SP0556

A compendium of UK peat restoration and management projects

APPENDICES TO SID5

The appendices give more detail about parts of the project.

APPENDIX 1 The comprehensive project information form and data collected

APPENDIX 2 A list of projects in the peat compendium and the compendium database

APPENDIX 3 Project objectives and how each project builds on previous work

APPENDIX 4 Results of follow up calls to eleven projects that returned a ≤50% overall success rate for their project.

APPENDIX 5 Outcomes from workshops at the Peat Compendium Conference 13 March 2008

APPENDIX 6 Analysis of existing UK science-base

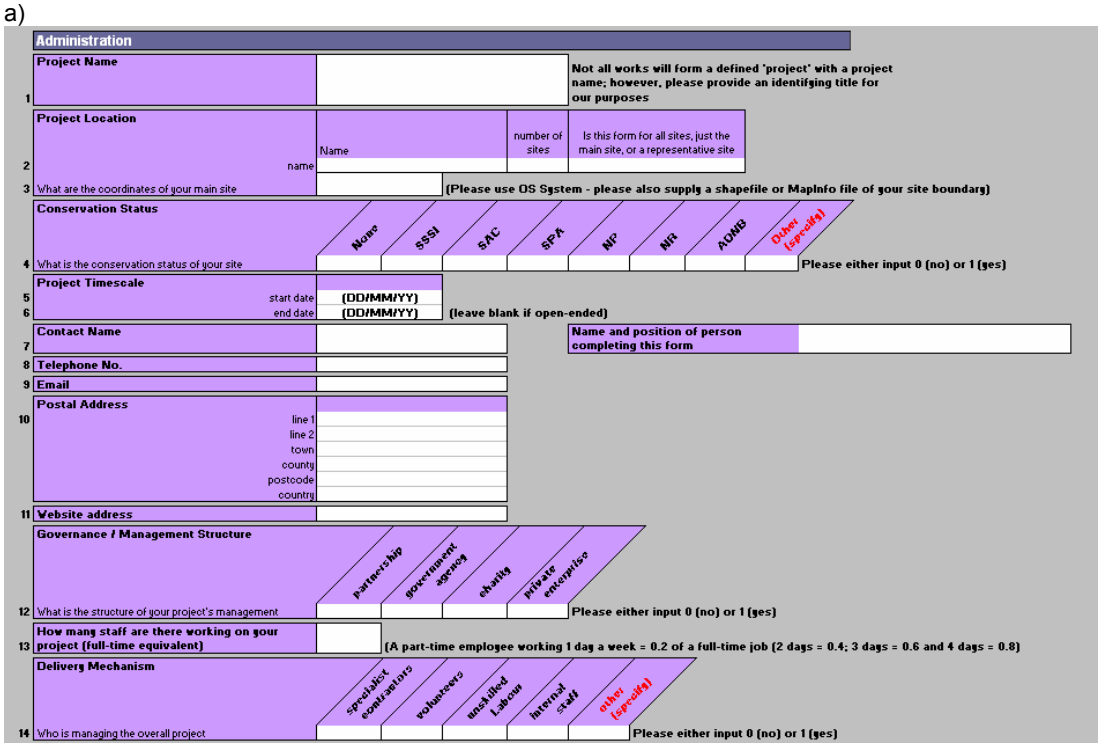
APPENDIX 7 Summary of a meeting held during the Peat Compendium Conference to determine interest and support for the creation of a peatlands network meeting

Appendix 1

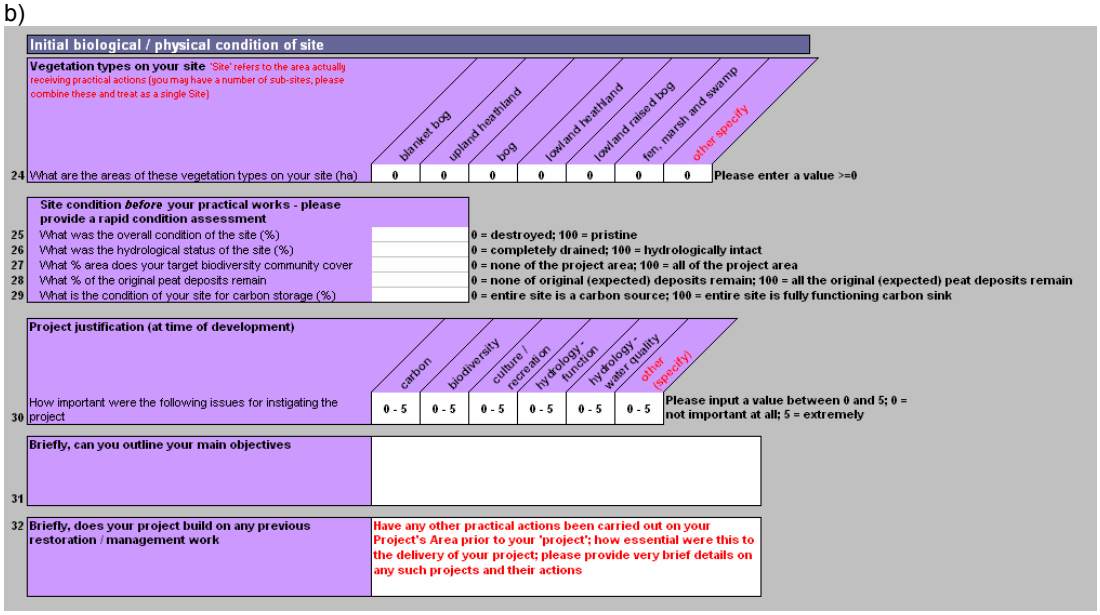
The comprehensive project information form and data collected

1) Screen shots of the comprehensive questionnaire; a) project administration page; b) initial biological / physical condition of site(s); and c) restoration project page

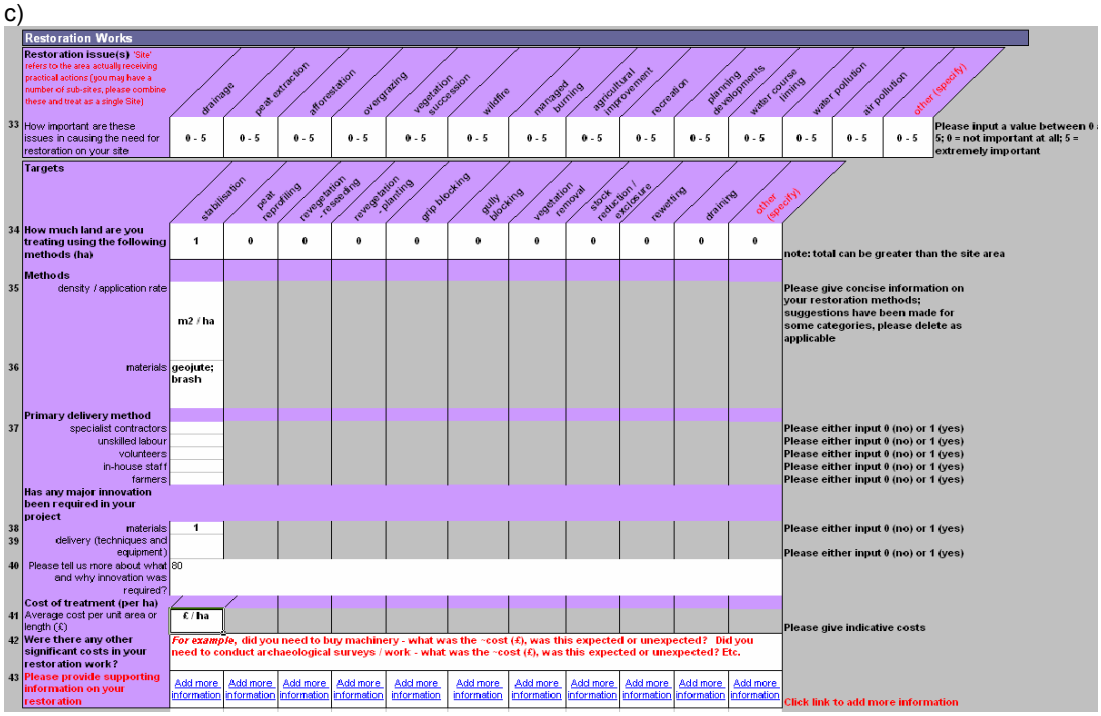
a)



b)



c)



Restoration Works

	Restoration issue(s) 'Site' refers to the area actually receiving practical actions (you may have a number of sub-sites, please combine these and treat as a single Site)	drainage	peat extraction	afforestation	overgrazing	vegetation succession	wildfire	managed burning	agricultural improvement	recreation	planning developments	water course liming	water pollution	air pollution	other (specify)	
33	How important are these issues in causing the need for restoration on your site	0 - 5	0 - 5	0 - 5	0 - 5	0 - 5	0 - 5	0 - 5	0 - 5	0 - 5	0 - 5	0 - 5	0 - 5	0 - 5	0 - 5	Please input a value between 0 and 5; 0 = not important at all; 5 = extremely important

	Targets	stabilisation	peat reprofiling	revegetation - reseeding	revegetation - planting	grip blocking	gully blocking	vegetation removal	stock reduction / exclosure	rewetting	draining	other (specify)	
34	How much land are you treating using the following methods (ha)	1	0	0	0	0	0	0	0	0	0	0	note: total can be greater than the site area
	Methods												
35	density / application rate	m2 / ha											Please give concise information on your restoration methods; suggestions have been made for some categories, please delete as applicable
36	materials	geojute; brash											
	Primary delivery method												
37	specialist contractors												Please either input 0 (no) or 1 (yes)
	unskilled labour												Please either input 0 (no) or 1 (yes)
	volunteers												Please either input 0 (no) or 1 (yes)
	in-house staff												Please either input 0 (no) or 1 (yes)
	farmers												Please either input 0 (no) or 1 (yes)
	Has any major innovation been required in your project												
38	materials	1											Please either input 0 (no) or 1 (yes)
39	delivery (techniques and equipment)												Please either input 0 (no) or 1 (yes)
40	Please tell us more about what and why innovation was required?	80											
	Cost of treatment (per ha)												
41	Average cost per unit area or length (£)	£ / ha											Please give indicative costs
42	**Were there any other significant costs in your restoration work?**	*For example*, did you need to buy machinery - what was the cost (£), was this expected or unexpected? Did you need to conduct archaeological surveys / work - what was the cost (£), was this expected or unexpected? Etc.											
43	**Please provide supporting information on your restoration**	Add more information	Add more information	Add more information	Add more information	Add more information	Add more information	Add more information	Add more information	Add more information	Add more information	Add more information	Click link to add more information

2) The questions (information requested) in the comprehensive questionnaire with details of the format we requested answers (column 1) and the location of these data (worksheet and columns) within the accompanying data file: 56 Project.xls (column 2).

Question on comprehensive questionnaire	Location (worksheet and column) in the data file: 56 Projects.xls
Administration	**Worksheet: Data1**
Project Number	**A**
Project Name (or identifying title)	**B**
Project Location	**C**
What are the coordinates of your main site	**D**
Number of sites	**E**
Is this form for all sites, just the main site, or a representative site	**F**
What is the conservation status of your site	
None	**G**
SSSI	**H**
SAC	**I**
SPA	**J**
NP	**K**
NR	**L**
AONB	**M**
Other	**N**
Project Start date	**O**
Project End date (blank if open-ended)	**P**
Contact Name	**Q**
Telephone number	**R**
E-mail	**S**
Postal address 1	**T**
Postal address 2	**U**
Town	**V**
County	**W**
Postcode	**X**
Country	**Y**
Website address	**Z**
Name of person completing form	**AA**
Position of person completing form	**AB**
What is the structure of your project's management	
o Partnership	**AC**
o Government agency	**AD**
o Charity	**AE**
o Private enterprise	**AF**
How many staff are there working on your project (full-time equivalent)	**AG**
Who is managing the overall project	
o Specialist contractors	**AH**
o Volunteers	**AI**
o Unskilled labour	**AJ**
o Internal staff	**AK**
o Other (specify)	**AL**
Project Budget	
What is the total budget of the project / work (£)	**AM**
How much was / will be spent on amount practical works (£)	**AN**
How much was / will be spent on monitoring (£)	**AO**
How much was / will be spent on land acquisition (£)	**AP**
What area of land was / will be purchased (ha)	**AQ**

