

Peatlands, Hydrology & (Terrestrial and Aquatic) Ecology

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Presenting to All Ireland Climate and Biodiversity Network

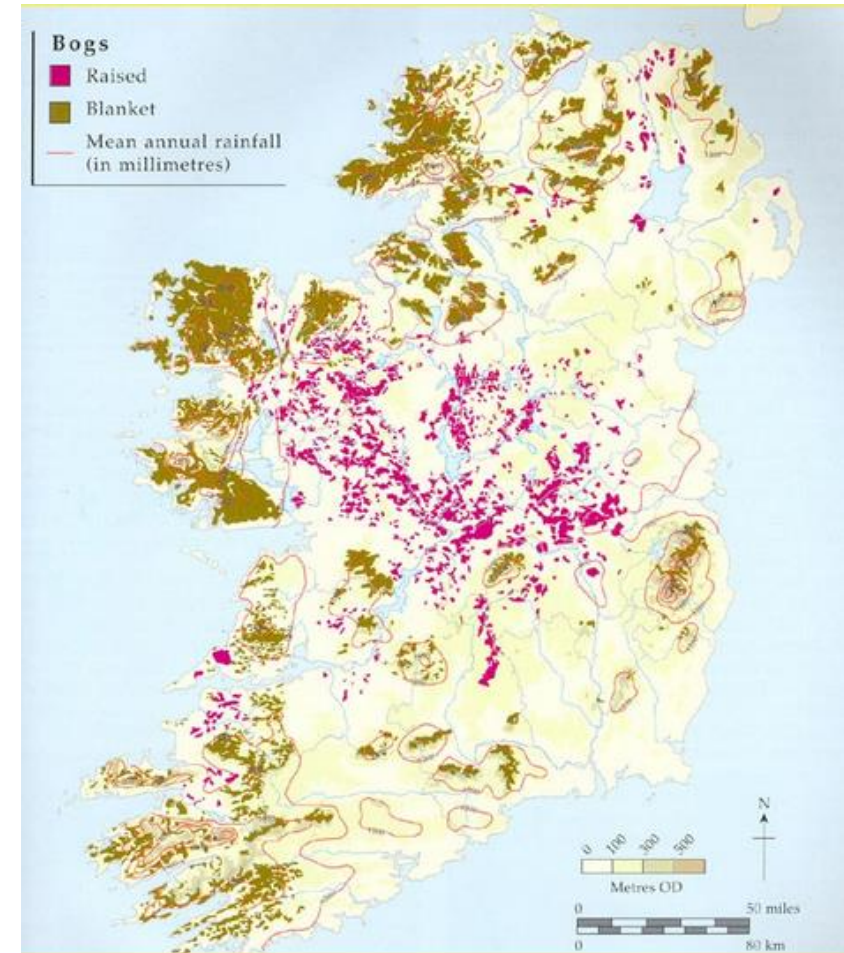
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Peatlands –What and Where?

