Time of Travel

- WV experience a major chemical spill on the Elk River polluting the drinking supply of the City of Charleston, WV.
- There is a national source water protection program that all states define and establish.
- Time of travel is integral to all the calculations.
- Critical variables include drainage area, reach slope, mean annual river discharge, discharge at time of measurement, and peak velocity.
- MN DNR has created an ArcGIS toolbox which enables time of travel equations with mannings n for each stream segment.
- Mannings n depends on surface roughness, vegetation, and channel irregularities, degree of meander, obstructions, size and shape of channel.
- Hydraulic Radius is calculated using: (X)a + Y where: X = hydraulic radius factor 1 (User setting, 0.0032 default) a = drainage area in square miles (calculated from low Accumulation) Y = hydraulic radius factor 2 (User setting, 1.7255 default)
- Velocity is calculated as: vel(feet/second) = (1.49 * Hydraulic Radius^0.667 * slope^0.5) / Mannings N
- Travel Time across individual cells is calculated as:
- Once travel time across individual cells is known then Travel Time is calculated for each cell to the outlet of the basin using the FlowLength command using the cell-based travel time grid as an impedance factor and the DOWNSTREAM option.

Student Notes:

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