Jordan River DO Linkage Symposium
Organic Matter at Sediment Interface - SOD

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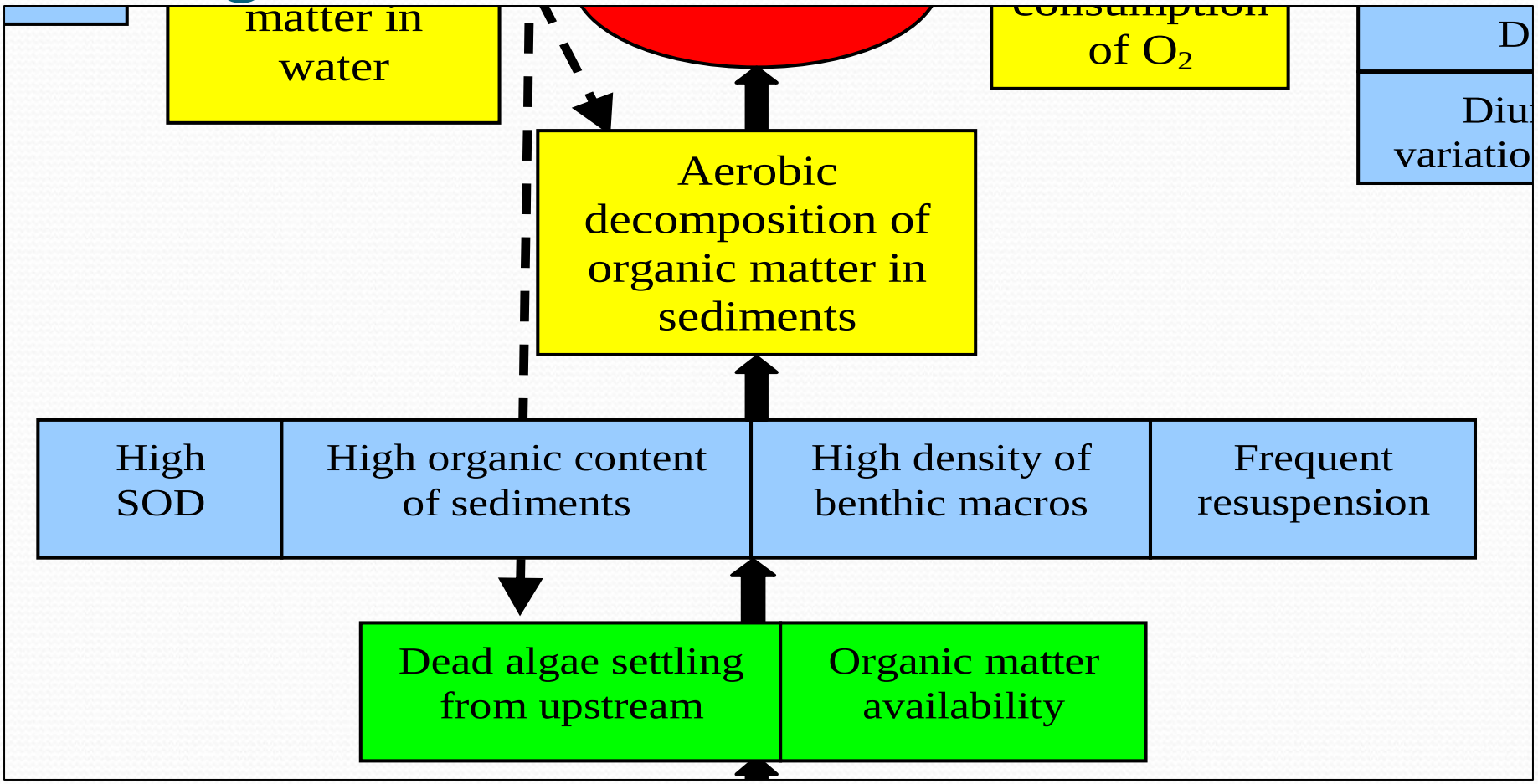
In our last episode…

- Physical processes not account for low DO – reaeration should be increasing DO, but it's ***decreasing*** downstream…
- Organic matter in water column (BOD) may account for 1/3 of reaeration
- Other indirect evidence for organic matter demanding DO for decomposition which may be settling out, given shallow slope