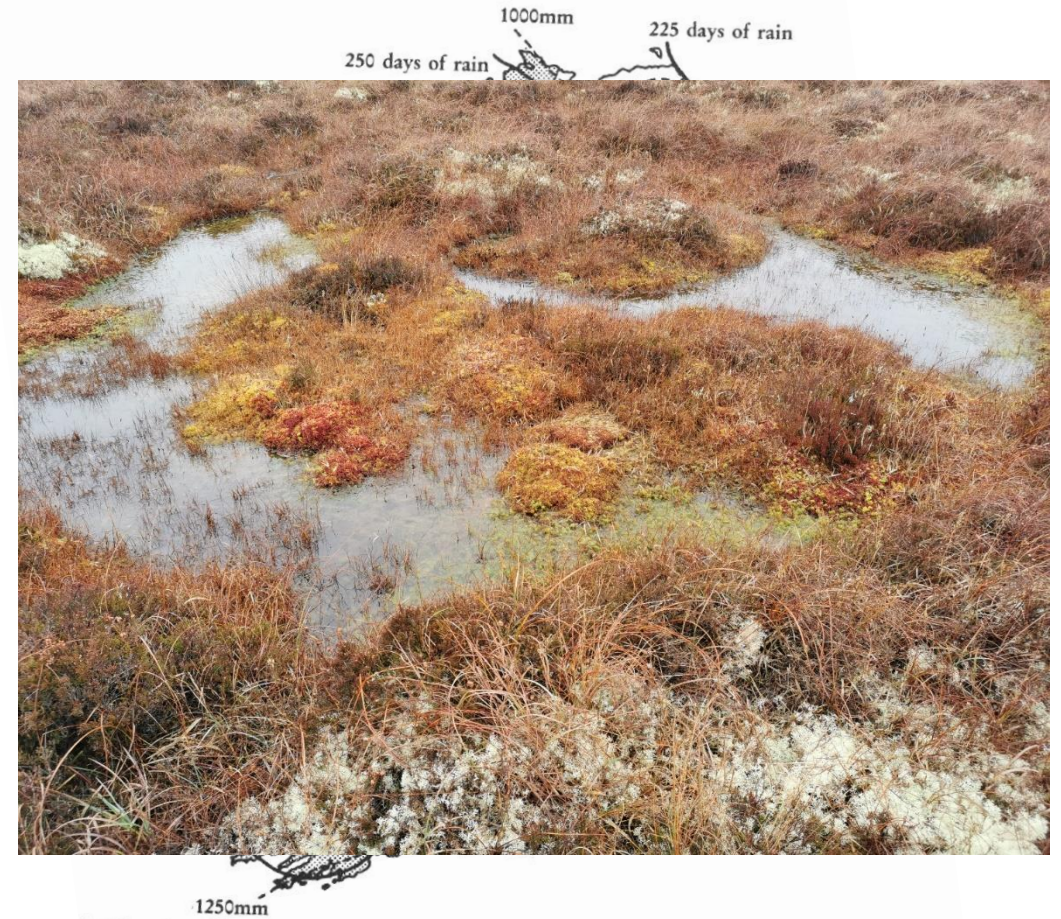
- Accumulations of partially decayed organic matter (peat->30% C).
- Peatlands: Threshold thickness varies around the world. In Ireland usually between 30 and 50cm.
- (...UNEP- 10cm?)
- In Ireland dominated by bogs
 - ~1/3 Raised bogs-Thick sequences of peat (up to 14m) mainly in the centre of Ireland.
 - ~2/3 Blanket bog-in Mountainous areas in east, extending down to sea in west. Generally thinner, but sequences up to 9m observed.



Map: Hammond (1979)

Water –A key component

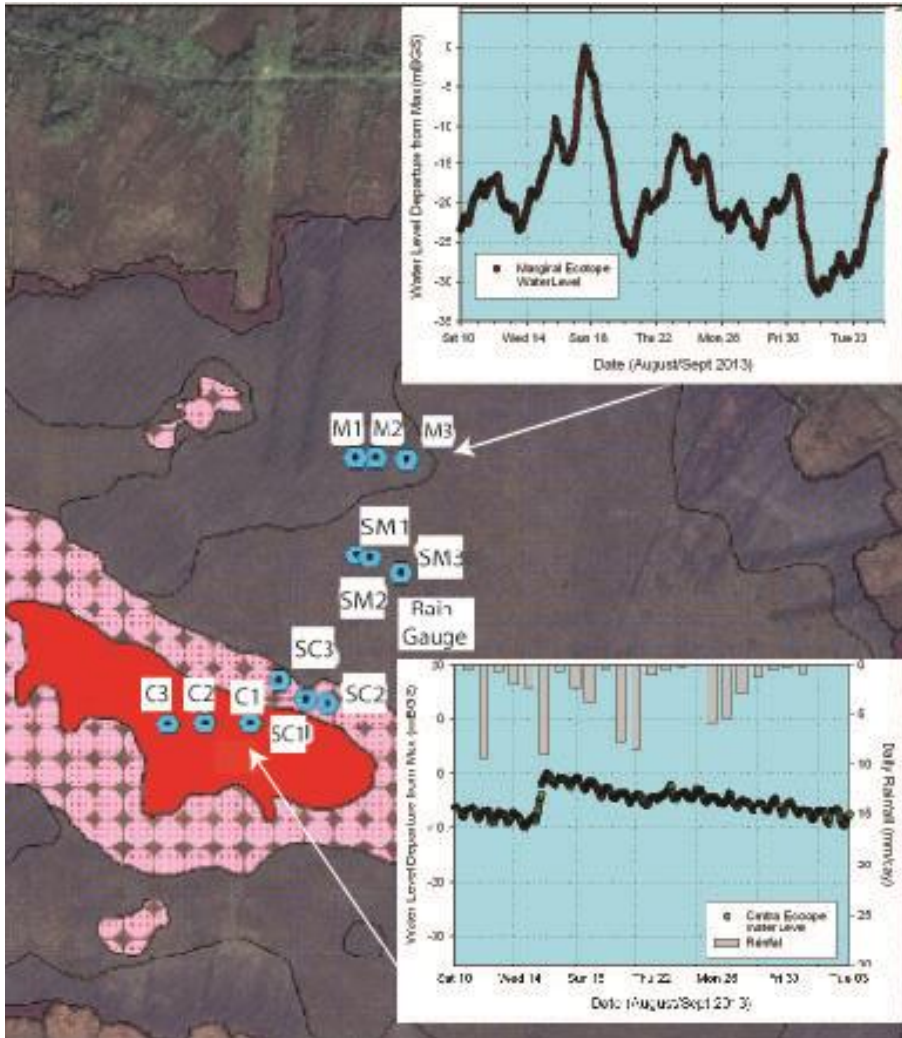
- Peat occurs where organic matter accumulates faster than it can decay.
- Bogs occur in areas of high and frequent year round rainfall.
- This prevents water tables declining.
- Naturally water logged all year.
- High water tables (at or very close to ground surface) lead to slow (anaerobic) decomposition.
- Rainfall is the dominant (and often only) source of water and nutrients.
- Allow for survival of specialist (peat accumulating) species.



