Suspended Sediment Transport: The Balance of Forces

The Equilibrium Balance

Suspension occurs when upward turbulent mixing exactly balances the downward settling velocity of particles.

Turbulent Mixing
(Upward Force)

Settling Velocity
(Downward Force)

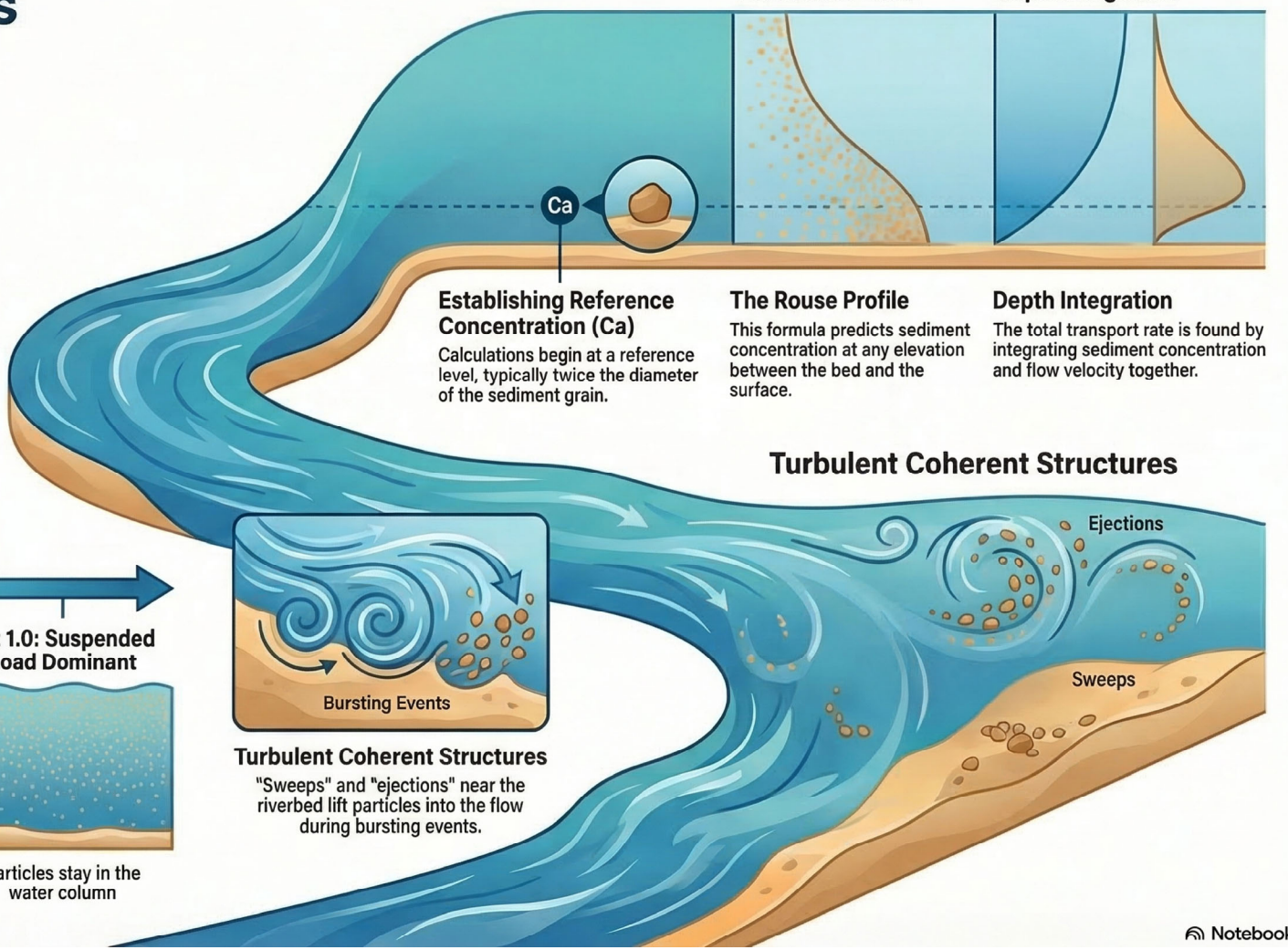
$$Z = \frac{\text{Settling Velocity}}{\text{Turbulent Mixing Intensity}}$$

Rouse Number (Z)
Dominant Transport Mode

Z > 2.5: Bed Load Dominant	1.0 < Z < 2.5: Mixed Load	Z < 1.0: Suspended Load Dominant
Particles stay near the bottom	Combination of bed and suspended	Particles stay in the water column

Calculating Transport Rates

The Rouse Profile | Depth Integration



Establishing Reference Concentration (Ca)

Calculations begin at a reference level, typically twice the diameter of the sediment grain.

The Rouse Profile

This formula predicts sediment concentration at any elevation between the bed and the surface.

Depth Integration

The total transport rate is found by integrating sediment concentration and flow velocity together.

Turbulent Coherent Structures

Turbulent Coherent Structures

"Sweeps" and "ejections" near the riverbed lift particles into the flow during bursting events.