

Jordan River DO Linkage Symposium Organic Matter in the Water Column - BOD

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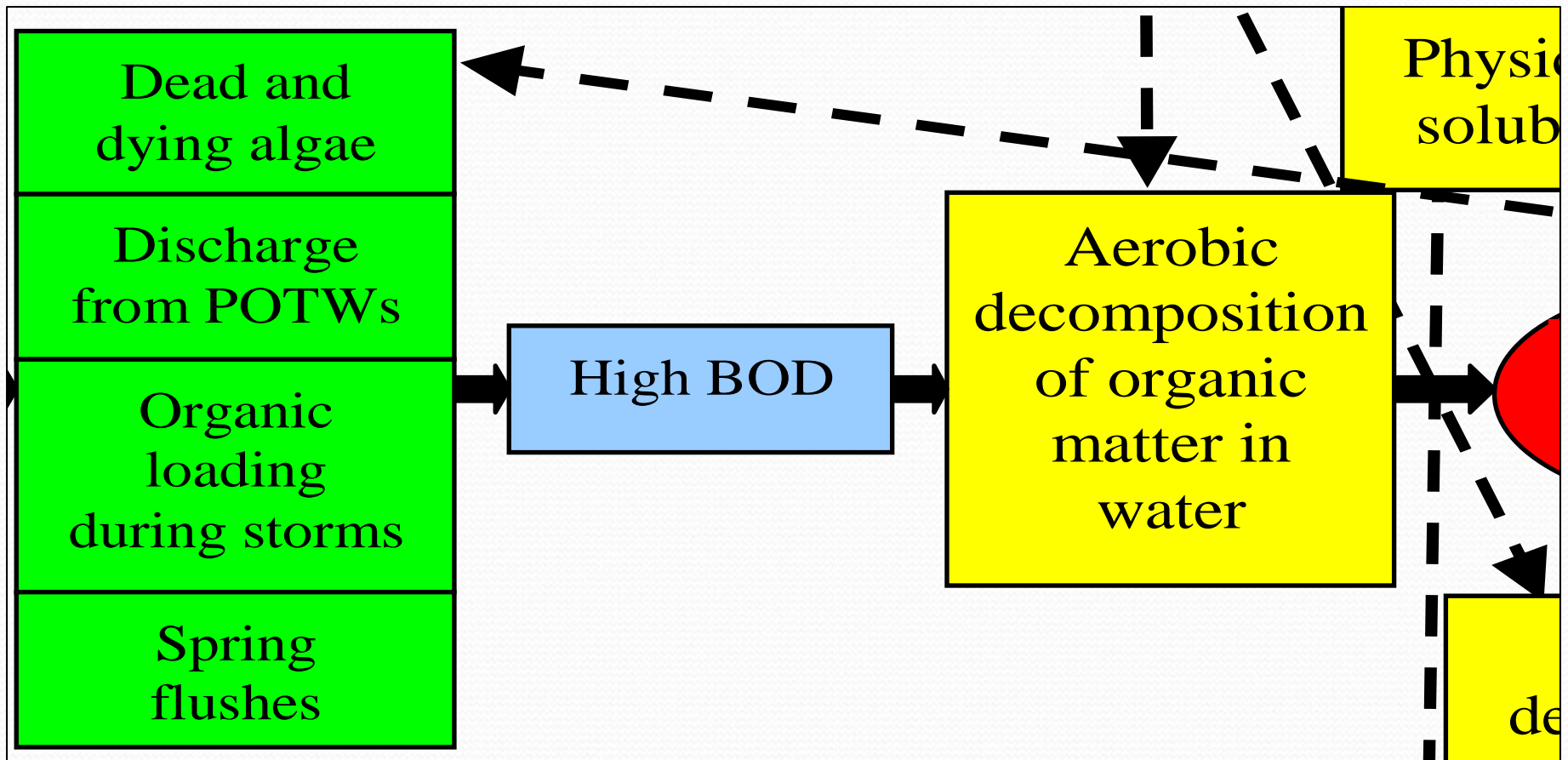


In our last episode...

- DO is not saturated in lower Jordan River (DO deficit).
- Reaeration rates mean DO should be increasing downstream of 2100 South, but it is **decreasing**.
- Some other process(es) consuming DO faster than reaeration can restore it...

Aerobic decomposition of organic matter?

