Evidence Table

Name of Evidence Review:	Uplands Evidence Review
Name of Review Sub-topic (if any):	Tracks
Review Question	Do tracks alter the structural integrity of blanket peat?

Study Details	**Population and setting**	**Methods of allocation to intervention / control**	**Outcomes and methods of analysis** (inc effect size, CIs for each outcome and significance	**Results**	**Notes**
Authors: Alakukku, L. Persistence of soil compaction due to high axle load traffic. I. Short-term effects on the properties of clay and organic soils. Year: 1996 Aim of study: To investigate compaction by vehicle movements on clay and organic soils. This table focuses upon the	Source population: Study on agricultural soil. Focus upon sedge-derived peat. Setting: Finland	Methods of allocation: Treatment plots identified that were representative of those in agricultural use in Finland. Intervention description: Three treatments - no vehicle passes; one pass and four passes. Front axle load was 1.5Mg and rear axle load was 6.5Mg. Tyre pressure front 150 kPa and rear 250 kPa. Control / comparison description: Cores taken from undisturbed sites to	Primary outcome measures: Soil compaction by vehicle movements measured. Secondary outcome measures: Follow-up periods: annual measure for three years. Methods of analysis: soil porosity and pore diameter measured.	One and four passes with a high axle load on wet fields compacted a well-decomposed sedge peat to a depth of 0.4-0.5 m. The effect of compaction on the pore space was observed only in changes in the pore size distribution. Subsoil	Limitations identified by author: Number of blocks sampled in each year small due to destructive nature of sampling; Water storage could not be estimated because microporosity not measured. Limitations identified by review team: Statistics OK for age of paper. Greater sample size would enhance findings.

results for the organic soil. Study design: Controlled before-and-after Quality Score 2++ External validity: 2+		assess porosity. Sample sizes: 3 blocks involving 2 treatments for three years plus additional treatment in year 3. Baseline comparisons: All plots subject to same treatment prior to experiment start. Study sufficiently powered: No power given. Low sample size so likely to be underpowered.		compaction persisted for at least three years.	Evidence gaps and/or recommendations for further research: Investigation of compaction impacts upon water storage capacity of soil. Sources of funding: No information given
Authors: Astron Year: 2006 Aim of study: To provide guidance on peat landslide hazard and risk assessments. Study design: Expert opinion and	Source population: blanket bog Setting: Scotland	Methods of allocation: n/a Intervention description: n/a Control / comparison description: n/a Sample sizes: n/a	Primary outcome measures: designed to provide guidance of risk and hazard for development on blanket peat. Section of relevance to this question is the causes of peat slides. Secondary outcome measures: n/a	Most frequently reported anthropogenic factors for peat mass movements relevant to this review: 1. Alteration to drainage pattern focussing drainage and generating high	

consensus. Quality Score 4+ External validity: 4+		Baseline comparisons: n/a Study sufficiently powered n/a	Follow-up periods: n/a Methods of analysis: n/a	pore-water pressures along pre-existing or potential rupture surfaces (e.g. at the discontinuity between peat and substrate). 2. Unloading of the peat mass by cutting of peat at the toe of a slope reducing support to the upslope material. 3. Digging and tipping, which may undermine or load the peat mass respectively, and may occur during building, engineering, farming or mining (including subsidence). 4. Changes in vegetation cover caused by	

				burning, heavy grazing or stripping of the surface peat cover, reducing tensile strength in the upper layers of the peat body.	
Authors: Barden, L. Year: 1968 Aim of study: To propose a simplified model for predicting primary and secondary consolidation of clay and peat. Study design: Quantitative experimental. Quality Score: 2+ External validity: 2+	Source population: Data taken from existing studies/models and compared with laboratory studies. Setting: Laboratory, Manchester, UK.	Methods of allocation: Critical review of existing models compared with laboratory findings. Intervention description: Loading of clay and peat in laboratory. Control / comparison description: existing clay and peat loading models. Baseline comparisons: Study sufficiently powered: No data provided on power or statistical techniques.	Primary outcome measures: Development of simplified model of primary and secondary consolidation of clay and peat soils. Secondary outcome measures: Follow-up periods: ongoing at time of paper. Methods of analysis: rate of compression against time using known rate of pressure.	1. A simplified model for primary and secondary consolidation of clay and peat. 2. Agreement with others that drainage results in deformation of the peat but not necessarily agreement over the processes taking place. 3. Recognition that drainage of micro-pores a key process but physics not yet established.	Limitations identified by author: Acknowledges gaps in scientific understanding. Limitations identified by review team: More detail on method of analysis and (statistical) significance of results would be helpful but must take into account age of paper. Evidence gaps and/or recommendations for further research: The physics surrounding drainage of micro-pores and water

					movement. Sources of funding: Not given.
Authors: Barry, A.J., Brady, M.A. & Younger, J.S. Year: 1992 Aim of study: To propose a road construction method on peat subject to specific environmental constraints. Study design: Expert opinion combined with collection of field and observational data Quality Score 2+ External validity:	Source population: Tropical peats. Setting: East Sumatra	Methods of allocation: Engineering problem identified in relation to construction of roads on peat. Intervention description: To identify suitable road construction method. The key constraints are especially relevant to this review. Control / comparison description: Existing failed roads. Sample sizes: N/A Baseline comparisons: N/A Study sufficiently powered: N/A	Primary outcome measures: Proposed construction that ensured road remained 0.5 m above ground level for the life of the road. Secondary outcome measures: Follow-up periods:None given. Methods of analysis:	1)The study identified that lowering of water table may be expected to cause settlement by three mechanisms: a) increase in effective stress, causing rapid settlement in permeable peat; b) drying shrinkage, which causes irreversible changes in the peat; c) allowing aerobic conditions, resulting in an increased rate of decomposition.	Limitations identified by author: None reported. Limitations identified by review team: No follow-up to see if proposal was successful following construction. Evidence gaps and/or recommendations for further research: Revisiting sites where this method has been adopted to investigate whether settlement has taken place. Sources of funding: None given.

2+				2) Field monitoring indicated that ditches cut close to the road increased settlement by reducing the ability of the peat to act as a mat. 3) A road constructed from corduroy(logs) and stone has been shown not to be capable in general of remaining 0.5 metres above the surrounding ground. A timber piled raft with a geogrid reinforced stone pavement has been shown to perform satisfactorily.	
Authors: Berry, P. L.	Source population:	Methods of allocation: area representative of	Primary outcome measures: Establishment of	Two options proposed for	Limitations identified by author: results