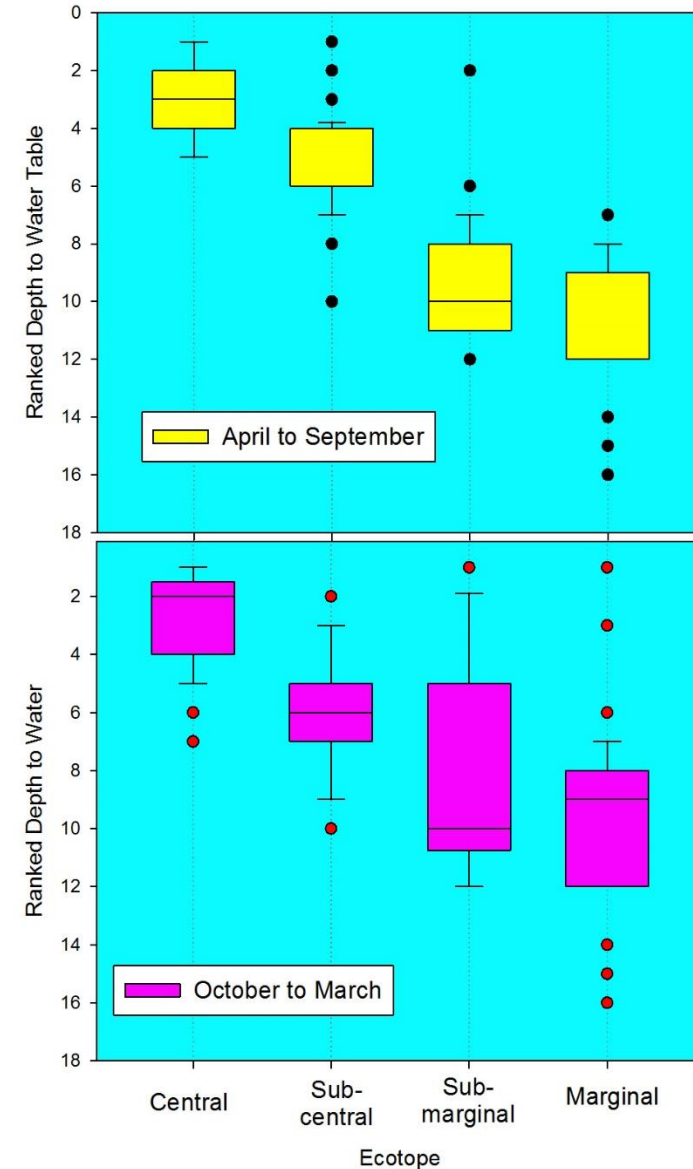
Picture: Francis Mackin, RPS

Image: Bellamy, D. "The Wild Boglands"

Peat Accumulating?