Where has the funding come from to undertake your project		
o Environmental Stewardship		**AR**
o ESA		**AS**
o CSS		**AT**
o EN Wild Enhance		**AU**
o Local Grants		**AV**
o National Grants		**AW**
o Regional Grants		**AX**
o International Grants		**AY**
o Private Sector		**AZ**
o Other		**BA**
Land Ownership (ha) Project 'Area' is the total land that requires restorative or management actions; project 'Site' refers to the area actually receiving practical actions (you may have a number of sub-sites within the Area, please combine these and treat as a single Site)		
What is the ownership of your project's Area		
o Area: Private (Commercial) (ha)		**BB**
o Area: Private (Charitable) (ha)		**BC**
o Area: Public (ha)		**BD**
o Area: Total (ha)		**BE**
What is the ownership of your project's Site		
o Site: Private (Commercial) (ha)		**BF**
o Site: Private (Charitable) (ha)		**BG**
o Site: Public (ha)		**BH**
o Site: Total (ha)		**BI**
What kind of project is yours (choose one category)		
o Restoration		**BJ**
o Management		**BK**
o Restoration & Management		**BL**
Please provide very brief information on how your project was planned		
Land ownership (eg consultations etc)		**BM**
Access (Any issues?)		**BN**
Special permissions (eg Environment Agency to impound water?)		**BO**
Special considerations (eg archaeology)		**BP**
Use/need for remote sensing/GIS		**BQ**
Any other factors/issues?		**BR**
Initial Condition		**Worksheet: Data1**
Vegetation types on your site 'Site' refers to the area actually receiving practical actions (you may have a number of sub-sites, please combine these and treat as a single Site)		
What are the areas of these vegetation types on your site		
o Blanket Bog (ha)	**BS (area)**	**BZ 0=no, 1=yes**
o Upland heathland (ha)	**BT (area)**	**CA 0=no, 1=yes**
o Bog (ha)	**BU (area)**	**CB 0=no, 1=yes**
o Lowland heathland (ha)	**BV (area)**	**CC 0=no, 1=yes**
o Lowland raised bog (ha)	**BW (area)**	**CD 0=no, 1=yes**
o Fen, marsh & swamp (ha)	**BX (area)**	**CE 0=no, 1=yes**
o Other (ha)	**BY (area)**	**CF (type)**
Site condition before your practical works - please provide a rapid condition assessment		
What was the overall condition of the site (%) 0 = destroyed; 100 = pristine		**CG**
What was the hydrological status of the site (%) 0 = completely drained; 100 = hydrologically intact		**CH**
What % area does your target biodiversity community cover 0 = none		**CI**

Instead of area some respondents just indicated 1/0. Binary data are therefore presented for all project in columns CA:CH

of the project area; 100 = all of the project area	
What % of the original peat deposits remain 0 = none of original (expected) deposits remain; 100 = all the original (expected) peat deposits remain	**CJ**
What is the condition of your site for carbon storage (%) 0 = entire site is a carbon source; 100 = entire site is fully functioning carbon sink	**CK**
Project justification (at time of development)	
How important were the following issues for instigating the project Please input a value between 0 and 5; 0 = not important at all; 5 = extremely important	
o Carbon	**CL**
o Biodiversity	**CM**
o Culture/recreation	**CN**
o Hydrology - function	**CO**
o Hydrology - water quality	**CP**
o Other	**CQ**
Briefly, can you outline your main objectives	**CR**
Briefly, does your project build on any previous restoration / management work	**CS**
Restoration Works	**Worksheet: Data1**
Restoration issue(s) 'Site' refers to the area actually receiving practical actions (you may have a number of sub-sites, please combine these and treat as a single Site)	
How important are these issues in causing the need for restoration on your site Please input a value between 0 and 5; 0 = not important at all; 5 = extremely important	
Drainage	**CT**
Peat extraction	**CU**
Afforestation	**CV**
Overgrazing	**CW**
Vegetation succession	**CX**
Wildfire	**CY**
Managed burning	**CZ**
Agricultural improvement	**DA**
Recreation	**DB**
Planning Developments	**DC**
Water course liming	**DD**
Water pollution	**DE**
Air pollution	**DF**
Other	**DG**
How much land are you treating using the following methods	
Stabilisation (ha)	**DH**
Density/Application rate m²/ha	**DI**
Materials used	**DJ**
Primary Delivery Method	
Specialist	**DK**
Unskilled	**DL**
Volunteers	**DM**
In-house	**DN**
Farmers	**DO**
Has any major innovation been required in your project	
Materials	**DP**
Delivery (techniques and equipment)	**DQ**
Please tell us more about what and why innovation was required?	**DR**

Cost of Treatment (per ha)	**DS**
Were there any other significant costs in your restoration work?	**DT**
Please provide supporting information on your restoration	**DU**
Peat reprofiling (ha)	**DV**
Primary Delivery Method	
Specialist	**DW**
Unskilled	**DX**
Volunteers	**DY**
In-house	**DZ**
Farmers	**EA**
Has any major innovation been required in your project	
Materials	**EB**
Delivery (techniques and equipment)	**EC**
Cost of Treatment (per ha)	**ED**
Please provide supporting information on your restoration	**EE**
Revegetation – reseeding (ha)	
Density/Application rate gm/ha	**EF**
Materials used	**EG**
Primary Delivery Method	**EH**
Specialist	**EI**
Unskilled	**EJ**
Volunteers	**EK**
In-house	**EL**
Farmers	**EM**
Has any major innovation been required in your project	
Materials	**EN**
Delivery (techniques and equipment)	**EO**
Cost of Treatment (per ha)	**EP**
Were there any other significant costs in your restoration work?	**EQ**
Please provide supporting information on your restoration	**ER**
Revegetation – planting (ha)	
Density/Application rate n/ha	**ES**
Materials used	**ET**
Primary Delivery Method	
Specialist	**EU**
Unskilled	**EV**
Volunteers	**EW**
In-house	**EX**
Farmers	**EY**
Has any major innovation been required in your project	
Materials	**EZ**
Delivery (techniques and equipment)	**FA**
Cost of Treatment (per ha)	**FB**
Please provide supporting information on your restoration	**FC**
Grip blocking (km)	**FD**
Density/Application rate n/km	**FE**
Materials used	**FF**
Primary Delivery Method	
Specialist	**FG**
Unskilled	**FH**
Volunteers	**FI**
In-house	**FJ**
Farmers	**FK**
Has any major innovation been required in your project	
Materials	**FL**
Delivery (techniques and equipment)	**FM**

Cost of Treatment (per ha)	**FN**
Please provide supporting information on your restoration	**FO**
Gully blocking (km)	**FP**
Density/Application rate n/km	**FQ**
Materials used	**FR**
Primary Delivery Method	
Specialist	**FS**
Unskilled	**FT**
Volunteers	**FU**
In-house	**FV**
Farmers	**FW**
Has any major innovation been required in your project	
Materials	**FX**
Delivery (techniques and equipment)	**FY**
Cost of Treatment (per ha)	**FZ**
Please provide supporting information on your restoration	**GA**
Vegetation removal (ha)	**GB**
Primary Delivery Method	
Specialist	**GC**
Unskilled	**GD**
Volunteers	**GE**
In-house	**GF**
Farmers	**GG**
Has any major innovation been required in your project	
Materials	**GH**
Delivery (techniques and equipment)	**GI**
Cost of Treatment (per ha)	**GJ**
Please provide supporting information on your restoration	**GK**
Stock reduction/exclosure (ha)	**GL**
Density/Application rate (Livestock units/ha)	**GM**
Primary Delivery Method	
Specialist	**GN**
Unskilled	**GO**
Volunteers	**GP**
In-house	**GQ**
Farmers	**GR**
Has any major innovation been required in your project	
Materials	**GS**
Delivery (techniques and equipment)	**GT**
Cost of Treatment (per ha)	**GU**
Please provide supporting information on your restoration	**GV**
Rewetting (ha)	**GW**
Primary Delivery Method	
Specialist	**GX**
Unskilled	**GY**
Volunteers	**GZ**
In-house	**HA**
Farmers	**HB**
Has any major innovation been required in your project	
Materials	**HC**
Delivery (techniques and equipment)	**HD**
Cost of Treatment (per ha)	**HE**
Please provide supporting information on your restoration	**HF**

Draining (ha)	**HG**
Primary Delivery Method	
Specialist	**HH**
Unskilled	**HI**
Volunteers	**HJ**
In-house	**HK**
Farmers	**HL**
Has any major innovation been required in your project	
Materials	**HM**
Delivery (techniques and equipment)	**HN**
Cost of Treatment (per ha)	**HO**
Please provide supporting information on your restoration	**HP**
Other (ha)	**HQ**
Density/Application rate (specify)	**HR**
Materials used	**HS**
Primary Delivery Method	
Specialist	**HT**
Unskilled	**HU**
Volunteers	**HV**
In-house	**HW**
Farmers	**HX**
Has any major innovation been required in your project	
Materials	**HY**
Delivery (techniques and equipment)	**HZ**
Cost of Treatment (per ha)	**IA**
Please provide supporting information on your restoration	**IB**
Management	**Worksheet: Data2**
Project Number	**A**
Management issue(s) 'Site' refers to the area actually receiving practical actions (you may have a number of sub-sites, please combine these and treat as a single Site)	
How important are these issues on your site Please input a value between 0 and 5; 0 = not important at all; 5 = extremely important	
Hydrological status	**B**
Vegetation succession	**C**
Wildfire	**D**
Managed burning	**E**
Agricultural improvement	**F**
Recreation	**G**
Planning Developments	**H**
Water course liming	**I**
Pollution	**J**
Natural Disasters	**K**
Other (specify)	**L**
How much land are you treating using the following methods	
Hydrological management (ha)	**M**
Density/Application rate n/ha	**N**
Materials used	
Primary Delivery Method	**O**
Specialist	**P**
Unskilled	**Q**
Volunteers	**R**
In-house	**S**
Farmers	**T**

Has any major innovation been required in your project	
Materials	**U**
Delivery (techniques and equipment)	**V**
Please tell us more about what and why innovation was required?	**W**
Cost of Treatment (per ha)	**X**
Were there any other significant costs in your restoration work?	**Y**
Please provide supporting information on your management	**Z**
Mowing (ha)	**AA**
Primary Delivery Method	
Specialist	**AB**
Unskilled	**AC**
Volunteers	**AD**
In-house	**AE**
Farmers	**AF**
Has any major innovation been required in your project	
Materials	**AG**
Delivery (techniques and equipment)	**AH**
Cost of Treatment (per ha)	**AI**
Please provide supporting information on your management	**AJ**
Grazing (ha)	**AK**
Livestock units / ha (plus reduction as LU / ha)	**AL**
Species	**AM**
Primary Delivery Method	
Specialist	**AN**
Unskilled	**AO**
Volunteers	**AP**
In-house	**AQ**
Farmers	**AR**
Has any major innovation been required in your project	
Materials	**AS**
Delivery (techniques and equipment)	**AT**
Cost of Treatment (per ha)	**AU**
Please provide supporting information on your management	**AV**
Burning (ha)	**AW**
Primary Delivery Method	
Specialist	**AX**
Unskilled	**AY**
Volunteers	**AZ**
In-house	**BA**
Farmers	**BB**
Has any major innovation been required in your project	
Materials	**BC**
Delivery (techniques and equipment)	**BD**
Cost of Treatment (per ha) £	**BE**
Please provide supporting information on your management	**BF**
Peat Cutting (ha)	**BG**
Density/Application rate m^3/ha	**BH**
Primary Delivery Method	
Specialist	**BI**
Unskilled	**BJ**
Volunteers	**BK**
In-house	**BL**

Farmers	**BM**
Has any major innovation been required in your project	
Materials	**BN**
Delivery (techniques and equipment)	**BO**
Cost of Treatment (per ha) £	**BP**
Please provide supporting information on your management	**BQ**
Scrub Clearance (ha)	**BR**
Density/Application rate n/km	**BS**
Primary Delivery Method	
Specialist	**BT**
Unskilled	**BU**
Volunteers	**BV**
In-house	**BW**
Farmers	**BX**
Has any major innovation been required in your project	
Materials	**BY**
Delivery (techniques and equipment)	**BZ**
Cost of Treatment (per km) £	**CA**
Please provide supporting information on your management	**CB**
Visitor Facilities (ha)	**CC**
Density n/ha or n/km	**CD**
Materials	**CE**
Primary Delivery Method	
Specialist	**CF**
Unskilled	**CG**
Volunteers	**CH**
In-house	**CI**
Farmers	**CJ**
Has any major innovation been required in your project	
Materials	**CK**
Delivery (techniques and equipment)	**CL**
Cost of Treatment (per ha) £	**CM**
Please provide supporting information on your management	**CN**
Others (ha)	**CO**
Density/Application rate	**CP**
Materials used	**CQ**
Primary Delivery Method	
Specialist	**CR**
Unskilled	**CS**
Volunteers	**CT**
In-house	**CU**
Farmers	**CV**
Has any major innovation been required in your project	
Materials	**CW**
Delivery (techniques and equipment)	**CX**
Cost of Treatment (per ha) £	**CY**
Please provide supporting information on your management	**CZ**
Evaluation	**Worksheet: Data3**
Project Number	**A**
***Vegetation Monitoring*: Are you**	
Carrying out ground surveys	**B**
Using remote sensing data	**C**
Using aerial photographs	**D**

