Responses to review No. 1

Reviewer general comment: This multi-proxy palaeoecological study assesses how one of Poland's largest peatlands, currently surrounded by monoculture Scots pine forests, was impacted by two major environmental disasters - the 1922-1924 *Panolis flammea* outbreak, and the historic 1992 fire. The authors have compelling evidence to support the environmental impacts of these major disasters and their implications regarding modern forest management. My only concerns with the paper are 1) the font in all the figures are too small and thus really hard to read; and 2) the current discussion section is a bit confusing and needs to be restructured. I hope my specific comments below will help with both of those concerns.

Author's response: We thank to the reviewer for his/her comments. Undoubtedly, they were all helpful in improving the quality of the manuscript, organizing its structure and linguistic correctness. Below are our responses to each of them and our actions to improve the article.

Line 42: simplified linkages to what? Are you trying to say simplified diversity here?

Author's response: Indeed, the sentence was constructed imprecisely and was unclear. It is about simplified linkages in the food web, which result in the ecosystem being less resilient to various types of disturbances.

Actions: We corrected the sentence's meaning, clarifying what linkages we meant. We hope that after the correction, this part of the text is no longer in doubt.

Before: *The danger is even higher for peatlands located within monoculture tree plantations that have simplified linkages […] and thus are more sensitive to fires, strong winds, droughts, and insect outbreaks.*

After: *Such an environment is particularly dangerous for Poland's peatlands because monoculture tree plantations have simplified linkages in food webs and thus are more sensitive to fires, strong winds, droughts, and insect outbreaks (Chapin et al., 2012), which also causes a threat to peatlands.*

Lines 42-43. Neither the Seidl et al. citation nor the Westerling citation discuss monoculture tree plantations or peatlands. I respectively ask the authors to either rewrite the sentence so it appropriately captures the scientific findings of these citations, or find more appropriate references that support the statement, " monoculture tree plantations... are more sensitive to fires, strong winds, droughts, and insect outbreaks."

Author's response: The citations Seidl et al, 2014 and Westerling, 2016 refer to the increase in the frequency of extreme events, not to the sensitivity of pine monocultures to extreme events.

Actions: We have edited and corrected the sentences to leave no doubt as to which citations refer to which information. The correction resulted in two separate sentences to which the corresponding citations were assigned.

Before: *The danger is even higher for peatlands located within monoculture tree plantations that have simplified linkages (Chapin et al., 2012) and thus are more sensitive to fires, strong*

winds, droughts, and insect outbreaks that are more common in recent years (Seidl et al., 2014; Westerling, 2016).

***After**: Such an environment is particularly dangerous for Poland's peatlands because monoculture tree plantations have simplified linkages in food webs and thus are more sensitive to fires, strong winds, droughts, and insect outbreaks (Chapin et al., 2012), which also causes a threat to peatlands. It should be strongly emphasized here that such extreme phenomena have become more common in recent years around the world (Seidl et al., 2014; Westerling, 2016).*

Line 258: Should be "generalised additive mixed models."
Author's response: Indeed, the abbreviation expansion was wrong.

Actions: An error in the GAMM abbreviation expansion has been corrected from mixed model generalised additive models to generalised additive mixed models

Before: *Mixed model generalised additive models (GAMMs) were then fitted to the data, with a smoothing term accounting for temporal autocorrelation.*

After: *Generalised additive mixed models (GAMMs) were then fitted to the data, with a smoothing term accounting for temporal autocorrelation.*

Line 259: Can you be more specific with your "smoothing term?" Did you use a specific family and link function, or apply a k-function? Did you use REML?

Author's response: We appreciate the reviewer's request for clarity in the methodology used in our rate of change analysis. We opted to use the same methodology used in Burge *et* al. (2023) - a cubic regression spline was used as the smoothing basis, with $k = 20$. We tested a range of values for k to ensure the model avoids overfitting or underfitting the data. Likewise, we did not use REML, using instead Maximum Likelihood (ML) for consistency with Burge's framework. I just reanalysed the data using REML in place of ML as a smoothing parameter, and it didn't make an appreciable difference to the results.

Actions: A couple of lines containing the above information have been added to the manuscript (lines 260-265) for additional clarity and transparency, reducing the need to refer to or be familiar with the original framework by Burge *et* al. (2023).

Before: *Mixed model generalised additive models (GAMMs) were then fitted to the data, with a smoothing term accounting for temporal autocorrelation. […]*

After: *Generalised additive mixed models (GAMMs) were then fitted to the data, with a smoothing term accounting for temporal autocorrelation. A cubic regression spline was used as the smoothing basis, with k = 20. A range of values for k was tested to ensure the model avoids overfitting or underfitting the data. Likewise, Maximum Likelihood (ML) was used for consistency with Burge's framework, instead of REML (Restricted Maximum Likelihood). However, REML was used to reanalyse the data in place of ML as a smoothing parameter, and it didn't make an appreciable difference to the results. […]*

Figures 2-4: the font size is currently too small to see. Can you increase font size. You might have to eliminate some data you don't discuss in the figure to accommodate a larger font size.

Author's response: We agree with the reviewer's opinion.

Actions: We have corrected the figure by making the font larger. We have made the figure clearer. We also reduced the number of data presented by eliminating some of the dates from the timeline, as well as some of the values from the horizontal axes next to the curves.

In Figure 2, we made the font larger, and we removed part of the values from the horizontal axes and the age axis.

In Figure 3, we made the font larger, we removed non-discussed taxa curves (*Cirsium* – fruits), and some of the values from the horizontal and vertical axes.

In Figure 4, we made the font larger, we removed non-discussed taxa curves (*Salix*, *Populus*, *Tilia cordata*, *Abies alba*, *Acer*, *Pteridium aquilinum, Melampyrum*, *Urtica*, *Humulus/Cannabis*, *Centaurea cyanus*, *Fagopyrum esculentum* type, *Ambrosia artemisiifolia* type, Chenopodiaceae, *Plantago major*, Apiaceae undiff, *Potentilla* type, Brassicaceae, *Anthemis* type, *Aster* type, Cichoriaceae, *Galium* type, *Typha latifolia*, *Sparganium* type, *Drosera rotundifolia*, HdV-153 *Riccia*, Filicales monolete, *Scenedesmus*, *Spirogyra* type, *Mougeotia* type. *Pediastrum* – sum, HdV-128A, HdV-128B, HdV-1 *Gelasinospora* sp., HdV-30 *Helicoon pluriseptatum*, HdV-28 Copecoda spermatophores, HdV-31 *Archerella flavum*, HdV-32A *Assulina muscorum*, HdV-32B *Assulina seminulum*), and some of the values from the horizontal and vertical axes.

