Raised Bog Hydrology

Bord na Móna Biodiversity Action Plan - Review Day

2nd February 2015 – World Wetlands Day

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Scientific Basis for Raised Bog Conservation Project

- Multidisciplinary study focused on developing a national raised bog Special Area of Conservation (SAC) management plan.
- Comprehensive review of raised bog Natural Heritage Areas (NHA) including assessing all bogs of potential conservation interest.
- Set national and site-specific conservation objectives for active raised bog habitat.
- Develop Site Specific restoration plans that relate out restoration actions to achieve site-specific and national conservation objectives.
Typical view of Raised Bog development

- Views development in isolation of surroundings
- Often little consideration given to geological conditions of
  a) substrate,
  b) surroundings.
Theoretical ecotope positions

Image: Adapted from Schouten (2002)
## Changes in Active Raised Bog

### Estimated loss of Active Raised Bog (ARB) within SACs

<table>
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<tr>
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<th>Area (Ha) in 1995</th>
<th>Area (Ha) in 2012</th>
<th>Change</th>
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<tbody>
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<td>Active raised bog (ARB)</td>
<td>1,940</td>
<td>1,210</td>
<td>-38 %</td>
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<tr>
<td>Total uncut bog</td>
<td>10,740</td>
<td>10,515</td>
<td>-2 %</td>
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Relatively small proportion of uncut bog cut away – contrasts with significant loss of active raised bog.

Restoration works have already taken place on many SACs - slowing the overall rate of decline.
Vital Elements for healthy bog eco-hydrology

1. Nutrient-poor water supply - Rainfall.
2. Water logging – but what exactly?

Must ask the “Three hows?”

Image: Ballynahone Bog – Alastair Ruffel, QUB.
How does it get there?
How often does it get there?

How long does it stay there?
Healthy vs. Unhealthy Bog
Hydrological Processes
Typical Raised Bog Topography
High Bog Drainage

A. Intact Bog Surface - Before Drainage

B. Immediately After Drainage
Peat Water Table (PWT) at Surface

C. After Prolonged Drainage
PWT and Bog Surface Decline.

D. Continued Drainage. Drains
Overgrown But Still Discharge Water
Marginal Drainage
(Drains around the edges)
High resolution topographic data
Detailed ecological mapping
Predicting where active raised bog can be sustained
Ballydangan Bog, Co. Roscommon
Does it always work?
Where does the rest of the water go?
Simple view of raised bog: Too Simple?
Geology more complicated than we originally thought…

Centre of Bog

Bog Margins
Impact of marginal drainage

Topographic gradients affected = more rapid flow off bog surface
Impact of marginal drainage

Topographic gradients and infiltration rates affected
= surface cannot remain sufficiently saturated
Impact of marginal drainage

This can also occur away from the bog margin!
Marginal drainage at Clara Bog
Subsidence (Sinking Ground)

Photos: Colm Malone, NPWS.
Map of Clara Bog: Regan (2012)
Theoretical ecotope positions

Central    Sub-central    Sub-marginal    Marginal    Lagg

Face-bank  Cutover
Ecological Effects of Subsidence

‘Wet’ ecotope has disappeared

‘Wet’ ecotope has increased

Images: Regan (2012)
How do we reverse degradation?

Develop an effective restoration plan that sets out short, medium and long-term measures

Key restoration measures for high bog:

• Preventing or minimising risk of further subsidence

• Slow flow of water off the bog:
  ▪ Drain blocking
  ▪ Forestry and scrub removal
Example of drain blocking at a Bord na Móna bog - Cuckoo Hill
Significant positive results can be expected within 10 years
Rehabilitation of cutover bog

Key measures for Cutover bog:

- Drain blocking
- Forestry and scrub removal
- Marginal dams to slow run-off and retain shallow areas of water.

Prioritise restoration:

1. Minimise loss of active raised bog on the high bog.

2. Increase area of peat-forming habitats on the cutover.

3. Maximise biodiversity/ecosystem services value of a site.
Significant positive results will take much longer than on the high bog but there are already some very positive examples.
Cutover rehabilitation

Killyconny Bog SAC – marginal dam
Marginal dam at Killyconny Bog SAC (Cavan/Meath)

Photo: Fernando Fernandez
Restoration

- Restoration plans are currently being developed for all raised bog SACs – collaboration between ecologists and hydrologists.

- Must consider importance of groundwater dependence – affects restoration and future management.

- Buy-in from stakeholders is essential – this will be difficult but requires a good concept plan of what restoration measures are needed for each site.

- Benefits of restoration extends beyond objectives under the Habitats Directive – ecosystem services including reduced carbon sequestration, water quality and regulation, biodiversity.
Thank you

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