A STREAM EVOLUTION MODEL INTEGRATING HABITAT AND ECOSYSTEM BENEFITS

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While channel evolution models (CEM) provide an organizational structure for considering river channels and their complex response to disturbances (for example changes in base level, channelization or alterations to the flow and sediment regimes), physically and ecologically streams comprise more than their channel. We review longstanding CEMs and propose a revised model, updated in light of several decades of research and practical experience, including realization that the single thread, meandering channel form may not represent the natural or pre-disturbed state, an assumption implicit to CEMs. The proposed Stream Evolution Model (SEM) includes a precursor Stage featuring a multi-threaded channel, and stream evolution as a cyclical phenomenon within which natural channels evolve, and disturbed channels may recover to a former Stage or repeat parts of the cycle rather than evolve through all Stages in linear fashion.

The hydrologic, hydraulic, morphological and vegetative attributes of the channel during each evolutionary Stage are associated with key habitat and ecosystem benefits. Our personal experience was combined with information gleaned from recent literature to construct a fluvial habitat scoring scheme that distinguishes clearly the relative ecological values of different channel Stages. Consideration of the links between channel evolution and ecological services leads to improved understanding of the ecological status of modern, managed rivers compared to their unmanaged, natural counterparts. The potential utility of the SEM, with its interpretation of habitat and ecosystem benefits, includes improved river management decision making with respect to future capital investments in river conservation, restoration, and species recovery.