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Simple Tools for Water Quality Modeling and TMDL Development

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Abstract:

Water quality models are being used to determine pollutant loads to water bodies and for developing Total Maximum Daily Loads (TMDLs). Watershed, stream and reservoir water quality models include a wide range of models that can be applied to virtually every water body type (including estuaries, bays, lakes, bayous, reservoirs, major river, streams, and ponds), pollutant type (from nutrients, DO, and bacteria to PCBs, metals, pH, and pesticides) and source type (including urban, agricultural, mining, and forestry). Modeling selection and criteria is based on the water body type and behavior, pollutants and processes of concern, source types, and other defining factors identified during the characterization of the watershed.

The vast majority of these models are complex and require significant amount of input data and time effort. When modeling water bodies with limited data, simple modeling tools are more effective and can be used to obtain reasonable results. The modeling tools include Load Duration Curves, BATHTUB, and QUAL2K.

Load duration curves are a simple and accurate method of determining existing and allowable pollutant loads in streams. Because the approach establishes loads based on a representative flow regime, it inherently considers seasonal variations and critical conditions attributed to flow regimes. BATHTUB is a steady state model that predicts eutrophication response in lakes based on empirical formulas developed for nutrient balance calculations and algal response. QUAL2K (or Q2K) is a one dimensional steady state river and stream water quality model widely used for simulating dissolved oxygen and pH.

Load Duration Curves, BATHTUB, and QUAL2K are water quality models that are efficient, simple to use and provide adequate results in simulating pollutant loads, load capacity of water bodies and pollutant load reductions required to meet water quality standards.

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