

Supplementary document outlining changes in revised manuscript by line number

Original manuscript line	Revised manuscript line	Comment
15	15	Sentence has been reworded to clarify point in the revised manuscript
19	NA	Sentence has been deleted in the revised manuscript
22	67-82	We agree that there are examples of certain soil biota affecting soil erosion rates and that this is an important distinction. However, this area is on the periphery of the manuscript which is focussed on the consequences of soil biota redistribution and egress. Thus we have added additional text and supporting references.
26	20-25	Amended the final section of the manuscript abstract to incorporate the comment that the abstract should specify the potential significance of different forms of soil loss in temperate arable agroecosystems.
62	88-121	Reviewer 2 requests further justification for using nematodes as a model organism. We have modified the text further justifying why nematodes are an appropriate model organism because of their ubiquitous and highly diverse nature, susceptible to a spectrum of erosion processes operating over multiple temporal and spatial scales. We have restructured the revised manuscript to present the text regarding nematodes earlier, thus to ensure a logical progression for the reader. We have moved what was the first part of section 5 to become new section 1.2 and have moved sections 5.1 and 5.2 to become new sections 4 and 4.1.
68	NA	We agree with the reviewer that the brief paragraph beginning at line 68 interrupts the flow of the text, and on reflection have deleted this from the revised manuscript.
71	NA	This comment relates to the omitted section in point above, and is thus no longer in the revised manuscript.
79/80	123/124	We have amended the text clarifying that both individual soil particles and soil aggregates are eroded, and have added 'within the soil matrix' to clarify that biota are within the soil.
87	132	The reviewer highlights the point that sediment is not entirely lost, and that it is also 'stored' within the landscape. We have clarified this point by adding additional text.
92	136-138	The reviewer highlights that we have failed to mention organic matter loss influencing erosion rates in arable systems. We have subsequently added text to reflect this point.
104	152	The reviewer notes we have missed 'detachment' from the process of erosion described, in the revised manuscript we have added 'detachment.'
111	160	We have corrected this typographical error in the revised manuscript.
112	NA	The paper cited does not mention biota transport, and we have addressed the reviewer's assertion to this point by removing the words 'and biota' from this sentence. The point is, however, reiterated in the more appropriate section 3 of the revised manuscript.
114	161-163	We have cited Poesen <i>et al.</i> , 2003 to support the assertion that gullies erode sediment at greater rates than rills.

117/ 117-121	165-170	The reviewer suggests that the section detailing landslides be omitted. However, we believe that in order to achieve a fully comprehensive review, landslides must be included in the description of erosion processes. Albeit that we accept the point raised that landslides are a lot rarer than other forms of soil erosion (e.g. Blaschke <i>et al.</i> , 2000).
127	177-180	The reviewer questions where the evidence is for erosion rates having a direct effect on biota. On reflection, we have carefully reworded this sentence to highlight that we are proposing the hypothesis that soil erosion rates have a direct effect on soil biota.
138	187	We thank the reviewer for highlighting that we made an error with sentence structure that presented information to state that Europe was less at risk of wind erosion than other parts of the world. This sentence is incorrect and has been restructured to clarify that Europe is at less risk of wind erosion than water erosion.
147	205-206	We agree with the reviewer that aggregate breakdown and soil displacement are distinct processes, we have restructured the sentence to reflect this point.
150	206-209	The reviewer suggests that compaction by agricultural machinery may increase shear strength and mitigate erosion. However, our view is that compaction changes the hydraulic properties of soil (decreased infiltration), promoting greater amounts of runoff that will outweigh any localised gain in strength. We accept our point could be clearer in the manuscript and have thus added 'which inhibits infiltration and decreases throughflow'.
153	211-214	The reviewer questions whether the tillage processes described increase severity of tillage erosion, or all forms. We have reworded the sentence in the revised manuscript to clarify that we mean tillage erosion, the end of the sentence refers to other forms of erosion.
165	198-202	This paragraph has been moved to the beginning of 'new' section 2.3 to improve the flow of the text. The reviewer questions where evidence that biota are transported, we have clarified that we are hypothesising this is the case by adding the word 'potential'. Later in the manuscript we refer to several papers that report nematodes in storm runoff (e.g. section 4 tropical studies, and section 4.1 temperate studies).
168	180	The reviewer suggests adding original data sources for Figure 1 (now Figure 2 in the revised manuscript), as well as improving axis labels and legend to enable the figure to stand alone. We have taken all of these suggestions on board and have incorporated changes in the revised manuscript.
169	223	The reviewer notes that not all processes in Figure 1 (now Figure 2 in the revised manuscript) have runoff rates. We have now amended the text to reflect this point.
172	226	We have corrected this typographical error in the revised manuscript.
173	224	The reviewer questions where the evidence base is for stating that biota transport is greater in rills. We have restructured the sentence in the revised manuscript to highlight that we hypothesise that since sediment is transported in greater volumes, we believe more biota within the soil matrix will be transported.
173	227	The reviewer questions why sediment delivery is inefficient, we have revised the terminology used in this sentence to reflect that we mean 'only a fraction reaches the channel network'.
175	228	We have cited Walling (1983) as the classic 'sediment delivery problem'