Year: 1983 Aim of study: calculation of preloading times and weights on peat to be used for housing development. Study design: Quantitative experimental. Quality Score: 2+ External validity: 2+	lowland raised mire Eligible Population: n/a Inclusion & exclusion criteria: n/a Setting: Manchester, UK.	fibrous peatland sites. Intervention description: peat samples collected and tested for rates of consolidation. Control / comparison description: n/a Sample sizes: 24 Baseline comparisons: previous studies. Study sufficiently powered: No power figures given.	pre-loading settlement rates for use in a reclamation scheme. Secondary outcome measures: n/a Follow-up periods: n/a Methods of analysis: modelled and experimentally tested. Statistical tests not reported.	loading of peat identifying predicted settlement and time required.	should be used to form basis for field trial scheme and not be considered a substitute for a pilot scheme. Limitations identified by review team: Earlier paper by author questioned appropriateness of size of each soil sample. This was not discussed or referred to in the present study despite the earlier paper being referenced. Evidence gaps and/or recommendations for further research: These figures are based upon known and laboratory calculated data that requires actual field testing. Sources of funding: Not

					given.
Authors: Berry, P. L. & Poskitt, T. J. Year: 1972 Aim of study: Review of published experimental data aimed at proposing a method of engineering assessment in the field of the consolidation of peat. Study design: Quantitative experimental Quality Score 2+ External validity: 2-	Source population: not reported Eligible Population: n/a Inclusion & exclusion criteria: n/a Setting: not reported	Methods of allocation: Review of experimental data plus authors own experimental data on peat. Intervention description: not reported Control / comparison description: not reported Sample sizes: not reported Baseline comparisons: not reported Study sufficiently powered: details not reported.	Primary outcome measures: Proposed method of assessing peat consolidation for engineering purposes. Secondary outcome measures: none given Follow-up periods: not reported Methods of analysis: not reported	An experimental investigation on the settlement of amorphous granular and fibrous peat showed very close agreement with theoretical predictions.	Limitations identified by author: The mechanical properties of peats vary at different sites and any theory needs to take account of the type of peat involved. Limitations identified by review team: 1) No information on the nature of the experimental work. 2) No information on the numbers of samples or the locations from where the samples were taken. 3) Not particularly clear on what information based upon review of experimental data and what information based upon authors experimental data. Evidence gaps and/or recommendations for

					further research: Sources of funding: None reported.
Authors: Berry, P. L. & Vickers, B. Year: 1975 Aim of study: Review and testing of theory of consolidation of fibrous peat. Study design: Quantitative Experimental Quality Score: 2+ External validity: 2+	Source population: n/a Eligible Population: n/a Inclusion & exclusion criteria: n/a Setting: Peats taken from road construction site in Cheshire, UK.	Methods of allocation: Site identified as typical of resource. Intervention description: Samples taken and subject to loading in laboratory. Control / comparison description: All samples undisturbed at time of collection. Sample sizes: 9 samples Study sufficiently powered: Possibly under-powered.	Primary outcome measures: Permeability of soils in relation to vertical consolidation and compressibility Follow-up periods: measures of creep done over a minimum of 3 months. Methods of analysis: standard measure of loading against time.	1. Close agreement between the observed and predicted rates of settlement. 2. The agreement between the experimental and theoretical rates of pore pressure dissipation was not exact but considered acceptable. 3. The decrease in vertical permeability during a consolidation process is of the order 10^3. The corresponding decrease in compressibility is	Limitations identified by author: 1. Further investigation into whether the size of the individual peat sample is physically big enough to be representative. 2. In applying this theory to predict field behaviour it will be necessary to ensure that the laboratory samples are representative of the soil mass. Limitations identified by review team: Relatively small number of samples. Evidence gaps and/or

				very much less than this with the net effect being a reduction in drainage rates. 4. Settlement times vary depending upon consolidation pressure.	recommendations for further research: Comparison with more humified peat. Sources of funding: Not given
Study Details	**Population and setting**	**Methods of allocation to intervention / control**	**Outcomes and methods of analysis** (inc effect size, CIs for each outcome and significance	**Results**	**Notes**
Authors: Dykes, A. P. & Jennings, P. Year: 2011 Aim of study: Investigation of the causes of peat slope failures and mass movements in Ireland in August 2008. Study design: Observational, correlation with	Source population: n/a Eligible Population: n/a Inclusion & exclusion criteria: n/a Setting: Western Ireland	Methods of allocation: n/a Intervention description: see results/notes. Control / comparison description: n/a Sample sizes: n/a Baseline comparisons: n/a Study sufficiently	Primary outcome measures: Identification of causes of peat movements. Secondary outcome measures: n/a Follow-up periods: n/a Methods of analysis: field measurements of peat volumes involved plus some recording of peat	Paper describes 9 different peatland movements ranging from 720m3 - 130,000m3 in volume. The suspected trigger for one of the slides was the construction of a track.	Limitations identified by author: The engineering difficulty in measuring peat strength accurately and the implications of this. Limitations identified by review team: None Evidence gaps and/or recommendations for further research: 1) Development of techniques to assess

some collection of field data. Quality Score: 2++ External validity: 2++		powered: n/a	strength measurement.		peat strength. 2) The effect of tracks on peat stability. Sources of funding: Acknowledgement that much of the work carried out under contract but companies not named.
Study Details	**Population and setting**	**Methods of allocation to intervention / control**	**Outcomes and methods of analysis** (inc effect size, CIs for each outcome and significance	**Results**	**Notes**
Authors: Dykes, A. P. & Jennings, P. Reply Year: 2011 Aim of study: Response to comments on earlier paper. Study design: Observational, correlation with collection of some	Source population: n/a Eligible Population: n/a Inclusion & exclusion criteria: n/a Setting: Ireland.	Methods of allocation: n/a Intervention description: n/a Control / comparison description: n/a Sample sizes: n/a Baseline comparisons: n/a	Primary outcome measures: n/a Secondary outcome measures: n/a Follow-up periods: n/a Methods of analysis: Combination of site visits and tests on peat strength.	This is a response to comments on earlier paper. The point of relevance to this review: The destruction of tensile strength of peat by the cutting through the upper 1-1.5 m for the extraction of peat 'turves' which allowed a	Limitations identified by author: See Dykes & Jennings 2011 Limitations identified by review team: None Evidence gaps and/or recommendations for further research: 1) assessment of shear strength of peat. 2) Research into levels of instability caused by

field data Quality Score: 2++ External validity: 2++		Study sufficiently powered: n/a		failure to develop and expand to a greater extent than might have otherwise been the case.	excavation. Sources of funding: none reported.
Study Details	**Population and setting**	**Methods of allocation to intervention / control**	**Outcomes and methods of analysis** (inc effect size, CIs for each outcome and significance	**Results**	**Notes**
Authors: Dykes, A. P. & Warburton, J. Year: 2008 Aim of study: Investigation into causes of peat slope failures at Dooncarton Mountain. Study design: Observational correlation with collection of field data. Quality Score: 2++	Source population: Blanket Peat Eligible Population: n/a Inclusion & exclusion criteria: n/a Setting: Ireland.	Methods of allocation: n/a Intervention description: n/a Control / comparison description: n/a Sample sizes: 9 representative failures investigated in detail (i.e. samples taken) Baseline comparisons: n/a Study sufficiently	Primary outcome measures: Identification of causes of peat slope failure on study site. Secondary outcome measures: n/a. Follow-up periods: n/a Methods of analysis: Field and laboratory investigation including testing of shear strength of peat allowing back analysis.	1. 40 separate slides were recorded and contrary to reports at the time, drainage channels at two of the sites were not determined to have played a significant role in the failures. 2. At one site, cutting of the peat for fuel was determined to have been a contributing factor to the	Limitations identified by author: 1. the structural discontinuities throughout peat deposits are unknown. 2. Predicting the effect of climate change relies upon knowledge of a range of hydrological processes and changing frequency of extreme rainfall events. 3. Further information is required on the characteristics and implications of iron pans and sub-peat macro-pore networks.

