CWR 5235 Open Channel Hydraulics
Homework 2, Spring 2021
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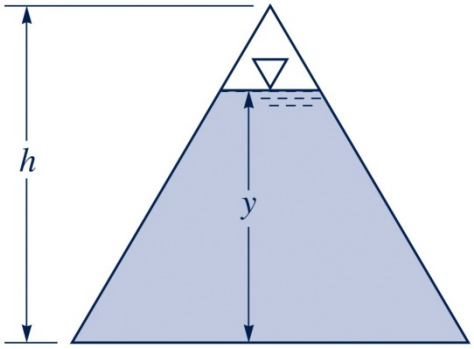
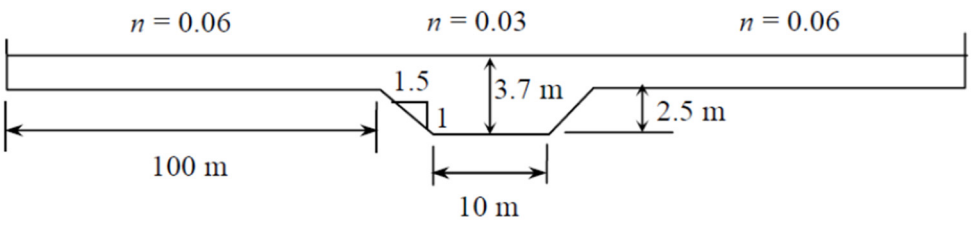
1. Determine the normal depth and critical depth in a trapezoidal channel with a bottom width of 40 ft, side slopes of 3H:1V, and a bed slope of 0.002 ft/ft. The Manning's n value is 0.025 and the discharge is 3,000 cfs. Is the slope steep or mild? Repeat for n=0.012. Did the critical depth change? Why or why not?

2. Find the normal depth of flow in a straight and uniform triangular road ditch that has been excavated recently and is free of weeds. The side slopes are 3:1 and the longitudinal ditch slope is 0.001. The design discharge is 1.5 cfs. If the permissible shear stress to avoid erosion is 0.05 lb/ft^2, is the channel stable?

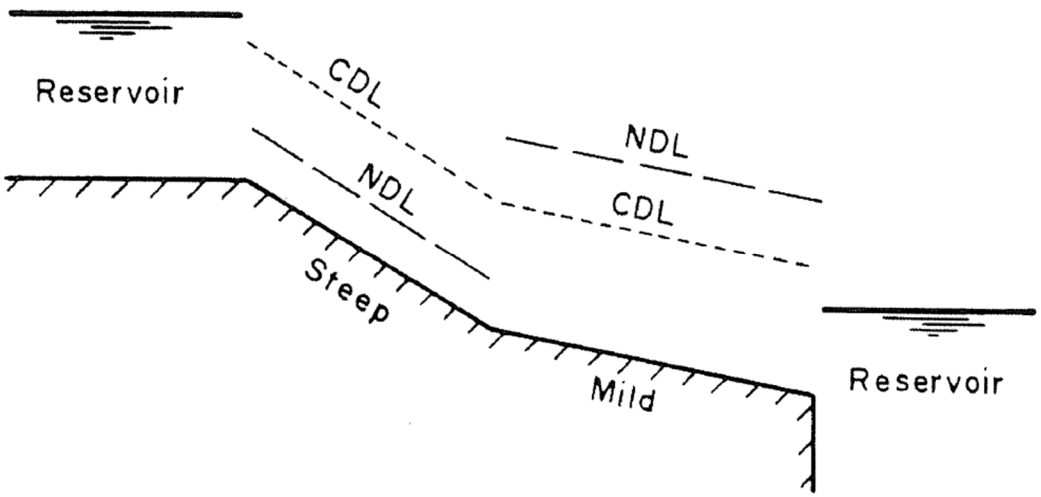
3. Water flows in a channel with an equilateral triangle cross-section, as shown in the figure below. For a given Manning coefficient, n, and channel slope, determine the depth that gives the maximum flowrate.

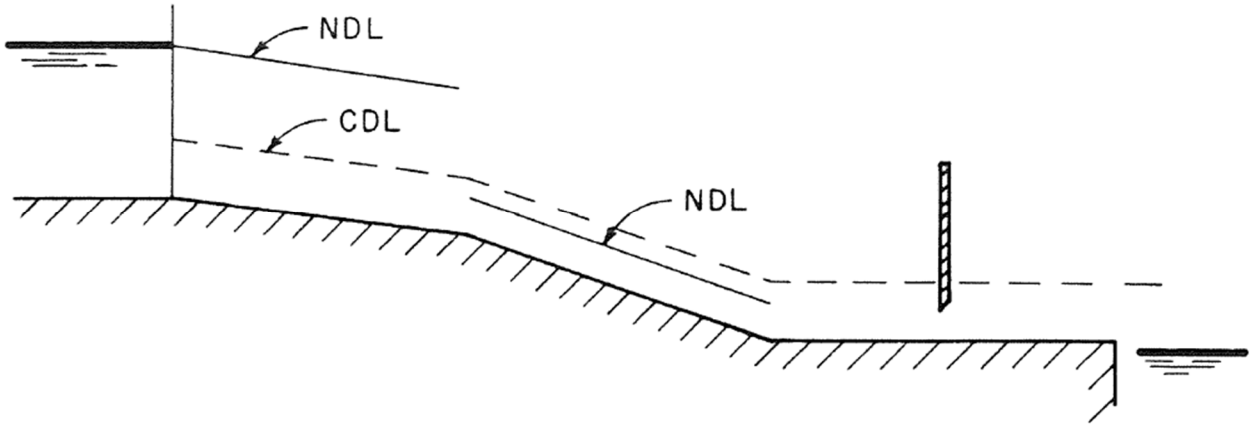


4. A compound channel has symmetric floodplains, each of which is 100 m wide with Manning's n = 0.06, and the main channel, which is trapezoidal with a bottom width of 10 m, side slopes of 1.5:1, a bank-full depth of 2.5 m, and a Manning's n of 0.03. If the channel slope is 0.001 and the total depth is 3.7 m, compute the uniform flow discharge using the divided channel method, first with a vertical interface both with and without wetted perimeter included for the main channel, then with a diagonal interface with wetted perimeter excluded.



5. Sketch and label the possible flow profiles for the two open-channel systems below





6. A rectangular channel 6.1 m wide with n = 0.014 is laid on a slope of 0.001 and terminates in a free overfall. Upstream 300 m from the overfall, a sluice gate produces a depth of 0.47 m immediately downstream of the gate. For a discharge of 17.0 m^3/s, compute the water surface profile and the hydraulic jump location using the standard step method. (Hint: If a hydraulic jump occurs, it will be at a location where the momentum function values for the profile before the jump and the profile after the jump are equal.)

7. A rectangular canal of 2.0 m width carries a flow with a velocity of 2 m/s and depth of 1.25 m. A side weir of height 0.75 m and length 1.20 m is provided in one of its walls. Find the total flow diverted by the side weir.