Using infra red images	**E**
Using LIDAR	**F**
Please name any other data you are using (for all monitoring)	**G**
Monitoring delivery:	
In-house	**H**
Academic Collaboration	**I**
Academic Contractors	**J**
Private contractor	**K**
Hired Technicians	**L**
Volunteers	**M**
For how many years will monitoring be conducted after completion of practical works	**N**
Success (from monitoring data) (provide any quantitative monitoring results)	
Baseline (initial) value	**O**
Target value	**P**
Current observed value	**Q**
Please provide supporting information on your monitoring	**R**
***Invertebrate Monitoring*: Are you**	
Carrying out ground surveys	**S**
Monitoring delivery:	
In-house	**T**
Academic Collaboration	**U**
Academic Contractors	**V**
Private contractor	**W**
Hired Technicians	**X**
Volunteers	**Y**
For how many years will monitoring be conducted after completion of practical works	**Z**
Success (from monitoring data) (provide any quantitative monitoring results)	
Baseline (initial) value	**AA**
Target value	**AB**
Current observed value	**AC**
Please provide supporting information on your monitoring	**AD**
***Birds Monitoring*: Are you**	
Carrying out ground surveys	
Monitoring delivery:	**AE**
In-house	**AF**
Academic Collaboration	**AG**
Academic Contractors	**AH**
Private contractor	**AI**
Hired Technicians	**AJ**
Volunteers	**AK**
For how many years will monitoring be conducted after completion of practical works	**AL**
Success (from monitoring data) (provide any quantitative monitoring results)	
Baseline (initial) value	**AM**
Target value	**AN**
Current observed value	**AO**
Please provide supporting information on your monitoring	**AP**
***Hydrology/Water Quality Monitoring*: Are you**	**AQ**
Carrying out ground surveys	**AQ**

Using remote sensing data	**AR**
Using aerial photographs	**AS**
Using infra red images	**AT**
Using LIDAR	**AU**
Please name any other data you are using (for all monitoring)	**AV**
Monitoring delivery:	
In-house	**AW**
Academic Collaboration	**AX**
Academic Contractors	**AY**
Private contractor	**AZ**
Hired Technicians	**BA**
Volunteers	**BB**
For how many years will monitoring be conducted after completion of practical works	**BC**
Success (from monitoring data) (provide any quantitative monitoring results)	
Baseline (initial) value	**BD**
Target value	**BE**
Current observed value	**BF**
Please provide supporting information on your monitoring	**BG**
***Carbon/Greenhouse Gas Monitoring*: Are you**	
Carrying out ground surveys	**BH**
Using remote sensing data	**BI**
Using aerial photographs	**BJ**
Using infra red images	**BK**
Using LIDAR	**BL**
Please name any other data you are using (for all monitoring)	**BM**
Monitoring delivery:	
In-house	**BN**
Academic Collaboration	**BO**
Academic Contractors	**BP**
Private contractor	**BQ**
Hired Technicians	**BR**
Volunteers	**BS**
For how many years will monitoring be conducted after completion of practical works	**BT**
Success (from monitoring data) (provide any quantitative monitoring results)	
Baseline (initial) value	**BU**
Target value	**BV**
Current observed value	**BW**
Please provide supporting information on your monitoring	**BX**
***Peat erosion Monitoring*: Are you**	
Carrying out ground surveys	**BY**
Using remote sensing data	**BZ**
Using aerial photographs	**CA**
Using infra red images	**CB**
Using LIDAR	**CC**
Please name any other data you are using (for all monitoring)	**CD**
Monitoring delivery:	
In-house	**CE**
Academic Collaboration	**CF**
Academic Contractors	**CG**
Private contractor	**CH**
Hired Technicians	**CI**

Volunteers	**CJ**
For how many years will monitoring be conducted after completion of practical works	**CK**
Success (from monitoring data) (provide any quantitative monitoring results)	
Baseline (initial) value	**CL**
Target value	**CM**
Current observed value	**CN**
Please provide supporting information on your monitoring	**CO**
***Climate Monitoring*: Are you**	
Carrying out ground surveys	**CP**
Using remote sensing data	**CQ**
Using aerial photographs	**CR**
Using infra red images	**CS**
Using LIDAR	**CT**
Please name any other data you are using (for all monitoring)	**CU**
Monitoring delivery:	
In-house	**CV**
Academic Collaboration	**CW**
Academic Contractors	**CX**
Private contractor	**CY**
Hired Technicians	**CZ**
Volunteers	**DA**
For how many years will monitoring be conducted after completion of practical works	**DB**
Success (from monitoring data) (provide any quantitative monitoring results)	
Baseline (initial) value	**DC**
Target value	**DD**
Current observed value	**DE**
Please provide supporting information on your monitoring	**DF**
***Pollution Monitoring*: Are you**	
Carrying out ground surveys	**DG**
Using remote sensing data	**DH**
Using aerial photographs	**DI**
Using infra red images	**DJ**
Using LIDAR	**DK**
Please name any other data you are using (for all monitoring)	**DL**
Monitoring delivery:	
In-house	**DM**
Academic Collaboration	**DN**
Academic Contractors	**DO**
Private contractor	**DP**
Hired Technicians	**DQ**
Volunteers	**DR**
For how many years will monitoring be conducted after completion of practical works	**DS**
Success (from monitoring data) (provide any quantitative monitoring results)	
Baseline (initial) value	**DT**
Target value	**DU**
Current observed value	**DV**
Please provide supporting information on your monitoring	**DW**
***Other Monitoring (specify)*: Are you**	

Carrying out ground surveys	**DX**
Using remote sensing data	**DY**
Using aerial photographs	**DZ**
Using infra red images	**EA**
Using LIDAR	**EB**
Please name any other data you are using (for all monitoring)	**EC**
Monitoring delivery:	
In-house	**ED**
Academic Collaboration	**EE**
Academic Contractors	**EF**
Private contractor	**EG**
Hired Technicians	**EH**
Volunteers	**EI**
For how many years will monitoring be conducted after completion of practical works	**EJ**
Success (from monitoring data) (provide any quantitative monitoring results)	
Baseline (initial) value	**EK**
Target value	**EL**
Current observed value	**EM**
Please provide supporting information on your monitoring	**EN**
Rapid site condition assessment post / during practical works:	**EO**
Overall condition of the site (%) (0 = destroyed, 100 = pristine)	**EP**
Hydrological status of the site (%) (0 = completely drained, 100 = hydrologically intact)	**EQ**
Area covered by target biodiversity community % (0 = none, 100 = all)	**ER**
Remaining peat deposits (%) (0 = none of original (expected) deposits remain; 100 = all the original (expected) peat deposits remain)	**ES**
Site condition for carbon storage (0 = entire site is a carbon source; 100 = entire site is fully functioning carbon sink)	**ET**
Factors responsible for any shortfall in success (0 = not important at all; 5 = extremely important)	
Governance	**EU**
Funding	**EV**
Implementation	**EW**
Access	**EX**
Availability of materials	**EY**
Unsuccessful land acquisition	**EZ**
Opposition	**FA**
Weather/natural disasters	**FB**
Lack of guidance/information	**FC**
Other (specify)	**FD**
Briefly, what are the biggest gaps in our knowledge and/or understanding of peatlands and their restoration / management?	**FE**
Briefly, have you revised your project's targets from those originally set out?	**FF**
Future Plans	**Datasheet: Data3**
Are post-project plans being created as part of the project:	
For Restoration	**FG**
For Management	**FH**
Is it anticipated that the project continue beyond it's set completion date (to deliver additional restorative works)	**FI**
Is it anticipated that the project continue beyond it's set completion date	**FJ**

(to deliver additional management)	
Please estimate stability / persistence of your site without future restoration work (no. years)	**FK**
Please estimate stability / persistence of your site without future management (no. years)	**FL**
If there is a funding shortfall, please estimate how much is required to complete the already planned restoration works (£)	**FM**
If there is a funding shortfall, please estimate how much is required to complete the already planned management works (£)	**FN**
If your site does not constitute the entire project area (all land requiring restorative or management work); how much additional funding is required to treat the entire Area in terms of restoration (£)	**FO**
If your site does not constitute the entire project Area (all land requiring restorative or management work); how much additional funding is required to treat the entire Area in terms of management (£)	**FP**

Appendix 2

A list of projects in the peat compendium and the compendium database

1) Projects and their status within the peat compendium

Green = Comprehensive project forms received by 25 February 2008and projects included in analysis
Yellow = Comprehensive project forms received between 26 February and 20 March 2008 and projects not included in analyses
Pink = Summary project forms received
Blue = Project identified but no response

1	12 Yards Road (Chap Moss)
2	Astley and Bedford Moss
3	Astley Moss NR
4	Border Mires Peat Restoration
5	Broads Fen Management - Bure Marshes
6	Caithness and Sutherland Peatland Management Scheme
7	Cayton & Flixton Carrs Wetland Project
8	Chartley Moss and Aqualate Mere
9	Chippenham Fen
10	Cors Dyfi
11	Cothill Fen and Parsonage Moor
12	Cumbrian Basin Mires
13	Cumbrian N Pennines SSSIs (Geltsdale, Moorhouse, Appleby)
14	Danes Moss Restoration Project
15	Dartmoor Blanket Bog Restoration Project
16	Bogs & Valley Mire Restoration in Dorset
17	Drumburgh Moss NNR
18	Exmoor Mire Restoration Project
19	Restoring Fenn's, Whixall & Bettisfield Mosses NNR
20	Foulshaw Moss NR
21	Gordano Valley NNR
22	Great Fen Project
23	HEATH Project
24	High Peak Favourable Condition Project (Kinder & Bleaklow)
25	Humberhead Peatlands (Thorne & Hatfield Moors)
26	LIFE Active Blanket Bog in Wales Project (Vyrnwy)
27	Meathop Moss NR
28	Mid Cornwall Moors LIFE Project (Goss Moor NNR)
29	Mointeach nan Lochan Dubha (Skye) Peatland Management Scheme
30	Moors for the Future Phase 1 Bleaklow Restoration
31	Moors for the Future Phase 1 Kinder Low Restoration
32	Mosslands of Northwest 1
33	New Forest LIFE 3 Wetlands Project
34	Newham Bog Restoration Project
35	North Lincolnshire Lowland Raised Bogs
36	Peatlands Park
37	Peatscapes Project
38	Red Moss Restoration Project
39	Redgrave and Lopham Fen NNR Restoration Project
40	Restoration of Lowland Raised Bog of SSI in Cumbria
41	Scaleby Moss

42	SCaMP Project Southern (North Longdendale)
43	Skiddaw Forest Restoration
44	Westhay Moor NNR (Somerset Wildlife Trust)
45	South Solway Mosses
46	Western Isles Peatland Management Scheme
47	Heysham Moss Restoration Project
48	Duddon Mosses Restoration
49	Fylingdales Fire Site Regeneration Project
50	Border Mires (Northumberland Wildlife Trust)
51	Holburn Moss Restoration
52	Wybunbury Moss NNR
53	Wicken Fen Vision
54	Conservation of Active Blanket Bogs (Cuilcagh Mountain Park)
55	Tees Water Colour Project (Wemmergill Southside)
56	SCaMP Project Southern (Goyt)
57	SNAP Severn Natural Assets Project (Allt Ddu part)
58	Ballynahone NNR
59	Isle of Axeholme, Baston & Thurlby Fens
60	Marsh Fritillary Habitat Improvement (Inishargy Bog)
61	Teal Lough
62	Moors for the Future Phase 1 Black Hill/Wessenden Moors Restoration
63	Mosslands Project (Red Rose Forest)
64	Wem Moss NNR
65	Rusland Moss NNR
66	Westhay Heath (Somerset Wildlife Trust)
67	Catcott Lows
68	Forsinard Flows Reserve
69	Campfield Marsh Reserve (Bowness Common)
70	Geltsdale
71	Mid Yare Valley
72	Sutton Fen
	Action for Wildlife Dartmoor Biodiversity Project
	Altikerragh NNR
	Arden Great Moor
	Arran Moors Moorland Management Scheme
	Bodmin Moor
	Breckland NNR's
	Burns Beck Moss NR
	Caithness Forests
	Camilty Forest
	Cannock Chase
	Cockayne Head
	Cors Bodeilio NNR
	Cors Caron NNR
	Cors Erddreiniog NNR
	Cors Fochno NNR
	Cors Geirch
	Cors y Llyn NNR
	Dartmoor -project name tba
	Dartmoor Vision 2030
	Delamere Forest
	Dersingham Bog, Swanton Novers & Paston Barn NNR
	Dornoch Forest (District)