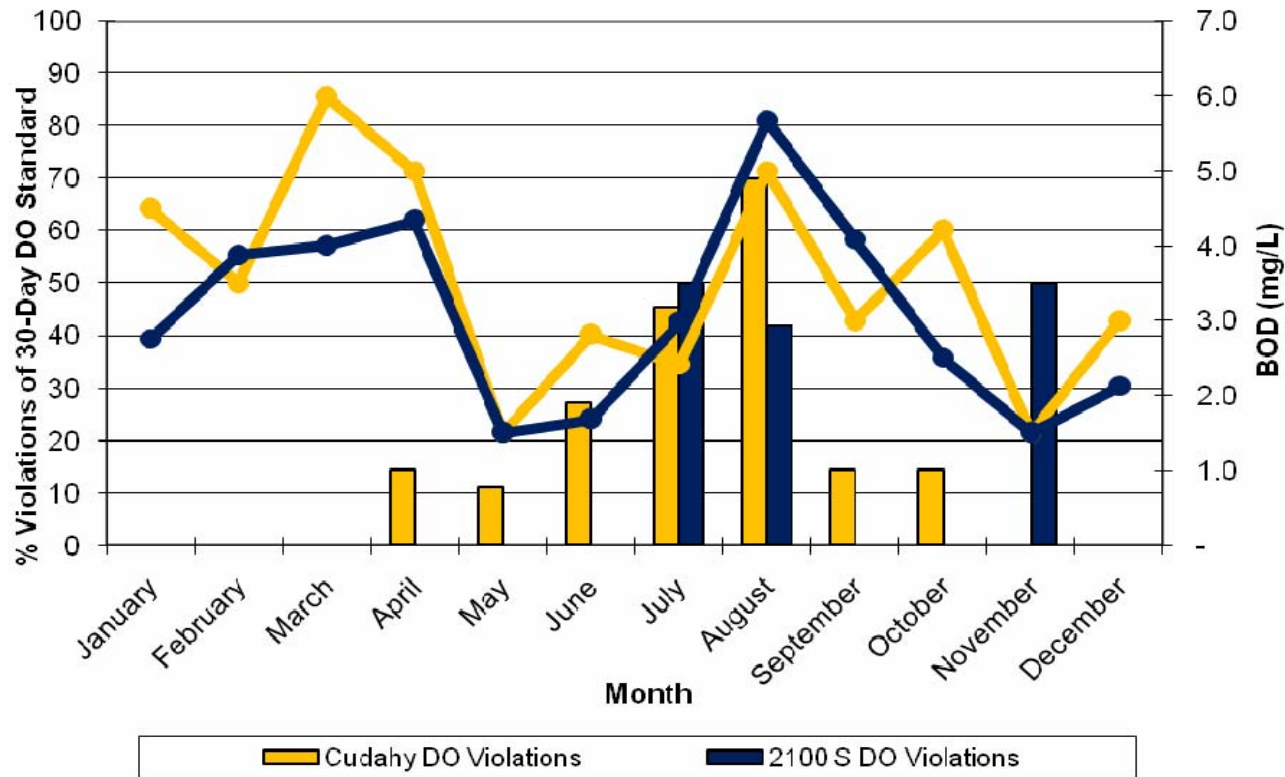
Organic Matter in the Water Column – Measured as BOD



Complex...BOD₅ versus cBOD, slow vs. fast cBOD, nitrogenous BOD (NH₄ to NO₂ and NO₃) ... So don't know how much DO is actually demanded from the water column in the lower Jordan River.

