Dear Viewer,

Thank you very much for your comments. We have carefully considered your suggestions and revised the manuscript accordingly. The comments and detailed responses can be summarized as follows:

1. Part of references cited in your manuscript is too old to illuminate your viewpoint, such as Page 14538, line 2; Page 14540, line 20; Page 14544, line 28, etc. It is better to refer the latest literature in you references.

Responds: In the revised paper, the following references are added to illuminate the history of non-point-source priority management areas:

Ghebremichael, L., Veith, T., and Watzin, M.: Determination of critical source areas for phosphorus loss: Lake Champlain basin, Vermont, Trans. ASABE, 53, 1595-1604, 2010.

Sahoo, G., Nover, D., Schladow, S., Reuter, J., and Jassby, D.: Development of updated algorithms to define particle dynamics in Lake Tahoe (CA - NV) USA for total maximum daily load, Water Resour. Res., 49, 7627-7643, 2013.

Savage, J. A., and Ribaudo, M. O.: Impact of environmental policies on the adoption of manure management practices in the Chesapeake Bay watershed, J. Environ Manage., 129, 143-148, 2013.

As a geographically connected unit, watershed has been covered by many researches. And some classical references, such as Page 14538, line 2; Page 14540, line 20; Page 14544, line 28, are also cited in this paper.

2. Please reorganize the description of PMA data in Results and Discussion section, according to your figure. Parts of them are hard to be read clearly!

Responds: In the revised paper, the following contents have been added:

Abstract: "Daning River watershed was taken as a case study in this paper, which have demonstrated that the integration of the upstream input changes was vital for the final PMAs map, especially for downstream areas. Contrary to conventional wisdom, this research recommended that the NPS pollutants could be best controlled among the upstream high-level PMAs when protecting the water quality of the entire watershed. The MAP-PMA framework provided a more cost-effective tool for the establishment of conservation practices, especially for a large-scale watershed."

Conclusion: "Based on the results obtained from this research, the integration of the upstream input changes was vital for the final PMAs map, especially for a more cost-effective allocation of those downstream PMAs. From this study, a maximum frequency of water quality target existed at the downstream river point if the pollutant removal potential at the upstream point was below a certain threshold. Contrary to the conventional wisdom, it is recommended that the NPS pollutant could be best controlled among the upstream high-level PMAs in protecting the water quality of the entire watershed."

3. Page 14547, line 1-9: Please move this paragraph to Results and Discussion section, and try to discuss the influences of water quality monitoring stations on your MAP-PMA framework calculation based on other related references.

Responds: We agree your point that "the major error of the MAP-PMA may come from the selection process of multiple assessment points." In fact, our group is doing some researches on the optimization of water quality monitoring stations from the point of nonpoint source pollution. In the revised, instead of moving **Page 14547, line 1-9** to Results and Discussion section, we revised this paragraph in a more detailed way. The following content can be found in the revised paper:

"In this research, the existing water quality monitoring stations were chosen as multiple assessment points where such were available. However, these stations were designed as a monitoring network for point source pollution and may not refer to the perspective of the NPS pollution. Therefore, by the aid of the MAP-PMA, the resolution of the current monitoring network should be improved. It is believed that the optimal design of the monitoring network, together with the MAP-PMA framework, would provide a valuable tool for effectively allocating state funds for the establishment of conservation practices where they are needed."

4. Please conclude the advantages of MAP-PMA framework based on your data obtained from the Daning river watershed.

Responds: The MAP-PMA framework provided a more cost-effective tool for the establishment of conservation practices, especially for a large-scale watershed. Our findings may broaden the forms of priority management areas and provide a valuable method for watershed nonpoint source pollution control. In the authors' view, the explicit link between the variations of upstream inputs and downstream water quality statues on which MAP-PMA is based in combination with its high practicality potential, make the MAP-PMA framework particularly interesting for watershed management.

5. Try to adapt statistical method to analyze the difference between the MAP-PMA and traditional targeting approach

Responds: The MAP-PMA framework, which integrates the interactions between multiple river points from upstream to downstream, is shown in Fig. 1. The upstream PMAs are first identified based on the required load reduction at the upstream assessment point. Then, the downstream PMAs are identified by the variations of pollutant fluxes at the downstream river point. The commonly-used goodness-of-fit indicator, such as Nash-Sutcliffe coefficient of efficiency (E_{ns}) was selected as the likelihood functions.

$$E_{ns} = 1.0 - \frac{\sum_{i=1}^{n} \left| O_i - P_i \right|^2}{\sum_{i=1}^{n} (O_i - \bar{O})^2}$$

where: $\{O_i | i = 1, 2, \ldots, n\}$ is the set of measured data, $\{P_i | i = 1, 2, \ldots, n\}$ is the set of predicted data and $\bar{O}$ is the mean value of measured data.