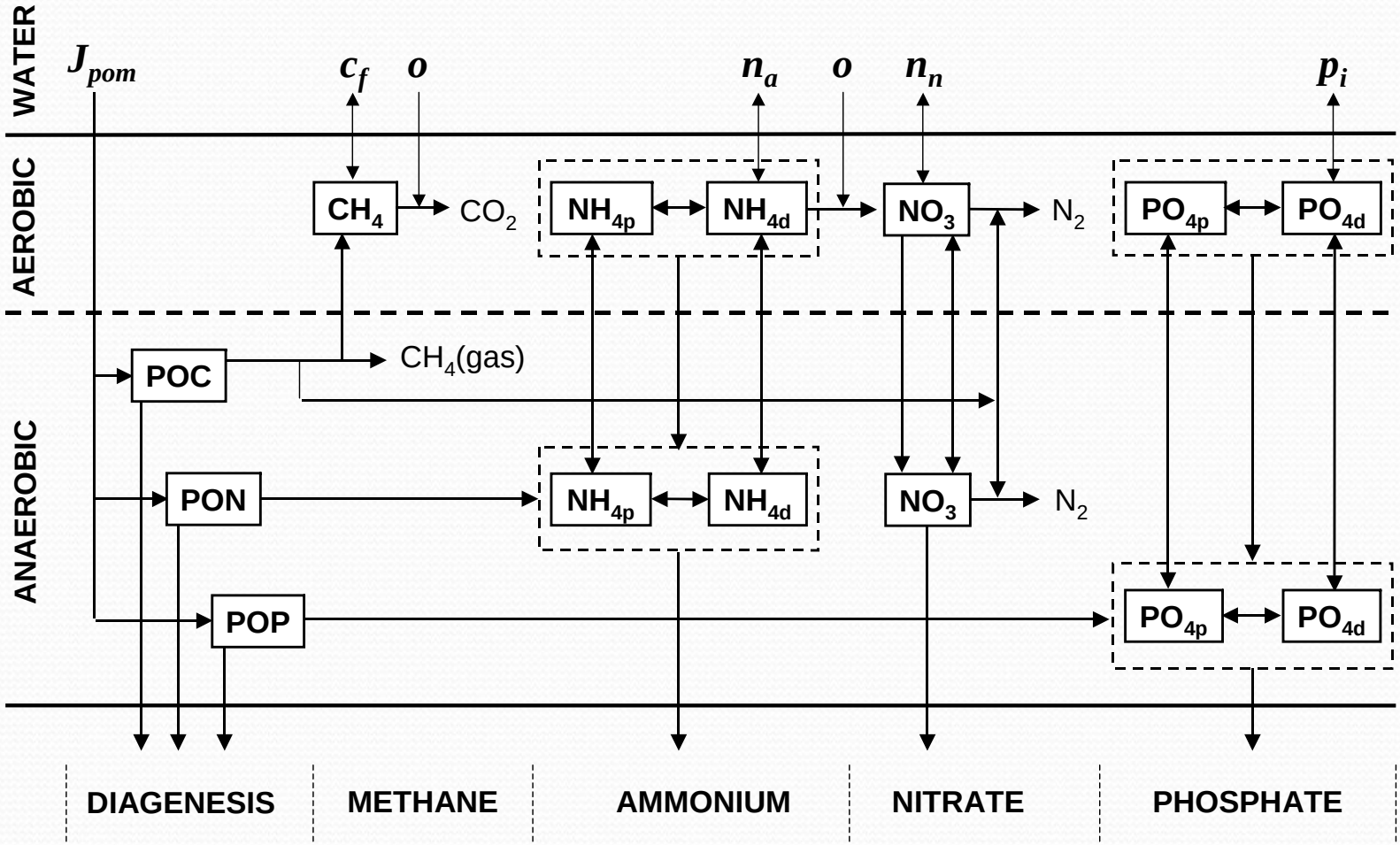
What about decomposition of organic matter on the river bottom?

