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Interactive comment on "Assessment of Integrated Watershed Health based on Natural Environment, Hydrology, Water Quality, and Aquatic Ecology" *by* So Ra Ahn and Seong Joon Kim

Anonymous Referee #1

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This study evaluated health condition of a watershed of the Han River basin (34,148 km^2) in South Korea was performed using monitoring data and SWAT modeling results. Six essential indicators of healthy watersheds were used in the assessment: landscape condition, geomorphology, hydrology, water quality, habitat, and biological condition. The research findings from this study provided guidance for watershed management at the watershed scale based on specific management objectives and can combined with any of the other sub-indices in the Han River basin for use in determining priority conservation areas. This paper is well organized and well written generally. Detailed method description was incorporated. The scientific results and conclusions

were presented in a clear, concise, and well-structured way. The number and quality of references is appropriate. But method and results should be reduced. The importance of six essential indicators of healthy watersheds was not well described. More in-depth discussion should be included to support the interpretations and conclusions. This manuscript can be reviewed after major revisions. What is the novel idea this manuscript provided to scientific knowledge? Please describe it and use your results and discussion to support it.

The last sentence of the abstract "The results suggest that approaches aimed at simultaneously improving the water quality, hydrology, and aquatic ecology conditions may be necessary to improve integrated watershed health." Is this the scientific questions being answered in this manuscript? Please provide specific discussion of results and summarize them in conclusion to support this point. Otherwise, I do not think this sentence should be here.

2.4 Hydrology and water quality simulations using the SWAT model: the session is mainly focus on basic information about SWAT. If it is not specific for your project, it is better to put information in the Introduction rather than in Methods. And authors already described data collection related to SWAT model setup and SWAT outputs in 2.3, thus it is better to introduce SWAT model before discussing data related to it.

Is 90 m grid size DEM data sufficient to accurately simulate hydrology and water quality at such a large area? Is there any higher resolution elevation data can be used?

Is calibration period (2005–2009) and validation period (2010–2014) both incorporate wet and dry years?

Statistical evaluation criteria R2, NSE and PBIAS are all sensitive to high values. Criteria less sensitive to high values, such as Modified NSE and KGE, may could be incorporated.

Page 8 line 197: this paragraph described a lot of detailed information about dams. It

is better to condense it and save more space for in-depth discussions. How was dam information being set in SWAT model?

Page 9 line 226: "The calibrated parameters and hydrograph of the calibration results in the Han River basin were described by 227 Chung et al (2017)." Parameter definition, physical meaning, range used for calibration and calibrated values are very important information. Please describe this information in supplementary materials to prove that your calibration and validation is reliable.

Results and discussion generally is redundant. This part need to be condensed. Some information can be incorporated in supplementary materials.

Page 10 line 237: "T-N was between 0.46 and" There should be a space between "0.46" and "and".

Page 10 line 239: should there have a space before and after $\geq$?

Page 19 line 478: Please improve wording of the first sentence.

Conclusion did not interpolate researching findings well. The results showed the watershed health declined and targeted the vulnerable areas, but what is boarder impacts of these results? How will it be beneficial for watershed management? It would be more meaningful if authors can incorporate this information.

What is limitation of this study, such as water quantity, quality data, or model input limitations? How to improve it in the further study? What kind of take-home messages you would like to delivery to readers?

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., doi:10.5194/hess-2017-88, 2017.