

Interactive comment on “The impact of land-use change on floristic diversity at regional scale in southern Sweden 600 BC–AD 2008” by D. Fredh et al.

Anonymous Referee #2

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The study's main aim is to quantify properties of a palaeoecological record of land-use change in order to test the widely held view, largely based on modern observations, that in the past traditional land-use mosaics of NW Europe fostered relatively high levels of diversity compared with those of today. In the record, changes in taxonomic richness and evenness are linked to changes in landscape openness, which themselves likely reflect the amount of land under some kind of agricultural management.

As an exploratory study the work has merit as it provides tentative confirmation that the projection of modern observations to past landscapes is likely correct, and this supports the strand of contemporary land management aimed at maintaining or increasing

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areas under traditional use as a conservation tool.

For the most part the paper is clear, but the discussion is somewhat weak and disjointed and could do with some revision. Below I list comments related to page and line numbers. These are of two kinds: first substantive comments requiring responses and then small points aimed at improving the writing and the clarity.

Substantive comments 19086/21 unclear what the word “distributuion” means here (and in some other places in the paper). The word normally refers to patterns, for example of a species in relation to soil properties or other environmental variables, or of elements of a mosaic (clumped, fragmented). But I suspect that is not what is meant here.

19088/13 Important to explain why evenness is ecologically significant/important

19089/1 et seq. There is an underlying assumption here that the changes are driven by land-use. However, within the past 2000 years there have been some significant climate changes, and these have been related to expansions and contractions in upland agriculture. It is important to justify why you are sure you are looking at the impacts of land-use change. This might include a brief description of the known patterns of climate change over the study period and also something about how much of a role is played by the elevation of these quite high-latitude, but relatively low, “uplands” in terms of limiting plant growth, particularly that of agricultural crops. (link to your comments in the next paragraph)

19096/22 justify assumption about *Juniperus* and *Corylus* for readers. If woodlands were open or being managed for wood, *Corylus* could be flowering in woodlands (see below also)

19096/23 OK so they are bulk dates, but they show that the sediment has accumulated coherently, which is more than can be said of the AMS dates. While there is strong pressure to use AMS as best practice, if suitable macrofossils are not available, dates

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on bulk sediment should not be discounted. As far as I can tell by lining up the calibrated mid-points of the bulk dates they fit your chosen age model very well. It may be worth slowing them on the diagram. They are actually rather reassuring, as the AMS dates are all over the place.

19097/10 Is it not also the case the Cs is rather mobile and tends to penetrate down-core?

19099/19 An assumption about land use and pollen production underlies the arguments in this paper, namely that tree pollen values diminish if land is cleared. However, certain kinds of woodland management also change tree pollen values, particularly for species that are coppiced or pollarded. It might be useful to address this in relevant places in the discussion of your results. See Waller M, MJ Grant and J Bunting (2012) Modern pollen studies from coppiced woodlands and their implications for the detection of woodland management in Holocene pollen records. *Review of Palaeobotany and Palynology* 187 11–28

19100/9 et seq The increase of *Picea* and *Fagus* at the expense of other late-successional trees has been noted elsewhere, yet this is not discussed later here. Do you think it is significant and does it match with other records?

19101/15 This paragraph (beginning /15) is a little hard to follow. "Many plants" is a vague term. Is this about just more SPECIES in a uniform landscape or are you actually recording a more complex mosaic of land cover that then allows more species overall to be present in the sampled area?

19102/8 Can you be a bit more precise about how this "migration period" might have been manifested in Southern Sweden, particularly in the study area?

/13 "discontinuous management" – as far as I can tell, there is no previous mention of this idea. What is it, exactly? It seems as if it should occur over a period not at a specific date.

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/17 "domination of tree plantations and crop cultivation". Change to dominance. But also it is rather hard to imagine how the landscape mosaic changes. What is included in small-scale agriculture – does this include extensive or only intensive land-use, for example? Or is it only a few farms in a landscape? And what kind of "tree plantations" are likely in AD 550? Orchards? Coppice? Plantations is an odd concept here – is there historical evidence for this? Or do you actually just mean reversion to high forest?