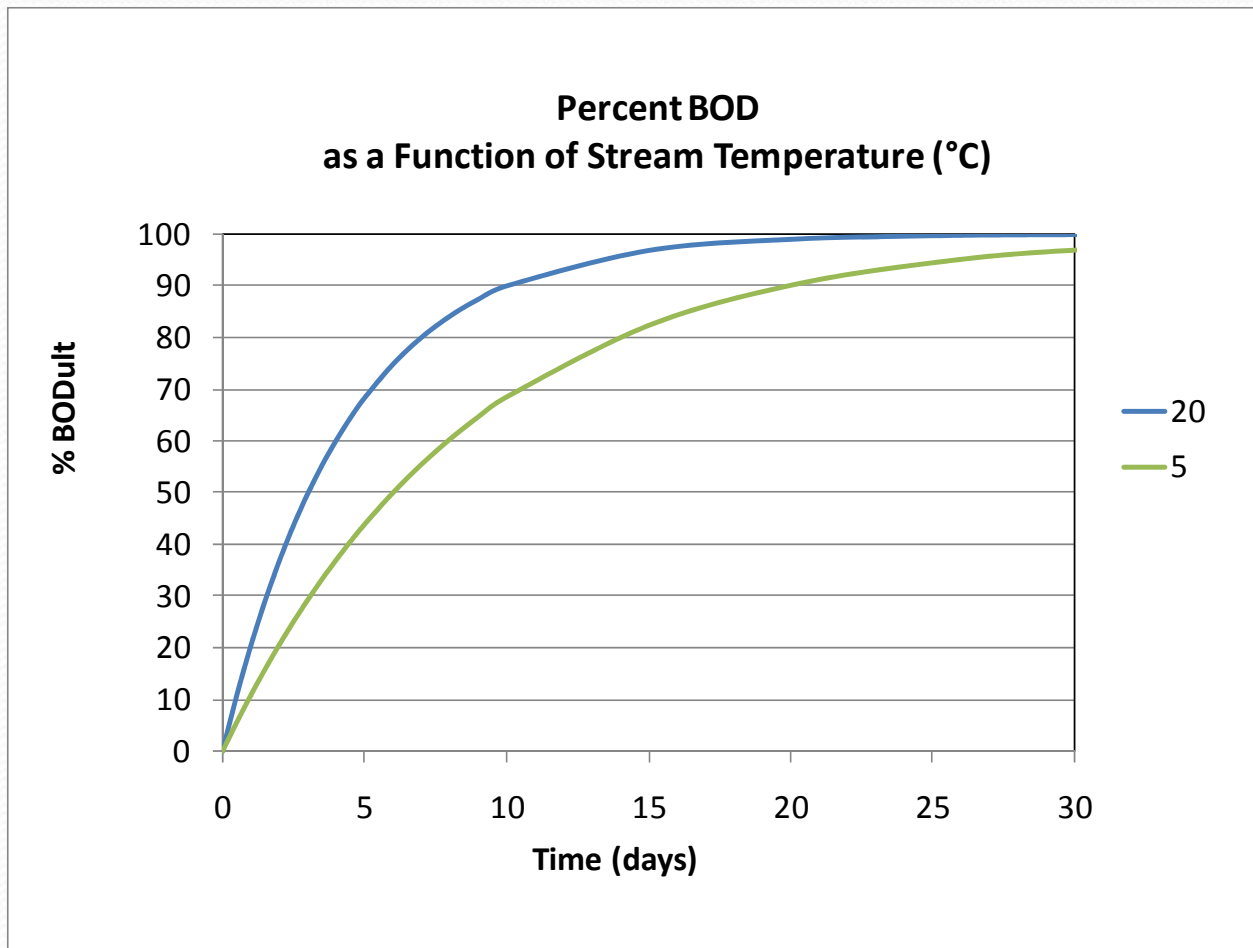
BOD₅ Direct Evidence of Organic Matter in Water Column

Monthly Average BOD and % Violations of 30-Day DO Standard at Cudahy Lane and 2100 South



- BOD₅ high in early spring and late summer 3-5.5 mg/L
- DO violates standard most often in summer (November only 2 measurements)
- DO violations worse downstream
- BOD still high at Cudahy

Biochemical Oxygen Demand



- BOD = demand on oxygen by bacteria decomposing organic matter
- BOD₅ = Dark, 20°C, 5 days, typically only carbonaceous (cBOD)
- Depends on properties of organic material (slow vs. fast degradation)
- At 20°C, 20% of ultimate BOD consumed each day (30% of the BOD₅ in the first day)

DO Problem Related to Velocity and Travel Time in Lower Jordan River

Table 4.6. Velocities and transit times of DWQ Segments at 200 cfs.

