Large woody debris in habitat models  
Progress report  
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Past and present work

Developing a hydrodynamic model of streams with large woody debris (LWD) requires that

1. the spatial distribution and scale of woody debris be determined and
2. the hydraulic effects be evaluated in order for a subgrid parameterization to accurately account for the presence of the debris.

Accordingly, in the fall semester of 2002, our research has focused on both these issues. To our knowledge, a systematic approach to determine the spatial distribution of LWD is yet to be devised. Most people usually use close-up photographs or eye-watching on short reaches to gather information on debris. However, a technique based upon the semi-variogram – widely used in mining geostatistics – seems to be promising and has been investigated. Provided that the spatial pattern of the streambed present some repetition, this tool could extract the repetitive pattern and ignore the erratic component, which would be the woody debris. A explanatory note on the use of the semi-variogram and its relevance to our problem is attached. Another technique called the roughness tree technique should be further investigated. It consists in applying a Gaussian filter several times to the data in order to extract bedforms of larger dimensions each time the filter is applied.

In parallel, a thorough review of the literature has been started and a first draft should be available by the end of January. The literature review concentrates on both these issues presented above. The part focusing on the hydrology of LWD (flow resistance, velocity distribution, turbulence) is intended to give insights as to how hydrodynamic models should be modified – most likely on the subgrid scale – to account for the presence of woody debris.

Finally, the data (bathymetry) for the Sulphur River have been obtained from the Texas Water Development Board and a first program has been written in C to compute the average depth at each GPS position and to display them using IBM Data Explorer.

Future work

In the very short-term, the literature review is to be completed. The next step is to process the bathymetry in more details. The semi-variogram technique (and possibly roughness technique) should first be experimented on a one-dimensional longitudinal series of depth measurements (after interpolation and digital resampling) to determine whether or not the method proves useful. Provided that the results be promising, we can move on to a two-dimensional version.

Concurrently, steps toward a clear understanding of SMS and RMA2 should be taken in order to be able to provide the model with an adequate subgrid parameterization of woody debris.