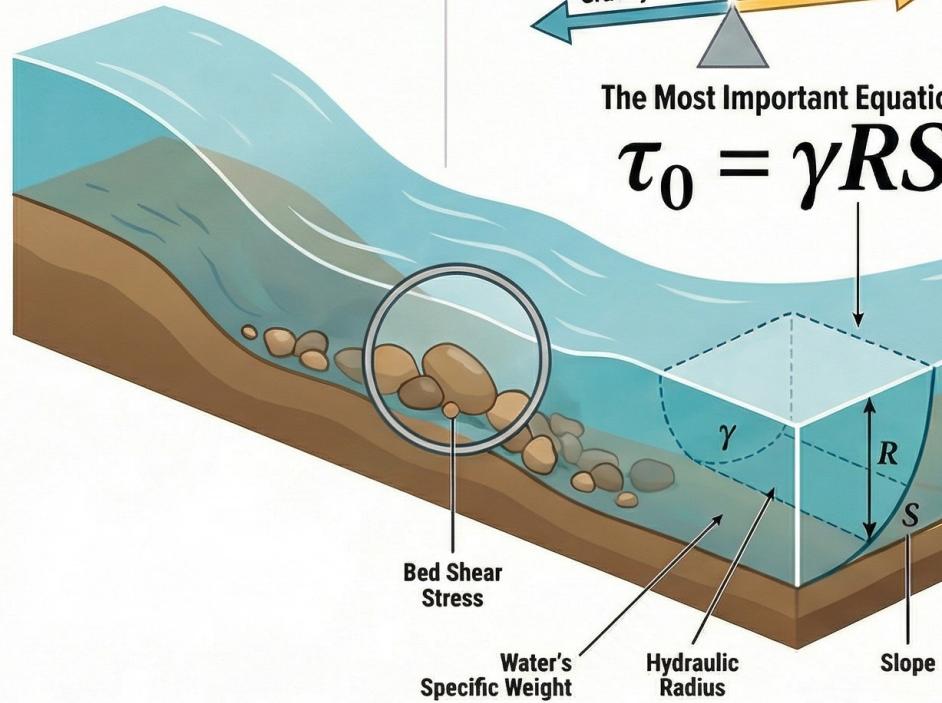


# From Flow to Force: The Fluid Mechanics of Sediment Transport

## THE CORE PRINCIPLE: BED SHEAR STRESS

**Shear Stress, Not Velocity, Is the Primary Driver**

This force initiates motion, controls transport rates, and forms riverbed features.



## A Balance of Forces in Uniform Flow

The downslope driving force of gravity is balanced by the resisting frictional force.



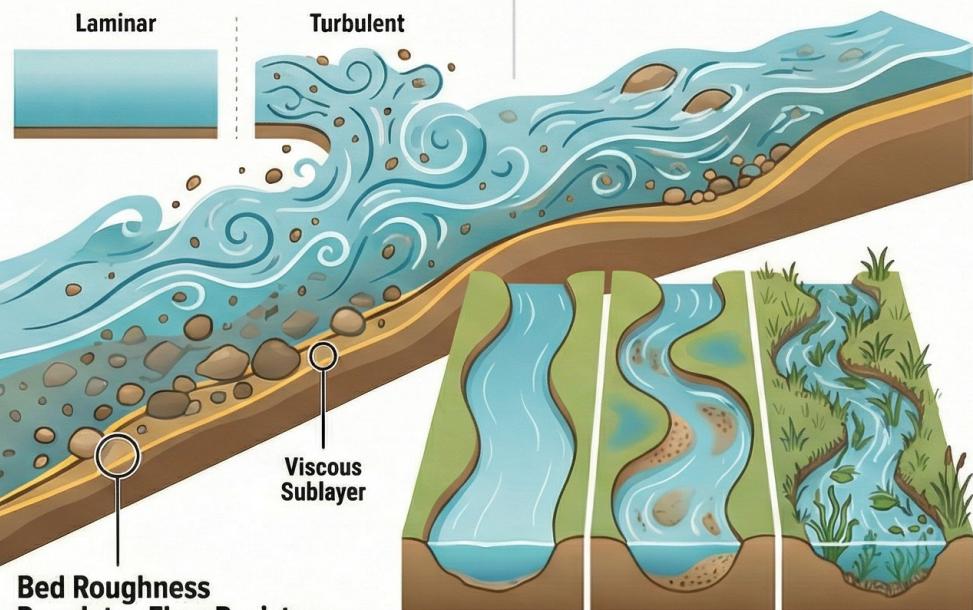
**The Most Important Equation:**

$$\tau_0 = \gamma R S$$

## CHARACTERIZING FLOW & RESISTANCE

### Laminar vs. Turbulent Flow

Natural sediment-transporting flows are almost always turbulent, with chaotic mixing that helps move sediment.



### Bed Roughness Regulates Flow Resistance

The interaction between sediment size and a thin viscous sublayer near the bed dictates flow resistance.

Typical Manning's *n* Value

0.025 – 0.030

0.033 – 0.040

0.075 – 0.150