Figure 4: What is the significance of the *Betula alba* type pollen curve? I think an admixture or deciduous curve would be more appropriate so the reader can visually see the decline in these pollen type during the specific discussion points mentioned in the discussion.

Lines 478-481: An admixture or deciduous curve in Figure 4 would be extremely helpful to better see these points.

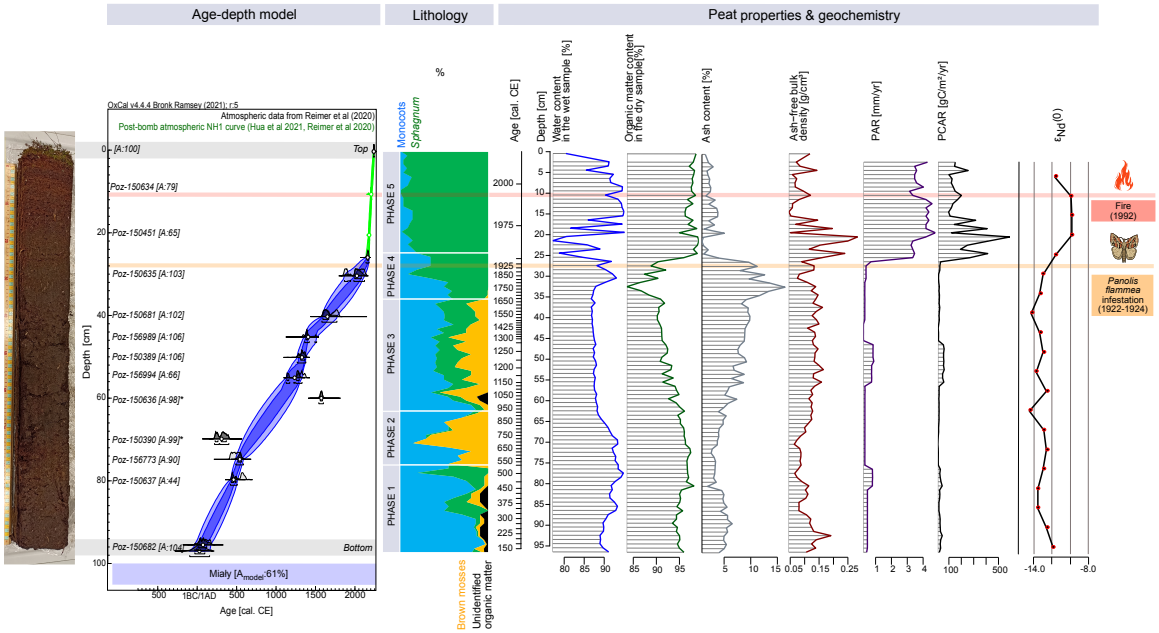
Author's response: Thanks to the reviewer for the comments. Indeed, the deciduous tree curve would be very helpful in understanding the changes in the composition of the forest. We agree that highlighting the *Betula alba* type curve was not necessary.

Actions: We modified the diagram (Figure 4). We created a deciduous tree curve as the reviewer suggested (on the left side). We moved the *Betula alba* type curve to a set of other curves relating to trees and shrubs. The curve of deciduous trees indicates a decline in the share of these taxa in the composition of the forest.

Modified figures we presented below.

Figure 2

Before:



After:

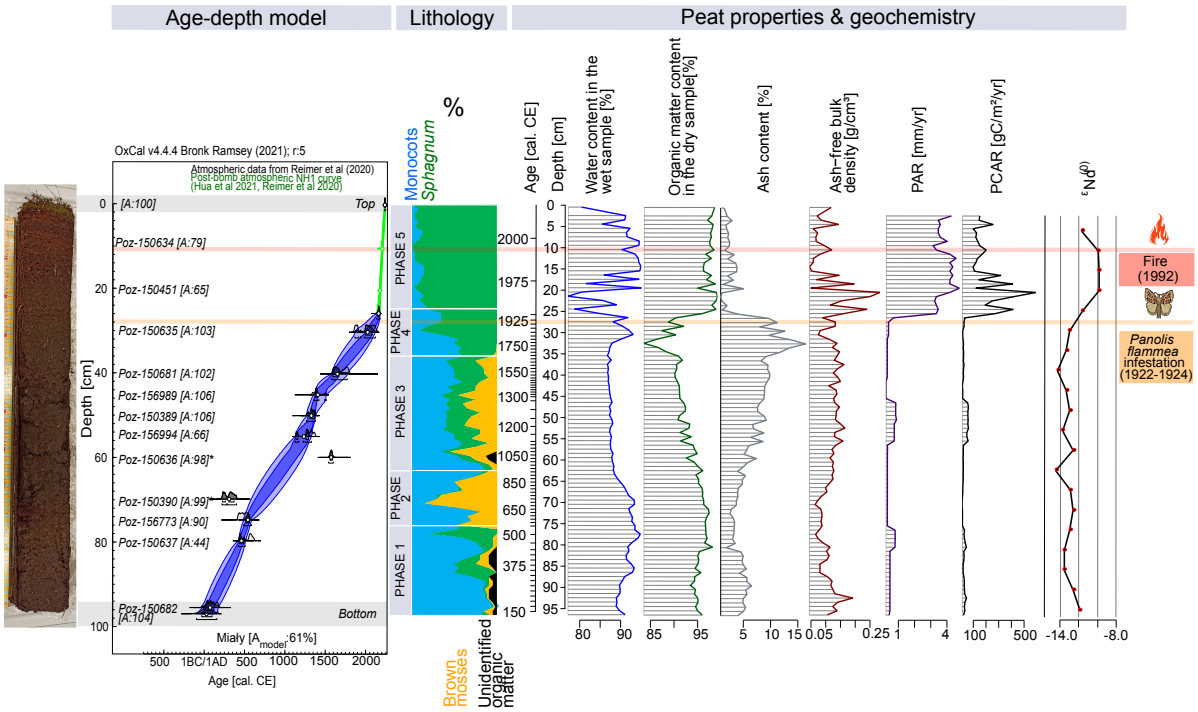
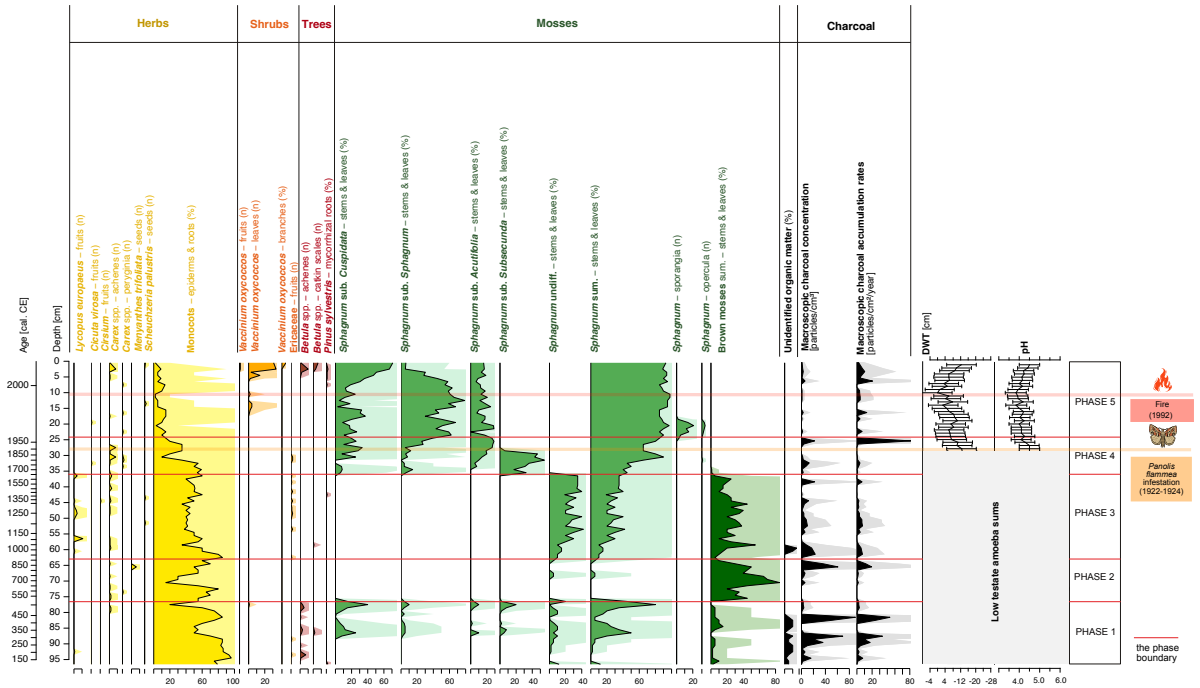