Organic Matter in Sediments - SOD



- Organic decomposition (similar to BOD_5)
- Nitrification (NH_4 to NO_2 and NO_3)

Schematic of SOD-Nutrient Flux Model of the Sediments (QUAL2K)

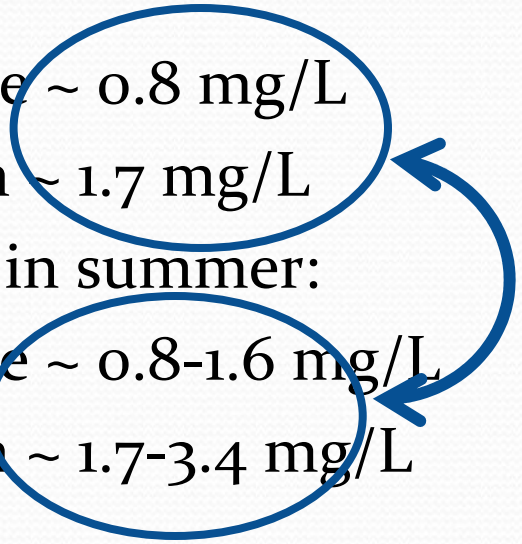


SOD Processes

- Sediment surface – aerobic bacteria demanding DO for decomposition; periphyton and other plants and organisms demanding DO for respiration
- Buried sediments – organic material converted to CH_4 and NH_3 ; Then…DO consumed in inorganic processes:
  - NH_3 converted to NO_3
  - CH_4 converted to CO_2 and H_2O
- Units of $g/m^2/day$ – which in lower Jordan River of average depth ~ 1 m equals ~mg/L/day

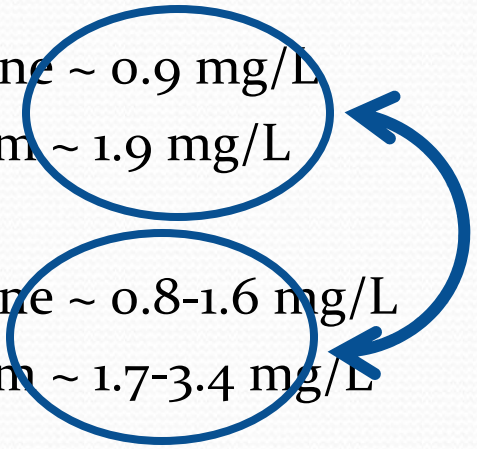
Lower Jordan River

- Measurements are from preliminary study in 2008
  - ~ 2 g/m²/day (~2 mg/L/day)
- Applied to Jordan River
  - 2100 South to Cudahy Lane ~ 0.8 mg/L
  - 2100 South to Burton Dam ~ 1.7 mg/L
- Remember…reaeration rates in summer:
  - 2100 South to Cudahy Lane ~ 0.8-1.6 mg/L
  - 2100 South to Burton Dam ~ 1.7-3.4 mg/L