Dyke Forest
East Devon Pebblebeds (RSPB Aylesbeare)
Flanders Moss, Red Moss, Carsegowan Moss, Dalnellington
Forest of Clunie Moorland Management Scheme
Forth and Borders Moorland Management Scheme
Glaisdale Moor
Glaisdale Moor 1980-1993
Glaisdale Moor 2001
Glen Affric, Loch Beinn a Mheadhoin
Glen App & Galloway Moors Moorland Management Scheme
Glendun
Grampian Lowland Bog Scheme
Hafren Forest
Hardy's Egdon Heath
Heathland Forest
Holme Fen, Upwood Meadows and Woodwalton Fen National Nature Reserves
Ince Moss (Wigan Flashes)
Inverasdale Peatlands
Involved in bog restoration in Cumbria
Isles of Scilly
Kylerhea
Lincolnshire Coversands Project
Lindisfarne NNR
Lowland raised bog restoration
Lyke Wake Walk
Muirkirk & North Lowther Uplands Moorland Management Scheme
Norfolk Broads
North Pennines NNRs
North West England Lowland Wetland Project
Orkney Hen Harrier Scheme
Orkney Mainland Moorland Management Scheme
Peatland restoration on West Midlands SSSIs (including Chartley Moss)
Rannoch Moor
Rattlebrook Project
Renfrewshire Heights Moorland Management Scheme
Restoring the Heaths of the Vale of York
Rhos Goch Common NNR
River Swale Regeneration Project
Shapwick Heath & Mendip NNRs
Shapwick Heath, Ham Wall, Westhay Moor
Somerset Levels
Somerset Levels & Moors (Natural England)
South Scotland Lowland Bog Scheme
Surrey Heaths
THH Orkney
THH Pembrokeshire
Upper Wharfedale Best Practice Project (1998-2002)
Walberswick, Benacre and Westleton NNRs
Waun Fignen Felen bog
Whitelee Moor NNR
Winmarleigh Moss SSSI

2) The peat compendium database
The peat compendium database is a live project that will continue to be updated through the peat compendium website. It will therefore continue to grow after the completion of this project and as such the data submitted represents information collected to date. Below is a list of fields within the peat compendium database that accompanies this report (Access Peat Compendium Database.mdb)

Data field within the peat compendium database

Field Title
ID
Project No.
Project name
Contact Name
Job title
Email
Phone
Organisation / Lead partner
Address 1
Address 2
Address 3
Address 4
Postcode
Website
Country
Region
County / Authority / District
Upland / Lowland
Habitat
Location: Eastings
Location: Northings
Start year
End Year
Land designations
Project area
Restoration project
Management project
GIS data used

Timetable of actions to identify and collect data of peatland restoration and management projects.

Date	Action
1-9/12/07	Identified regional and local contacts (where possible) of Natural England, Scottish Natural Heritage, Countryside Council for Wales, Wildlife Trusts, RSPB, Department of the Environment Northern Ireland, National Trust, Forestry Commission, Environment Agency, National Parks in England, Wales and Scot;land, Environment Heritage Service Northern Ireland, SEPA and others (eg Heather Trust, Countryside Alliance).
10/12/07	109 contacts emailed requesting information on known/historic/potential peatland restoration and/or management projects
02/08	'Comprehensive' Project Information Forms (CPIF) sent to 115 projects
5-17/02/08	Telephoned every contact who had been sent forms (>300 calls)
25/02/08	Internal deadline for completed CPIFs to be used be in the analyses of projects
26/02/08	Summary Project forms sent to 27 projects who had not returned CPIFs
03/08	Follow up (telephone) interviews with 11 projects
13-14/03/08	Project Information gaps followed up at conference
24-27/03/08	Second copy of Summary Project forms sent out to projects that did not attend the conference as a reminder to those that did
03/08	Short forms continue to be followed up

Appendix 3
Project objectives and how each project builds on previous work

Project	Outline objectives	Does it build on previous work
1	Raise water levels within the site to the optimal height for growth of bog vegetation. Protect the site from the hydrological influences of the adjacent peat extraction.	Past management has included the damming of a number of ditches, which has helped to maintain some of the wetness on the moss and prevent excessive drying out of the peat mass.
2	Maintain current extent of mossland and re-wet areas of dry bog	no
3	Remove invading scrub/woodland habitat and re-instate hydrological control of the water levels within the area. Create association habitat adjacent to the core mossland area that will both increase biodiversity and help maintain hydrological integrity of the mossland habitat.	Astley Moss has been managed by the Trust since 1982. This project compartment forms part of a higher and drier section of the moss. Restoration works have taken place a large sections of the mossland. There has however been little work undertaken in this particular area.
4	Re-establish the hydrology and ecology of a series of upland raised blanket bogs, known collectively as the border mire. Though due to funding stream the majority of the work is currently directed toward SSSI sites	The Border Mires restoration project started in 1986 through internal funding. A LIFE fundied project then ran from 1998 -2002. The current stage of the project form part of the SSSI PSA target.
5	Removal of scrub and wet woodland, without causing undue damage to peat surface (oxidation, nutrient deposition, physical damage) to restore "instant fen" - S24 community.	Much piecemeal scrub removal in this and other Broads sites since 1960'2 - many unsuccessful, due to subsequent regrowth/lack of management. More recent mechanised removal using 360 diggers to uproot stumps solved regrowth problem, but left peat surface uneven and often oxidised/broken up, as well as creating huge disposal problem, with on-site bonfires damaging peat and depositing nutrients (P).
6	The main objective is to encourage best practice in livestock, sporting management and muirburn which will benefit a range of peatland habitats of conservation interest.	no
7	Restore wet grassland for breeding waders. Sustainable option for continued farming in the area. Restore functioning floodplain. Provide a recreation and tourism resource.	Nucleus of project was a local authority arable field with wetland nature reserve potential. Partnership for wider area grew as a result of interest from a neighbouring farmer. A £40000 grant enabled tenancy buyout of this first site.
8	To restore active, growing bog communities	Builds on similar projects in other parts of site.
9	National Nature Reserve standard objectives	no
10	To return former water-logged peat land which had been planted with conifers to fen, marsh, bog, swamp, heathland with open water for the benefit of wildlife.	no
11	Restoration of assumed 'natural' hydrology and introduction of grazing to an area of alkaline fen to improve the condition of SAC habitat	Previous work was hindered by lack of management control of key areas, so that changes to hydrology were difficult and grazing was not possible.
12	The project consists of a series of basin mires all of which are suffering from diffuse pollution mainly from agriculture and also have a history of being cut-over for peat. The objective is to achieve sympathetic management of the adjacent farmland through CSF and practical restoration on site to rewet.	no
13	Favourable condition of the blanket bog within the SSSIs. Potential improvement of the Gelt, Tyne and Tees catchments for water quality, and reduction of flood risk. Education of grouse moor owners.	Yes, this work builds on restoration of some sites through overgrazing, and was in conjunction with land management agreements for agricultural and sporting management.
14	To take control of the water levels; reduce the cover of scrub; promote lowland heath in the higher areas.	A small project in the 1970's sought to dam one drain as an experiment to see how the back-up of water would affect the site
15	To enhance blanket bog condition, to slow rates of run-off and reduce spatiness downstream, to stabilise the carbon store/increase carbon sink, to benefit breeding wading birds	no
16	Restoring a mosaic of habitats favouring threatening or protected species; Promote those activities toward our stakeholders; Bringing back some traditional practices such as grazing and controlled burning; Find a good balance between conservation and recreation	We use the experience our team had in the New Forest where they did an extensive programme of riverine restoration
17	Restoration of damaged raised bog to a fully functioning wetland	About 60 ha of bog still supported good quality M18 vegetation
18	Restoration of hydrologically and ecologically degraded peatlands on Exmoor	Pilot project which restored a small area and trailed methods was essential. Vegetation and Hydrological baseline monitoring was also carried out by pilot project on ENPA owned sites
19	To restore the NNR back to actively forming raised bog with appropriate macrotope	no
20	Restoration of drained aforrested raised bog to a functioning wetland	All previous management had been destructive
21	To raise summer and winter water levels in the site's ditches to ensure that the mire communities do not dry out.	We have sluiced many of the field ditches in the past but this has failed to halt the drying process. The arterial system still drains down to sub-optimal levels.
22	rehabilitation and protection of two NNRs, creation of high value wildlife habitats. Proviso on of access & tourism	
23	restore appropriate management to abandoned lowland heath sites in west Cornwall and Brittany, Normandy and Holland	small actions consisting of ESA and SSSI restoration grants and charity site grazing re-introductions
24	Restoration of moorland to favourable condition status, with blanket bogs areas actively functioning and land management practices not damaging the conservation status of the moors	Based on many years previous experience of moorland management and small scale restoration work. Also built on research findings from various papers
25	Not provided	
26	To bring about a significant and sustained improvement in the condition of blanket bog in the Berwyn and Migneint SACs.	Trial ditch blocking work on Lake Vyrnwy in 2003 indicated the potential benefits of the work. These, along with work at the RSPB reserve at Geltsdale were very important in driving the project actions.
27	Restoration of damaged raised bog to a fully functioning wetland	About 12 ha of bog had been kept clear of trees and still supported good quality M18 vegetation
28	Moving major trunk road out of wetland NNR & SAC. Utilising downgrading costs of old trunk road as funding for practical habitat management for Marsh Fritillary butterfly at landscape scale.	Moving major trunk road out of wetland NNR & SAC. Utilising donwgrading costs of old trunk road as funding for practical habitat management for Marsh Firillary butterfly at landscape scale.
29	protect integrity of site, through positive management agreements with owners/managers	yes - there was a management scheme prior to this one, which paid for similar outputs

30	To stabilise and revegetate with a grass nurse crop bare and eroding peat on former blanket bog	Stock exclosure (2500 ha) carried out by defra and English Nature through the Dark Peak ESA scheme. In addition the techniques implemented were based on work done through the Moorland Management Project, initially trialled at a large scale through English Nature's "Nature for People" project on Shining Clough moss, completed through this project
31	The main objectives were restoration of blanket bog damaged by moorland wildfires, with a mass of channels of bare and eroding peat on the Kinder plateau	The site has had various treatments in the past, over the past 25 years. It is subject to a tier 2b moorland restoration exclosure, although this is shepherded and gathered rather than fenced.
32	The 30 remaining fragments of Mosslands have had their ecology assessed and their potential for habitat re-creation evaluated.	no
33	Where wetlands were identified as being in unfavourable condition the Life 3 project aimed to achieve the sustainable restoration of 261 ha of riverine woodland, 18ha of bog woodland, 184 ha of valley mire, 141 ha of wet grassland, 10km of river channel. All habitats are SAC habitats	The Life 2 Project, 'Securing Natura 2000 Objectives in the New Forest' identified a series of generic prescriptions and management Policies in relation to wetland habitats. Where wetlands were in unfavourable condition these management prescriptions have been taken forward under Life 3. The Life 2 project also carried out mire habitat restoration from which valuable lessons were learned and which started the habitat restoration process in the New Forest.
34	To establish optimum hydrological conditions within and outside the SAC/ NNR. To maintain rare fen communities. To attempt to re-establish optimum hydrological regime over rest of Embleton's bog	All continuation of NNR management since inception of status, 1984
35	Feasibility study (water level management plan) to investigate whether it is possible to raise water levels on the sites and restore conditions for active lowland raised bog.	There has been scrub/woodland clearance and bracken control, fencing and introduction of sheep and cattle grazing.
36	To maintain and enhance existing ecosystems, provide condition for their recovery where damaged and to facilitate the educational and recreational use of the site for the general public	Site previously exploited for peat extraction. No history of conservation.
37	1) Restoration Supporting restoration and management work through the promotion of existing agri-environment and wildlife enhancement grants and through sourcing new additional funds; 2) Celebration Raising the level of understanding and appreciation of the significance of the resource to those living in, working in and visiting the area; 3) Promoting best practice Supporting the provision of management advice on upland peatland to form the basis of practical management works; 4) Research Supporting and disseminating new and existing research into peatland processes, ecology and management.	Builds on and works in coordination of NE peatland restoration work
38	Installation of plastic piling dams and peat plugs to raise water levels within the drier areas of the mossland.	The Trust has been undertaking restoration works on Red Moss since 1999. A restoration plan was written and completed by the creation of bunds within the mossland designed to isolate peat compartments. Installation of right-angled pipes into the bunds allow for control of water levels. The current project is to build on the initial works and raise water levels within some of the higher areas of the mossland.
39	To fully restore the hydrology & hydrochemistry of the fen; to remove 80ha invasive scrub cover; to rejuvenate >20ha aquatic fen plant communities. To re-establish Target Fen Types within framework of Habitats Directive communities.	It was generally quite pioneering when started (in local circles at least). Expert advice from leading fen ecologists was sought prior to deciding on high level of practical works and intervention.
40	To restore the functioning of SSSI/SAC lowland raised bogs so that they become self-sustaining once more.	no
41	Re-wetting and scrub removal	no
42	1) Achieve SSSI PSA 2) Biodiversity 3) Water quality	Small scale works and experimental trials have been done in the area going back to the mid-Sixties. These have all contributed to guiding future works
43	To restore the blanket bog habitat (SSSI/SAC), to reduce quantity of sediment reaching Bassenthwaite Lake (also SSSI/SAC) and to restore hydrology to reduce flash flooding and therefore further erosion and sediment flows to Bass Lake.	no
44	Not provided	
45	To reinstate appropriate hydrology to support a fully functioning lowland raised mire (and lagg where feasible) within the designated site boundaries. To work outside the site boundary to reinstate the mire/lagg within its former hydrological catchment	Work started 20 years ago on the centre of the 3 component mires. The current work which has been ongoing for 8 years builds on the lessons and techniques learnt
46	Bring sites into assured management and thus in time into favourable condition - had suffered from historical over grazing and muirburn	no
47	The main objective of the project was to re-wet the site to prevent further drying out and to extend the area of bog through tree removal. Other objectives included engagement of local community, through education and participation and the provision of onsite interpretation	no
48	Establish a consistently high water table over raised mire extent by blocking peat drains and cutting to slow rate of water loss to system. To eradicate rhododendron over whole site. To manage scrub encroachment	'Project' is ongoing habitat restoration and management of site, which commenced in 1990. Most significant works have been carried out since 2001.
49	Prevent further peat/soil erosion. Protect extensive archaeological remains. Revegetate the site as soon as possible. Establish a suitable moorland habitat.	no
50	To block up active drains on the site and remove self sown trees there	Builds on previous work on the Border Mires.
51	To block up active drains on the site and remove self sown trees there	Builds on previous work on site and on Ford Moss and Border Mires.
52	To restore ombrotrophic mire communities to favourable condition.	Small scale tree removal in adjacent areas.
53	See http://www.wicken.org.uk/vision_firstdraft.htm	Mainly the Netherlands experiences of large areas for conservation, use of large grazers, hydrological management.
54	Restoration and continued management of the blanket bog and associated flora and fauna.	no