Figure 3

Before:



After:

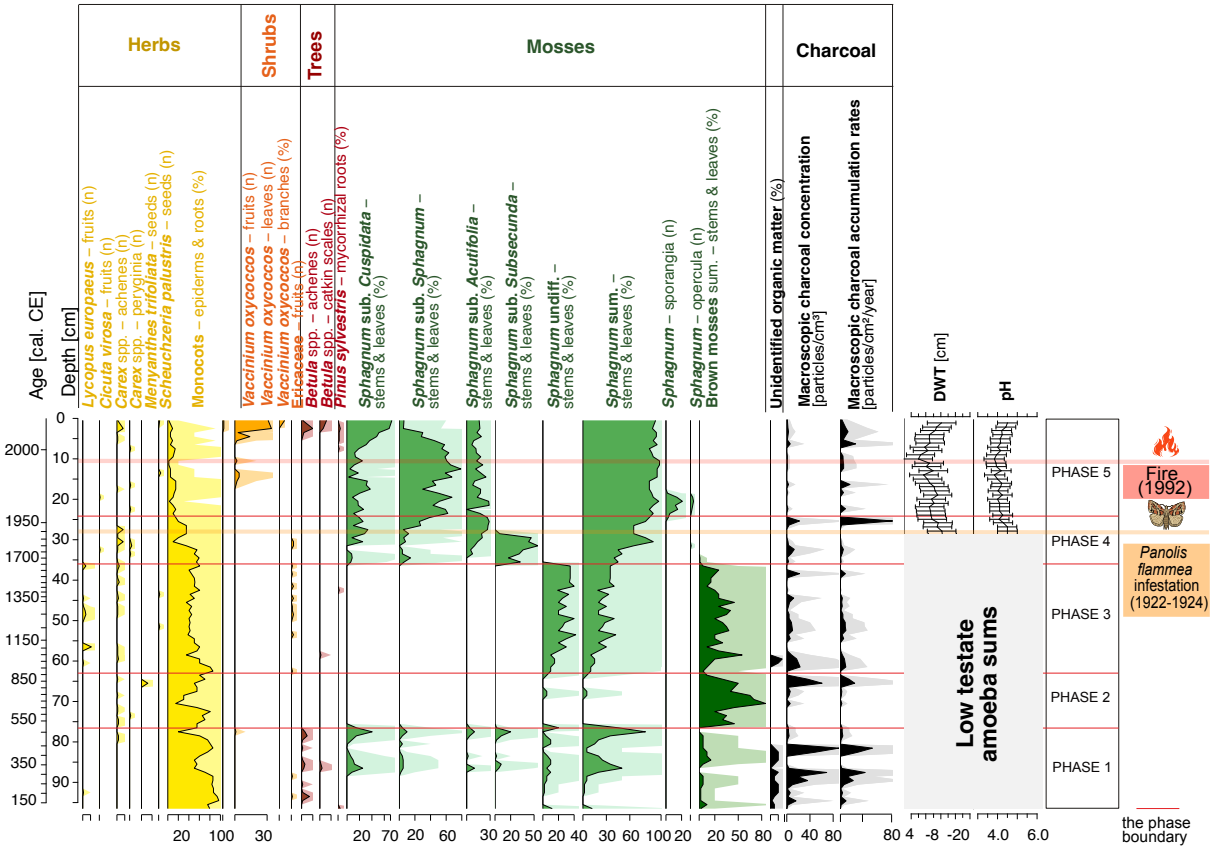
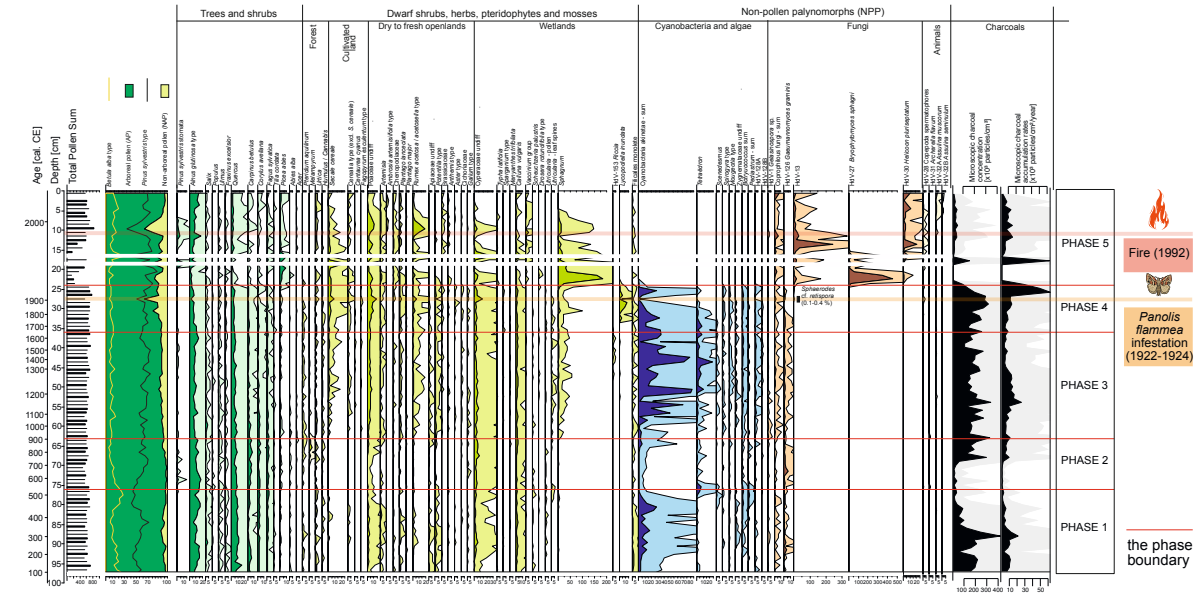
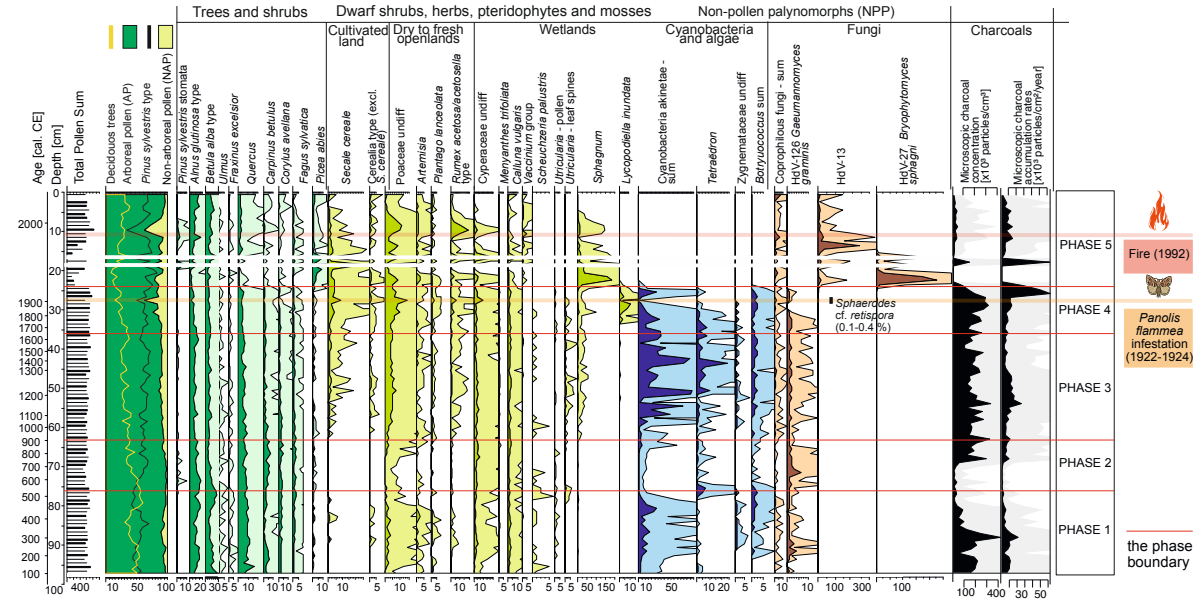