Box & whisker plots of ranked depth to water table by ecotope, Ballynafagh SAC raised bog, Co. Kildare



Condition of Bogs – Raised Bogs

Reasonable areas of uncut bog remaining, but that's not what the Habitats Directive protects.

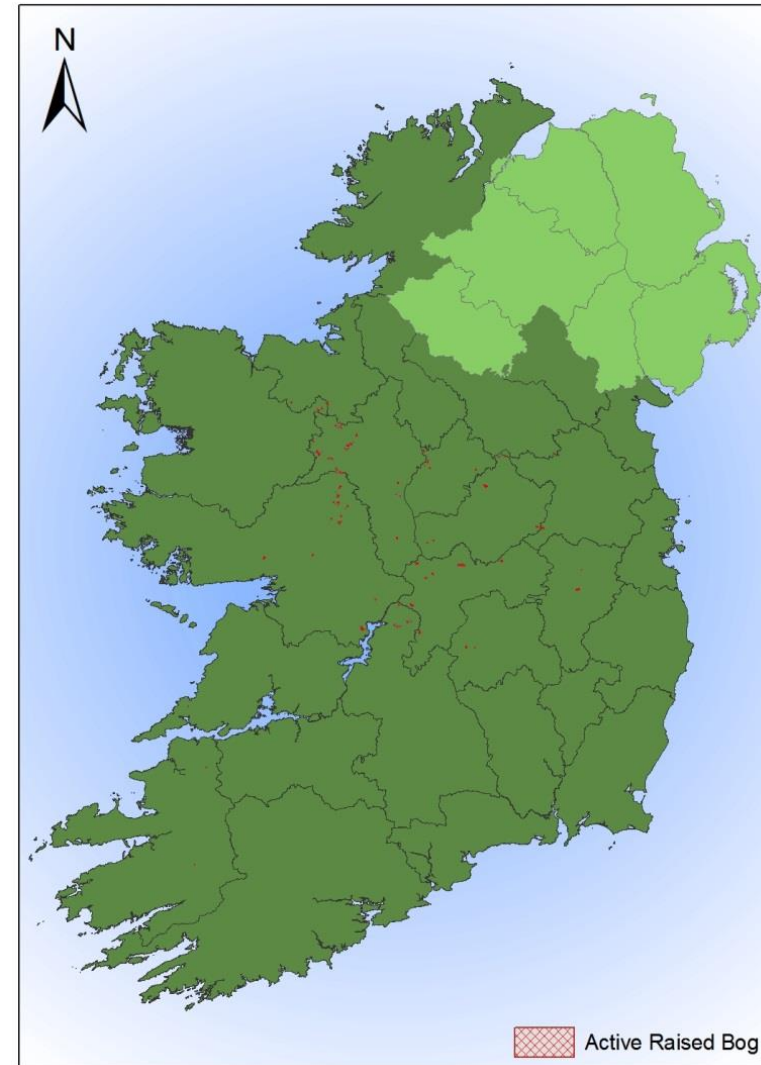
Ireland hosts the majority (>60%) of remaining (peat accumulating) active raised bog (ARB).

Most of the remaining areas of ARB are in the conservation network of special areas of conservation (SACs) and National Heritage Areas (NHAs), most of which were protected in the early/mid 1990s

Peat cutting and associated drainage continued at many of these sites following designation.