External validity: 2++		powered: n/a		slide.	Limitations identified by review team: None Evidence gaps and/or recommendations for further research: 1. Relationship between drainage channels and stability. 2. The differences in stability/structure of blanket bog in different parts of the UK. Sources of funding: NERC.
Study Details	**Population and setting**	**Methods of allocation to intervention / control**	**Outcomes and methods of analysis** (inc effect size, CIs for each outcome and significance	**Results**	**Notes**
Authors: Dykes, A. P., Gunn, J. & Convery, K. J. Year: 2008 Aim of study:	Source population: Blanket Bog Eligible Population: n/a	Methods of allocation: n/a Intervention description: Investigation of peat movements.	Primary outcome measures: identification of causes of peat movements. Secondary outcome measures: n/a	1) 45 landslides investigated. 2) One slide possibly had a drainage ditch as a contributory factor.	Limitations identified by author: Some of the measured shear strengths of the peat may be unrepresentatively high.

Investigation into causes of landslides on Cuilcagh Mountain Study design: Experimental correlation with field data Quality Score: 2++ External validity: 2++	Inclusion & exclusion criteria: n/a Setting: Ireland.	Control / comparison description: n/a Sample sizes: n/a Baseline comparisons: some data e.g. hydrological was collected from adjacent pristine bog. Study sufficiently powered: No power given but likely to be statistically sound.	Follow-up periods: n/a Methods of analysis: Back analysis and peat strength tests with additional extensive modelling.	3) One slide had a leaking pvc water pipe as a contributory factor.	Limitations identified by review team: None. Evidence gaps and/or recommendations for further research: The relationship between drainage channels and instability of peat. Sources of funding: Fermanagh District Council, University of Huddersfield and Royal Geographic Society.
Study Details	**Population and setting**	**Methods of allocation to intervention / control**	**Outcomes and methods of analysis** (inc effect size, CIs for each outcome and significance	**Results**	**Notes**
Authors: Dykes, A. P. Year: 2008 Aim of study: Investigation of tensile strength of	Source population: Blanket bog Eligible Population: n/a Inclusion &	Methods of allocation: Peat samples collected and laboratory tested and then results applied to known blanket bog failures.	Primary outcome measures: Development of a laboratory method for identifying tensile strength of peat. Secondary outcome	In relation to the Evidence Review the key finding is: The quantitative evidence of the importance of the acrotelm tensile strength in bog	Limitations identified by author: 1. Small samples. 2. Sample collection tended to avoid obvious weaknesses in the in situ peat mass possibly leading to an

peat and its relationship to specific blanket bog failures. Study design: Experimental Quantitative Quality Score: 2++ External validity: 2++	exclusion criteria: n/a Setting: Republic of Ireland.	Intervention description: Loading of peat samples in laboratory. Control / comparison description: n/a Sample sizes: 6 slides investigated with 31 peat samples collected. Baseline comparisons: Study sufficiently powered	measures: Application of laboratory results to actual bog failures. Follow-up periods: n/a Methods of analysis: Combination of laboratory testing and back analysis.	flows.	overestimation of tensile strength. 3. Small original sample length that determines the strain experienced under load. 4. The design of the fingers for cutting peat on the prototype machine for testing load may not have exerted a consistent force. Limitations identified by review team: None Evidence gaps and/or recommendations for further research: 1. Increasing the number of samples and geographical range of slides investigated plus correction of issue with prototype machine for testing load. Sources of funding:

					NERC, University of Huddersfield.
Study Details	**Population and setting**	**Methods of allocation to intervention / control**	**Outcomes and methods of analysis** (inc effect size, CIs for each outcome and significance	**Results**	**Notes**
Authors: Mesri, G. & Ajlouni, M. Year: 2007 Aim of study: Quantification of consolidation and compression of fibrous peats. Study design: Experimental evaluation with use of existing data. Quality Score: 2+ External validity: 2+	Source population: Blanket Peat Eligible Population: n/a Inclusion & exclusion criteria: n/a Setting: U.S.A & Canada	Methods of allocation: n/a Intervention description: n/a Control / comparison description: n/a Sample sizes: 2 samples for laboratory testing but also used existing published data. Baseline comparisons: n/a Study sufficiently powered:	Primary outcome measures: compression rates and shear strengths of peat. Secondary outcome measures: n/a Follow-up periods: NR Methods of analysis: compression/shear tests, no statistical test details provided.	1) Fibrous peat particles are large and filled with water making them very compressible. 2) Upon compression, permeability of fibrous peats decreases dramatically. 3) For fibrous peats, effective surcharge ratios of 1 to 2 may be required to substantially reduce post-construction secondary settlements.	Limitations identified by author: None. Limitations identified by review team: Some of the laboratory techniques not clearly explained. No details on statistical evaluation or confidence levels. Evidence gaps and/or recommendations for further research: Further research into field examples to measure applicability of laboratory calculations. Sources of funding: None reported.

Study Details	**Population and setting**	**Methods of allocation to intervention / control**	**Outcomes and methods of analysis** (inc effect size, CIs for each outcome and significance	**Results**	**Notes**
Authors: Blackwood, T.W. & Vulova, C.V. Year: 2006 Aim of study: report on the construction of a metalled "floated" road. Study design: Experimental Quantitative and observational Quality Score: 2+ External validity: 2+	Source population: Blanket Peat. Eligible Population: n/a Inclusion & exclusion criteria: Not excluded as contains calculations on peat consolidation and pre-loading. Setting: Oregon, U.S.A	Methods of allocation: Peat samples taken from road site. Intervention description: Samples tested for consolidation. Control / comparison description: n/a Sample sizes: Baseline comparisons: n/a Study sufficiently powered: n/a	Primary outcome measures: Predicted settlement rates for pre-loading. Secondary outcome measures: n/a Follow-up periods: Road built 2001-2003, revisited visually 2005. Methods of analysis: n/a	1. Route over 14ft deep peat and organic silt. The settlement during primary consolidation was 0.6 metres (2 ft) and less than calculated.	Limitations identified by author: 1) some discrepancy between actual and predicted probably due to variation in silt/soil phases of route. Limitations identified by review team: None Evidence gaps and/or recommendations for further research: 1. Pre-loading techniques/calculations during construction of upland tracks. 2. Does pre-loading make a difference in terms of impacts of moorland tracks? Sources of funding:

					None reported.
Study Details	**Population and setting**	**Methods of allocation to intervention / control**	**Outcomes and methods of analysis** (inc effect size, CIs for each outcome and significance	**Results**	**Notes**
Authors: Dykes, A. P. & Kirk, K .J. Year: 2006 Aim of study: review of slope instability and mass movements in peat deposits. Study design: Review of existing data plus a case study using authors data. Quality Score: 2++ External validity: 2++	Source population: n/a Eligible Population: n/a Inclusion & exclusion criteria: n/a Setting: n/a	Methods of allocation: n/a Intervention description: n/a Control / comparison description: n/a Sample sizes: n/a Baseline comparisons: n/a Study sufficiently powered: n/a	Primary outcome measures: n/a Secondary outcome measures: n/a Follow-up periods: n/a Methods of analysis: n/a	The part most relevant to this review relates to how drainage channels affect peat stability. This is based in part upon the authors own work and in part upon other publications. 1. Ditches cut across a sloping bog may eliminate down-slope support for the bog above the ditch (2 cases). 2. A more common effect may be the transferring of additional storm	Limitations identified by author: several with theme being the unpredictability of peat slope failures due to lack of knowledge. Limitations identified by review team: None. Evidence gaps and/or recommendations for further research: the authors make several recommendations relating to greater understanding of hydrological processes including role of pipes; further work on the tensile strength of peat and the role of climate change in altering properties of peat are