		paper.
182	236	The reviewer raises the important point that biota may move downward in the soil profile due to leaching, infiltration or rainwater flushing. In this particular section, we are highlighting that certain soil biota can actively move in response to changing soil-environment conditions, which may potentially lead to their subsequent passive dispersal. We agree with the reviewer that passive dispersal mechanisms are also possible, and discuss this in section 3.1 (of the revised manuscript). However the point made in this section refers specifically to an example of active movement of earthworms. To clarify, we have added the word earthworms in the sentence.
184	NA	We thank the reviewer for the observation that the section on climate change is outside the main scope of the paper, and on reflection, have omitted this from the revised manuscript.
195	NA	This sentence formed part of the deleted section in the previous comment and is therefore not in the revised manuscript.
196	239	We have re-worded the title of this section
207-209	NA	The reviewer notes repetition in this section and this is addressed by restructuring of the revised manuscript.
209	242-243	The reviewer asks for clarity over what soil biota decompose, we have added 'organic matter' to clarify.
210	NA	The reviewer notes 'maintaining environmental quality' is vague, and on reflection, we believe this role is covered by the others listed in this sentence, and have thus omitted it from the revised manuscript.
222	256	We have corrected this typographical error in the revised manuscript.
223	257	We thank the reviewer for his suggestion to change the wording of this sentence and have incorporated the change in the revised manuscript.
241	276	We have changed 'biota' to 'biotic'
244	276-287	We agree with the reviewer that quantifying the spatial scales of soil function would be valuable. However the conceptual description provided aims to be holistic for the entire soil foodweb, and in doing so covers a vast range of soil organisms, spanning a spectrum of spatial scales. Due to the array of different spatial ranges of different soil organisms, putting a quantified spatial scale to the function is both challenging, and potentially inaccurate. Whilst there are examples in the literature that explore spatial scales of soil function for certain taxa (e.g. Nielsen <i>et al.</i> , 2010), and others that have reported on spatial distributions of certain taxa (e.g. Boag <i>et al.</i> , 1984; Marshall <i>et al.</i> , 1998), we believe that it would be very challenging to achieve a definitive quantified spatial scale in this instance.
252	285	The reviewer states that the links between spatial scales are not very clear. We have addressed this by referring to (new) Figure 1 earlier in the section. The revised Figure incorporates the description of scales of soil function and potential consequences of erosion on them.
255	NA	We thank the reviewer for noting repetition, and have omitted this sentence in the revised manuscript.
256	289	We have changed niches to voids to clarify the presence of micro-biota in aggregates.