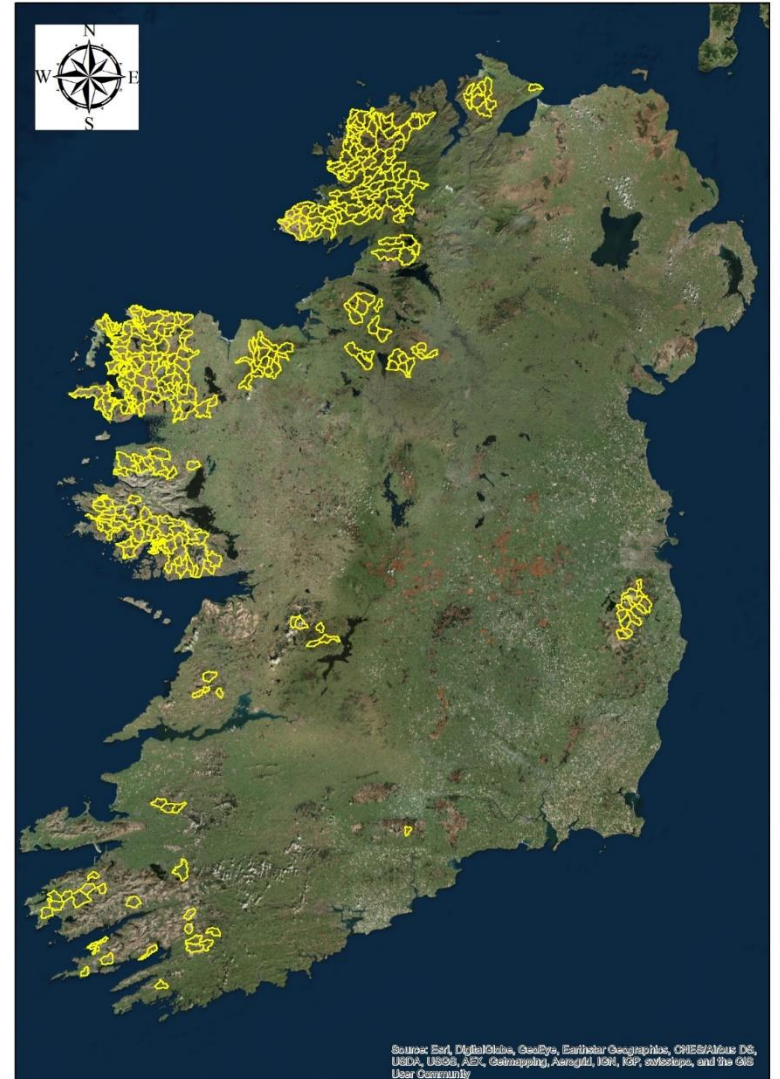
Between 1995 and 2005, losses of ARB, mainly due to marginal cutting and drainage, estimated at 37%. (2005-2013 – a further 1% lost)

Remaining area of protected ARB estimated as approximately 0.3% of the original area.

