Mine Reclamation Applications of a New Water Budget Model: Wetbud[1]

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Abstract: The development of accurate water budgets is essential for the appropriate design of created wetlands on formerly surface mined areas and also has applications to other permitting needs such as evapotranspiration and runoff predictions. The primary goal of this interdisciplinary research program has been the development and validation of a new set of wetland water budget procedures which are collectively known as "Wetbud". The model estimates wetland water budgets using available weather data and site-specific topographic, soil and geohydrologic data, coupled with mass balance mathematics. Wetbud can be run in its basic form where wetland topography, soil parameters and groundwater flux are simplified, or in the advanced form, where these parameters are included in a more complex approach via integration of the MODFLOW package, a free 3D program that was developed by the United States Geological Survey. Both versions can also include overbank flow hydrology sources and the advanced form can also model sloping and irregular topography. The program downloads weather data from the nearest applicable station and selects appropriate wet-normal-dry (W-N-D) years following a modest user data clean-up step. Wetbud then automatically calculates evapotranspiration for any input year via Thornthwaite (monthly) or Penman (daily) methods. Wetbud also has the ability to utilize existing short-term (e.g. 6 to 9 months) groundwater data from an upgradient well to simulate longer-term groundwater level inputs for the selected W-N-D years. In addition, Wetbud features a "Wizard" version that comes pre-loaded with 14 pre-selected weather data sets for all areas of Virginia that can develop a simple monthly water budget in less than 15 minutes – a feature that could be expanded anywhere geographically with historic weather data. Wetbud is now available for public use as freeware from www.landrehab.org/WETBUD and runs in Windows environment.

Additional Keywords: Wetland creation, design tool, evapotranspiration, runoff.

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