				runoff water into failure zones either directly or indirectly through connecting natural pipes (4 cases). 3. Drains associated with plowing for forestry planning were thought to contribute to one failure.	perhaps the priorities. Sources of funding: None reported.
Study Details	**Population and setting**	**Methods of allocation to intervention / control**	**Outcomes and methods of analysis** (inc effect size, CIs for each outcome and significance	**Results**	**Notes**
Authors: Yang, J. & Dykes, A. P. Year: 2006 Aim of study: The procedure for determining the liquid limit as an index property that may explain some peat failures.	Source population: Blanket Bog Eligible Population: n/a Inclusion & exclusion criteria: n/a Setting: Ireland	Methods of allocation: Investigation focused upon failure sites. Intervention description: samples taken, laboratory and field testing carried out. Control / comparison	Primary outcome measures: To provide systematic comparisons for improvements to the standard procedure for measuring the liquidity of peat. Secondary outcome measures: to use results from above to assess	The key point to note for this review is that under certain natural conditions movement of water into pore spaces may lead to deformation of the peat and failure. Where	Limitations identified by author: 1. Very little comparable data concerning blanket bog as opposed to fen. 2. The nature of the disturbances that lead to failure are unknown. 3. Difficulty in controlling water content variations during penetrometer

Study design: Experimental quantitative. Quality Score: 2++ External validity: 2++		description: , n/a Sample sizes: 24 from 3 sites plus additional samples for specific testing. Baseline comparisons: Existing data. Study sufficiently powered: Power not given.	likelihood that fluidisation of in situ peat may have been cause of peat failures. Follow-up periods: n/a Methods of analysis: Back analysis, laboratory tensile testing.	the peat is susceptible to this, engineering works in the form of drainage ditch excavation, peat excavation, wind farm construction or the storing of material on a peat body, can lead to failure of the peat body.	tests, Limitations identified by review team: None Evidence gaps and/or recommendations for further research: 1. The nature of the disturbances that lead failure. 2. The influence of water chemistry on the liquid limit of peat. Sources of funding:
Study Details	**Population and setting**	**Methods of allocation to intervention / control**	**Outcomes and methods of analysis** (inc effect size, CIs for each outcome and significance	**Results**	**Notes**
Authors: Cola, S. & Cortellazzo, G. Year: 2004 Aim of study: To establish shear strength of two peat soils.	Source population: Deep peat soils Eligible Population: n/a Inclusion & exclusion	Methods of allocation: Intervention description: Samples taken from two areas of extensive peat soil coverage.	Primary outcome measures: Evaluation of the fiber and over consolidation effects on shear strength. Secondary outcome measures: n/a	Note that some of the results relate to remolded peat but natural peats also tested (and formed the bulk of the work). Of note for this	Limitations identified by author: Shows the difficulty in evaluating a significant failure model for the design of structures and dependence of shear strength both on test type and the applied

Study design: Quantitative experimental. Quality Score: 2++ External validity: 2+	criteria: n/a Setting: Italy	Control / comparison description: n/a Sample sizes: Unclear, possibly 13 natural and 4 remolded. Baseline comparisons: n/a Study sufficiently powered: n/a	Follow-up periods: n/a Methods of analysis: laboratory testing with back analysis.	study: Shear behaviour is sensitive to over consolidation.	stress path. Limitations identified by review team: None Evidence gaps and/or recommendations for further research: Application of results in field environment, specifically, conditions where loading of peat is likely to lead to failure. Sources of funding: European Community Funding
Study Details	**Population and setting**	**Methods of allocation to intervention / control**	**Outcomes and methods of analysis** (inc effect size, CIs for each outcome and significance	**Results**	**Notes**
Authors: Munro, R. Year: 2004 Aim of study: Current practices	Source population: Northern Peatlands Eligible	Methods of allocation: n/a Intervention description: road construction over northern peatlands.	Primary outcome measures: Methods of road construction on peatlands. Secondary outcome	Of relevance to this review: 1. Excavation of roads only viable at less than 4m depth of peat as	Limitations identified by author: numerous caveats through-out report.

for construction over peatlands in Northern Europe. Study design: Expert opinion/consensus Quality Score: 4+ External validity: 4+	Population: n/a Inclusion & exclusion criteria: n/a Setting: Norway, Finland, Sweden & Scotland.	Control / comparison description: n/a Sample sizes: n/a Baseline comparisons:n/a Study sufficiently powered: n/a	measures: n/a Follow-up periods: n/a Methods of analysis: n/a	sides become unstable. An expensive but reliable approach but only likely to be used on shallow peats. 2. In deeper bogs, where excavation used, pockets of peat can be left that can result in bearing and settlement issues if not corrected. 3. If the peat has low shear strength, sides lopes can unstable and migrate into excavations before backfilled - can add to cost and volumes of excavated peat. 4. With geotextile the overall settlement is not reduced in the	Limitations identified by review team: lack of empirical work on tracks themselves. Evidence gaps and/or recommendations for further research: Specific research into tracks, their impact and best practice for construction in regard to use on blanket peat. Sources of funding: EU funded project.

				long term and creep may affect the long term performance of the geotextile - although note that these are geotextiles used as part of construction for heavier traffic.	
Study Details	**Population and setting**	**Methods of allocation to intervention / control**	**Outcomes and methods of analysis** (inc effect size, CIs for each outcome and significance	**Results**	**Notes**
Authors: Warburton, J., Holden, J. & Mills, A. J. Year: 2004 Aim of study: Review of evidence for link between hillslope hydrology and mass movements in areas of blanket peat.	Source population: Blanket peat. Eligible Population: n/a Inclusion & exclusion criteria: n/a Setting: North Pennines, England, UK.	Methods of allocation: n/a Intervention description: n/a Control / comparison description: n/a Sample sizes: 18 failures Baseline comparisons: n/a	Primary outcome measures: summary of data then examine them in context of the importance of rainfall, macro-scale drainage conditions and soil water hydrological processes. Secondary outcome measures: n/a Follow-up periods:n/a	In relation to this Evidence Review key finding is that out of 18 peat failures, 7 may have had anthropogenic activities (drainage and peat cutting) as a contributory factor.	Limitations identified by author: Requires further knowledge of peat hydrological processes, material properties and modelling of slope instability required to make firmer conclusions. Limitations identified by review team: More information on the