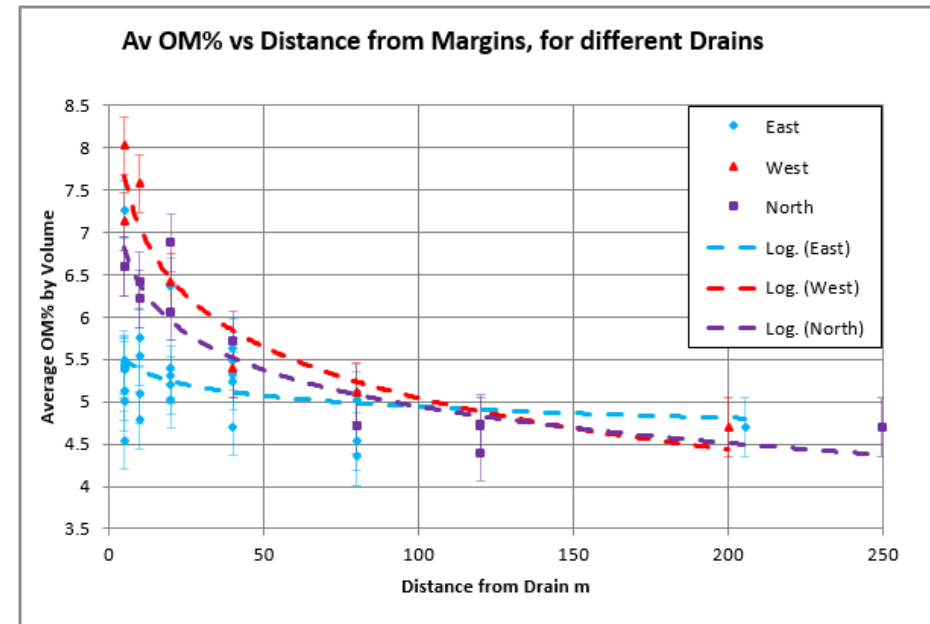
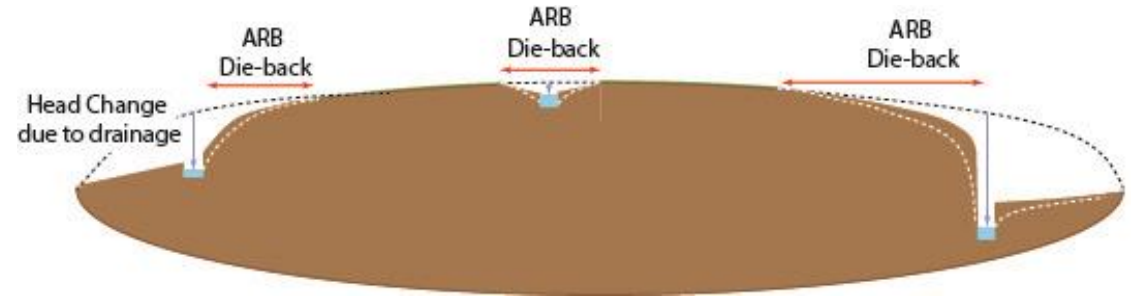
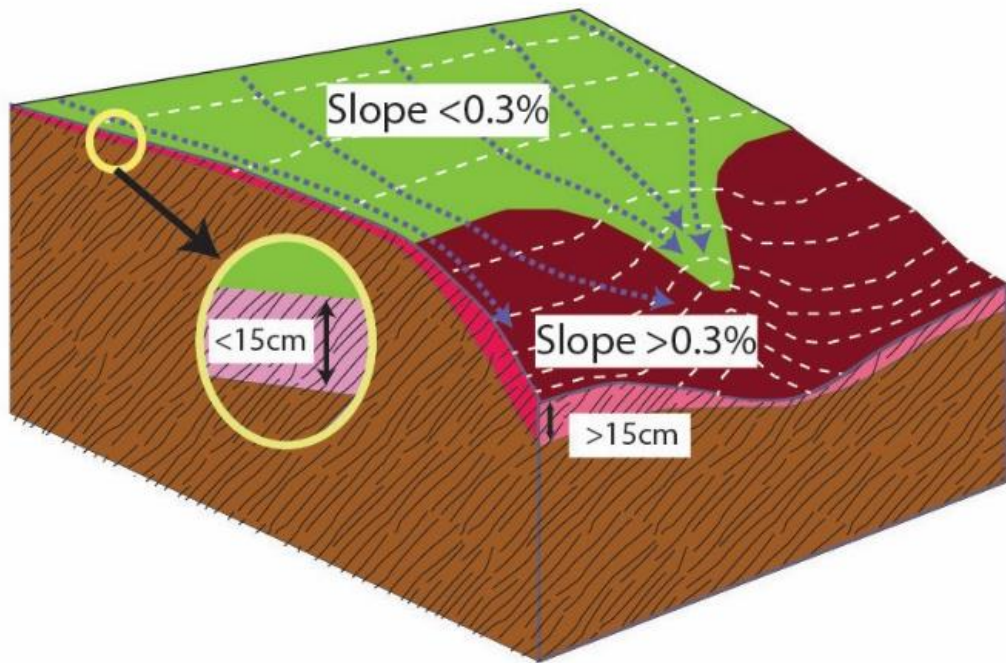


....and Blanket Bog?

- Approximately 150,750 ha in 50 sites making up SAC network.
- Area considered Active Blanket Bog (not cut or eroding) 1366 km². (NB: Not the same as peat accumulating)
- Approximately 10% lost since 1994.
- Suspected underestimation of damage.
- Initial survey of 1406 blanket bog subcatchments 95% displayed evidence of anthropogenic damage
- More detailed study of 341 least impacted catchments (>1km²), only 11 suggested no damage. Further investigation of four of the most suitable catchments showed all had some damage.
- **Or....all catchments have experienced some damage**