Figure 4

Before:



After:



Line 310: *Carpinus betulus* is missing a percent sign.

Author's response: We thank the reviewer for pointing out this missing element.

Actions: We have completed and corrected the percentage value.

Before: *Pinus sylvestris (39.0–65.8%) grains are the most frequent, but the pollen of deciduous trees is relatively common as well (Fig. 4): Betula (7.4–26.4%), Alnus (max. 17.0%), Quercus (max. 15.6%), Carpinus betulus (max. 5.8), Corylus avellana (max. 4.6%), […]*

After: *Pinus sylvestris (39.0–65.8%) grains are the most frequent, but the pollen of deciduous trees is relatively common as well (Fig. 4): Betula (7.4–26.4%), Alnus (max. 17.0%), Quercus (max. 15.6%), Carpinus betulus (max. 5.8%), Corylus avellana (max. 4.6%), […]*

Lines 452-455: I apologize, I'm not familiar with PrC. How do you know which line belongs to the PrC, the GAMM and the adaptive spline in Figure 5? Can you provide more detail here so Figure 5 is easier to understand.

Author's response: We appreciate the request from the reviewer for clarity in Figure 5 and its caption, now realising that the caption does not contain adequate information to allow the figure to stand alone apart from the article text.

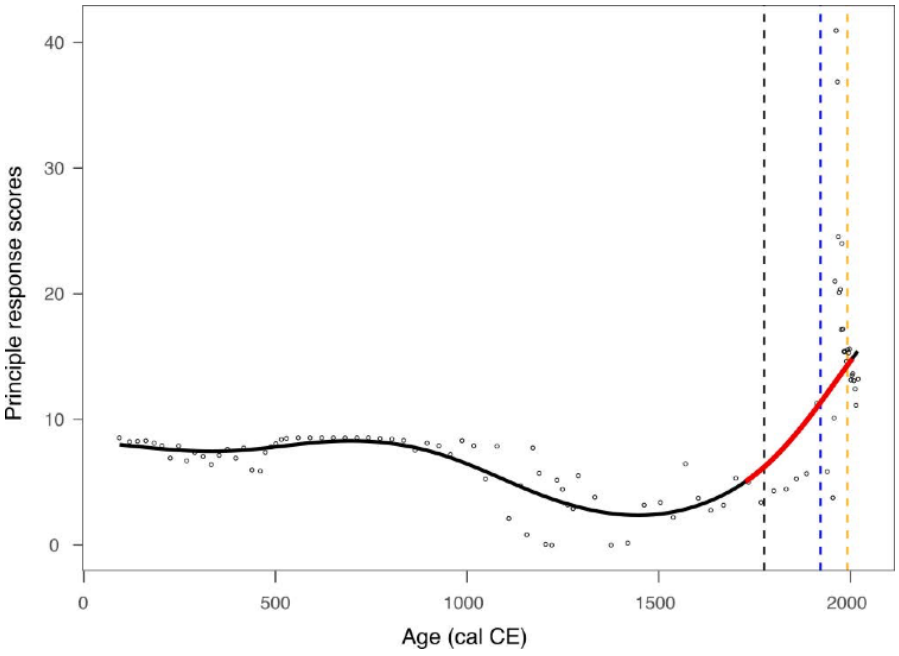
Actions: In Figure 5, the raw PrC scores are displayed as points. The line (both black and red sections) represents the GAM fit which is overlain across the raw points. The red section of the line indicates where the confidence intervals surrounding the first derivative of the GAM did not include zero – representing a period of significant, rapid rate of change in the pollen data. We've now updated the figure caption to reflect the information detailed above and included a legend to Figure 5 for added clarity- this information was included but was not well explained. We have also added some information to the methodology section to line #, further explaining the methods used, and better representing the package by Burge et al., and its dependencies.

