

Reservoir sedimentation management using diversion tunnel

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Abstract

Reservoir sedimentation management has become an important topic to large dams in the United States due to their historical design, current age, and increased environmental regulation. Less attention has been paid to small dams in remote mountains even though they are facing a more urgent sedimentation problem due to their relatively small storage. This study aimed to explore the relation between reservoir operations and sediment erosion in a small dam's backwater zone to seek potential alternative solutions to flushing and excavation. Mindful timing and magnitude adjustment of water transfer, water diverted by tunnels, through a reservoir was hypothesized to strategically redistribute sediment erosion for sites with water transfer/diversion facilities in the main channel. It was found that sediment erosion was increased by over 100% by turning the water transfer to the maximum level which is 12 times higher than mean annual discharge. With stage drawdown, the increment of sediment erosion was further increased by over 50% compared with water transfer only scenarios. Upstream inflow with occurrence from 5% to 25% was found to be the optimal hydrologic condition for water transfer. These results indicated that water transfer is a promising strategy to redistribute deposited sediment downstream of it with appropriate stage drawdown.

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