55	Key aim is to investigate the potential for non-landowning water companies to work with catchment stakeholders to improve water quality - focus on water colour. Also to incorporate additional wider costs and benefits associated with taking a catchment approach, e.g. for biodiversity, for flood management, for farm incomes, for carbon management. Three main areas of work within the project:1) Working with a catchment landowner to change land management in a way that benefits water quality and monitoring any changes resulting from this – project has delivered blocking of 70km of grips (artificial moorland drains) on an estate in Lunedale, and there is ongoing hydrological and ecological monitoring of response. 2) Modelling various colour scenarios and relating these to operational costs (primarily chemical and sludge management costs) at Broken Scar WTW. 3) Development of a stakeholder framework, or how might non-landowning water companies best exert influence over land managers to benefit water quality and operational interests (including optimising treatment costs and extending the life of existing water treatment infrastructure assets).	no
56	1) Achieve SSSI PSA 2) Biodiversity 3) Water quality	no

Appendix 4

Results of follow up calls to eleven projects that returned a ≤50% overall success rate for their project.

Project	Success	Reason for 'low' success
Gordano Valley	0%	Project is just about to start. Was due to begin last summer but such a wet summer that they could not get on to site.
Mosslands of Northwest	1%	Physical habitat restoration – the Wildlife Trust are looking into funding and basically are just starting on phase II of the project.
Cayton & Flixton Carrs	10%	Felt question a little vague – basically down to land management agreements. Most of the area is in agreement and management negotiations with the drainage Board. Still at early stages.
Wicken Fen	15%	Aiming to turn 5000 ha of arable land, including peat soils, into a nature reserve. Have acquired 700 ha (purchased and in various stages of restoration) so simple 15% on land area alone
Astley & Bedford Mosses	20%	A large proportion (60%) of the area was very degraded. Birch removal has taken place and re-wetting is taking place slowly.
Peatlands Park	30%	Reflects an improvement but work is on-going. Was very poor to begin with.
Cumbrian Basin Mires	40%	Much of the site is outside the SSSI so makes progress slow.
Chartley Moss	50%	A time issue – have cleared trees, the site is now wet but still a lag before peat community back to favourable condition.
Heath Project	50%	Had problems with staffing – 3 people covering for 4 posts. Two years delay due to the reorganisation and recruitment freeze when EN/NE merged. Consultations delayed progress. Every private site now has to have individual approval and caused delay.
Scaleby Moss	50%	Halfway through; trees removed, bunding on-going and re-wetting
Heysham Moss	50%	Half of work completed (this figure may have been a slight understatement)

Formatted: Centered
Formatted Table
Formatted: Centered
Formatted: Centered
Formatted: Centered
Formatted: Centered
Formatted: Centered
Deleted: ¶
Formatted: Centered
Formatted: Centered
Formatted: Centered
Formatted: Centered
Formatted: Centered

Appendix 5

Outcomes from workshops at the Peat Compendium Conference 13 March 2008

Three workshops were held, one addressing project implementation, one on monitoring and one on future / governance. The following sections provide the results from the conference workshops.

1. Implementation Workshop

Following the analysis of the questionnaire this workshop considered 2 questions:

1) What was the most cost-effective restoration technique?
2) What was the best restoration technique?

The groups were asked to identify ways of tackling the above questions and produced a list of issues that resulted in restoration being necessary. The groups then discussed the above questions relative to these issues. The issues were: hydrology, succession, erosion, bare ground, fire, water quality and conversion/reversion. However, due to time constraints water quality was not covered by discussion.

a) Hydrology

Hydrology was understood as being the restoration of water table and normal peat function. The groups were clearly divided between lowland and upland in their understanding of restoration relative to the hydrology of the peat. For restoration in lowland settings the problem was one of supply while for upland restoration it was a problem not of supply but of energy. In lowland settings the need for adequate water supply in order to raise or maintain water tables meant that the groups identified a greater need for the understanding of hydrology prior to restoration, such a need was not identified for upland settings. In upland settings no specific preference was expressed for any particular method of raising the water table and indeed, the groups expressed a preference for techniques that were as simple as possible.

b) Vegetation succession

This problem was identified in the questions as being an issue largely within lowland peat settings and thus this issue was given only to a group dominated by lowland site operators. They identified a preferred path in dealing with vegetative succession – i) cut and remove problem vegetation; 2) raise the water table; 3) introduce vegetation management be it by either repeated cutting or introduction of grazers. There was strong support for the introduction of grazers. Other vegetation control methods were discussed and although none of those techniques mentioned were dismissed as unhelpful or inefficient by the group no preferences for any particular method were stated (e.g. herbicides vs. reseeding). It was proposed that the general procedure for dealing with unwanted vegetation succession should be augmented with an understanding of the reasons for succession so that the root cause can be identified and removed (e.g. eutrophication). The groups raised a question of to what extent vegetative succession could be lived with? This was identified as philosophical and beyond the scope of the workshop.

c) Erosion

This problem was given to a group dominated by upland practitioners who were divided between those favouring a focus on small areas and ‘easy wins’ in terms of preventing erosional problems and those that felt that the ‘hardest to restore’ and the most severely eroded sites should be tackled first. In the end the group were content to express a preference that, for preventative purposes, it is the ‘easy’ cases that should be focused upon first, while for remediation it is the ‘hard’ cases that should be tackled. The group identified easy wins as those sites which were: most accessible; could be controlled by re-vegetation alone; and those sites where the problem was dominated by sheet rather gully erosion and therefore more amenable to treatment with re-vegetation alone. The group identified that the simplest method for dealing with erosion was to identify the cause and if possible remove it. In this case there were no active in situ works proposed and this was therefore considered to be a passive approach whereby the land was simply allowed ‘to rest’. No other preferences for treatment technique were expressed.

d) Bare ground

The groups that addressed this issue considered its treatment relatively easy and recommended only that the water table be raised and re-vegetation takes place. The groups did not express any preference for techniques for re-vegetation.

e) Fires
The groups were asked to consider both wildfires and managed burns, but focused upon problems of over-burning with respect to managed burns. There was general agreement that cessation of burning was a good idea and important for allowing natural re-vegetation to occur, but there was concern that this would lead to dry heath vegetation upon deep peat which was considered unhelpful by all groups. Therefore there was a strong suggestion that restoration should include re-wetting and re-vegetation with *Sphagnum* species. There was not time to consider fire management or cutting as an alternative to managed burning.

f) Conversion/reversion
The groups identified reversion as helping an area previously wetland to return to being wetland and conversion as developing wetland on areas which were never previously wetland. The groups identified that the present funding and regulatory structure did not favour conversion but conversion could become possible with increased importance of drivers such as: carbon sequestration and/or flooding. If conversion was to be achieved then practitioners allowed for greater flexibility and even greater "brutality" in methods that could be adopted.

2. Monitoring Workshop
The workshop on project monitoring aimed to follow up on issues that emerged from the analysis of the questionnaire data on monitoring. In particular, three main areas were identified for discussion. These were framed as questions and participants were encouraged by the facilitator to structure their discussions around these questions:

A. What was the purpose of the monitoring implemented on your project?
B. What monitoring approaches were adopted?
C. What opportunities or constraints did you encounter during the monitoring of your restoration project?

A. What was the purpose of the monitoring implemented on your project?
The questionnaire allowed identification of the main environmental parameters monitored but did not allow exploration of the motivation behind the instigation of the monitoring programme. During the workshop discussion participants identified a broad range of motivations which are summarised below. These have been classified into internal and external drivers. Internally, project development was identified as important with examples of both the adaptation of management and techniques in the light of monitoring results but also the adaptation of project targets. It was also identified that for many projects the link between project monitoring and adaptive management occurs between projects rather than within projects. It was suggested that the motivation for monitoring is the ability to apply the lessons learnt from the current project to future works.

Reasons for monitoring peat restoration projects

Internal reasons
Project Development
- To provide a steer on future management
- Project Development
- To assess the effectiveness of various restoration methods – pilot projects
- Impact assessment on-site
- Feasibility assessments
- To allow adaptation of targets to more appropriate or achievable values

Feedback to managers
- To be able to visualise the effects of ground works
- Reassurance that you are doing the right thing
- To develop site understanding

Practical conservation research
- Developing best practice

- To inform management at other sites

External reasons

Funding related

- Proving value for money to funders
- Vegetation and hydrological monitoring is carried out in order to justify the project – to show the project is working.
- Monitoring is a funding deliverable.

External relations

- Impact assessment-off site
- Academic Research
- Legal reasons
- As a response to external pressures
- To enhance public relations
- Monitoring required to demonstrate achievement of a particular conservation status

The externally driven motivations for monitoring fell into two categories dependent on the intended external audience. For many projects monitoring was required to demonstrate success to funding agencies either as a condition of current funding or in order to justify future funding. A range of other imperatives for monitoring were linked with the relationship of the project with wider audiences including reassuring landowners about off site impacts, winning public support for landscape modification and demonstrating conservation success to achieve particular conservation designations. Several projects also identified productive relationships with academic partners as important in monitoring efforts.

B. What monitoring approaches were adopted?

Discussion aimed to elucidate more detail on the nature of the monitoring approaches. The questionnaire identifies projects which undertook hydrological monitoring, for example, but did not distinguish between monthly dipwell measurement and quasi-continuous logged data. Two subsidiary discussion points were raised under this heading, namely; to what extent were monitoring results used to modify or adapt the ongoing management approach to the site, and would you see benefit in central guidance on appropriate standardised monitoring approaches to restoration projects?

Monitoring approaches

There was reasonable consensus between projects over the nature of a basic monitoring programme. For example, where dipwells were being used to monitor water table a typical approach involves monthly manual measurements supplemented by continuous automated measurement at a smaller number of sites. The following examples of types of monitoring being undertaken were offered in the discussion.

- Water table – dipwells, a mixture of automated loggers and manual monitoring regimes.
- Discharge.
- Full water balance.
- Vegetation surveys.
- Subjective monitoring – e.g. feedback from land managers, where vehicles have got stuck. It was noted that this was difficult to record and personal agendas also need to be taken into account.
- Basic recording of the restoration work that has been carried out is the simplest form of monitoring and can prove very useful.
- Monitoring of things other than actual restoration work – e.g. emerging moorland threats, tracks, fires etc. is also valuable.
- Fixed point photography is very useful as a low sophistication option.
- Hydrochemistry to assess eutrophication risks.