Before: *Periods of significant change were identified in the GAMM models by calculating the time intervals where the confidence intervals surrounding the first derivative did not include zero.*

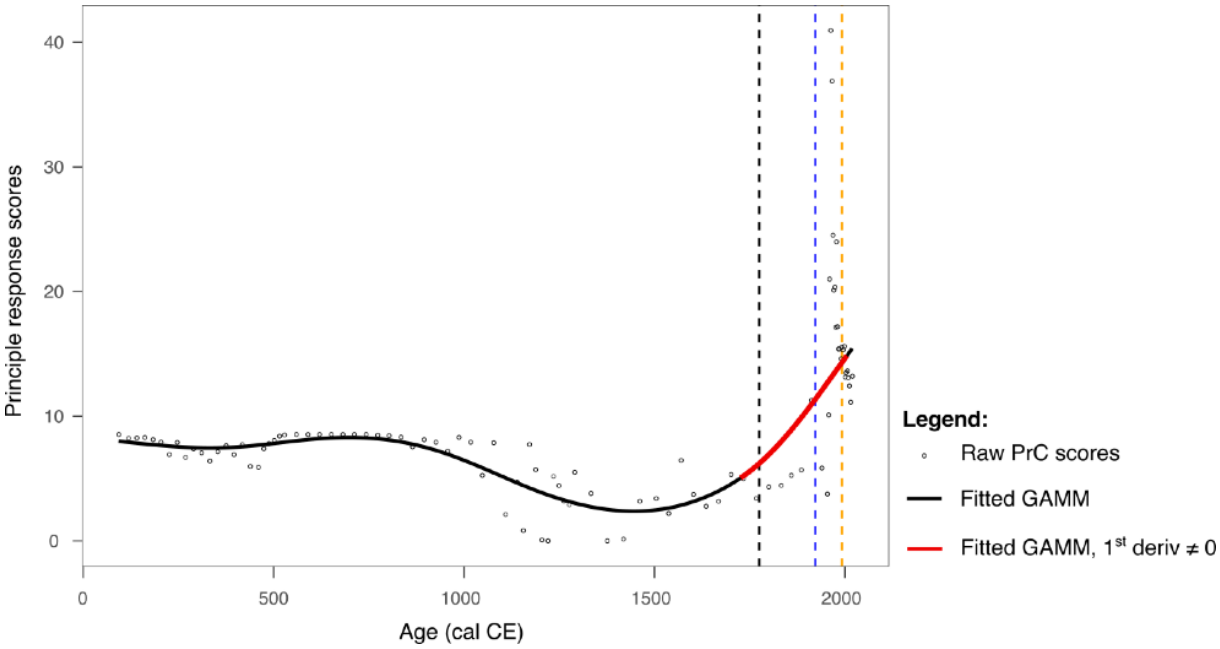
After: *Periods of significant change were identified in the GAMM models by calculating the time intervals where the confidence intervals surrounding the first derivative did not include zero. PrC curves were derived from constrained ordination of the time series palynological data, which use the prcurve() function (package analogue) in R.*

The modified figure is presented below.

Figure 5
Before:



After:



Discussion section 1: In its current form, this discussion section seems to mix objective 1 with 2. I had a hard time following this section specifically because you don't fully discuss things in depth; because they are in the following discussion section. I think this discussion section needs to be re-written; I think lines 468-501 are fine for this discussion section, but you should really end with which events are unprecedented in your record. That would then lead into your following discussion sections where you discuss in detail each of the two major events.

Author's response: We thank the reviewer for this comment. We agree that the discussion was not clear, and some of the information was intertwined, duplicated, or referred to other sections of the discussion.

Action: The discussion has been rewritten according to the reviewer's suggestions. The information that relates to acidification has been moved to the section on changing trophic and hydrological conditions after *Panolis flammea* infestation. We have provided detailed explanations of the changes in the responses to individual comments below. We hope that these will be satisfactory to the reviewer.

Line 496: Sentence suggestion: "...the distinct admixture of *Quercus*, *Carpinus betulus*, and *Corylus avellana* was recognized in our study." Also, just curious, how do you know these weren't wind-drifted from regional sources?

Author's response: We thank the reviewer for suggesting editorial changes, being curious and willing to explore the topic. Indeed, the palynological method has the feature of recording both regional and local signals. However, this means that throughout the core, the proportion of local and regional sources should be about the same. In addition, in a closed landscape (as in this case - a forested landscape), the proportion of pollen supplied from close distances is relatively high. We therefore assume that each sample of our core represents a high share of pollen from close distances.
The size of the peatland is also important. The proportion of pollen from a local source to pollen from a regional source in a small peatland is higher than in a large peatland. Our peatland is only 1.4 hectares in size.

Action: We have corrected the sentence as suggested by the reviewer.

Before: *[…] the distinct admixture of Quercus, Carpinus betulus, and Corylus avellana was recognized.*

After: *[…] the distinct admixture of Quercus, Carpinus betulus, and Corylus avellana was recognized in our study.*

Lines 496-497: Sentence suggestion: "Previous multi-proxy palaeoecological studies exist from the Noteć Forest, however, those previous were unable to..."

Author's response: We appreciate the reviewer's work on the grammatical and stylistic correctness of the manuscript. We agree that the proposed sentence form is clearer.

Action: We have corrected the sentence as suggested by the reviewer.

Before: *The other multi-proxy palaeoecological studies from the Noteć Forest were unable to provide such information because […]*

After: *Previous multi-proxy palaeoecological studies exist from the Noteć Forest; however, those previous ones were unable to provide such information because […]*

Lines 501-502: Sentence suggestion: No need for a new paragraph here since there is no new topic.

