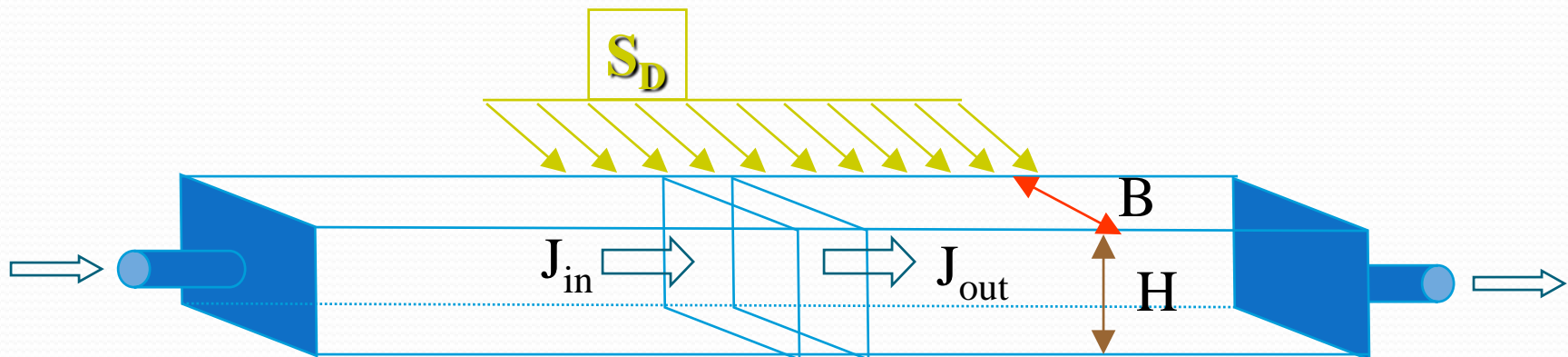


CEE 577: Surface Water Quality Modeling

Lecture #11_a
(Distributed Systems)
Chapra, L9 (cont.)

Distributed Sources

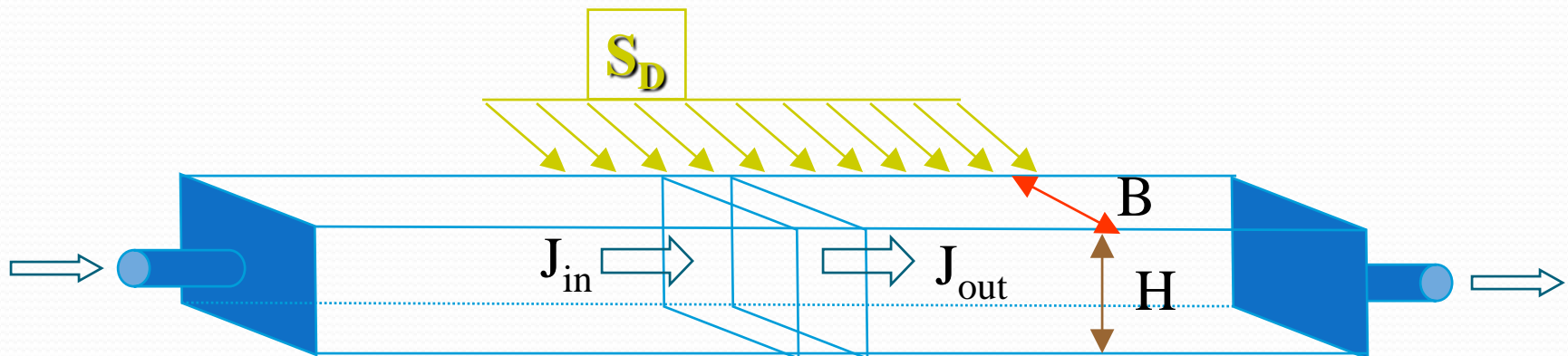
- Source (or sink) that is spread out along the stream length
 - classical non-point sources
 - agricultural, urban runoff
 - Sediment processes
 - sediment oxygen demand
 - Atmospheric deposition

