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Abstract

The Waterways Experiment Station has developed dynamic numerical hydraulic and water quality simulation models of the Missouri River reaches downstream of Fort Peck, Garrison, and Fort Randall Dams in support of Master Water Control Manual studies. The numerical modeling approach is to compute spatial and temporal variations in stage and discharge in each of these reaches using UNET, a one-dimensional dynamic flow model. Hydraulic and geometric parameters calculated by UNET are then linked with transport algorithms in the CE-QUAL-RIV1 numerical model for computing spatial and temporal variation in water temperature and dissolved oxygen in each of the modeled reaches. Parameters for verifying the numerical models were determined using prototype data collected for both steady releases from the reservoir powerhouses as well as peaking power releases. Subsequent to model verification, several powerhouse release scenarios were simulated, and the resultant hydraulic and water quality parameters in the open river reach computed. Water quality scenarios used the results of this study to quantify the downstream extent of depressed water temperatures and habitat suitability scenarios to quantify the physical habitat parameters.

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