Study design: Quantitative correlation. Quality Score: 2+ External validity: 2+		Study sufficiently powered: n/a	Methods of analysis: None presented but based upon previously published data.		methods of analysis and comparison would have been helpful. Evidence gaps and/or recommendations for further research: Peat slide hydrological processes. Sources of funding: Durham University and The Royal Society.
Study Details	**Population and setting**	**Methods of allocation to intervention / control**	**Outcomes and methods of analysis** (inc effect size, CIs for each outcome and significance	**Results**	**Notes**
Authors: Dykes, A. P. & Kirk, K. J. Year: 2001 Aim of study: 1. To examine role of drainage and pipes in peat slide. 2 Establish whether mass movement could have been	Source population: Blanket Bog Eligible Population: n/a Inclusion & exclusion criteria: n/a Setting: Ireland	Methods of allocation: n/a Intervention description: n/a Control / comparison description: n/a Sample sizes: n/a	Primary outcome measures: Determination of causes of peat slide on site. Secondary outcome measures: n/a Follow-up periods: n/a	1. The presence of a degraded drain and pipes in clay contributed to the failure of slope.	Limitations identified by author: Slight chance that peat samples suffered some deformation in their collection. Failure of peat very difficult to explain. Limitations identified by review team: None

initiated by failure of a small slope segment. Study design: Quantitative correlation. Quality Score: 2++ External validity: 2++		Baseline comparisons: n/a Study sufficiently powered: No details given.	Methods of analysis: Combination of modelling and data collected from site visit and analysed in laboratory.		Evidence gaps and/or recommendations for further research: The role of drainage ditching in creating instability in peat. Sources of funding: None reported.
Study Details	**Population and setting**	**Methods of allocation to intervention / control**	**Outcomes and methods of analysis** (inc effect size, CIs for each outcome and significance	**Results**	**Notes**
Authors: Fox, P. J. & Edil, T. B. Year: 1996 Aim of study: Effect of stress and temperature on secondary compression of peat. Study design: Quantitative	Source population: Eligible Population: Peat deposit - raised mire? Inclusion & exclusion criteria: n/a Setting: Wisconsin, USA.	Methods of allocation: Samples taken from proposed highway widening site. Test embankments built on site. Intervention description: Laboratory samples subjected to range of stress and temperature testing. Embankments instrumented to record settlement, temperature,	Primary outcome measures: Quantification of temperature on settlement rates. Secondary outcome measures: n/a Follow-up periods: Embankments subject to treatment and monitoring for up to 800 days.	1. Large fraction of total settlement due to secondary compression. Field and laboratory tests indicated that compression increases with time so that predictions using constant settlement may	Limitations identified by author: Heating in field experiments not high enough to show effects related to thermal pre-compression. Limitations identified by review team: Not blanket bog peat. Evidence gaps and/or

experimental. Quality Score: 2+ External validity: 2+		pore pressure and lateral deformation. Control / comparison description: Embankments - 1 heated 1 not heated. Sample sizes: 12 lab and 2 test embankments. Baseline comparisons: No details given. Study sufficiently powered: Possibly not. Sample size may be adequate re laboratory tests but unlikely to be large enough for field tests.	Methods of analysis: Focus upon engineering stress tests. Nothing presented on statistical analysis.	be under estimates. 2. Laboratory tests of compression should be should be performed at the same temperature and stress conditions as those existing in situ. 3. Cooling a peat specimen causes a decrease in rate of secondary compression.	recommendations for further research: Effect of temperature (and loading) on settlement rates in blanket bog. Sources of funding: United States Science Foundation.
Study Details	**Population and setting**	**Methods of allocation to intervention / control**	**Outcomes and methods of analysis** (inc effect size, CIs for each outcome and significance	**Results**	**Notes**
Authors: Wilson, P., Griffiths, D. & Carter, C.	Source population: Blanket bog.	Methods of allocation: n/a Intervention description:	Primary outcome measures: Description of event and identification of	It is suggested that a degraded ditch with two	Limitations identified by author: Acknowledgement of

Year: 1996 Aim of study: Characteristics, impacts and causes of large-bog flow. Study design: Qualitative review Quality Score: 3- External validity: 3-	Eligible Population: n/a Inclusion & exclusion criteria: n/a Setting: Northern Ireland, UK.	n/a Control / comparison description: n/a Sample sizes: Not reported. Baseline comparisons: n/a Study sufficiently powered: No.	causes. Secondary outcome measures: n/a Follow-up periods: not reported. Methods of analysis: Not reported.	other narrow ditches may have resulted in an increase in pore pressure by water that contributed to the slope failure.	the difficulty in identifying the roles of slope form and gradient. Limitations identified by review team: No empirical data or back analysis. No description of the type of analysis or statistical validity. Partly due probably to the target audience. Evidence gaps and/or recommendations for further research: The contribution of ditching to pore pressure and the stability of peat. Sources of funding: Aerial imagery funded by University of Ulster.
Study Details	**Population and setting**	**Methods of allocation to intervention / control**	**Outcomes and methods of analysis** (inc effect size, CIs for each outcome and significance	**Results**	**Notes**
Authors: Bradof,	Source	Methods of allocation:	Primary outcome	Only resulted	Limitations identified

K.L. Year: 1992 Aim of study: Investigation into impacts of road building and drainage upon peat structure and vegetation. Study design: Quantitative Quality Score: 2++ External validity: 2+	population: Eligible Population: Peatland Inclusion & exclusion criteria: n/a Setting: Minnesota, USA.	Existing road and drainage system. Intervention description: Impact of road upon structure and vegetation growth on peat. Control / comparison description: sites nearby. Sample sizes: two sites, 22 and 24 paired sampling points respectively for peat depth. 14 water-table sampling points in 2 transects. Baseline comparisons: data from time of road construction. Study sufficiently powered: Yes.	measures: Quantification of settlement of peat by road and growth of tree species. Secondary outcome measures: n/a Follow-up periods: not reported. Methods of analysis: Range of statistical tests.	relevant to this review presented. 1. Changes in peat surface elevation can be related to changes in water level. 2. From 1915 -1979/82 at one site average subsidence is c.3mm per year. From 1915-1979/82 at second site. Average subsidence c. 10mm per year. 3. One site showed a weak negative correlation between subsidence and distance from ditch (closer = greater subsidence) whilst the second site showed poor	by author: several relating to control sites, comparisons with baseline points that were under the road, slight confounding due to proximity of some paired sites to ditches. Relatively slow rate of subsidence may reflect that some/many ditches were blocked. Limitations identified by review team: No issues beyond those identified by authors. Evidence gaps and/or recommendations for further research: Type of ditch required for track construction and relationship with subsidence. Timescales. Does pre-loading have a positive/negative effect. Role of track

				relationship.	acting as a drain and overland surface water trap. Sources of funding: None reported.
Study Details	**Population and setting**	**Methods of allocation to intervention / control**	**Outcomes and methods of analysis** (inc effect size, CIs for each outcome and significance	**Results**	**Notes**
Authors: Carling, P. A. Year: 1986 Aim of study: Investigation into mechanisms of peat failures in North Pennines. Study design: Quantitative correlation. Quality Score: 2+ External validity: 2+	Source population: Blanket Bog Eligible Population: n/a Inclusion & exclusion criteria: n/a Setting: North Pennines, UK.	Methods of allocation: Five sites where peat slides took place with focus upon three sites. Intervention description: n/a Control / comparison description: n/a Sample sizes: Soil samples 15 = clay, 6 = peat. Baseline comparisons: standard figures e.g. Atterberg limits.	Primary outcome measures: Suggested mechanisms for slope failures. Secondary outcome measures: n/a Follow-up periods: n/a Methods of analysis: Field data collection and laboratory analysis of soil samples.	Of relevance to this review: 1. Slides occurred on slopes that had already displayed history of mass movement. 2. Alignment of artificial drainage channels may have contributed to instability of slope.	Limitations identified by author: Time constraints meant that not all sheer strength tests could be carried out. Limitations identified by review team: lack of statistical analysis means difficult to determine significance. Evidence gaps and/or recommendations for further research: Role of drainage ditches in slope instability. Identification of slopes