The period of monitoring varied but most projects were monitoring hydrological parameters monthly and vegetation at longer periods. A few projects were monitoring carbon flux mostly with the help of academic partners.

There was general consensus that it is important not to overlook the simplest monitoring approaches including detailed recording of conservation works, annual fixed point photography and recording the subjective experience of managers and other site users.

Adaptive Management
The responses to the adaptive management question reinforced the points made in the previous section about the uses of monitoring. The main area where management approaches were adaptive in the light of monitoring data was in the practical implementation of monitoring works. Basic monitoring of dam effectiveness in grip and gully blocking projects was used to select the most effective dam types for local conditions. The relatively rapid response of hydrological systems meant that whilst hydrological monitoring was likely to feed into ongoing management, data from more slowly responding vegetation systems was largely not used. Longer term monitoring data is more likely to influence management in subsequent projects and this was mentioned several times as an important aspect of project monitoring. In this context the following comments were captured from project managers in the workshop.

- Adaptive management is important between projects as well as within – the importance of networks and information flow was stressed.
- Formalising best practice and distributing within a network of similar organisations would be seen as useful.
- Building a research / monitoring compendium in parallel with peatland restoration compendium would be useful.
- Need for linkages and synergies to make best use of available resources.
- Developing best practice regarding knowledge transfer and research synergies is also vital.
- Developing knowledge sharing networks is vital.

There was a clear consensus that there is a greater need for an effective network to share the knowledge generated through project monitoring and for the development of best practice. Project managers who worked for large conservation organisations with a national remit such as RSPB and Natural England reported internal networking opportunities but there was very strong support for the development of a wider network and a feeling from several managers working outside of these established networks that this was an essential development.

Standardised approaches
In all three monitoring workshop sessions there was considerable discussion generated in response to the suggestion that some form of guidance on appropriate monitoring strategies and techniques for peatland restoration projects was desirable. The main responses are summarised below. Broadly there was strong support for the idea of guidance, possibly web based and possibly as a menu of costed options. The major advantage of a standardised approach is comparability of the data between projects and over time which will allow the development of more general evidence based guidance on restoration best practice.

Perceived advantages of guidance on monitoring
- Standardised / off-the-peg monitoring packages (possibly made available by a central agency) would be helpful both to organisations lacking in expertise, and represent maximum value for money.
- Developing monitoring standards and then sticking to them would make comparison of data much easier.
- Database of likely costs of various monitoring programs would also allow more accurate budgeting at the bidding stage.
- Advice on project (monitoring) design would also be useful.
- Building a research / monitoring compendium in parallel with peatland restoration compendium would be useful.

Perceived risks of standard guidance on monitoring
- Standardisation of monitoring may represent a burden if adopted in parallel with existing monitoring.
- A danger of standardisation is that it becomes an unnecessary requirement.

- Where restoration methods are proven and already working is monitoring necessary or is it just and unnecessary burden?

Several projects also felt that some approximate costings on standard monitoring programmes would be of value in the preparation of bids. It was also noted that some projects had felt constrained in bidding for the full cost of monitoring and that the ability to refer to some standard costed approaches might encourage funding bodies to properly fund monitoring. There were some concerns expressed that guidance should not become prescription or a requirement and that some monitoring might be unnecessary. In particular it was noted that where a particular restoration technique was accepted and had been proved to work on site or elsewhere that monitoring to demonstrate that the technique was working was perhaps unnecessary. The importance of networks for effective knowledge sharing was again emphasised here. A distinction needs to be drawn here between monitoring to demonstrate that the restoration targets are being achieved which is more likely to be widely necessary and monitoring of the direct efficacy of restoration techniques which is likely to be more important when non-standard or experimental approaches were adopted.

Overall, it should be emphasised that the mood of the workshops was that some guidance on standard monitoring approaches, possibly with a menu approach with gold silver and bronze options, would be warmly welcomed by practitioners.

3) What opportunities or constraints did you encounter during the monitoring of your restoration project?

The aim of this question was to explore any common issues which projects reported as limiting their ability to monitor restoration projects and also to share best practice of any innovative approaches they had developed to minimise the cost and logistical difficulty of monitoring.

The following points were raised in the workshops:

Constraints

- There is a lack of critical assessment of existing monitoring – does this mean a lack of future focus?
- A lack of existing (pre-restoration work) baseline data is very constraining. Time / financial constraints often preclude such monitoring.
- There is often a lack of control sites. Does leaving damaged areas untreated conflict with the restoration ethos, or are controls a necessary evil?
- Proof of effectiveness via good monitoring is essential before restoration techniques can be taken up in wider funding schemes – e.g. agri-environment.

Opportunities

- Use of external consultants from the planning stage can fast track / streamline the procedure.
- Volunteers can be a useful resource, especially for large scale or long term monitoring programs.
- Buy-in of other interested parties such as game-keepers is also useful.

A range of points were made in the discussion including the reluctance of some funding sources to fund monitoring. Two important points were raised in response: 1) the necessity to distinguish between monitoring which can be justified as an integral part of adaptive management and research which might be funded through other avenues; 2) the necessity to continue to fully cost appropriate monitoring into projects so that funders are aware of the requirements.

It was widely recognised that the ability to conduct before and after studies was severely constrained by the requirement for restoration works to start once project funding began. This highlights the importance of fast tracking the installation of monitoring equipment which can often be rapidly installed whilst restoration contracts are let to provide at least some data which is obtained before restoration works begin. In one instance this approach in combination with delays in initiating restoration work had produced three years of pre-intervention data

Several projects reported good results from the use of volunteers for monitoring, particularly RSPB projects which were able to draw on a strong list of committed volunteers. The risks of using volunteer labour were also highlighted, particularly high drop out rates after training.

The lack of critical assessment of monitoring data was summed up by the comment '*we have lots of data and its all in the bottom of my filing cabinet'*. This relates to two points which emerged earlier namely the difficulty of funding research as opposed to monitoring and the need to adopt standardised approaches to facilitate across site comparisons. Several projects reported productive academic partnerships but it was felt, again, that more information sharing between academic institutions and projects would highlight available data and might facilitate further data analysis through research projects or postgraduate theses.

3. Future Workshop

In the future work workshop three broad questions were asked, each of which was presented to a different group of conference delegates:

1) What has worked well within past / existing projects, what obstacles have there been and how might we overcome these?
2) What have been the major positive and negative factors within projects?
3) What would you aim to do in future projects?

1) What has worked well within past / existing projects, what obstacles have there been and how might we overcome these?

The factors that worked well within projects could be categorised under four distinct headings:

a) Partnership approach
Partnership working made the most of resources and expertise from different organisations – and resulted in multiple benefits from the same work. It was found that the inclusive approach provided a 'big picture' view of capital works and more readily enabled a demonstrable benefit (and efficiency) of the works to the public.

b) Planning
Time and effort devoted in the planning stages of projects was considered to be of great benefit to the success of a project and represents a very worthwhile investment of time and resources. This included securing necessary permissions, agreements and skills. Building flexibility into the project and having realistic expectations were also considered important (e.g. with regards to actual start date and length of time to deliver capital works).

c) Engage local parties
Engagement (both consultation and PR) with all interested parties was considered necessary at the earliest opportunity to enjoy agency and public buy–in and support, particularly through face to face contact but also other PR channels (and in addition, providing continual information on project progress). It was considered that this was important before any media campaigns were launched (or information leaked).

d) Leadership
Good management structure and experienced staff with senior staff (manager) who understand local political and economic conditions was considered important. Additionally the use of contractors with experience of ground conditions and suitable equipment was important.

The factors that identified as obstacles to project success formed six natural categories:

a) Partnership issues
Despite being considered a key to a successful project, partnerships can also present an obstacle to success as a result of delays caused from securing agreement within large partnerships and other

administrative difficulties associated with a diversity of partner working methods. In essence there are occasions when project partners do not work together towards project objectives and sometimes a general lack of understanding. In addition it was suggested that large partnerships sometimes forget the people on the ground such as farmers.

b) Vision
The lack of (a clear) vision can impede project delivery and limit what can be achieved.

c) Lack of planning
A lack of project planning was thought to result in unrealistic resourcing of projects, both in terms of the project budget and staffing requirements plus inadequate reviews of, and engagement with, past and ongoing projects from which valuable lessons and expertise could be learnt.

d) Local/External concerns
Universal agreement by all partners, stakeholders and other interested parties can be difficult to secure and as a result, objection to projects represents a significant obstacle. For example, objection to stock removal, and access refusal by landowners were cited. There were also issues where obstacles might be put forward by interested parties where works do not directly benefit them. Communication was also raised as an obstacle, ranging from a lack of project communication to ineffective communication and also negative communication (mixed messages). Lack of data, public risk concerns, and the idea that peatlands are of low perceived economic value were also raised.

e) Practical Issues
Practical issues concerned timescale restrictions experienced by projects, both biological and administrative. Factors such as weather, seasons and short-term nature of projects were important. Site logistics can be a particular obstacle, particularly to remote sites as can the lack of a contractor base. Other issues included inflexibility of funding gained (e.g. that precludes any research), difficulty in obtaining necessary data/information to make informed decisions and not keeping accurate and up to date records of what has been done.

f) Monitoring
Inability to be able to demonstrate success because no base line data exists.

The recommendations for a successful project were:

- Allow time for planning and securing agreements / permissions etc.
- Engage with stakeholders and identify project champions / supporters / or similar schemes that have been successful
- Identify concerns and opponents early on in project in order to best mitigate risks / threats
- Collaborate and ask for help
- Implement effective and frequent communications, both internally and externally – including pictures and site visits
- Undertake baseline monitoring and keep records of what was done where
- Build relationships with contractors
- Be flexible

2) What have been the major positive and negative factors within projects?
Group 2 were asked to identify positive (green) and negative (red) factors within the projects they have been involved with (see table below). What is evident from these responses is that the categories they identified, and therefore their specific comments, were biased towards the early stages of a project (pre-planning, planning and set-up stages), indicating that factors the early developmental stages of a project are considered critical in the overall success of projects.

Pre-planning	Planning	Set up	Implementation	Aftercare
clear vision and objectives	strategic overview	acquire resources	acquire land access	sustained resources
feasibility	stakeholder consultation	public consultation	good, cost effective management	monitoring
key stakeholder support	partnership building	media work	good staff and contractors	review
identify champions	information gathering	develop local support	continued resources	adaptation
	set up internal team	statutory consents		
internal cowardice / apathy	lack of understanding		lack of funding	
conflicts of interest	lack of time		short-term funding	
lack of overview	stakeholder imbalance		organisational 'fashion'	
rushed opportunism			staff turnover	
short-termism			changing public perception	
			climate change	

3**) What would you aim to in future projects?**
Below is a synthesis of points raised by Group 3 as actions they would like to implement in future projects and not necessarily in strict chronological order. Note: this list is not a comprehensive list of actions required in order to deliver a successful project:

Planning

- Identify partners, steering groups, expert advisors and stakeholders – create partnership
- Co-ordinated fund raising strategy
- Information gathering and development of a (flexible) management plan (as part of a strategic plan) and contingences – make maximum use of in-house and local knowledge
- Determine clear, measurable aims, objectives and risks – be conservative and realistic
- Dedicated project staffing as opposed to taking existing staff time – include time and money for training in project budget
- Stakeholder engagement
- Communication of project aims and objectives, identification and resolution of any conflicts / issues
- Prioritise target sites and determine a schedule of works
- Identify specific techniques to be used in accordance with recognised best practice and site conditions – build-in flexibility into time-scale to allow for natural 'disasters'
- Estimate costs
- Secure all necessary agreements and permissions
- Design monitoring programme; conduct baseline monitoring from which change (success and shortcomings) can be measured
- If possible conduct a pilot study

Implementation

- Deliver capital works, adapting methods as and when required
- Carry out monitoring and timely analysis to inform capital works methods and schedule

Aftercare
- Put things right that didn't work
- Identify areas for future work
- Communicate success of the project
- Sustainable management of the site – scope options for generating future income
- Distribute information on best practice and lessons learnt

Ongoing considerations
- Continued involvement and community of interest and dissemination of progress reports
- Clear and effective project communications both internally and externally

Management
- Ensure high quality, enthusiastic leadership
- Ensure project team cohesion and retention – reward staff
- Supervision of contractors

There were four reasons given why the above do not happen that were beyond the control of the project, 1) funding horizons being too short; 2) not enough time to physically deliver; 3) sites are slow to respond to capital works and therefore monitoring may show little 'success' within the timeframe of the project; and 4) shifts in policy and / or funding priorities.

