Are Your Sediment Data Reliable and Comparable?

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OUTLINE OF PRESENTATION

- Introduction
- Look at simple suspended sediment monitoring design.
- Look at a monitoring design using transport curve to estimate sediment loads.
- Discuss ways to reduce inherent errors.

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INTRODUCTION

- Sediment and sediment transported pollutants are a leading cause of stream reaches being listed on the 303d list.
- TMDL implementation requires estimating current sediment load, sometimes by size class, and determining reductions in these loads to meet designated uses.
- Major errors can be introduce by the design of a sediment monitoring program, thus drastically effecting the recommendations for load allocations.

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Design of Sediment Monitoring Program #1

- Install automatic pumping sampler with intake in the bank of the stream
- Collect pumped samples throughout the rise and recession of the hydrographs
- Analysis using EPA 160.2 or Standard Methods TSS laboratory analysis to determine total suspended solids concentration.

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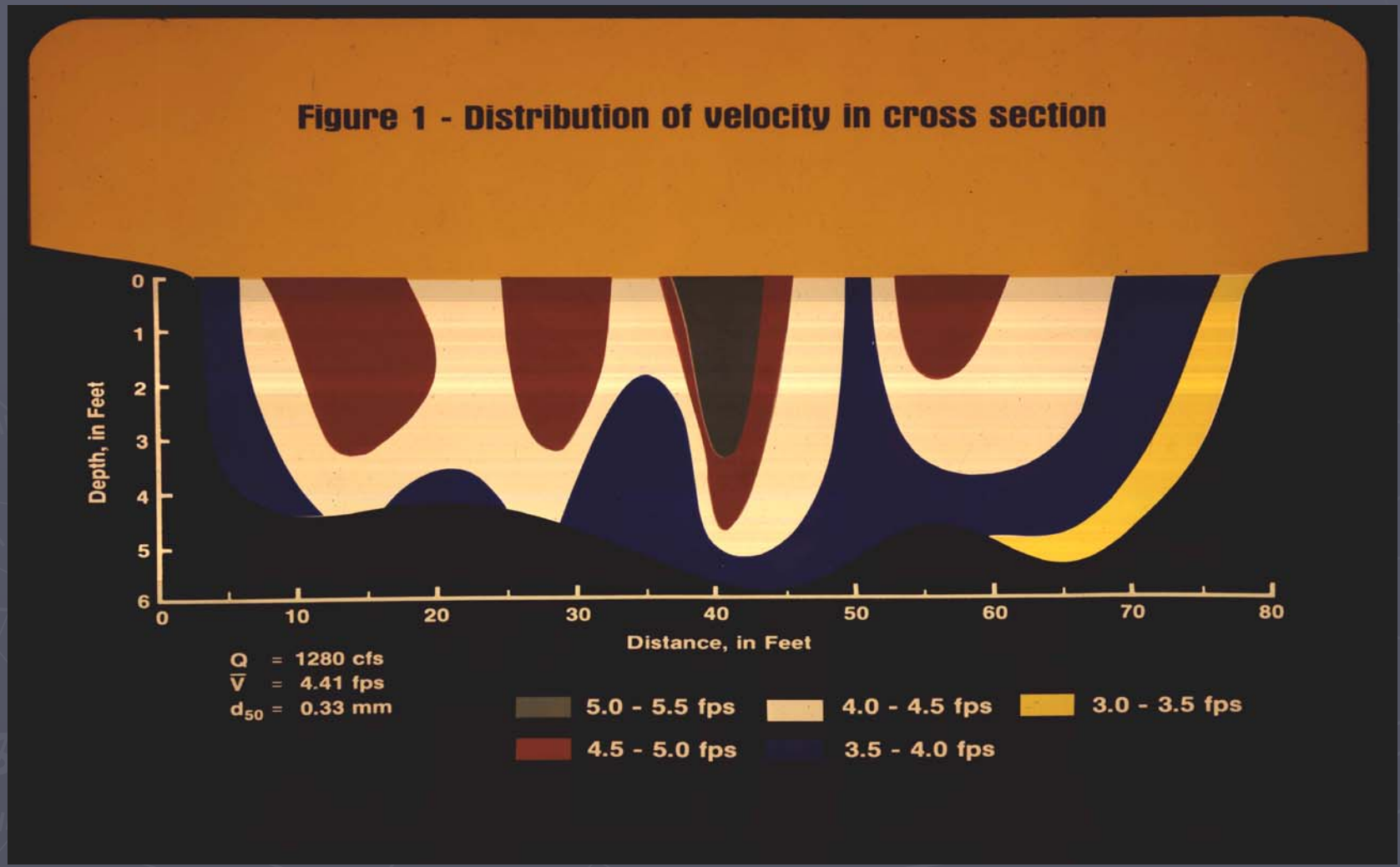
Actual Cross Section Data



