

This paper describes ecosystem nutrient fluxes in three beech forests on different soils over a period of 12 years, which makes it possible to compare mast years and non-mast years for tree growth, litter production, including seeds, throughfall, and resorption.

The scope and detail of information represented here is very impressive. Monthly measurements of throughfall and stemflow, litter collections 5 times per year, for over a decade! An important value of this paper will be future use of the data set. I hope that the data will be shared and discoverable.

The important differences associated with mast years were mainly seed production, which is perhaps a little disappointing, but not surprising. I suggest that the figures and the results lead with seed production, as all the other significant differences follow from this one (if you add other fluxes to the seed production flux, the sums are highest in years with high seed production, which is easy to understand).

Importantly, failure to detect an effect (e.g. of mast years on growth, resorption, etc.) does not mean that the effect size is small (Amrhein et al. 2019) <https://doi.org/10.1038/d41586-019-00857-9> You can calculate how big an effect you are ruling out; i.e., given the variability in your data, how big an effect would be needed to achieve statistical significance? When you cite other studies that did find effects, were these of larger or smaller magnitude than what you can rule out?

I was confused about the number of replicates in each of the three ecosystems, which varies by the type of measurement. It's important to specify n, or we don't understand the standard error (Figures and Tables).

I was surprised that dead wood production was not included in the budgets. Well, it's rarely reported, because it's hard to measure, but I don't think there is a justification to ignore it. What did you do with tree mortality? I think it would be better to admit that you are omitted this flux than to claim that it is zero.

The results are difficult to read because they recite lists of numbers that probably do not belong in the text. We can see these values, relatively speaking, in your figures, and I don't think it's important for a reader to know them to 3 digits. Your message will be more clear if you focus the Results section on what we are supposed to see in your results; the numbers could be in supplemental tables, if you think they are so important, and your raw data should be published in data packages, if they aren't already.

When I got to the Discussion, which is much more readable, I found many passages that would be excellent if moved to the Results. See markup on the scanned ms. printout (to

be sent by email). The parts that relate to other studies and to speculation about mechanisms belong in the Discussion, obviously.

Detailed line-referenced comments

23. This conclusion seems not to be justified by your results. Can you make this more clear in the abstract? If not, drop it.

28 what is the novel indicator? Clarify or omit.

33. I live in North America, and I don't agree that ecosystem fertility is driven by nutrient cycling efficiency. Perhaps this is true in Europe, if forests grow only on marginal lands? At a broad scale, differences in ecosystem fertility reflect differences in parent material; nitrogen accumulation depends on the supply of phosphorus from weathering.

38. Is this Yanai paper about nitrogen? Looks like it would be from my dissertation on phosphorus (1992).

34, 38 is this a mistake? Maybe you need to define biological cycling, because I would have guessed that it included nutrient translocation within plants, but you were calling this the biochemical cycle.

39 how is translocation different from internal recycling?

43. I think you should avoid introducing concepts that we don't need understand your paper; you could describe what you need here without asking us to distinguish geochemical cycles from biochemical and biological.

I liked the conceptual diagram, but thought it could be better annotated to stand alone: the description of what the colors of the arrows means belongs in the figure legend, not in your text. You could improve the degree to which the background material in this paragraph corresponds to the figure. Instead of biological cycling, biochemical, cycling, and geochemical cycling, we have internal tree recycling and biological recycling. I have never seen biological recycling defined this way; is it necessary? Now I'm doubting whether this diagram is warranted... Think about it and be sure it's justified.

Page 3 made more sense to me; I have mostly copy edits scribbled in green. On line 59 I question whether a mast event is defined at the stand level. Mysteriously, trees synchronize seed production across wide spatial scales.

Page 4. I like the objectives. It would be nice if the third prediction were also stated in terms of expected result, in parallel to the first two.

95 in my view, the background material about your study site belongs towards the end of your introduction, before the objectives. I like to see the objectives as the last paragraph of the introduction.