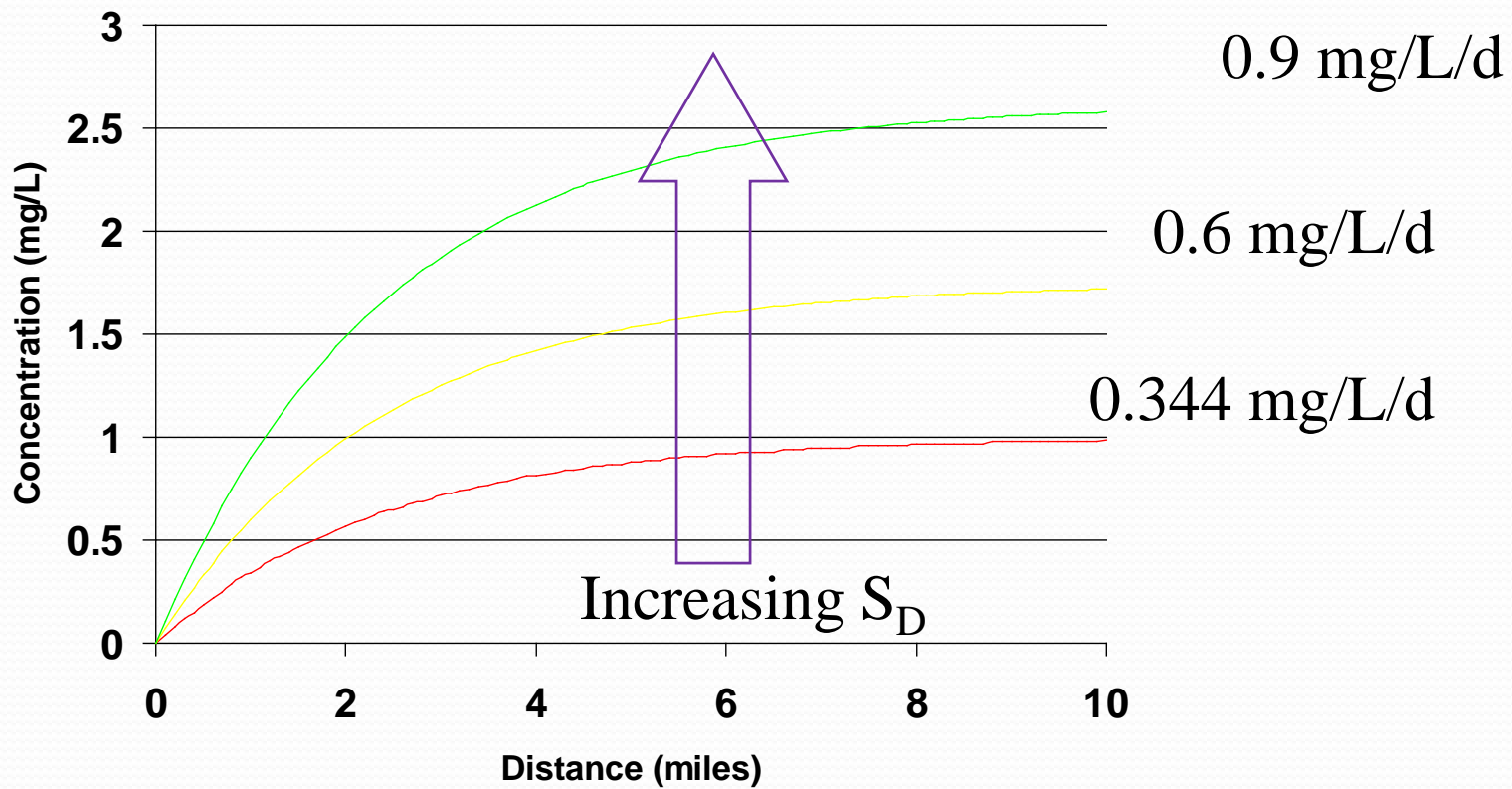


Distributed source in PFR @SS

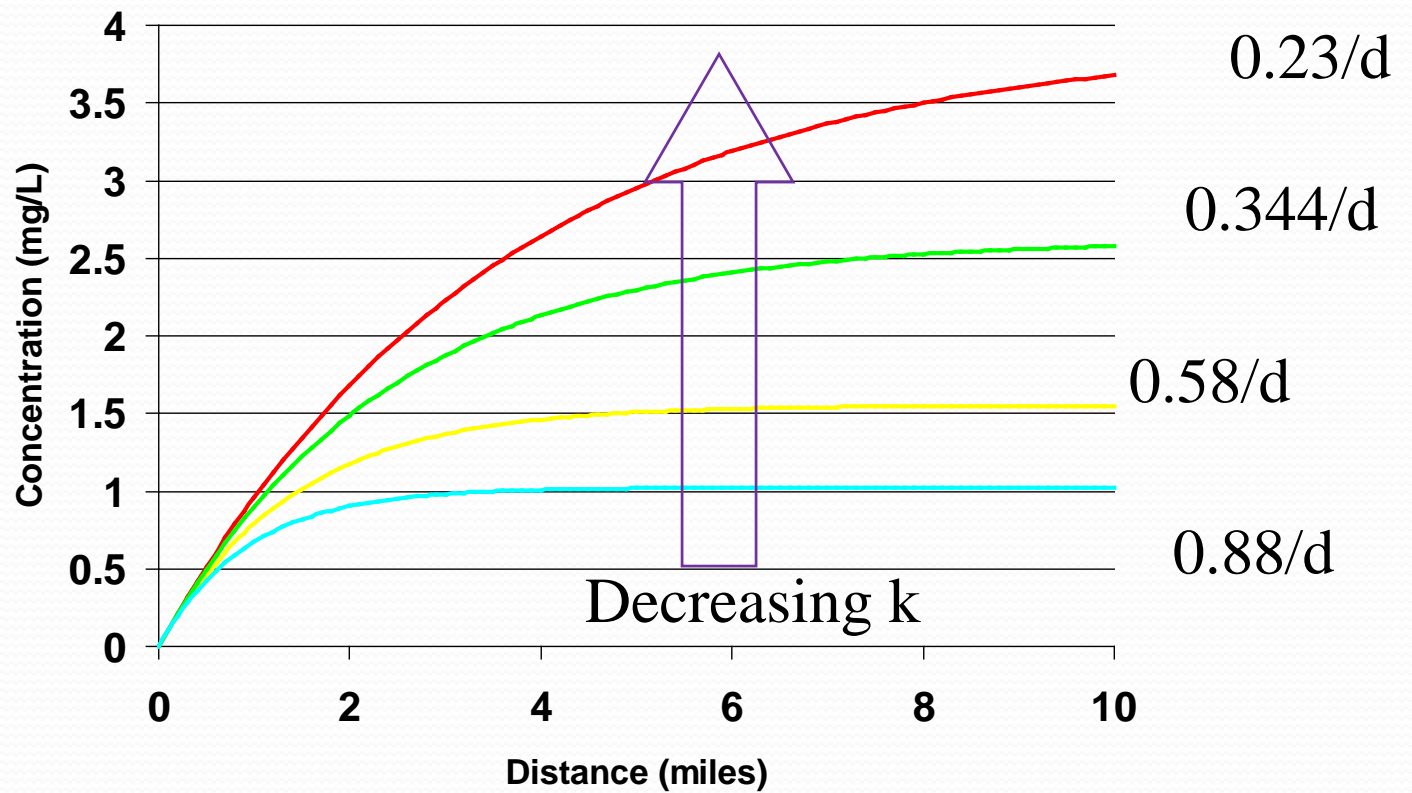
$$0 = -U \frac{dc}{dx} - kc + S_D$$

