

CE 717 – RIVER MECHANICS

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COMPUTER PROBLEM # 1 due February 22, 2022

Aggradation and Degradation

This assignment is in reference to the computer assignment in the course Erosion and Sedimentation. In CIVE 716, you readily calculated flow depth, velocity, shear stress and bed load transport from the backwater analysis under constant discharge and friction factor.

A. Estimate the bed material discharge in metric tons per day using the method from last semester (see Chap. 11 of *Erosion and Sedimentation* for the formula). Assume that the upstream bed elevation is fixed, and the upstream sediment supply corresponds to steady uniform flow conditions at that location. Provide a diagram showing the sediment transport distribution in metric tons per day over the entire reach. You can use either a constant value of Manning n or Darcy-Weisbach f for the entire reach and it is fine to ignore the effects of bedforms.

B. Use a simple finite difference scheme of the equation describing continuity of sediment. For instance, you can use Equation 12.9a in *Erosion and Sedimentation* for constant width channels. Find a suitable grid size such that the trap efficiency over a grid cell is close enough to unity. Carry out calculations until the reservoir is approximately half full. Provide sketches at different times (e.g. select logarithmic time scales such as ...1 day, 10 days, 100 days...) showing significant changes in bed and free surface elevations. Also compare the sediment transport rates in metric tons per day (calculated in A above) at these different times. Briefly discuss the assumptions, methods, numerical schemes and results. Show evidence of your computer program and provide selected printouts on 8^{1/2} x 11 paper.

[Hint: The following Section from RM should be useful in your analysis. Look at Section 2.2 for the governing equations, and Section 7.3 regarding aggradation and degradation. Your graphical results should look somewhat like those of Figure 7.10].