268	301	We have corrected this typographical error in the revised manuscript.
268	301	We have reworded this sentence to explain that macro-biota have a motility mechanism that enables movement through soil.
270/279	304	We have revised this sentence and condensed it to make clear that the citation Roots (1956) refers to biota moving towards favourable environmental conditions.
273	305	We have changed 'relatively small' to 'micro- and meso-biota'.
275	72/73 & 307	We thank the reviewer for their suggestion to change the wording from 'up' to 'along'. We have also strengthened the description of the erosion-energy and effective-erosion-depth continuum, by introducing and explaining it earlier in the revised manuscript (line 72/73).
281	314-316	We agree with the reviewer that sites of deposition may improve habitat (a component of the redistributive effect of erosion) and have thus added a sentence to highlight this in the revised manuscript.
301	336	We have corrected this typographical error in the revised manuscript.
303	335-338	We have revised this sentence to explain clearly the mechanism whereby nematodes are 'sieved' out of sand by wind.
309	458	The reviewer highlights the point that rainfall-runoff dispersal of PPNs may not be related to soil erosion processes. The citations (Freckman & Baldwin, 1990 & Hugo & Malan, 2010) make reference to soil erosion as an interrelated component of runoff in the transport of PPNs. We are grateful for the reviewer's observations, and agree that the transport of soil nematodes as a consequence of runoff alone (i.e. not erosion-related) is possible. However, we believe that the coupled process of runoff generation and soil erosion mean that nematode transport and redistribution by erosion is likely to be the dominant mode of nematode transport (i.e. storm runoff). Thus in the concluding section of the revised manuscript, we highlight that a research priority should be to characterise mechanisms responsible for biota transport (e.g. erosion), Section 5.1, line 458 in the revised manuscript.
312/315		Please refer to above point
317	352	We have corrected this typographical error in the revised manuscript.
320	355/356	The reviewer notes that loss of biota and habitat restructuring are two processes, we have reworded the sentence to clarify this.
325 & 365	360-363, 40 & 458-468	We have revised this section to clarify that our assertion is that erosion is likely to affect different soil species to different extents. In terms of selectivity, we hypothesise that selective transport of certain species of soil biota by different erosion processes is possible (<i>cf.</i> Villenave <i>et al.</i> , 2003, described in line 403 of the revised manuscript). Furthermore, we believe in the context of temperate agroecosystem research, that this is an important area for future research and assert this in Section 5.2, line 467.
326	NA	This sentence has been omitted from the revised version of the manuscript.
328 & 343	475	The reviewer asks if the net effect of erosion on biota may be positive due to depositional environments being potentially enriched. We hypothesise that this may be the case, as an indirect consequence, but only in depositional environments. We believe this is an important and under-researched area, and suggest it as a research priority in Section 5.3, line 475 of the revised

		<p>manuscript.</p> <p>The reviewer also asks if an eroded soil profile creates a better habitat for soil biota. This is an important question that relates to net ecosystem service delivery that we believe remains unanswered in the literature. We support this as a research question, and it is included within section 5.3, line 475 in the revised manuscript.</p>
333	371	We have corrected this typographical error in the revised manuscript.
333/334	371	The reviewer notes that the sentence repeats the section above. We believe that the sentence provides an important assertion that clarifies and reinforces the broad potential effects of erosion on soil biota.
339	377	The reviewer questions the appropriateness of the 'jerky conveyor belt' analogy. We believe that it is important to highlight that erosion and sediment transport events are highly episodic. By extension it also follows that biotic redistribution is also likely to be discontinuous and therefore delivery to the channel network will occur over multiple steps. The jerky conveyor belt analogy is well known in the geomorphology literature in particular.
344-349	89-93	The reviewer questions the relevance of this paragraph to the paper. In the revised manuscript it features in section 1.2, which places it in a broader conceptual section.
350	94	We have restructured this sentence in the revised manuscript to clarify the use of soil nematodes as an appropriate model organism in soil erosion research.
361	103-109	Lines 103-109 in the revised manuscript assert the appropriate use of nematodes in assessing disturbance by erosion.
369	118	The reviewer asks what effect soil properties have on nematodes. We add 'on nematode community structure' for clarity in the revised manuscript.
373	423	The reviewer notes the use of 'rainfall runoff' in the title rather than erosion. Several of the papers cited deal specifically with soil erosion processes and we have reworded the section title in the revised manuscript to take account of the reviewer's point.
376	385	The reviewer notes that we cite water-borne nematode transport. The paper cited reports nematode transport in rainfall runoff, in a region subject to intense rainfall, and thus erosion. We have reworded this sentence to remove ambiguity. We believe that the coupled process of runoff generation and soil erosion mean that nematode transport and redistribution by erosion is likely to be the dominant mode of nematode transport. Thus in the concluding section of the revised manuscript, we highlight that a research priority in this new field of research is to characterise mechanisms responsible for biota transport (e.g. erosion), Section 5.1, line 458 in the revised manuscript.
381	394	The reviewer asks for clarity over what rainsplash is detaching, thus we have added 'nematodes' to clarify in the revised manuscript.
383	396	The reviewer draws attention to Cadet <i>et al.</i> 's (2002) reporting that nematodes can be entrained and transported by discharges 25% of that necessary to transport soil particles. The reviewer questions whether this undermines the hypothesised linkages between erosion and biota transport. However we believe this confirms the vulnerability of soil biota to physical redistribution. We also believe that since runoff and soil-erosion are a coupled process, once critical shear stresses have been exceeded then biotic transport in both sediment-associated and clear runoff will combine. Thus in the concluding section of the revised manuscript, we highlight that a research priority in this new field of research is to characterise mechanisms

