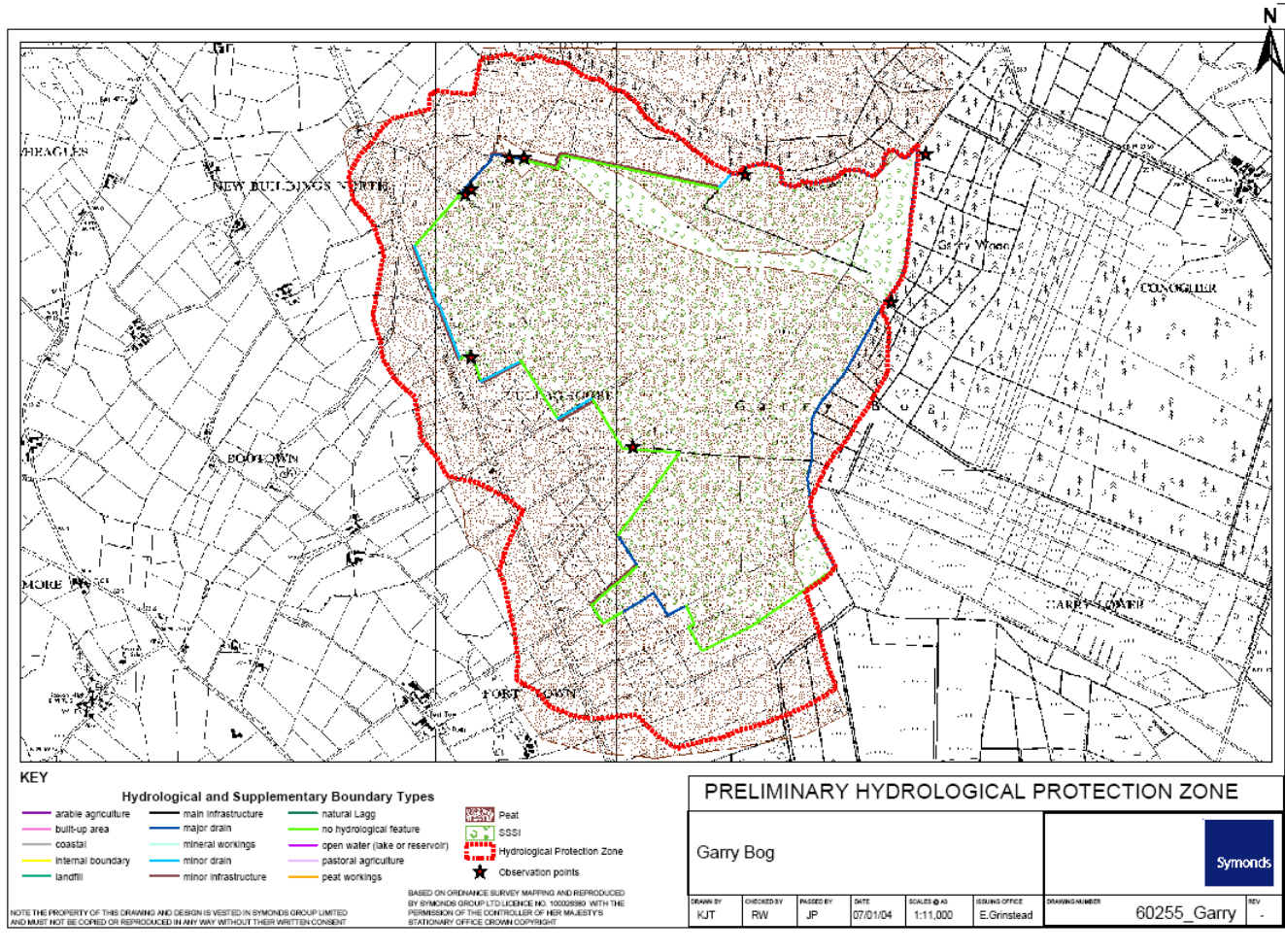
For example Infiltration is defined from Met Office MORECS and HER data.

The exception is the estimation of Hydraulic Conductivity (k) which relies on soil sampling.