		Study sufficiently powered: Probably not.			with characteristics that suggest they are susceptible to movement. Sources of funding: None reported.
Study Details	**Population and setting**	**Methods of allocation to intervention / control**	**Outcomes and methods of analysis** (inc effect size, CIs for each outcome and significance	**Results**	**Notes**
Authors: Hobbs, N. B. Year: 1986 Aim of study: Review of testing procedures for predicting settlement in peat. Study design: Review of quantitative experimental. Quality Score: 2++ External validity:	Source population: Studies from N. America and Europe. Inclusion & exclusion criteria: n/a Setting: see above	Methods of allocation: n/a Intervention description: Review of knowledge of distribution of water within peat, permeability and compression based upon reported field and laboratory testing. Control / comparison description: n/a Sample sizes: n/a Baseline comparisons: n/a	Primary outcome measures: Evaluation of settlement rates in different peat types. Secondary outcome measures: n/a Follow-up periods: n/a Methods of analysis: collation of previously published field and laboratory data.	In relation to this Review: <u>Water properties</u> 1. Bulk of water held as intracellular and inter-particle water with proportions depending upon structure and morphology of plants present. 2. Drainage of peat influences the proportions and quantity of water in the peat. 3. Considerable	Limitations identified by author: Assumptions and issues discussed throughout. Main limitation is that shear strength of peat not part of the review. Limitations identified by review team: The range of peat types included (e.g. fens) may mean that some of the results may have less significance. Evidence gaps and/or recommendations for

2+		Study sufficiently powered: Probably.		evidence that fibrous peats have higher total water contents that granular-amorphous peats. 4. Stronger less decomposed peat is more susceptible to compression than softer more highly decomposed peat. <u>Engineering Properties</u> 1. Permeability controls rate of consolidation. 2. Acrotelm - tensile strength depends upon plant cover. More permeable than catotelm but permeability declines with depth. 3. Catotelm -	further research: increase in number of studies focused upon blanket bog Sources of funding: none reported.

				permeability depends upon: botanical composition (sphagnum moss least permeable); degree of humification - least humified are more permeable; bulk density - higher bulk density the lower permeability; fibre content - higher fibre content, the higher permeability; void ratio/porosity, the higher the quantity the higher the permeability; drainable void ration /porosity - the higher the drainable void ration the higher	

				the permeability as most readily drainable voids present the least resistance to the water flow; surface loading - this diminishes the permeability by decreasing the void ratio/porosity. <u>Permeability under load</u> 1. Primary consolidation - the expulsion of pore water accompanied by structural re-arrangement of the particles is relatively short-term process. 2. Secondary compression which is influenced by the size of the load, is the dominant	

				process with settlement possibly increasing over time. This process is largely independent of the water content. Overburden and pre-consolidation 1. Drainage of mires increases the overburden pressure with the extent depending upon draw down. The age of the drainage scheme may affect the calculation of settlement. 2. It is concluded that accurate prediction of the amount and progress of settlement is not possible.	
Study Details	**Population and**	**Methods of allocation to**	**Outcomes and methods of**	**Results**	**Notes**

	setting	**intervention / control**	**analysis** (inc effect size, CIs for each outcome and significance		
Authors: Lefebvre, G., Langlois, P., Lupien, C & Lavallee, J.-G. Year: 1984 Aim of study: Settlement rates in peat under construction. Study design: Quantitative experimental. Quality Score: 2++ External validity: 2+	Source population: Eligible Population: Peatland Inclusion & exclusion criteria: n/a Setting: Canada	Methods of allocation: Access routes to service hydro-electric development. Intervention description: Field loading and laboratory testing. Control / comparison description: Comparing with clay stress figures and other published soil data. Sample sizes: Two cores taken with 11 and 5 sections taken and tested in laboratory. "several" test fills at each site constructed. Baseline comparisons: Instrumentation and recording took place before construction.	Primary outcome measures: settlement rates of peat under loading in Canada. Secondary outcome measures: n/a Follow-up periods: n/a Methods of analysis: statistical analysis not reported. Data associated with loading/stress/compression and void water content etc is presented.	1. In this case primary consolidation took between 10-20 days after construction. 2. Inferred secondary compression in field about double that of laboratory tests.	Limitations identified by author: Several around accuracy of readings. Limitations identified by review team: None Evidence gaps and/or recommendations for further research: Settlement rates on peats with different tensile strength. What does this mean for drainage requirements? Sources of funding: Some financial assistance provided by the Societe d'energie de la Baie James.

		Study sufficiently powered: probably			
Study Details	**Population and setting**	**Methods of allocation to intervention / control**	**Outcomes and methods of analysis** (inc effect size, CIs for each outcome and significance	**Results**	**Notes**
Authors: Landva, A.O. & La Rochelle, P. Year: 1983 Aim of study: settlement of peat. Study design: Review, Quantitative experimental. Quality Score: 2+ External validity: 2+	Source population: Peat Eligible Population: n/a Inclusion & exclusion criteria: n/a Setting: Canada	Methods of allocation: Not reported Intervention description: Laboratory sheer tests and review of published information. Control / comparison description: not reported Sample sizes: not reported Baseline comparisons: not reported Study sufficiently powered: Possibly	Primary outcome measures: shear strength of Radforth peats Secondary outcome measures: n/a Follow-up periods: not reported Methods of analysis: Standard shear tests in laboratory but no details on analysis of findings or statistical significance.	1. Radforth peats highly compressible with high rate of creep (these are Sphagnum dominated peats). 2. Predictions of magnitude and rate of settlement are difficult.	Limitations identified by author: acknowledges the difficulty of assessing peat under field and laboratory conditions. Limitations identified by review team: Not enough geographical context. No data on individual samples or methods of analysis. Evidence gaps and/or recommendations for further research: Sources of funding: None reported.
Study Details	**Population and setting**	**Methods of allocation to intervention / control**	**Outcomes and methods of analysis** (inc effect size, CIs	**Results**	**Notes**

			for each outcome and significance		
Authors: Tomlinson, R. W. & Gardiner, T. Year: 1982 Aim of study: Causes of bog slides. Study design: Quantitative correlation. Quality Score: 2+ External validity: 2+	Source population: Blanket bog Eligible Population: n/a Inclusion & exclusion criteria: n/a Setting: County Antrim, Ireland.	Methods of allocation: Sites of bog slides. Intervention description: n/a Control / comparison description: not reported Sample sizes: not reported Baseline comparisons: not reported Study sufficiently powered: Probably not.	Primary outcome measures: Identification of causal factors in slide initiation. Secondary outcome measures: n/a Follow-up periods: n/a Methods of analysis: Rainfall data and field inspections but no statistical evidence presented.	1. Common characteristics of the seven slides were: torrential rainfall, all had breaks of slope at the head of the movement, drains (4 slides) or streams were present and an impervious layer was present under the peat.	Limitations identified by author: None Limitations identified by review team: Analysis of peat tensile strengths etc and statistical analysis would make findings more robust. Evidence gaps and/or recommendations for further research: The role of drainage in blanket bog instability. Sources of funding: None reported.
Study Details	**Population and setting**	**Methods of allocation to intervention / control**	**Outcomes and methods of analysis** (inc effect size, CIs for each outcome and significance	**Results**	**Notes**
Authors: Casagrande, L. Year: 1966	Source population: Peatlands.	Methods of allocation: not reported Intervention description:	Primary outcome measures: considerations for construction of embankments on peat.	Majority of paper not relevant to review as focused upon surcharging	Limitations identified by author:

