# A Summary of Revisions and Responses on "Optimizing Implementation Orders of Watershed Best Management Practices with Time-varying Effectiveness under Stepwise Investment" (Paper #2022WR032986R)

**With regards to comments from Reviewer #1:**

***"Overall I think this paper is suitable for publication and is an important contribution to the BMP optimization literature. I find the authors responses to comments acceptable and appreciate the addition section added on applicability to other watershed optimization problems. However, I still find the language used in the article to be vague and below the standard I believe is required for WRR. I strongly suggest the authors sit down with an editor and revise the paper line-by-line. I cannot provide line-by-line edits for the entire paper, but provide some examples below."***

Thanks for the reviewer's approval and careful checking. We have made revisions according to the reviewer's suggestions. We also read and revised throughout the manuscript according to the reviewer's suggestions and tried our best to eliminate unclear descriptions.

Suggestions that are directly accepted and revised accordingly:

- ***Key point #3: suggest rewording to "Demonstrated BMP optimization approach in an agricultural watershed case study for forest management BMPs" ---*** Revised.
- ***Line 28: "implementation time or orders in a management scenario, which ~~is~~ <u>are</u> ~~most likely~~ <u>often</u> restricted by investments." ---*** Revised.
- ***Line 33: You do not need to use the SEIMS acronym here as it is not used again in the abstract. ---*** We removed the SEIMS acronym and capitalized the initials of "Spatially Explicit Integrated Modeling System".
- ***Line 34-36: "…demonstrated using a small agricultural watershed case study of controlling soil erosion under a 5-year stepwise investment…" Grammatically this does not make sense. Suggest revising this and the following sentence: "…demonstrated in an agricultural watershed case study. The case study optimized the implementation time of four erosion control BMPs in a specific spatial configuration scenario under a 5-year step wise investment." ---*** Revised.
- ***Line 131: These problems are solved in turn, that is, the optimization problem under the first investment is solved first with the result of occupying several spatial units, followed by the next optimization problem occupying the remaining spatial units in the study area. The stepwise optimized BMP scenarios were then combined." Check tenses here. ---*** We revised to use present tense.

Other suggestions and comments with revisions and responses as follows:

- ***Line 30: "by ~~introducing the~~ <u>using</u> net present value and the process of taking effect of BMPs to evaluate the environmental effectiveness of multistage BMP scenarios." I do not follow the highlighted text. The process of taking effect of BMPs? Please clarify.***

  The "process of taking effect of BMPs" in the previous manuscript was to express the effectiveness changes for the first stage post implementation of BMPs, as shown in Figure 1. This statement is suitable for the forest management BMPs considered in the case study in this manuscript. It may not cover other BMPs, such as those that take effect immediately after implementation and then gradually decrease in effectiveness. So, we revised to use "the time-varying effectiveness of BMPs."

- ***Line 38 – 39: "Time-varying BMP effectiveness should be adopted extensively to better model the effect of BMPs on improving the environment over time." This is unclear. How can time-varying BMP effectiveness be adopted extensively? BMP effectiveness either varies with time or it does not. It's not something that can be "adopted". Do the authors mean to suggest that incorporating time-varying effectiveness in BMP optimization should be adopted extensively? Or that more data on BMP effectiveness over time should be gathered?***

  Yes, we meant to suggest both points as the reviewer's understood. To clarify this, we revised this sentence as "Gathering time-varying BMP effectiveness data and incorporating them in watershed modeling and scenario optimization should be adopted extensively to better depict the effect of BMPs on improving the environment over time."

- ***Line 40: "the proposed framework was sufficiently flexible to be transplanted to other technical chains…" Use a word other than "transplanted" – maybe "applied to". What are "other technical chains"?***

  The "transplanted" has been revised to "applied to."

  The "other technical chains" are technical implementations of the simulation-optimization framework, such as the SWAT model and the shuffled frog leaping algorithm. We have revised to use "other technical implementations" for clarification.

- ***Line 75 – 79: The existing optimization methods for watershed BMP scenarios can be categorized into two types. The first is based on identifying key watershed areas such as the critical source areas (Pionke et al., 2000; Srinivasan et al., 2005) and priority management areas (Dong et al., 2018; Shen et al., 2015). A key area often refers to a small area that produces disproportionately high pollutants…." The term "key areas" is used throughout this paragraph but is vague. What is "a key area"? Do the authors mean "critical source areas" here (defined in the first sentence)? Please be explicit.***

  The term "key areas" refers to the priority management areas (PMAs), which are more commonly used as critical source areas (CSAs). But studies on CSAs often does not

emphasize propagation effects from upstream to downstream in the watershed, which is essential for decision-making for comprehensive watershed management (Wu et al., 2023). Therefore, we prefer to use the term PMA. We have revised this paragraph accordingly to use the term PMA explicitly and cited a new reference for this term.

New reference: Wu, T., Zhu, L.J., Shen, S., Zhu, A.X., Shi, M., & Qin, C.Z. (2023). Identification of watershed priority management areas based on landscape positions: An implementation using SWAT+. Journal of Hydrology, 619, 129281. https://doi.org/10.1016/j.jhydrol.2023.129281

- ***Line 356: "The soil erosion type was majorly severe and moderate water erosion, which is typical and representative." "Majorly severe" seems redundant. "and moderate water erosion" this phrase is confusing. Is this a type of soil erosion? "typical and representative" of what?***

  The "severe" and "moderate" are two classes in the standards for the classification and gradation of soil erosion in China. We removed the confusing expression. As for "typical and representative," we meant that severe water erosion is a typical and representative soil erosion type in Changting County, where the study area is located. We revised the last two sentences of this paragraph to "The study area is within one of the counties with the most severe soil erosion in Southern China. The soil erosion type is severe water erosion, which is typical and representative of Changting County."