Author's response: We appreciate the reviewer's work on the grammatical and stylistic correctness of the manuscript and its clarity. We agree that creating a new paragraph was unnecessary.

Action: We have combined the two paragraphs into one, as they cover the same topic.

Before: *[…] and did not capture the entire background of the changes related to human activity and subsequent forest management (Barabach, 2014; Lamentowicz et al., 2015; Milecka et al., 2017; Słowiński et al., 2019).*
The knowledge of the historical background is essential for the interpretation of the ecosystem response to forestry practices because […]

After: *[…] and did not capture the entire background of the changes related to human activity and subsequent forest management (Barabach, 2014; Lamentowicz et al., 2015; Milecka et al., 2017; Słowiński et al., 2019). The knowledge of the historical background is essential for the interpretation of the ecosystem response to forestry practices because […]*

Line 511: delete 'the' in this sentence; "All these taxa disappeared in phase 5.'

Author's response: We appreciate the reviewer's work on the grammatical correctness of the manuscript. We agree that the proposed sentence form is proper.

Action: We have removed the 'the' from this sentence.

Before: *All these taxa disappeared in the phase 5, after ca. 1960 CE.*

After: *All these taxa disappeared in phase 5, after ca. 1960 CE.*

Line 513: delete 'the' before *Sphagnum* mosses; and 'acid' should be 'acidic'

Author's response: We appreciate the reviewer's work on the grammatical correctness of the manuscript. We agree that the proposed changes are proper.

Action: We have removed the 'the' from this sentence, and we have corrected a wrongly spelt adjective.

Before: *Monocot plants and brown mosses were displaced by the expansion of the Sphagnum mosses that tolerate acid conditions.*

After: *After the infestation, in our dataset, we also notice the expansion of Sphagnum mosses, which tolerate more acidic conditions.*

Lines 514-516: Does this mean acidification? I assume yes based on the opening of the next sentence, but it would be nice to synthesize the 'so what' of this data. Also, any mention of acidification (i.e., lines 512-524) could be moved to the next discussion section where you again discuss acidification of the landscape post the *Panolis flammea* outbreak; it would simplify and streamline your discussion instead of having to discuss the acidification process twice.

Author's response: We thank the reviewer for his comments on the discussion. We agree that the solution of moving all content about acidification of the peatland and changing its trophic and hydrological conditions into one section is appropriate. We see that this will make the discussion clearer and more structured. We have decided to respond to the three comments together, as they were all about rewording the discussion and making it more structured.

Action: We have rewritten the discussion, moving some content on acidification and changing trophic and hydrological conditions into one section. In the first section, we only refer to the issue of ecosystem stability before the introduction of planned forest management. Then, we introduce information on extreme phenomena and their consequences in the results of this way of forest management. We synthesise, therefore, our data indicate acidification.

Lines 519-520: "...to poor fen by combining *Sphagnum* sub. *Subsecunda* and *Lycopodiella inundata* taxa in phase 4 (ca. 1660-1960 CE)." Why did you combine those taxa? Is 'combining' a typo?Additionally, when I first read the paper, I immediately wanted to know why 1960 CE was important management wise. But then realised you discuss in detail the outbreak and its eventual contribution to acidification. I think having all discussion regarding the outbreak and acidification in one section would be much easier to understand.

Author's response: Thank you to the reviewer for your comments on the structuring and clarity of the discussion. We appreciate the comments and have decided to make changes as necessary.

Action: We have removed sentences relating to the indicator significance of the taxa *Sphagnum* sub. *Subsecunda* and *Lycopodiella inundata* in determining transitions between peatland trophic conditions.

After rewriting the discussion, we have emphasised the importance and reasons for choosing 1960 as the date of the extreme change in trophic and hydrological conditions in the peatland. We hope that the discussion is now clear and structured.

As we mentioned above, some of the information from Section 1, according to the reviewers' comments, has been moved into one section where we discuss the causes and consequences of acidification of the peatland and rewritten.

Line 529: 'pre-infestation part', this is the first mention of the 'outbreak.' Without any context, this sentence makes no sense. Thus, further evidence of why you should combine this paragraph with the next discussion section.

Author's response: Thank you to the reviewer for your comments on the structuring and clarity of the discussion. We appreciate the comments and have decided to make changes as necessary.

As we mentioned above, some of the information from Section 1, according to the reviewers' comments, has been moved into one section where we discuss the causes and consequences of acidification of the peatland and rewritten.

Line 558: "Over 500,000 ha of forest have been defoliated in Europe" as a result of this particular outbreak? Or is 500,000 ha total ha affected over the past decade? Be more specific with time here.

Author's response: We appreciate the reviewer's work on the clarity of the manuscript. We agree that the sentence should be written more specifically.

Action: We have corrected a sentence by detailing the time scale as a reviewer suggested.

Before: *Over 500,000 hectares of forests have been defoliated in Europe (Głowacka, 2009).*

After: *As a result of the 1922-1924 Panolis flammea infestation, over 500,000 hectares of forests have been defoliated in Europe (Głowacka, 2009).*

Line 560: sentence suggestion: "Over the next two years, between 1922-1923, ca. 64,000 ha of the forest..."

Author's response: We appreciate the reviewer's work on the grammatical and stylistic correctness of the manuscript. We agree that the proposed sentence form is clearer.

Action: We have corrected the sentence as a reviewer suggested

Before: *Still, in the following two years, ca. 64,000 hectares of the forest were destroyed (Hernik, 1979).*

After: *Over the next two years, between 1922-1924, ca. 64,000 hectares of the forest were destroyed (Hernik, 1979).*

Lines 563-566: sentence suggestion: "This outbreak is evidenced in our pollen record, marked a sharp decrease in the percentage of *Pinus sylvestris* pollen (48%; 1900-1926 cal. CE) compared to the neighbouring layers - ca. 1875-1900 cal. CE (60.6%) and ca. 1925-1950 cal. CE (62.8%).

Author's response: We appreciate the reviewer's work on the grammatical and stylistic correctness of the manuscript. We agree that the proposed sentence form is clearer.

Action: We have corrected the sentence as a reviewer suggested.

Before: *We assume that in the pollen record, this outbreak is well recognizable (1900-1926 cal. CE; phase 4). It is marked by a sharp decrease in the percentage of Pinus sylvestris pollen (48.0%) compared to the neighbouring layers – ca. 1875-1900 cal. CE (60.6%) and ca. 1925-1950 cal. CE (62.8%).*

After: *This outbreak is evidenced in our pollen record, marked a sharp decrease in the percentage of Pinus sylvestris pollen (48.0%) compared to the neighbouring layers – ca. 1875-1900 cal. CE (60.6%) and ca. 1925-1950 cal. CE (62.8%).*

Line 567: Przebieg..., 1929 citation appears to be missing the rest of the citation?

