

Problem 7.4

Below is a top view of a channel of width b . The cross section of the channel is constant, so that the velocity, U , is also constant along the channel. Part of the channel is filled with vegetation whose morphology is uniform over depth, and emerges through the water surface. The mean stem diameter is d , and the mean spacing between stems is ΔS . Consider the model, $D_{t,y} \sim v' l_y$, to describe the lateral diffusivity.

- How will the lateral turbulent diffusivity change as the flow enters the vegetation?
- Compare the diffusivity in the vegetated zone for $Ud/v = 1$ versus $Ud/v = 1000$?
- Suppose the flow is unconfined, *i.e.* no side-walls, but the lateral extent of the vegetated zone is unchanged, how will the turbulence scales, turbulence intensity, and diffusivity differ in the vegetated and unvegetated zones?