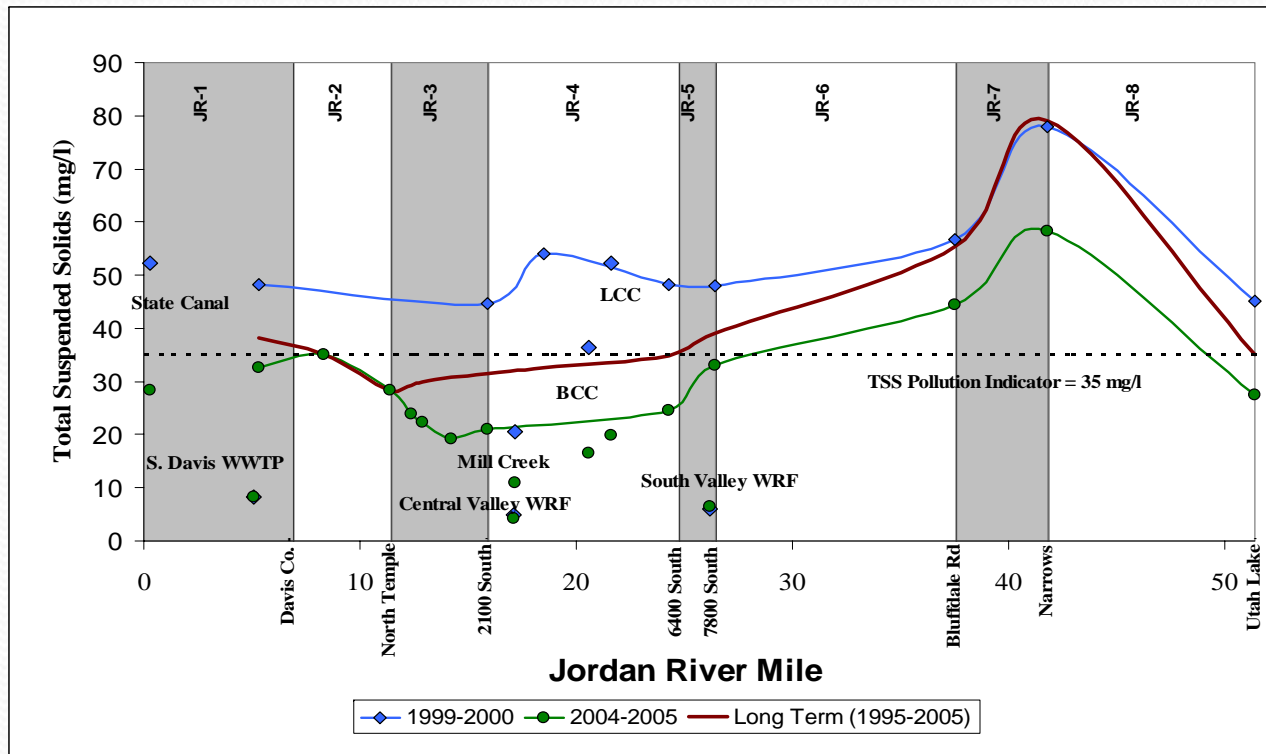
DWQ Segment	Segment Description	Segment Length (mi)	Average Slope (ft/mi)	Average Hydraulic Depth (ft)	Average Velocity (ft/s)	Travel Time (hr)
8	Utah Lake to Narrows	9.6	0.8	2.5	0.6	23.1
7	Narrows to Bluffdale Road	4.3	22.7	1.7	2.4	2.6
6	Bluffdale Road to 7800 South	11.0	9.3	1.6	2.1	7.8
5	7800 South to 6400 South	1.7	6.7	2.3	1.7	1.5
4	6400 South to 2100 South	8.9	5.2	2.2	1.4	9.6
3	2100 South to North Temple	4.5	1.4	2.7	1.5	4.5
2	North Temple to Davis County	4.4	1.7	2.9	1.2	5.3
1	Davis County line to Farmington Bay	6.9	0.1	3.5	1.0	10.5
	Totals	51.3				64.9

~0.4 Days to Cudahy,
 ~ 0.85 Days to Burton

DO Demand from BOD

- 2100 South to Cudahy ~ 0.4 – 0.7 mg/L BOD
(3.0-5.5 mg/L BOD x 0.4 days x 8.8% in 1st 0.4 days)
 - Reaeration ~ 0.8-1.6 mg/L in 0.4 days
- 2100 South to Burton Dam ~ 0.8 – 1.4 mg/L
(3.0-5.5 mg/L BOD x 0.85 days x 17.8% in 1st 0.85 days)
 - Reaeration ~ 1.7-3.4 mg/L in 0.85 days