Author's response: The author of this reference is unknown. The first word in the citation is the first word of the title of the paper. In the bibliographic list, it appeared as „Anon: Przebieg i bilans katastrofy sówkowej w Wielkopolsce, Rynek Drzewny i Budowlany, 116, 3–4, 1929."

Action: We edited the item in the bibliographical list so that it begins with the first word of the title, according to the citation called out in the text.

Before: *Anon: Przebieg i bilans katastrofy sówkowej w Wielkopolsce, Rynek Drzewny i Budowlany, 116, 3–4, 1929.*

After: *Przebieg i bilans katastrofy sówkowej w Wielkopolsce, Rynek Drzewny i Budowlany, 116, 3–4, 1929.*

Line 621: sentence suggestion: delete 'again' at the end of the sentence.

Author's response: We appreciate the reviewer's work on the grammatical and stylistic correctness of the manuscript. We agree that the proposed sentence form is proper.

Action: We have corrected the sentence as a reviewer suggested.

Before: *Still, P. sylvestris was selected as the primary species again.*

After: *Still, P. sylvestris was selected as the primary species.*

Line 633: sentence suggestion: 'Unfortunately, they do not preserve well in sediments (Bąk et al., 2024)."

Author's response: We appreciate the reviewer's work on the grammatical and stylistic correctness of the manuscript. We agree that the proposed sentence form is proper.

Action: We have corrected the sentence as a reviewer suggested.

Before: *Unfortunately, they do not preserve well in the sediment (Bąk et al., 2024).*

After: *Unfortunately, they do not preserve well in the sediments (Bąk et al., 2024).*

Lines 647-649: suggest moving all mention of *Sphagnum* and acidification from the first discussion section here, somewhere. Also, delete 'already' before '85%".

Author's response: Thanks to the reviewer for his comment. We have complied with the discussion comments earlier. We hope that now the discussion is clear and the information is arranged in a way that helps to understand the message of the discussion. We appreciate the reviewer's work on the grammatical and stylistic correctness of the manuscript. We agree that the proposed sentence form is proper.

Action: We have updated the name of the section, as some of the information from the first discussion section has been moved here. Here we discuss threads related not only to changing trophic conditions, but also to hydrological conditions.

We have corrected the sentence as a reviewer suggested.

Before: *Sphagnum content reaches 65% for ca. 1900-1925 cal. CE and already 85% for ca. 1955-1960 cal. CE, further increasing in the upper part of the section (Fig. 3).*

After: *Sphagnum content reaches 65% for ca. 1900-1925 cal. CE and 85% for ca. 1955-1960 cal. CE, further increasing in the upper part of the section (Fig. 3) […]*

Lines 655-656: sentence suggestion: This is confirmed by the highest percentages of *Pinus sylvestris* at Miały between 1950-1960.

Author's response: We appreciate the reviewer's work on the grammatical and stylistic correctness of the manuscript. We agree that the proposed sentence form is proper.

Action: We have corrected the sentence as a reviewer suggested.

Before: *Our assumption is confirmed by the period of occurrence of the maximum of the Pinus sylvestris pollen curve at Miały, which is in the 1950s and 1960s.*

After: *This is confirmed by the highest percentages of Pinus sylvestris at Miały between 1950-1960.*

Lines 663-664: When does 'the period of transition to trophic conditions" actually occur?

Author's response: Thanks to the reviewer for the comment. Indeed, the sentence should be more precise and specify what time we mean.

Action: We have corrected the sentence as a reviewer suggested.

Before: *In the period of the transition of trophic conditions in a peatland, we observed […]*

After: *In the period of the transition of trophic and hydrological conditions in a peatland (ca. 1925-1960 CE), we observed […]*

Line 667: Again, when does 'the narrow period of changing trophic conditions" occur?

Author's response: Thanks to the reviewer for the comment. Indeed, the sentence should be more precise and specify what time we mean.

Action: We have corrected the sentence as a reviewer suggested.

Before: *Although we observe numerous spores of this fungus in the narrow period of changing trophic conditions in our dataset, we also […]*

After: *Although we observe numerous spores of this fungus in the narrow period of changing trophic and hydrological conditions in our dataset (ca. 1925-1960 CE), we also […]*

Line 676: sentence suggestion: delete 'the' before phases 5, 4, 3. Suggest changing '5,4,3' to '3-5'.

Author's response: We thank the reviewer for his work on the stylistic and grammatical correctness of the manuscript. We agree that corrections are needed.

Action: We have corrected the sentence as a reviewer suggested.

Before: *In our plant macrofossil data, Sphagnum mosses, as we mentioned above, have almost completely displaced monocots, including Carex, which dominated the peatland in the phases 5, 4, and 3.*

After: *In our plant macrofossil data, Sphagnum mosses, as we mentioned above, have almost completely displaced monocots, including Carex, which dominated the peatland in phases 3-5.*

Lines 676-678. Did these authors attribute the appearance of *B. sphagni* to changes in trophic conditions or ombrotrophication? If so, that would strengthen your argument.

Author's response: The authors of this study do not explicitly write about ombrotrophication or acidification of the peatland they studied. However, they indicate that the large number of *B. sphagni* spores was one of the key data points based on which they decided to distinguish an additional developmental phase of the studied site, which they called "Sphagnum bog."

Action: We have expanded on the details of the conclusions of the Aoustin et al. (2022) article. We detailed that they emphasized the indicator role of *B. sphagni* as a taxon to help identify changes in the bog.

Before: *A coincident disappearance of G. caricis, the appearance of B. sphagni and the development of Sphagnum, has been noted in the past in southwest France (Aoustin et al., 2022).*

After: *A coincident disappearance of G. caricis, the appearance of B. sphagni and the development of Sphagnum, have been noted in the past in southwest France (Aoustin et al., 2022). These authors, among others, based on the large number of spores of B. sphagni, decided to separate the developmental phase of the object they studied, which they referred to as Sphagnum bog (Aoustin et al., 2022).*

Lines 686-687: Is the 'potential high and medium fire danger' specific to modern fires? Late Holocene fire? What fires in time?

Author's response: We appreciate the reviewer's work on the clarity of the manuscript. We agree that the sentence should be written more specifically.

Action: We have corrected a sentence by detailing the time scale as a reviewer suggested.

