Stability Evaluation for Designed Ephemeral Channels In Wyoming

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STABILITY EVALUATION FOR DESIGNED EPHEMERAL CHANNELS IN WYOMING

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Final Technical Report
For
Abandoned Coal Mine Lands
Research Program

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ABSTRACT

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ABSTRACT FOR
STABILITY EVALUATION FOR DESIGNED EPHEMERAL CHANNELS IN WYOMING

by

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Evaluating the performance of reconstructed ephemeral channels at coal mine sites in Wyoming is a great challenge because major channel adjustments typically occur only in response to infrequent flood events. A risk-based channel stability analysis was developed by Western Water Consultants, Inc. (WWC, 1993) which allows statistical comparison between reclaimed channel designs and similar characteristics of unmined channels. Unmined, natural stream channels can provide critical information about stable channel forms because the natural channel geometry has evolved over long time periods under prevailing climatic conditions. The 1993 research was limited to areas encompassing Abandoned Mine Land (AML) channel reclamation projects near Rock Springs and Hanna, Wyoming. Three channel parameters that are important channel design elements (channel slope, flow velocity, cross sectional flow area) comprised separate stability tests. One-tailed confidence intervals calculated about the mean predicted channel slope, flow velocity, and flow area define the recommended range of acceptable channel designs.

In the current study (1994-1995), the stability evaluation was extended to the active coal-mined regions of the state: northeast of Rock Springs, north of Hanna, west of Kemmerer, eastern Wyoming (Powder River Basin), and north of Glenrock. Stream channel and drainage basin information was compiled for these five coal-bearing areas in Wyoming using mine permit application premining data, published reports, and field data. Additional parameters including sediment characteristics of the channel bed and banks was included in the analysis to better understand how sediment influences channel stability.

Results, in general, showed a high degree of correlation between basin parameters and ephemeral channel hydraulic parameters. Recommended channel design criteria which provide for stability are presented. Results of the study provide mine reclamation specialists and regulatory personnel with a quantitative method to evaluate reclaimed designs for ephemeral channels in the main coalmined areas of Wyoming.

Additional Key Words: reclamation, geomorphology, channel design, channel stability, stability evaluation

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