Appendix 6
Analysis of existing UK science-base

A number of organisations have produced peat restoration guidelines. These should be referred to where appropriate. They include:

- RAMSAR Guidelines for global action on peatlands - a series of guidelines on wise use of peatlands and the need for knowledge, data on trends, education and public awareness, policies, research networks and international cooperation (Ramsar, 2002).
- Europeat: a series of tools and scenarios for sustainable management of European peat soils (Europeat, 2006).
- English Nature Upland Management Handbook, and Peat Bog Conservation (English Nature, 2001, 2002).
- Conserving Bogs (Brooks and Stoneman, 1987): a manual of good practice.

There is relatively little published literature on peatland restoration based on the UK experience. A recent review for Defra as part of project SP0352 highlighted the key points. Much more is understood from international work which is being reviewed as part of a concurrently running Defra project (SP0565) and is therefore not covered here. Most published UK work relates to the impact of grip-blocking in blanket bogs on water table or water colour or DOC production (Wallage et al., 2006; Worrall et al, 2007a, b). There is also a limited amount of work on gully-blocking (Evans et al. 2005). In other areas Holden et al. (2007) provide a comprehensive review and there is therefore no need to repeat this here. However, the key point is that very little is known about peat restoration processes and impacts in the UK scientific literature. The following sections only cover topics where there is a reasonable body of literature. Scientific information is lacking in many areas of peatland restoration and hence those areas are not covered in the following sections.

Revegetating bare peat
There are large expanses of bare peatlands in the UK. Revegetation is necessary to stabilise the soils and protect them from further degradation. Experiments on revegetation have been carried out at a number of sites by agencies including National Parks, The National Trust, English Nature and many others. The main conclusions derived from these were outlined in SP0352 and are:

- Grazing by sheep is the single most important factor restricting the survival and spread of self-seeded and sown vegetation.
- Use of a fast growing nurse crop of grasses and heather which will stabilize the peat over a period of 3-5 years provides the natural vegetation time to establish in sufficient quantities to survive.
- Following seeding, materials can be applied to stabilise the peat (e.g. cut heather or textiles).
- For *Sphagnum* dominated sites the best approaches involve four stages:

    a. field preparation (e.g. bunding an area to provide high water tables, and creation of an appropriate topography to allow pools to form etc);
    b. collection and spreading of diasporas: *Sphagnum* diaspores (fragments of *Sphagnum* plants) can be collected from the upper layers of an active peat bog and then scattered over the restoration site;
    c. diaspore protection: on bare soils, *Sphagnum* and other mosses benefit from an application of a thin protective mulch to prevent drying out of the peat surface and desiccation of the plants; and
    d. fertilisation: P fertilisation may increase the success of restoration by accelerating the establishment of bog plants that help nurse the *Sphagnum* growth, but suitable doses have yet to be determined.

A recent study of the revegetation of the Bleaklow Plateau following a severe wildfire, (Worrall and Rowson, 2008) demonstrated that revegetation did bring significant carbon benefit relative to no restoration even if after 4 years since the wildfire it was still significantly worse than the carbon budgets of more undamaged control sites. By far the greatest benefit was the decline in erosion and fluvial fluxes as a result of vegetation, but the study could demonstrate no statistically significant improvement in the water tables at revegetated sites.

Gully blocking

The pre-existing knowledge base for gully blocking approaches to restoration is very limited. Much of the work which has been undertaken has been practical conservation and the results have not been widely available. The forthcoming moorland restoration handbook being produced by Moors for the Future and Natural England summarises the current state of this practical knowledge. The only systematic research into the efficacy of gully blocking was the work by Evans et al. (2005). This extensive survey of the efficacy of existing gully blocks on Bleaklow and Kinderscout in the southern Pennines suggested that block height and sediment supply are key controls on sediment accumulation behind gully blocks. Sediment accumulation is thought to be necessary to promote re-vegetation. Sediment accumulation varies significantly between block types with stone wall and wood fencing proving most efficient, plastic piling less efficient and the Hessian sack blocks working very poorly. However, the most effective water retention was by plastic piling. The survey made the following recommendations for practice:

1) The objectives of gully blocking need to suit chosen sites and gully types: Intact domes of peat on shallow gradients with minimal gullying may be targeted for raising water levels with water holding techniques such as plastic piling. On heavily degraded moorlands the emphasis should be placed on re-vegetation works and peat stabilisation such as by using wooden dams and potentially *Eriophorum* planting to reduce sediment loss from the system.
2) Efforts should focus on blockage of sites with slopes less than 0.11 m/m
3) Wooden fencing, plastic piling and stone walls are all effective gully blocking methods
4) Block spacing should not exceed 4 m. Minimum spacing can be derived as a function of gully depth.
5) Target gully block height should be 45 cm. 25 cm should be a minimum height.
6) Maximum block widths should not exceed 4 m.
7) Planting of blocks with *Eriophorum angustifolium* once stable sedimentation has been achieved may aid peat stabilisation.

Evans et al (2005) also reported on the development of an effective GIS tool which uses topographic wetness index and LiDAR DEM data to efficiently plan the most effective location of gully blocking.

One difficulty with gully blocking approaches is that several effective approaches have been developed for shallow headward gullying but much less attention has been paid to stabilising large scale gully systems which are eroded to the mineral substrate. In naturally re-vegetating systems the stabilisation of these locations is instrumental in promoting upstream vegetation so this is an area which requires further attention.

Drain blocking (grip-blocking)

Table A6.1 outlines sites for which data is available on grip-blocking impacts. Most projects monitored water table depth, but other variables are less well monitored. The main findings that have some scientific confidence are that blocking decreased grip flow and mean depth to water table (although the water table remained lower adjacent to the grip), vegetation which prefers wetter conditions increased (*Eriophorum angustilfolium, Narthecium ossifragum*) and those that prefer drier conditions decreased (*Calluna vulgaris*, lichens). It has also been shown that grip-blocking decreases colour and DOC production across the UK (Wallage et al., 2006; Armstrong et al., in review). A UK wide survey of 350 drains at 32 sites across the UK performed by Armstrong et al., (in review) and funded by Yorkshire Water showed that in general grip-blocking successfully reduced colour, but that at some sites there was no change. Thus practitioners will have to accept that for some sites and for some variables grip-blocking may result in no change. However, the general pattern is one of colour and DOC reduction. A survey of over 500 blocked and unblocked grips across the North Pennines AONB (Worrall and Warburton, in prep.) has shown that although all grips showed significant infilling, blocked grips showed 30% more infilling than unblocked grips even within as little as 2 years of blocking. In other words blocking did increase the rate of restoration.

The UK-wide survey also assessed the blocking techniques used and their effectiveness. Results are presented here for the first time (unpublished University of Leeds data) and we gratefully acknowledge Dr Alona Armstrong who collected the data and performed the data analysis. The work was funded by Yorkshire Water. The main types of grip dam used are peat turves, heather bales, perspex, plastic piles

and plywood. The blocks examined were classified as shown in Table A6.2. The majority of blocks were categorised as class 3, 4 or 5 and therefore effective (Table A6.2). In terms of block effectiveness plastic piles, plywood dams, and heather bales appear to be the most reliable: ≥ 80% of blocks were well blocked (class 4 or 5) (Figure A6.1). However, the assessment criteria for heather bales were slightly different as bales were not designed to stop flow unlike other methods. In terms of preventing block failures, plywood dams and heather bales are preferable methods (though once again the criteria for heather bales were different). Peat turves, the most popular and economical method, are intermediate in terms of success; just under 60% were considered well blocked, and just over 5% failed (Figure A6.1).

Table A6.1. Summary of UK studies providing data on the impacts of grip-blocking.

Site	Discharge	Water table	Colour	DOC	Suspended sediment	Temperature	Precipitation	Vegetation	pH	Conductivity
Candleseaves, Cumbria	■	■			■		■			
Wharfedale, West Yorkshire		■	■	■			■	■		
Cow Green, Cumbria	■		■	■	■	■	■		■	■
Hexhamshire, Northumberland	■		■	■	■	■	■		■	■
Black Pitts, Devon	■	■						■		
Exe Head, Devon	■	■						■		
Cross Lochs, Caithness		■						■		
Grain Head, Northumberland		■								
Whitendale, Lancashire		■	■	■					■	■
Halton Lea Fell, Cumbria	■	■								

The most prevalent grip-blocking technique is peat turves; 74% of surveyed grips were blocked using this method (Table A6.3). The majority of the more recent blocking has been undertaken using peat turves. The other block types all constitute less than 10 % of the total number (Table 13). The distribution of some of the block types are regional: corrugated Perspex was predominantly used in Scotland and plywood dams predominantly at sites surrounding Kielder Water and in Exmoor.

Table A6.2. Block classes and their descriptors.

Block class	Descriptor
1	Complete failure, blocked washed out
2	Partial failure
3	Mostly intact, not effective at higher flows
4	Intact but not redistributing water
5	Intact and redistributing water across the peat surface

Table A6.3 Percentage of each block type in each class. Total: 278.

Block type	Block class					
	1	2	3	4	5	Total
Combination	0	0	3	2	0	6
Heather bales	0	0	1	3	0	4
Peat turves	1	4	27	15	28	74
Perspex	0	1	3	2	1	7
Plastic piles	0	0	0	2	2	5
Plywood dam	0	0	0	1	2	3
Total	1	6	34	25	34	100

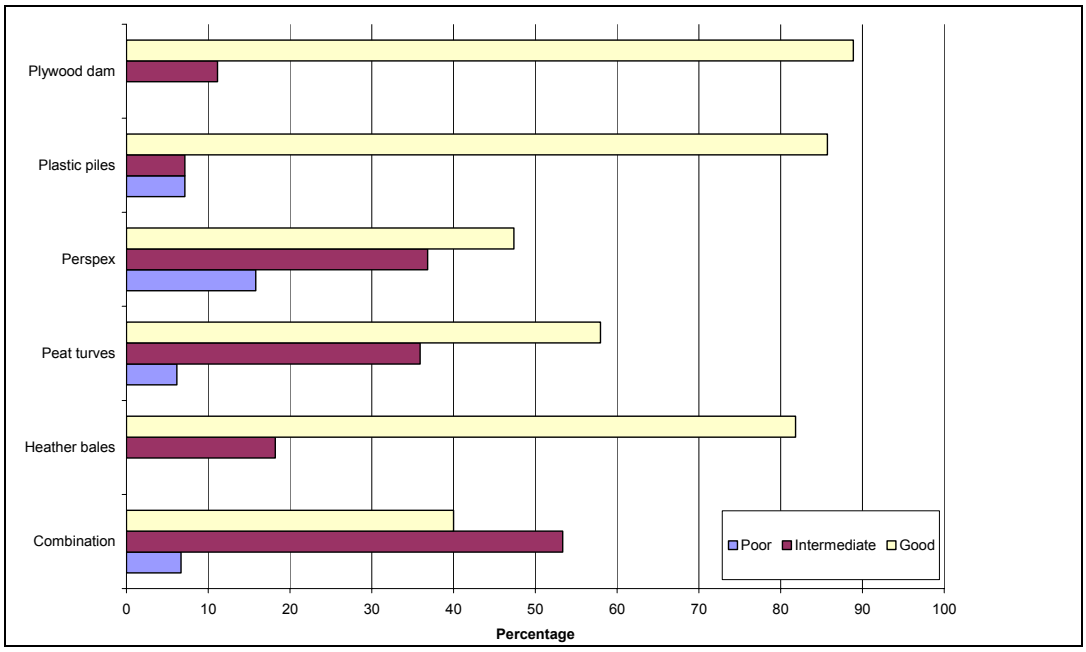


Figure A6.1. The effectiveness of different blocking techniques. Block class 1 & 2 = Poor, class 3 = intermediate and class 4 & 5 = good.

Although these data suggest plywood dams are the most preferable technique it should be noted that these were only located in one region and some farmers and keepers were against sheer-sided dams for fear of animals becoming trapped in the grips. In terms of cost, it may be more economical to use peat turves which are carefully installed, packed down with surface water escape routes from the dams enabling rewetting of the surrounding hillslope. This is because while peat turves are intermediate in terms of success with just under 60% considered well blocked and just over 5% failing, this may be acceptable given how much cheaper they are to install. However, the research also examined other factors such as slope, grip depth, substrate condition and so on and determined a simple decision-tree which could be used by practitioners planning which methods should be used to block their drains. This decision-tree is shown in Figure A6.2. Some additional factors to take into consideration are also summarised in Table A6.4.