$$c = c_o e^{-k(x/u)} + \frac{S_D}{k} \left(1 - e^{-k(x/u)} \right)$$





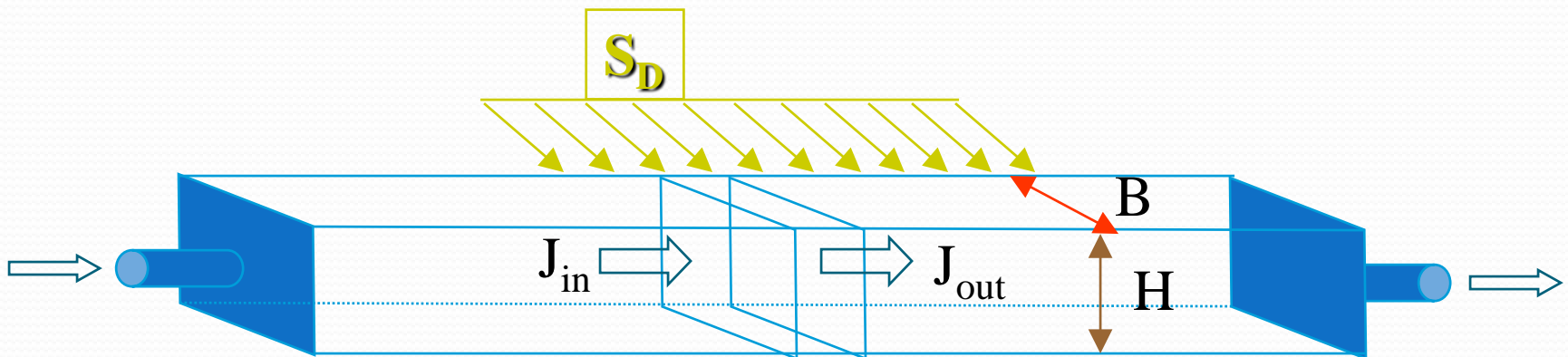
$K=0.344/d$



$$S_D = 0.9 \text{ mg/L/d}$$