19103/9 Do you think the fact that *Cerealia* affect the value strongly means the richness is based on rather few herb taxa, and is this something that should be discussed further?

/20, I would be inclined to put this discussion of the dating at the beginning of your discussion section. After all, the way you deal with the dating problems defines the chronology and when you interpret changes to have taken place.

19104/19 et seq. This paragraph is a bit hard to follow. How much difference in biomass produced in a year is there if a hay crop is taken before flowering (and it then grows back) versus the meadow is left to flower? I am not sure biomass is particularly relevant here. This is more about if the meadows are allowed to flower. Perhaps this is what you are saying?

19105/11 et seq – the remainder of this paragraph rather repeats information discussed before. Not clear what you are saying here that is new. Omit?

/21 this last paragraph is a little weak as a concluding statement. Perhaps you can think a bit more about how this informs contemporary management and expand and clarify this last paragraph. See below.

Overall, I am not excited by the conclusions, which basically reiterate the findings and thus parallel the abstract. I wonder if a different slant can be found for this. Perhaps looking to how this approach can be refined, or tested elsewhere, and how particularly

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it might help management.

Minor technical comments and corrections

General writing point – you use the words “cover” and “coverage” apparently interchangeably. I can see no advantage to “coverage”, which is longer and more unusual and tends to be used in a slightly different context (like news broadcasts). I suggest a universal replace to “cover” 19086/17 REVEALS-based ??? what? 19087/13 Sentence about steppe plants unclear. What do you really mean here? The species have adaptation to disturbance and stress caused by factors such as wind and drought, and these are similar to the conditions in cultivated fields. /19 based more on crop cultivation – more than? need to understand what this is being compared with. 19088/1 from lake or mire sediments? /3 use “among” rather than “between” 5/ Moreover, it now makes it possible... /7 ..two parameters: richness and evenness /12 The aims are as follows:

19089/8 The bedrock is mainly crystalline granite and gneiss, ... /17 “largely” or “mostly” fit better than “usually” and were therefore colonized... 19091/26 explain why you excluded samples or refer reader to place in text where this I explained. 19092/5 Say why lead pollution dating also used – as an independent check on other dating? /11 and in some cases other markers are also observable. /16 medieval times have a typical..... 19093/5 ..we had to be selective in the use of..... 19095/12 unclear what “relative abundance between the taxa” means – needs a bit more explanation 19096/table 2 and fig 2. I suggest that either you add an AD-BC column in the table or change the time axis on the graphs to BP. At the moment it is confusing. /27 Fig 4 caption – what does “excluding bushes” refer to? Do you mean shrubs? Does this include Juniperus and Corylus? Needs clarifying. /25 The quantification of taxa coverage related to human impact – is it the taxa or the cover – or both – that is related to human impact? Please clarify. 19098/10 Figure 3 – I find this figure hard to read. I should prefer two axis facing right with the uncorrected and corrected values, or failing that, a much clearer divider between the left- and right-facing curves.

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19101/4 Fyfe et al? /8 agriculture /9 “equal distribution” – see previous comment, not clear – needs further development or re-wording. /19 trees 19102/2 “the vegetation” to expand does not make sense, clarify what is meant here /3 You say that this type of land use change is not good for herbs. How do you know this? You need to explain that the change in richness was driven by herb taxa disappearing from the record. /23 REVEALS-based ? /19 Is Calluna a herb? 19103/7 agriculture /23 clarify this in “this study” and /26 clarify “this is not obvious”. 19105/3 We have been long aware... 19106/ move sentence “We identified...” to before the preceding sentence – makes better temporal sense. /13 Not sure why this is a contrast. The pattern is actually the same except the process is reversed?

Interactive comment on Biogeosciences Discuss., 9, 19085, 2012.

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