103. I routinely tell students to describe their study site, not some bigger geographical area that happens to have a name or a funding source. I was editing the section accordingly (do your three stands cover an area of 73 ha?), but then I saw that you want to describe your funding source. You can decide how relevant that is, or whether it belongs in the acknowledgments.

113 on my continent, even-aged management means that a single intensive harvest caused a single cohort of regeneration to dominate the current stand. Is that the case here? I am unfamiliar with harvesting every 7 to 8 years unless in a uneven-aged management system. If you want readers in America to understand your forest, avoid using terms that we define differently than you do. Maybe it's a translation issue.

172 Will your data be archived, including the QC data? If not, it's important to give more detail here. 10% uncertainty is high for chemical analysis, but "at most" is not a good way to describe your QC data; we need some central tendencies, mean, median, or interquartile range? Ranges are sensitive to sample size, so I don't like "at most."

I suggest "leaf litterfall" rather than Leaf with the s subscript s. Ditto for Fruit.

Everywhere possible, use language that will be familiar to your readers (that's how language works). How about "mast production" for your fruits? Even "fruit litterfall" would be better than introducing a term that people will not recognize and have to go searching for a definition of. I think the subscript s is particularly bad because it looks like a plural. Also, "litterfall production" is redundant; choose between "litterfall" and "litter production."

Similarly, I'm not crazy about MY and NMY, as these are not common in the literature. I did manage to learn them, but I think you should consider writing them out at each occurrence. Ditto for CE, DD, all these acronyms that nobody knows. NCB is an important one, and having put your paper down, I have no idea what it means. Writing it out in figure and table captions would help, if you need the acronym at all.

The narrative describing statistical analysis is incomplete; fortunately, the response variables and predictor variables are listed in table 2. I might not have felt so dissatisfied with your description if you had cited table 2 sooner.

298 I don't think you can attribute your site differences to soils. Is this the term you call "ecosystem" in table 2? Please be consistent. I vote for "site."

Figure 3: why bar graphs? And this is an average over many years? What is n, the number of years, using the average of all trees? The number of trees, using the average of years? If you are describing a population of all trees in all years, that's pseudoreplication (an exaggeration of your statistical power).

The authors should use AI tools to clean up the writing. The manuscript is very understandable, but full of spelling, grammar, and punctuation that are not good English. I'm surprised that you don't have a spellcheck feature that would take care of this for you. There are many errors of the use of the definite article, I crossed a lot of them out, but I hope you will find a tool to automate your English checking. A reviewer shouldn't be doing this level of copy editing, but I couldn't resist.

One general rule is that when a noun is used as an adjective to modify another noun, we use the singular.

The following suggestions are strictly copy editing, and you should not bother responding to them in a response document

20. Avoid the word “globally” when not referring to a global data set.

Use past tense consistently in the methods and results. Currently you have a mix of past and present tense.

285. We don't need to know how you are going to describe significance levels until you show us a result.

290 defining types of mast years is a method, not a result.

Here is a diatribe on power analysis that I wrote for a graduate student's paper.

Absence of statistical significance does not mean that an effect is small (Amrhein et al. 2019) <https://doi.org/10.1038/d41586-019-00857-9> Specifically, because soils are inherently variable, you likely have poor power to detect large changes. In other words, failure to detect a difference could mean that the effect size was small, but it could mean instead that your statistical power was poor (small sample size, high variability). You can calculate your minimum detectable difference—it would great if you could say, “changes were less than 1% per year” (Yanai et al. 1999) but you could instead be in a case where “the minimum difference detectable with our observed variability ranged from 46% to 352%” (Rice et al. 2022). To this point, please don't say “There were no differences...” or “Treatments did not affect...” as these constructions claim a zero effect size. It's correct to say “There were no consistent patterns...” (consistency across replicates is the source of statistical significance) or “Treatment effects were not detectable...”

Ruth Yanai (anonymous reviewer)