Similar Rivers

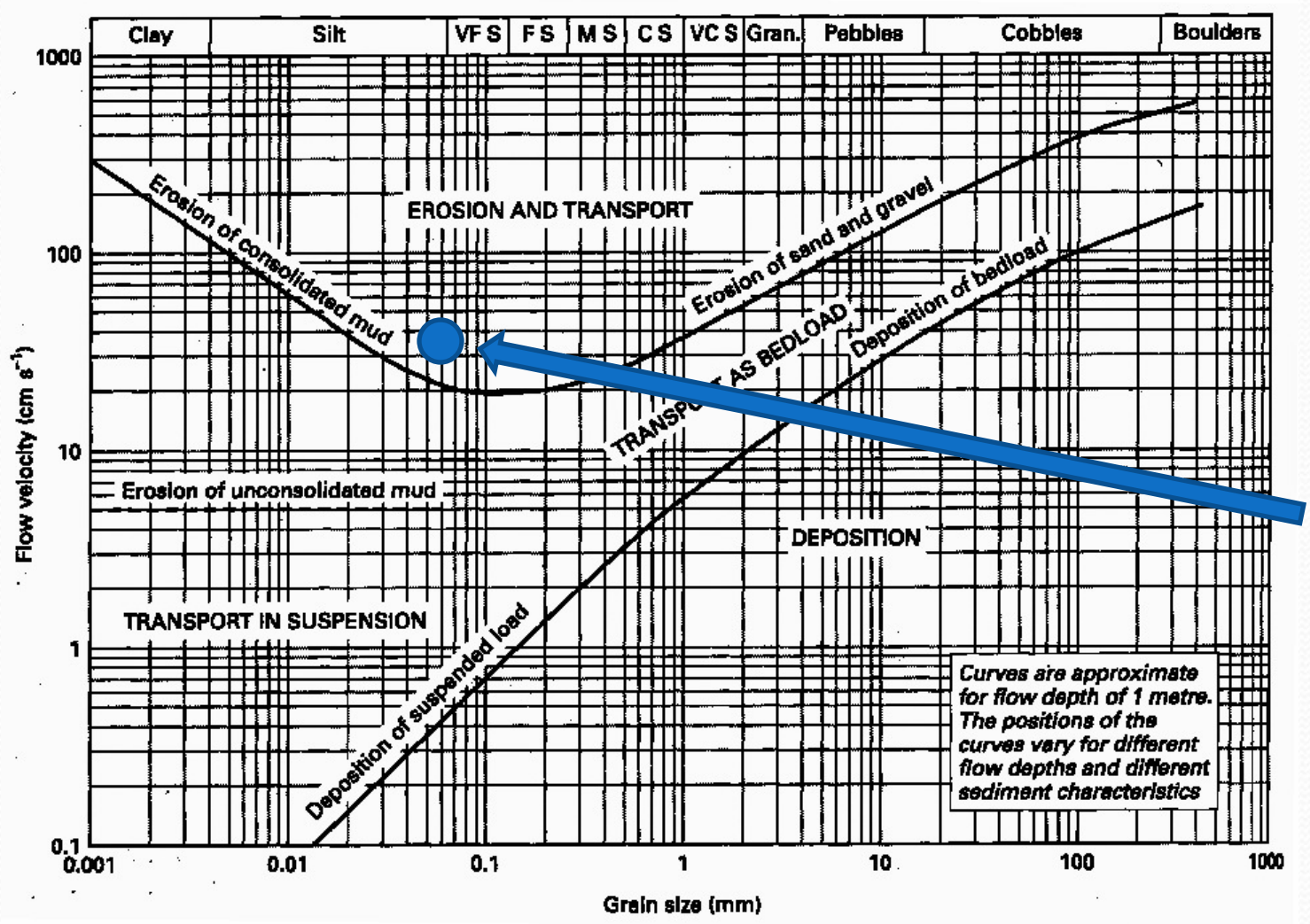
- Tualatin in Oregon similar to Jordan River (Rounds and Doyle 1997)
  - 712 sq mi watershed
  - 302,000 population
  - 200 cfs summer
  - Channel 50 ft wide, slope 1.3 ft/mile
- 0.6 – 4.4 g/m²/day; mean ~2.3 g/m²/day or 2.3 mg/L/day
- Applied to Jordan River
  - 2100 South to Cudahy Lane ~ 0.9 mg/L
  - 2100 South to Burton Dam ~ 1.9 mg/L
- Remember…reaeration
  - 2100 South to Cudahy Lane ~ 0.8-1.6 mg/L
  - 2100 South to Burton Dam ~ 1.7-3.4 mg/L



Resuspension of Sediments in Lower Jordan River – Increase BOD

- Stantec (2006)
  - Mean hydraulic depth ~ 0.8 to 1.1 m
  - Typical flows ~ 200 cfs
  - Typical velocities 30-45 cm/s
- Bio-WEST (1987)
  - Bottom conditions = soft sand and silts

Hjulstrom's Diagram



Flows of 30-45 cm/s can erode and transport fine sands and silts found in lower Jordan River

Conclusions

- Preliminary measurements of SOD indicate DO demand 0.8 – 1.7 mg/L

  Large percentage of reaeration…

- Measurements of SOD in similar river – Tualatin in Oregon – indicate similar results
- Indirect:
  - Organic matter in water column above 2100 South
  - Low velocities can allow settling
- Flows in lower Jordan River can resuspend sediments

DO Interactions in QUAL2K