		responsible for biota transport (e.g. erosion), Section 5.1 in the revised manuscript.
385	400	The reviewer has asked for clarity over the sentence: 'beneficial' actually refers to nematodes beneficial to the soil environment, i.e. non-plant-parasitic We have restructured this sentence to remove potential ambiguity.
391	402-404	The reviewer states that the statement that demonstrates selectivity of nematode transport is not clear. We have reworded this sentence in the revised manuscript to address this point.
395	408	The reviewer notes that we cite Chabrier & Quénéhervé's (2008) assertion that runoff is the dominant nematode dispersal mechanism. We propose that most authors are not distinguishing between sediment-free clear-water mixtures and more complicated water-sediment mixtures. Thus dispersal is a coupled process and we have acknowledged that this issue requires further investigation (see Section 5.1 in the revised manuscript).
398	410	We have clarified that we refer to 'plant-parasitic nematode' erosion source.
416	427	We have corrected this typographical error in the revised manuscript.
426	437-439	We agree with the reviewer's important assertion that the direction of movement of nematodes will be influenced by soil-water levels, which will in turn influence susceptibility to erosion. We have reworded this sentence to reflect this point.
432-436	440-445	We note the reviewer's point that the presence of nematodes, or other soil organisms, found in downstream waters does not necessarily confirm a role for upstream erosion. However, we argue that runoff and erosion are closely linked, and that erosion plays a significant role in soil biota erosion and redistribution. This point has been incorporated as a future research priority (see section 5.1, line 458 in the revised manuscript).
443,451,458,461465	NA	The concluding section (5 in the revised manuscript) has been restructure in response to comments from both reviewers and as a result, the typographical errors listed have been corrected in the revised manuscript.
Figure 1	Figure 2	Please note Figure 1 is now Figure 2 in the revised manuscript. We have added the primary sources used to determine magnitude ranges of erosion processes, have reworded the axis labels to make them more self-explanatory and have reworded the legend in the revised manuscript.
Figure 2	Figure 1	Please note Figure 2 is now Figure 1 in the revised manuscript. We have added greater detail into the consequences of the different nested erosion processes on the different scales of soil biotic function; replaced the x-axis label 'Time' with 'Recurrence Interval', and have changed m to m ² on the y-axis in the revised manuscript.

References cited:

- Blaschke, P.M., Trustrum, N.A. and Hicks, D.L. (2000). Impacts of mass movement erosion on land productivity: a review. *Progress in Physical Geography*, 24, 21-52.
- Boag, B. and Topham, P.B. (1984). Aggregation of plant parasitic nematodes and Taylors Power Law. *Nematologica*, 30, 348-357.
- Marshall, B., Boag, B., McNicol, J.W. and Neilson, R. (1998). A comparison of the spatial distributions of three plant-parasitic nematode species at three different scales. *Nematologica*, 44, 303-320.