Before: *Potential high and medium fire danger concerns 83% of forests in Poland (65% in Europe) (Szczygieł, 2012).*

After: *Potential high and medium modern fire danger concerns 83% of forests in Poland (65% in Europe) (Szczygieł, 2012).*

Line 690: What do you mean by 'ecosystem links'? Links to what exactly?

Author's response: Thank you to the reviewer for the comment. Indeed, the sentence was constructed imprecisely and was unclear. It is about simplified linkages in the food web, which result in less resilience of the ecosystem to various types of disturbances.

Actions: We corrected the sentence's meaning, clarifying what linkages we meant. We hope that after the correction, this part of the text is no longer in doubt.

Before: *Fire danger is also a result of the young age of the tree stands, which have not yet developed stable ecosystem links.*

After: *Fire danger is also a result of the young age of the tree stands, which have not yet developed stable ecosystem links in food webs.*

Lines 697-701: sentence suggestion: The largest fires in Poland's post-war history, which burned more than 9,000 ha of forest (Szcyzgiel, 2012), occurred near the town of Ruznia Raciborksa (Silesia, southern Poland) between 26 to 30 August, 1992. Two weeks prior to this event, the second largest fire in Poland's post-war history affected Noteć Forest."

Author's response: We thank the reviewer for his work on the stylistic and grammatical correctness of the manuscript. We agree that corrections are needed.

Action: We have corrected the sentence as a reviewer suggested.

Before: *The largest fire in Poland's post-war history occurred near the town of Kuźnia Raciborska (Silesia, southern Poland) from 26 to 30 August. More than 9,000 ha of forest were destroyed. Two weeks earlier, the second largest fire in Poland's post-war history had affected the Noteć Forest.*

After: *The largest fire in Poland's post-war history, which burned more than 9,000 ha of forest (Szczygieł, 2012), occurred near the town of Kuźnia Raciborska (Silesia, southern Poland) between 26 and 30 August. Two weeks prior to this event, the second largest fire in Poland's post-war history had affected the Noteć Forest.*

Line 704: "...and reduce the threat..." threat to what exactly?

Author's response: Thank you to the reviewer for the comment. Indeed, the sentence was constructed imprecisely and was unclear. It is about the fire threat.

Actions: We corrected the sentence's meaning, clarifying what threat we meant. We hope that after the correction, this part of the text is no longer in doubt.

Before: *The authors stressed the need to introduce admixture species to change the age structure of the forest and reduce the threat.*

After: *The authors stressed the need to introduce admixture species to change the age structure of the forest and reduce the fire threat.*

Lines 705-706: How does a fire cover 700 ha but only burn 400 ha? I don't understand.

Author's response: Thank you to the reviewer for the comment. Indeed, the sentence was constructed imprecisely and was unclear.

Actions: We have corrected the sentence according to the cited reference.

Before: *June 2, 1992, a fire covered about 700 hectares of the Noteć Forest, 400 hectares of which burned completely (Bugaj, 1992) […]*

After: *June 2, 1992, a fire covered about 700 hectares of the Noteć Forest (Bugaj, 1992) […]*

Lines 707-708: sentence suggestion: ...(Fabijański, 1996). The total area affected was mapped in detail by foresters (Fig. 6)."

Author's response: We thank the reviewer for his work on the stylistic and grammatical correctness of the manuscript. We agree that corrections are needed.

Action: We have corrected the sentence as a reviewer suggested.

Before: *[…] hours (Fabijański, 1996), and the area affected was mapped in detail by the foresters (Fig. 6).*

After: *hours (Fabijański, 1996). The total area affected was mapped in detail by the foresters (Fig. 6).*

Lines 733-735: Move this sentence to after the high water level discussion.

Author's response: We agree with the reviewer that moving this sentence after the discussion of water levels improved the message of the issue and made the paragraph more organized and clearer.

Action: We have moved the sentence as the reviewer suggested.

Before: *[…] by Pinus in the peatland (which we explain below). Rumex acetosa/acetosella type reaches its maximum percentage, which is accompanied by an increase in the percentage of pollen of Poaceae, a taxon characteristic of open areas, indicating the landscape's opening due to the forest's reduction. The water table rose to the ground level, probably due to inundation. The rise in the groundwater level […]*

After: *by Pinus in the peatland (which we explain below). The water table rose to the ground level, probably due to inundation. The rise in the groundwater level […]. Rumex acetosa/acetosella type reaches its maximum percentage, which is accompanied by an increase in the percentage of pollen of Poaceae, a taxon characteristic of open areas, indicating the landscape's opening due to the forest's reduction.*

Line 785: "We have shown that the peatland has..." Which peatland? Remind the reader which peatland you are talking about.

Author's response: Thank you to the reviewer for the comment. Indeed, the sentence was constructed imprecisely and should be more specific.

Actions: We have added the name of the peatland in the proper place in the sentence.

Before: *We have shown that the peatland has rapidly acidified as a result of Panolis flammea infestation and forest restoration activities.*

After: *We have shown that the Miały peatland has rapidly acidified as a result of Panolis flammea infestation and forest restoration activities.*

Line 798: change "coming" to "going"

Author's response: We appreciate the reviewer's work on the grammatical and stylistic correctness of the manuscript. We agree that the proposed sentence form is proper.

Action: We have corrected the sentence as the reviewer suggested.

Before: *To understand current or recent changes in peatlands and their surroundings, it is often not enough to analyze the last hundred or two years, but the background coming back hundreds or thousands of years must be considered.*

After: *To understand current or recent changes in peatlands and their surroundings, it is often not enough to analyze the last hundred or two years, but the background going back hundreds or thousands of years must be considered.*

Lines 800-801: This is your main conclusion. Tell me which times in the past your record sees major changes; summarize figure 7 in the conclusions.

Author's response: We appreciate the reviewer's request to expand the conclusions to include a time scale and a summary of Figure 7. We agree that this arrangement is more suitable.

Action: We have expanded the conclusions to include a time scale of events, including the two extreme events discussed earlier, summarised in Figure 7.

Before*: The peatland was also hydrologically and trophically stable for most of the time analyzed. Drastic changes in these conditions have occurred due to the Panolis flammea infestation and its consequences.*

After: *The peatland was also hydrologically and trophically stable for most of the time analyzed. Drastic changes in trophic and hydrological conditions of the Miały peatland began after the introduction of planned forest management in the late 18th century, weakening the forests' resilience to environmental disasters. Particularly extreme changes occurred with the 1922-1924 Panolis flammea and the subsequent approach from forest restoration after 30-40 years. Keeping the forest structure homogeneous in turn led to a huge fire in 1992 (Fig. 7).*