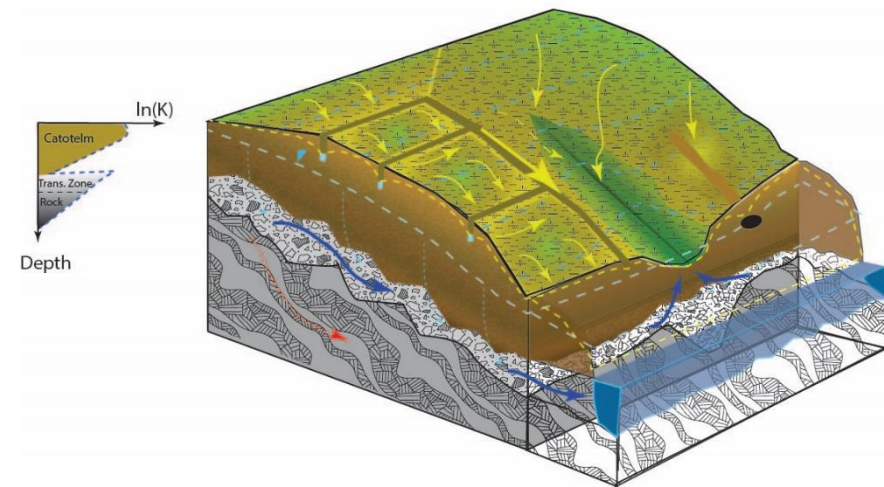
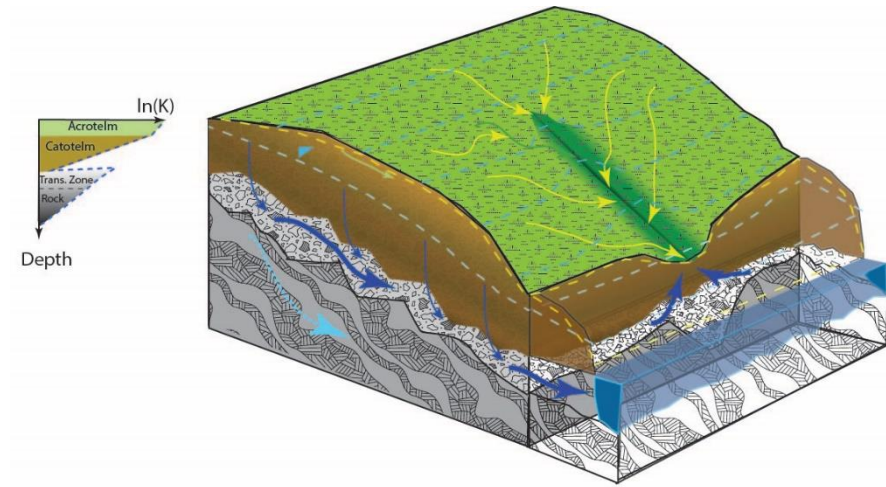


What's' going on?



...and blanket bogs?

- More & more frequent rainfall allows peat development on steeper slopes.
- Drainage has comparable impacts to raised bogs.
- Also significant aquatic impacts to head waters.
- Affects quality and quantity.



Quantity

- Bogs considered sponges to dampen flow but remarkably little supporting evidence.
- Often concerns about flooding.
- But need also consider dry weather conditions.
- when aquatic ecosystems often most stressed.
- Water quality doesn't matter if there's no water!