Other, Indirect Evidence of Organic Matter - Total Suspended Solids

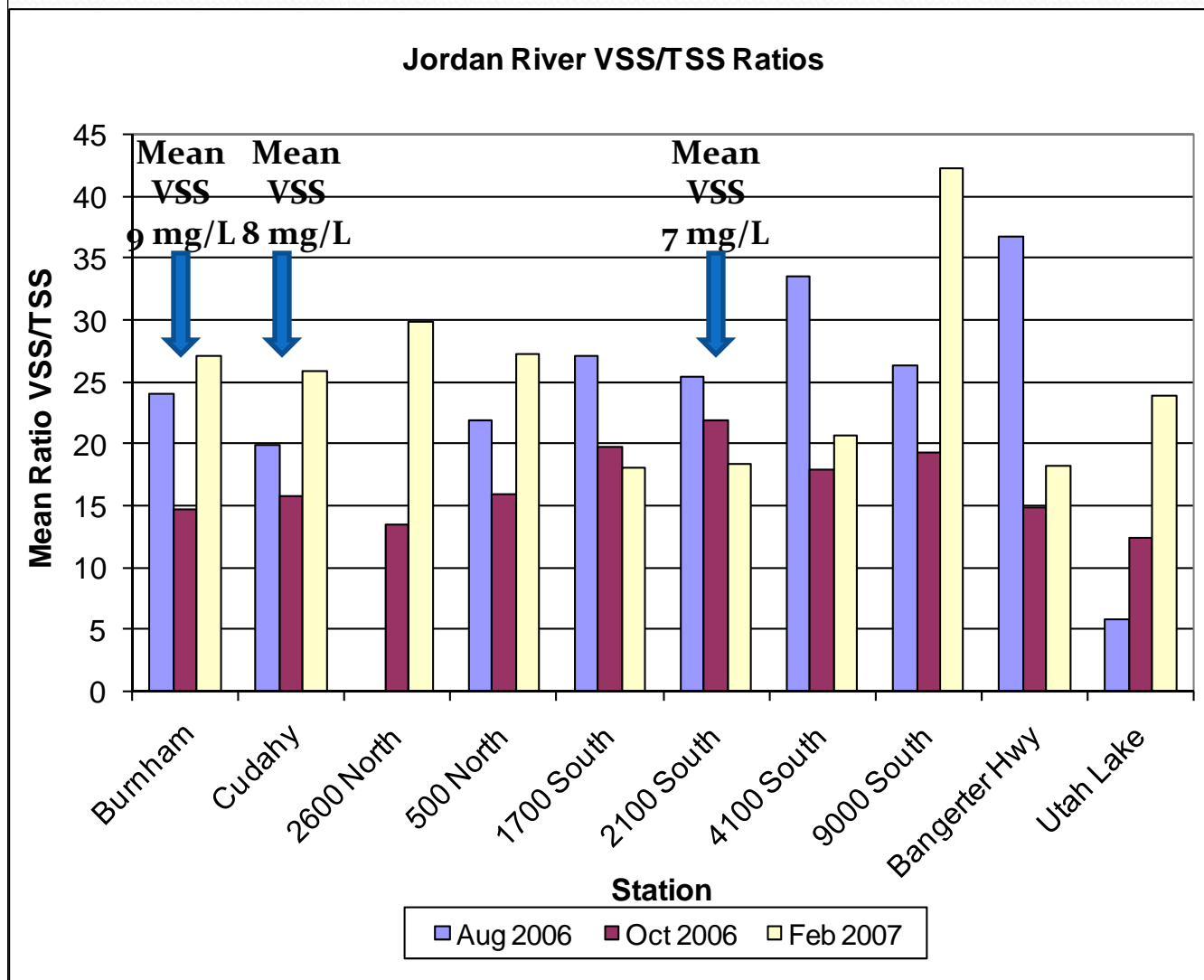


TSS 1995-2005:

- 2100 South = 31.4 mg/L
- Cudahy Lane = 38.2 mg/L

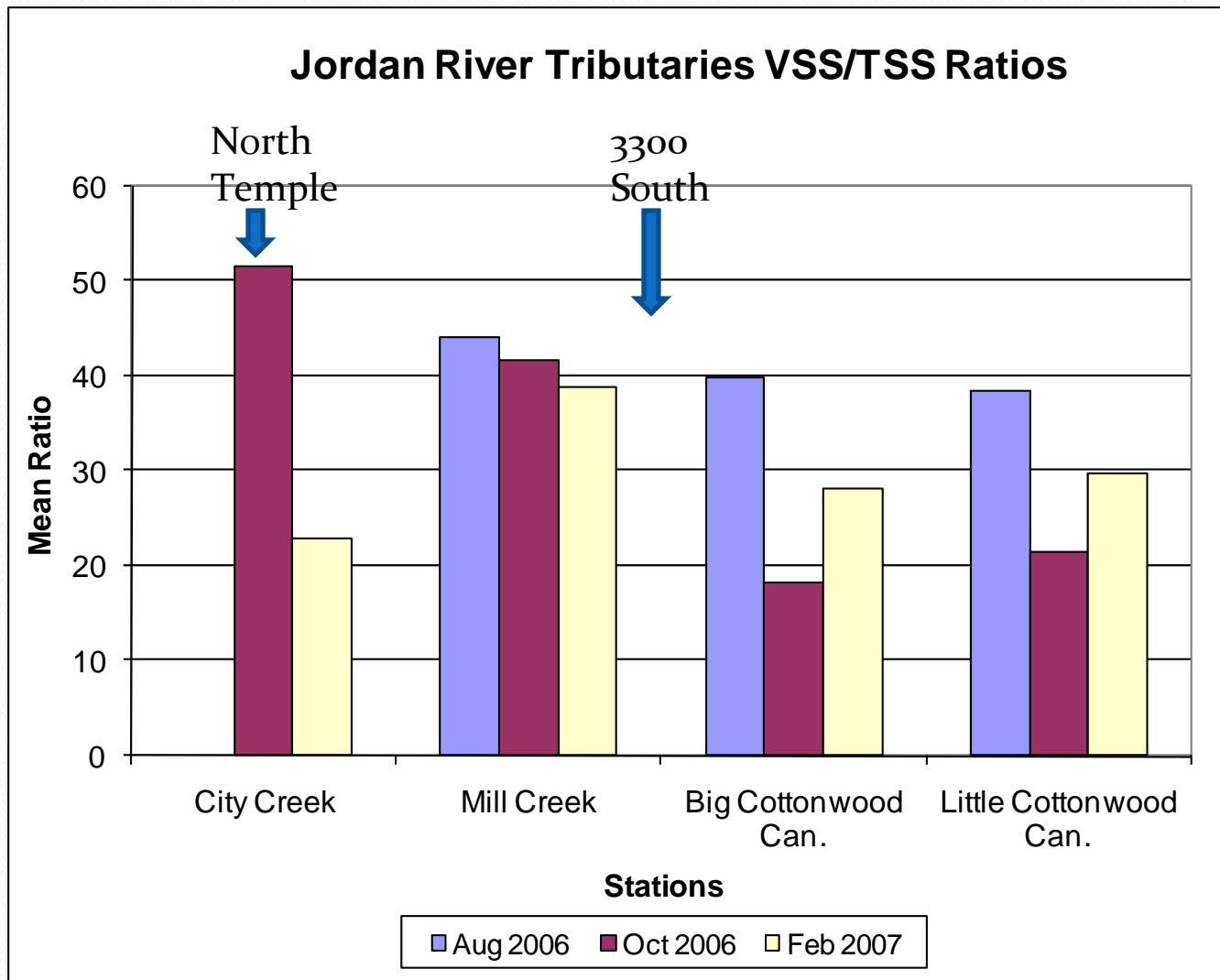
Figure 24. Mean concentrations of TSS measured at intensive monitoring locations on the Jordan River. The plot background indicates relative positions of Jordan River segments 1 (JR-1) through 8 (JR-8) with respect to monitoring locations.

VSS Measurements (n = 3)



- VSS – organic material lost when TSS exposed to heat – is 10-40% of TSS
- All increase below Utah Lake
- August – Increases, then declines below 4100 South (Cottonwoods)
- October – Same general pattern, smaller
- February – Increases at 9000 South and below 1700 South
- VSS ~ 6-22 mg/L

VSS From Tributaries



- Tributaries significant source of VSS

- 20-40% VSS

Conclusions

- BOD - Direct evidence of organic matter demanding DO for decomposition
- BOD consumes $\sim 1/2$ of reaeration below 2100 South
- VSS – Indirect evidence of organic matter demanding DO for decomposition