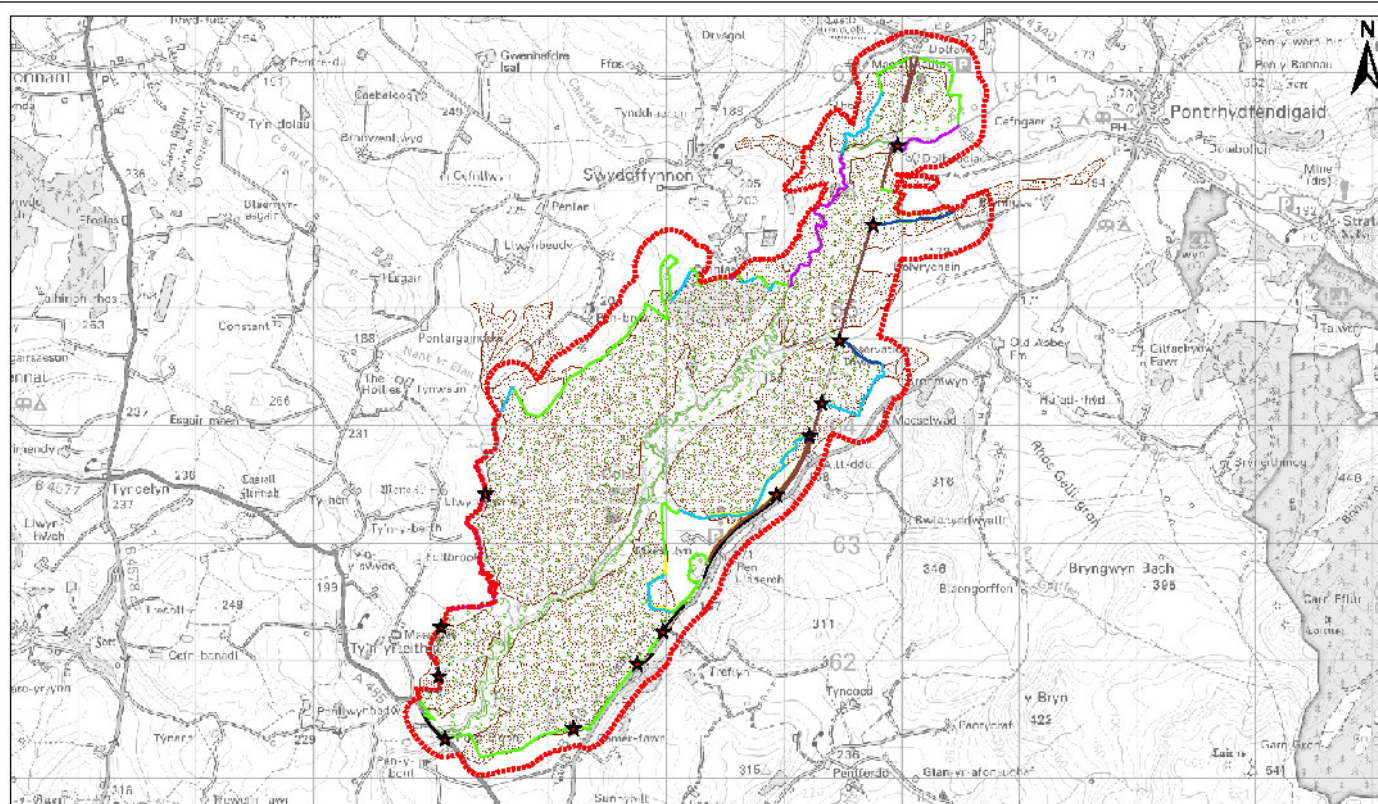


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KEY

arable agriculture	main infrastructure	natural Lagg	Peat
built-up area	major drain	no hydrological feature	SSSI
coastal	mineral workings	open water (lake or reservoir)	Hydrological Protection Zone
internal boundary	minor drain	pastoral agriculture	Observation points
landfill	minor infrastructure	peat workings	

PRELIMINARY HYDROLOGICAL PROTECTION ZONE

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Duddon Moss