Variable Channel Geometry

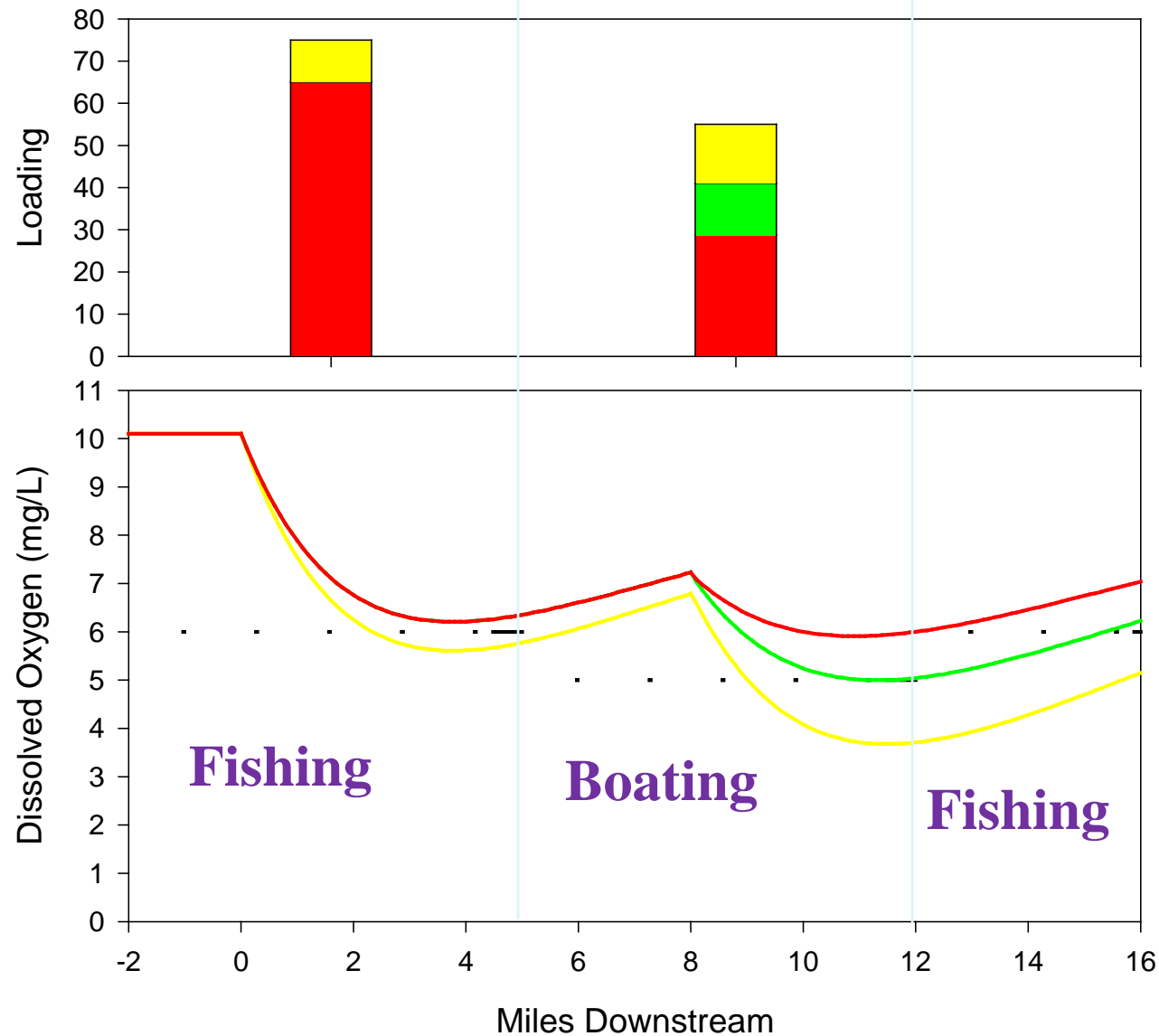
$$\Delta V \frac{\partial c}{\partial t} = J_{in} A_c - J_{out} A_c - rV$$



