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Influence of Partial Dam Removal on Change of Channel Morphology and Physical Habitats: A Case Study of Yu-Sheng River

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The rivers in Taiwan have the characteristic of large slope gradient and fast flow velocity caused by rugged terrain. And Taiwan often aces many typhoons which will bring large rainfall in the summer. In early Taiwan, river management was more focus on flood control, flood protection and disaster reduction. In recent years, the rise of ecological conservation awareness for the precious fish species brings spotlight on the Taiwan salmon (*Oncorhynchus masou formosanus*) which lives in the river section of this study. In order to make sure ecological corridor continuing, dam removal is the frequently discussed measure in recent years and its impact on environmental is also highly concerned. Since the dam removal may causes severe changes to the river channel, the action of dam removal needs careful evaluation.

As one of the endangered species, Taiwan salmon is considered a national treasure of Taiwan and it was originally an offshore migration of the Pacific salmon. After the ice age and geographical isolation, it becomes as an unique subspecies of Taiwan and evolved into landlocked salmon. Now the Taiwan salmon habitats only exists in few upstream creeks and the total number of wild Taiwan salmon in 2015 was about 4,300. In order to expand the connectivity of the fish habitats in Chi-Jia-Wan creek basin, several dam removal projects had completed with good results. Therefore, this paper focuses on the dam removal of Yu-Sheng creek dam.

In this paper, a digital elevation model (DEM) of about 1 kilometer channel of the Yu-Sheng creek dam is obtained by unmanned aerial vehicle (UAV). Using CCHE2D model, the simulation of dam removal will reveal the impact on channel morphology. After model parameter identification and verification, this study simulated the scenarios of three historical typhoon events with recurrence interval of two years, fifteen years, and three decades under four different patterns of dam removal to identify the the head erosion, flow pattern, and siltation and erosion of channel. With simulations by River2D under mean flow and ecological reference flow for the channels before and after dam removal, the habitat suitability curves of adult, two-aged juvenile, and one-aged juvenile salmons were applied to estimate the weighted usable areas. With results of two models on channel changes, infrastructure protection, and habitats improvement the best way for dam removal is then suggested.