Aim of study: Construction techniques in relation to embankments on peat. Study design: Review, Quantitative experimental. Quality Score: 2+ External validity: 2+	Eligible Population: n/a Inclusion & exclusion criteria: n/a Setting: USA	variety of in situ and laboratory tests plus analysis of published data. Control / comparison description: not reported Sample sizes: not reported Baseline comparisons: Published data Study sufficiently powered: Not clear.	Secondary outcome measures: n/a Follow-up periods: n/a Methods of analysis: Stress tests reported but not statistical analysis.	and blasting. One finding that is relevant: Confirmation that an increase in shear strength is found with decreasing water content.	Limitations identified by review team: Evidence gaps and/or recommendations for further research: guidance/classification of peat surface types and where appropriate or not, to construct routes. Sources of funding: US Army Engineers Waterways Experiment Station.
Study Details	**Population and setting**	**Methods of allocation to intervention / control**	**Outcomes and methods of analysis** (inc effect size, CIs for each outcome and significance	**Results**	**Notes**
Authors: Rahman, A., Yahya, A., Zodaidie, M., Ahmad, D., Ishak, W., & Kheiralla, A.F. Year: 2004	Source population: Tropical peatland Eligible Population: n/a Inclusion &	Methods of allocation: Not reported Intervention description: Field and laboratory testing of shear strength in relation to drainage.	Primary outcome measures: Impact upon shear strength of peat when drained. Secondary outcome measures: n/a	Key points in relation to this Review. 1. In field situations drainage increased the bulk density of the peat. 2. In	Limitations identified by author: None Limitations identified by review team: No examples of what this means for vehicle use or types of vehicles.

Aim of study: Mechanical properties of peat in relation to vehicle use. Study design: Quantitative experimental. Quality Score: 2++ External validity: 2+	exclusion criteria: n/a Setting: Malaysia	Control / comparison description: undisturbed samples tested. Sample sizes: 9 sample areas Baseline comparisons: n/a Study sufficiently powered: Probably	Follow-up periods: n/a Methods of analysis: not reported (other than shear testing)	laboratory normal stress, depth and drainage conditions of the test site were significant in relation to shearing stress of the peat samples. 3. In field situations shearing stress increased when peat drained. 4. The mean surface mat stiffness of the peat and the stiffness of the underlying peat increased with drainage.	Evidence gaps and/or recommendations for further research: Tensile strength of blanket bog surfaces and implications for different types of vehicle use. Sources of funding: Ministry of Science, technology and the Environment of Malaysia.
Study Details	**Population and setting**	**Methods of allocation to intervention / control**	**Outcomes and methods of analysis** (inc effect size, CIs for each outcome and significance	**Results**	**Notes**
Authors: Hanrahan, E. T. Year: 1964	Source population: Blanket peat	Methods of allocation: Existing road Intervention description:	Primary outcome measures: Causes of road failure.	In relation to this Review: 1. Variable settlement	Limitations identified by author: Acknowledges engineering difficulties

Aim of study: Investigation into causes of a road failure on peat. Study design: Quantitative experimental. Quality Score: 2+ External validity: 2+	Eligible Population: n/a Inclusion & exclusion criteria: n/a Setting: Ireland	Ranges of field and laboratory testing. Control / comparison description: not reported Sample sizes: not reported Baseline comparisons: n/a Study sufficiently powered: Probably not but note age of paper.	Secondary outcome measures: n/a Follow-up periods: Revisited 8 years later. Methods of analysis: Not reported (other than laboratory strength/compression tests).	(deformation) of the road took place as a result of the non-uniform, and in places, excessively thick applications of gravel.	regarding peat. Limitations identified by review team: None (considering age of paper). Evidence gaps and/or recommendations for further research: The implications for loading of floating tracks on blanket bogs. Sources of funding:
Study Details	**Population and setting**	**Methods of allocation to intervention / control**	**Outcomes and methods of analysis** (inc effect size, CIs for each outcome and significance	**Results**	**Notes**
Authors: Lake, J.R. Year: 1961 Aim of study: Problems of constructing roads on peat. Study design:	Source population: peatland Eligible Population: n/a Inclusion & exclusion criteria: n/a	Methods of allocation: n/a Intervention description: Field and laboratory testing of settlement rates. Control / comparison description: not reported.	Primary outcome measures: Impacts of settlement rates in relation to various interventions. Secondary outcome measures: n/a Follow-up periods: 27	In relation to this Review the key points are: 1.Displacement of peat during construction despite low speed of construction - fill added at a rate that would	Limitations identified by author: Fundamental questions remain about the nature of peat. Limitations identified by review team: None (given age of paper).

Quantitative experimental. Quality Score: 2+ External validity: 2+	Setting: Scotland	Sample sizes: not reported for non-molded peat. Baseline comparisons: not reported. Study sufficiently powered: probably not.	months Methods of analysis: Settlement tests but no discussion of statistical analysis.	be too low for practical purposes. 2. The behaviour of peat under load appears to be affected by the properties of the peat itself which were not fully understood at the time of the research. Note that some of the work related to remolded peat but the above results relate to non-remolded peat.	Evidence gaps and/or recommendations for further research: Implications for loading of floating tracks on blanket bog. Sources of funding: Road Research Board of the Department of Scientific and Industrial Research.
Study Details	**Population and setting**	**Methods of allocation to intervention / control**	**Outcomes and methods of analysis** (inc effect size, CIs for each outcome and significance	**Results**	**Notes**
Authors: Wilson, P. & Hegarty, C.	Source population: Blanket peat.	Methods of allocation: Existing peat slides	Primary outcome measures: Probable causes of	1. Two shallow slides recorded with causes likely	Limitations identified by author: Acknowledges that

Year: 1993 Aim of study: causes of peat slides Study design: Quantitative correlation. Quality Score: 2+ External validity: 2+	Eligible Population:n/a Inclusion & exclusion criteria:n/a Setting: Ireland	Intervention description: Investigation into peat depths, vegetation and water pathways on slide sites. Control / comparison description: not reported Sample sizes: peat depth = 26/27. Vegetation = 5 sites with 2 quadrats per site. Bulk density = 12 Baseline comparisons: 2 intact sites - blanket bog and ditch and one displaced ditch. Study sufficiently powered: Possibly.	Secondary outcome measures: n/a Follow-up periods: n/a Methods of analysis: No statistical analysis presented.	to be a combination of heavy rainfall, degraded ditches and slope morphology.	slides unpredictable and that whilst many common factors there are equally many different ones as well. Limitations identified by review team: Would be more robust with greater number of samples plus shear tests. Statistical analysis also missing. Evidence gaps and/or recommendations for further research: The role of ditches and state in causing instability in blanket peat. Sources of funding: None reported.
Study Details	**Population and setting**	**Methods of allocation to intervention / control**	**Outcomes and methods of analysis** (inc effect size, CIs for each outcome and significance	**Results**	**Notes**
Authors: Lindsay,	Source	Methods of allocation: Site	Primary outcome	1. As well as large	Limitations identified