CEE 577: Surface Water Quality Modeling

Lecture #11_b
(Waste Load Allocations)
Chapra, here and there

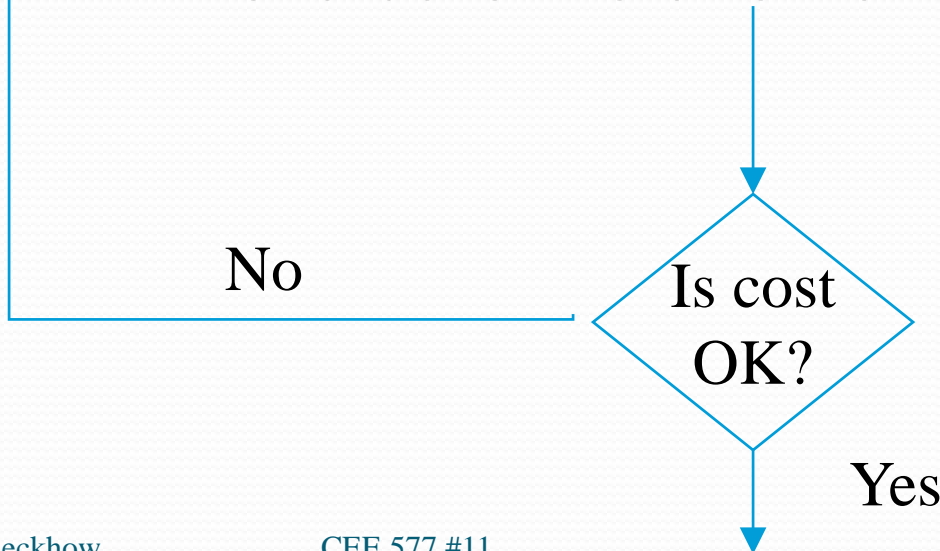
Graphical Representation



• See also: Fig 1.2 from Thomann & Mueller

WLA: Step by Step

- ▶ • Designate a specific water use
- Adopt a Water Quality Criterion
- Determine action necessary
 - formulate several alternatives
 - evaluate the alternatives



WLA: breakdown of steps

- Designate a specific water use
 - recreation: swimming, boating, aesthetics
 - water supply: municipal, industrial
 - agriculture
 - fisheries: commercial or sport
 - ecological balance
- Adopt a Water Quality Criterion
 - must support the above use
 - EPA “red book”

WLA: breakdown of steps

- Determine the action necessary to meet criterion: usually a discharge or effluent Water Quality Standard (enforceable)
 - Formulation of several engineering alternatives to meet the WQC
 - choose *model*
 - collect data
 - *calibrate* model
 - *verify* model
 - sensitivity analysis
 - model run under design conditions
 - alter waste loads and re-run model

- To next lecture