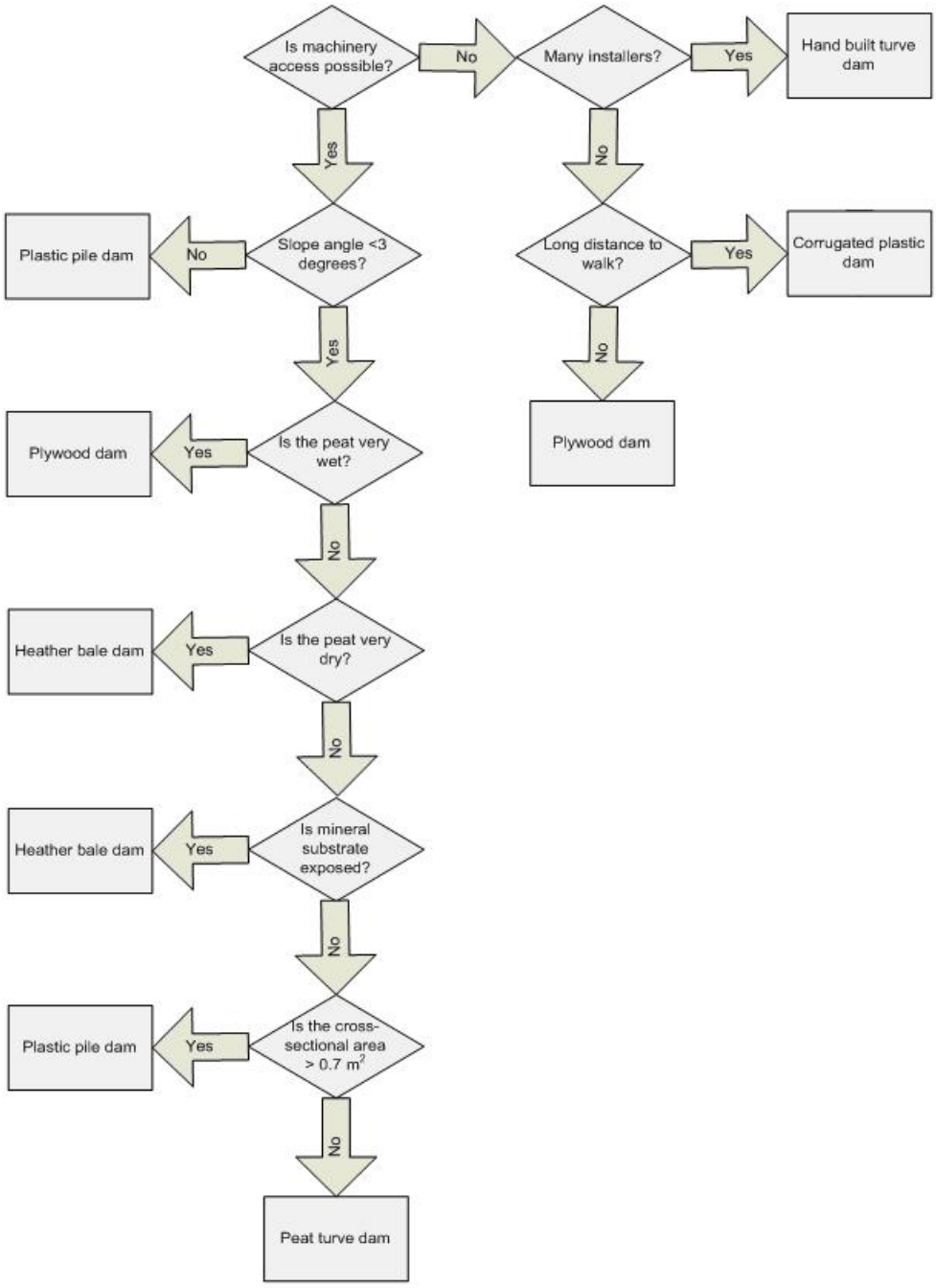


Figure A6.2. Simple grip-blocking decision-tree produced by University of Leeds

Table A6.4. Some additional considerations to be taken into account when peatland drain-blocking.

Comment	Rationale
Minimise site disturbance	Sensitive environments, some with rare vegetation species.
Avoid blocking during very wet periods (inc melting snow)	There is more disturbance and up-turned peat if the ground is very wet.
Block just prior to the growth season	Vegetation will grow and stabilise the block. Disturbed vegetation will recover quicker.
Do not expose mineral soil	Exposing mineral soil can lead to the establishment of vegetation communities (i.e. reed beds) which are not associated with moorlands and reversal can be difficult.
o not leave bare peat surfaces through disturbance or on blocks	Bare peat can dry out and desiccate. If this occurs it is likely that it will remain bare: Spoil from grip installation is still bare at some sites
Trim overhanging vegetation, commonly heather	Overhanging vegetation prevents/slows vegetation growth in the grip
Engage with landowners/users to limit resistance	Positive views: Increase the area of standing water for grouse to drink from. Increase the area of wet ground for insects to inhabit that grouse feed on. Provide 'bridges' for young grouse and livestock to cross, thus reducing death rates. Turves and bales could make it easier for lambs/grouse to climb out of grips. The dams have been used as high areas on which to place grit for grouse Negative views: Increase land wetness leading to a reduction in heather & therefore grouse numbers. Concerns that lambs will become trapped in grips, especially given the smooth vertical faces of plastic piles and wooden dams.

Figure A6.3 shows how topographic data can be used to determine which grips might be the most economical to block. It does this by predicting how grips alter the natural flow-lines of water across hillslopes and hence those areas that are shaded green are drier because of the presence of grips (see Holden et al., 2006b for further explanation). It is possible to identify using OS topographic data which grips should be targeted for restoration because they would have the biggest influence on rewetting the peat hillslopes.

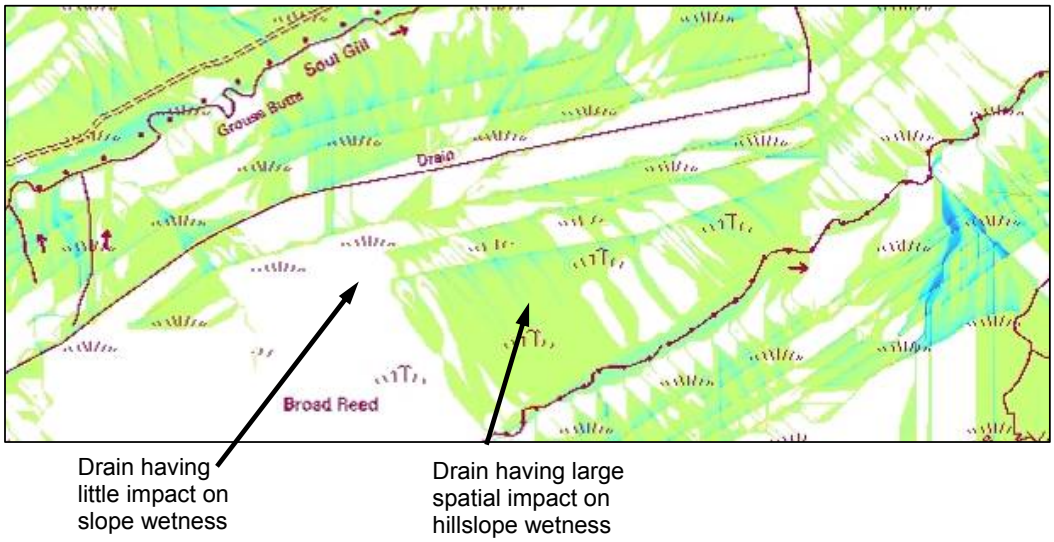


Figure A6.3. Part of Wemmergill Moor, N. Pennines. The map shows all areas that are likely to be drier because of the grips (in green). The map is produced using topographic data and determining how grips would intercept flow that would otherwise follow the topography down the slope.

Stocking levels

Where peat soils are highly degraded, an immediate removal of livestock is recommended. Where erosion is occurring but not highly degrading then a reduction of stocking should be considered. On the Kinder plateau, Derbyshire, restriction of access to grazing livestock through shepherding resulted in a 90 % recovery of vegetation within 5 to 8 years (Anderson and Radford, 1994). Unfortunately the use of shepherding as a management technique has reduced in recent years, however. In the Hey Clough catchment in the Peak District, the reduction in grazing pressure in the 1980s resulted in revegetation of eroding sheep scars (80 % of the bare soil had revegetated within 5-10 years on the lower, more shallow, slopes (480masl, c. 11˚ slope), although it took 20 years for recolonisation on the upper slopes (530masl, 30˚ slope). In studying a 54 year old exclosure on an upland peat, Worrall et al. (2007c) have shown that the presence of sheep increased the depth to the water table by an average of 11%, but that presence of grazers had little effect upon water quality.

Burning and mowing

Defra have recently reviewed the Heather and Grass burning code (Glaves and Haycock, 2005) and it was identified that there are many research gaps, particularly on the impacts of burning (or its alternatives such as cutting) on hydrology, water quality and soil processes. Heather cutting has been trialled in some locations. However, on Dartmoor in southwest England, regrowth rates of heather were slower after cutting than after burning, although in other locations there has been little observed difference (Brown, 1990). The additional benefits of cutting are that it can be done at any time of year, without impacting soil microbial processes very greatly and the cut material itself can be used to regenerate heather (or infill ditches and gullies) elsewhere. Milligan et al. (2004) found that repeated cutting (as opposed to burning) reduced *Molinia* cover and that was seen to be beneficial because *Molinia* is perceived to be a threat to heather moorland. Cutting may, however, be restricted on stony, very damp, or steep and remote terrain and is considered by many land managers to be uneconomical compared to burning (Reed et al., 2005). Jones *et al.* (2004) investigated cutting versus burning trials on dry heath and blanket mire habitats in the Berwyn Mountains. There were advantages and disadvantages of both techniques but cutting was viewed as being more beneficial. CCW have produced guidelines on burning and mowing of heath and note the presumption against burning on blanket bog (Sherry, 2005). Worrall et al. (2007c) have examined managed burn plots relative to unburnt controls and shown that water tables in peat rose significantly with burning as this restricted development of shrubby heather, but also demonstrated improvements in water quality and changes in soil structure.

Appendix 7

Summary of a meeting held during the peat compendium conference to determine interest and support for the creation of a peatlands network.

Following the conference presentations and discussions a workshop meeting was held to explore the appetite and enthusiasm for a continuing communication between peatland projects. This was lead by:

Chris Dean - Moors for the Future
Paul Leadbitter – Peatscapes
Jared Wilson – RSPB Wales

The discussion in the meeting brought together previous discussions which are ongoing between some of the upland peatland projects in the north of England and North Wales. It concluded that there was a great deal of enthusiasm to create a networking opportunity for the whole community of peatland projects both upland and lowland and that there is a real need for more sharing of information and collaboration to increase our effectiveness. The conference had showed the need for this and it was felt that the momentum created here and within the initiative of the joint peat project should be continued.

Moors for the Future as the lead contractor for the compendium work have proposed a discussion website be set up as a legacy of this conference and the wider compendium project and this meeting agreed that this would be a good communication tool and should be followed through.

All the participants spoken to, and in particular the leaders of the discussion, were concerned that any networking group and website development is well supported if it is to prosper. It was agreed that some dedicated administration assistance would be needed. Discussions were held to explore the possibility of this being a relatively simple email type of group but it was felt that the importance of this communication required something more than this. The leaders of this discussion suggest that a figure of £10,000 a year for three years would support the development of the website communications network and would set up and manage (including providing learning events) the networking group. This cost would largely be to pay for the salary and establishment costs of a project officer to provide this facility (1 day/week).

Report of the Workshop event:
Firstly would such a communication group be useful?
A show of hands was overwhelmingly in support of the formation of some sort of networking group covering peatland management and restoration.

Following this three short brainstorming activities were carried out with a simple question heading up each brainstorm (in bold)

If such a group were formed what would it look like / what type of organisation should it be?

- Upland and lowland combined
- Networking and communication group for practitioners rather than policy or research led
- Include landowners
  - via information
  - invite to events
- Peer support needed
- Technical groups
- Pressure group to policy makers
- Working groups
- E-mail groups?
- Should make best use of a dedicated web discussion
- Critical that it has administrative support

What should such a group regard as its core activities?

- Identify methods and good practice
- Feed into Defra etc via Joint Peat Project

- Share practical experience
  - monitoring methods
  - contractor training
  - contractor database
- Regular site visits
  - to new projects
  - to ongoing projects
- Academic register / specialists
  - fundraising
  - agri-environment schemes
  - policy & delivery

What should such a group <u>not</u> become involved in?

- Responding to consultations (individual members would be doing this through their own organisations and there might be some conflict)
- Replicate work (e.g. of MFF & Peatscapes)
- Commercial sensitivity (i.e. upset contractors etc)
- Giving free advice to consultants