R. & Bragg, O. Year: 2005 Aim of study: Review of the adequacy of the EIA & EA; to highlight and consider additional issues not covered in the report; to assess in similar terms the two geotechnical investigations undertaken after the peat slide. Study design: Quantitative Review with some correlative data. Quality Score: 4+ External validity: 4+	population: Blanket peat Eligible Population: n/a Inclusion & exclusion criteria: n/a Setting: Scotland, UK.	of bog slide. Intervention description: Construction of wind farm and associated infrastructure. Control / comparison description: n/a Sample sizes: n/a Baseline comparisons: n/a Study sufficiently powered: n/a	measures: issues related to the instability and alteration of hydrology of blanket bog. Secondary outcome measures: n/a Follow-up periods: n/a Methods of analysis: Review of documents relating to development with additional field data.	slide subject to the study, a smaller slide also occurred related to the construction work. 2. Site shows movement in a range of places not all related to the construction works. 3. On one of the deepest peat areas a photograph is presented showing how the peat has bowed along a drainage ditch. 4. An adjacent windfarm (Sonnagh Old) is also discussed (with photographs) with a slide that is believed to have originated at an	by author: These relate to the omissions at EA/EIA stage. Some concerns about whether all Factors of Safety calculations would be completed but this may reflect timing of respective reports. Limitations identified by review team: Whilst processes reported are recognised there is still a general lack of data to support them. Evidence gaps and/or recommendations for further research: settlement rates of tracks on peat and impact upon hydrology. Sources of funding: Derrybrien Development Cooperative.

				access road.	
Study Details	**Population and setting**	**Methods of allocation to intervention / control**	**Outcomes and methods of analysis** (inc effect size, CIs for each outcome and significance	**Results**	**Notes**
Authors: Alakukku, L. Year: 1996 Aim of study: Long-term effects of soil compaction. Study design: Quantitative experimental. Quality Score: 2++ External validity: 2+	Source population: Organic (peat soil) and non-organic soils Eligible Population: n/a Inclusion & exclusion criteria: n/a Setting: Finland	Methods of allocation: Agricultural soils. Intervention description: Making set number of passes across treatment areas (see Alakkuku 1996a. Control / comparison description: See Alakkuku 1996a Sample sizes: See Alakkuku 1996a Baseline comparisons: See Alakkuku 1996a Study sufficiently powered:	Primary outcome measures: Secondary outcome measures: n/a Follow-up periods: 9 yrs. Methods of analysis: porosity and soil structure with statistical testing for significance.	This revisited the plots after 9 years. Key finding for this review was that all soils demonstrated compaction at sub-soil level (below 0.25 metres). Note that the organic soil was a sedge based peat but only 0.2 - 0.4 metres thick with clay mixed in below 0.2 metres so not typical of peat soils subject to review.	Limitations identified by author: Variation in the properties of the soil tested was high. More robust if number of samples higher. Limitations identified by review team: None other than study was looking at agricultural machinery. Evidence gaps and/or recommendations for further research: Compaction by different ORV on blanket peat that has not been surfaced. Sources of funding: None reported.
Study Details	**Population and**	**Methods of allocation to**	**Outcomes and methods of**	**Results**	**Notes**

	setting	**intervention / control**	**analysis** (inc effect size, CIs for each outcome and significance		
Authors: Dykes, A. P. Year: 2008 Aim of study: Review of the causes of peat slope failure. Study design: Quantitative Review. Quality Score: 2++ External validity: 2+	Source population: Blanket Peat Eligible Population: n/a Inclusion & exclusion criteria: n/a Setting: Ireland	Methods of allocation: Existing peat slide sites. Intervention description: n/a Control / comparison description: n/a Sample sizes: n/a Baseline comparisons: n/a Study sufficiently powered: Not a statistical study.	Primary outcome measures: Identification of major factors at play in Irish peat slides. Secondary outcome measures: n/a Follow-up periods: n/a Methods of analysis: n/a	In relation to this Review the following are relevant: 1. Future weather patterns associated with warming may make peatlands more susceptible to failure. 2. Many old and degraded land drains and boundary ditches can focus water into a particular area of slope or reduce lateral support for the peat layer upslope from the ditch. 3. New wind farms are also increasing the risks as a result of the	Limitations identified by author: Acknowledges that most appropriate technique for determining peat hazards have yet to be developed. Limitations identified by review team: non. Evidence gaps and/or recommendations for further research: the role of drainage channels in peat instability. Sources of funding: Fermanagh District Council, Limestone Research Group, NERC and University of Huddersfield.

				loading of "floating" gravel access roads.	
Study Details	**Population and setting**	**Methods of allocation to intervention / control**	**Outcomes and methods of analysis** (inc effect size, CIs for each outcome and significance	**Results**	**Notes**
Authors: Gunn, J. Year: 1998 Aim of study: A summary report on the issues around construction of a 3km access track on blanket bog. Study design: n/a Quality Score: 4+ External validity: 4+	Source population: Blanket bog Eligible Population:n/a Inclusion & exclusion criteria:n/a Setting: Ireland	Methods of allocation: A blanket bog site requiring access to facilitate restoration. Intervention description: Building an access track. Control / comparison description: n/a Sample sizes: n/a Baseline comparisons: n/a Study sufficiently powered: n/a	Primary outcome measures: n/a Secondary outcome measures: n/a Follow-up periods: n/a Methods of analysis: n/a	Several issues associated with this track. 1. Failures - material underlying the track squeezed sideways and the adjacent bog rose; material underlying the track compressed due to weight of the track and the track sank into the bog. 2. Most of the failures were in the degraded cut-over bog and required considerable depths of stone to build the track,	Limitations identified by author: Some issues e.g. use of limestone discussed. Limitations identified by review team: Not clear if data exists in another report. Would be more robust of measurements taken etc. Evidence gaps and/or recommendations for further research: If before and after data recorded then revisiting site to look at changes would be extremely valuable.

				in some cases, 1.3 metres rather than the design depth of 0.3 metres. 3. Surface flow drainage had been concentrated in places resulting in scouring. 4. Some suggestion that the limestone aggregate used resulted in the decline of sphagnum mosses but not clear which or how many mechanisms at play.	Sources of funding: EU
Study Details	**Population and setting**	**Methods of allocation to intervention / control**	**Outcomes and methods of analysis** (inc effect size, CIs for each outcome and significance	**Results**	
Authors: Dargie, T. Year: 2004	Source population: Blanket Peat.	Methods of allocation: n/a	Primary outcome measures: n/a	1. Acknowledges importance to minimising	

Aim of study: reporting experiences of wind farm construction on blanket peat. Study design: Expert opinion Quality Score: 4- External validity: 4-	Eligible Population: n/a Inclusion & exclusion criteria: n/a Setting: Scotland	Intervention description: Road construction associated with wind farm developments Control / comparison description: n/a Sample sizes: n/a Baseline comparisons: n/ Study sufficiently powered: n/a	Secondary outcome measures: n/a Follow-up periods: n/a Methods of analysis: non reported.	crossings of water courses and avoidance of wet and deep peat. 2. Makes comment "Overall, roads form the largest impact on blanket bog". 3. Peat overburden from cut road used in floating road construction thereby reducing costs of material movement and haulage. 4. Floating road construction used stone laid on geotextile to depth of 700-800mm. Vegetation cover either side of the road stripped back for 4-5 m then re-instated. 5. Heavier	

				vehicles require 4-4.5 , width with about 1,000 mm of stone laid on geotextile. 6. The wettest ground had two layers of geotextile. 7. 200m of road sank to depth of 0.7 m and required building up with rocks. 8. Acknowledges that roads have an impact upon blanket bog hydrology and that some compression takes place with probable changes to hydraulic conductivity. 9. Cut roads through blanket peat have a steepened upper slope, a side ditch, cross-	

				drains and a zone of disturbance where water and sediment is discharged which is likely to result in drier conditions adjacent to much of the road corridor. 9. Concludes that wind farms in Scotland do not pose a serious risk to blanket bogs (see note in next box).	