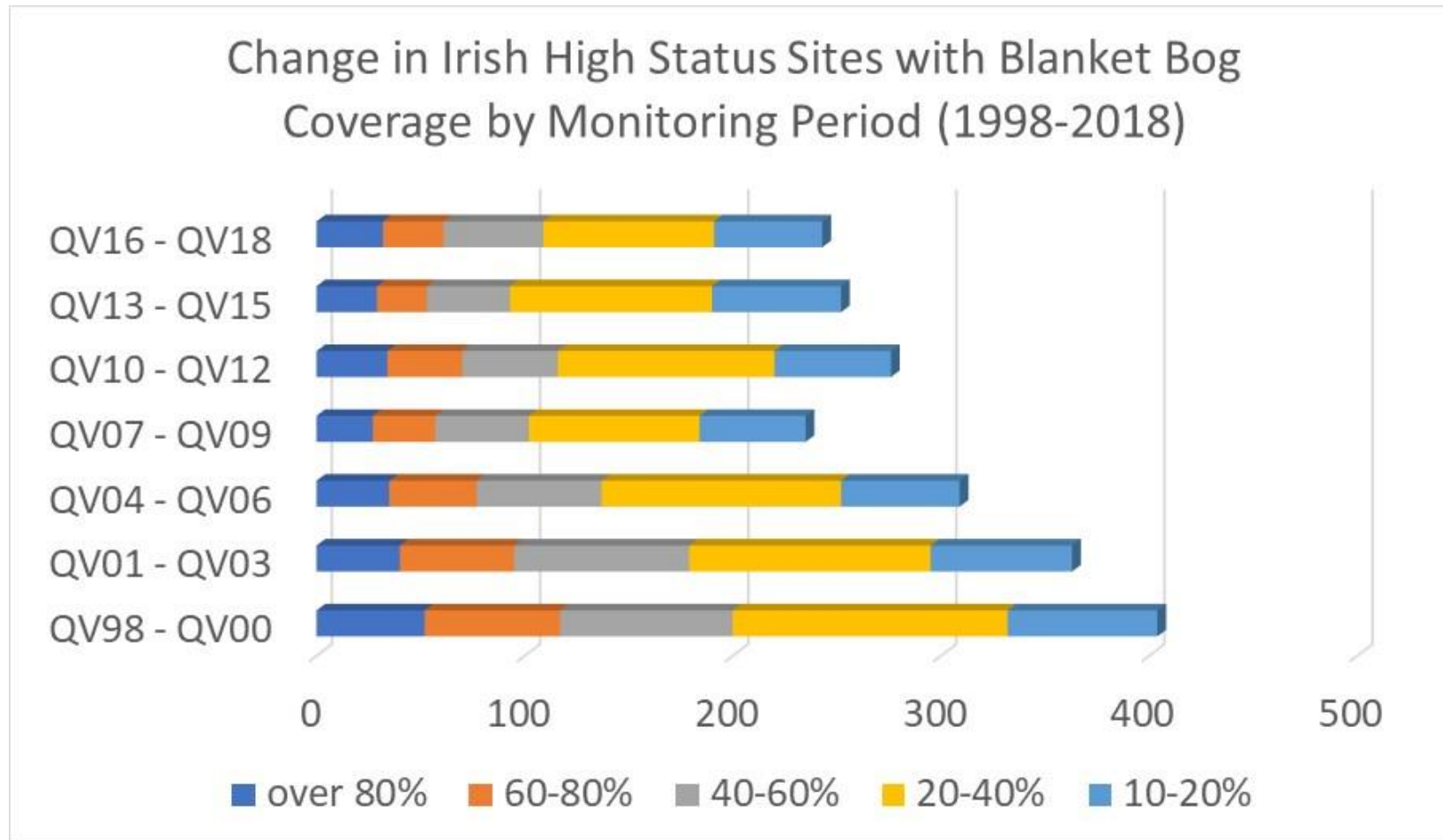


And quality.....

- Much less (nutrient poor) bog water at low flow.
-leads to streams with lower flow and more mineralised water.
- Can have adverse impacts on aquatic and terrestrial ecology, and the ecosystem services blanket bogs provide.



Overall Aquatic Ecological Impacts



Conclusions

- Ecosystems and the biodiversity they support consist of biotic and abiotic elements.
- Water (quantity and quality) is a fundamental component of Irish peatland ecosystems and their influence must be considered to understand functioning, how they are affected by human activity and the most appropriate restoration methods.
- Disturbance to Irish (raised and blanket) bog hydrology has caused widespread loss of peat accumulating plant communities.
- Impacts extend to aquatic ecosystems by altering flow and water quality regimes.
- These have resulted in sustained loss of high status water bodies.
- Moving forward-conserving remaining peat accumulating habitats and restoring those that are damaged habitats for both terrestrial and aquatic biodiversity.....
-but it is possible –and quicker than you may think.



Above: Example of successful cutover restoration at Mount Allen Bog, Co. Roscommon.

If you want to know more, try:

- Flynn, Raymond, Francis Mackin, and Florence Renou-Wilson. *Towards the quantification of blanket bog ecosystem services to water*. No. 378. EPA Research Report, 2021.
- Mackin, Francis, Raymond Flynn, Alan Barr, and Fernando Fernandez-Valverde. "Use of geographical information system-based hydrological modelling for development of a raised bog conservation and restoration programme." *Ecological Engineering* 106 (2017): 242-252.
- Flynn, Raymond, Claire McVeigh, Francis Mackin, and Florence Renou Wilson. "Sources of stream base flow in blanket peat covered catchments." *Journal of Hydrology* 603 (2021): 126965.
- Flynn, Raymond, Francis Mackin, Claire McVeigh, and Florence Renou-Wilson. "Impacts of a mature forestry plantation on blanket peatland runoff regime and water quality." *Hydrological Processes* 36, no. 2 (2022): e14494.
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