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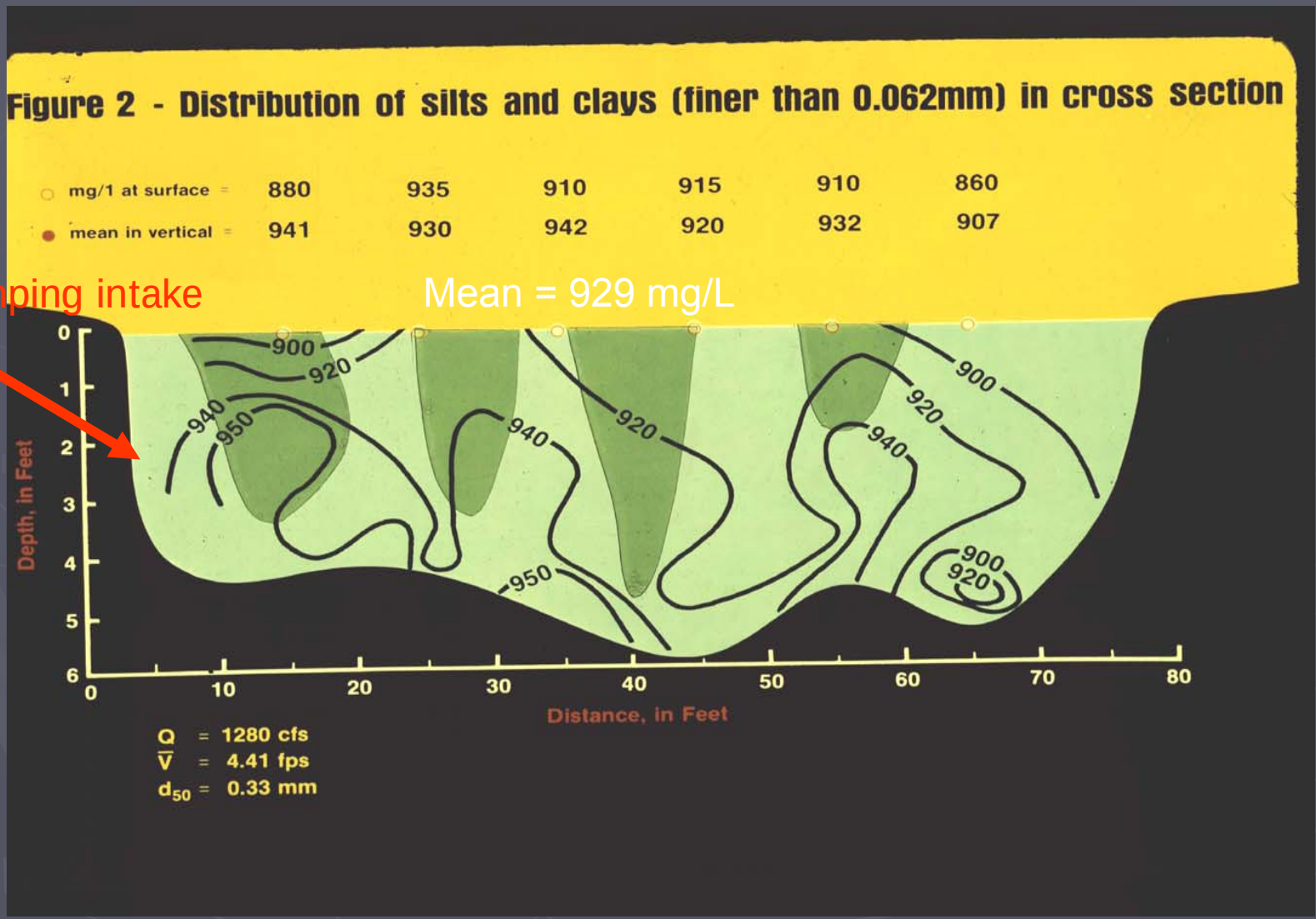
Distribution of sediment



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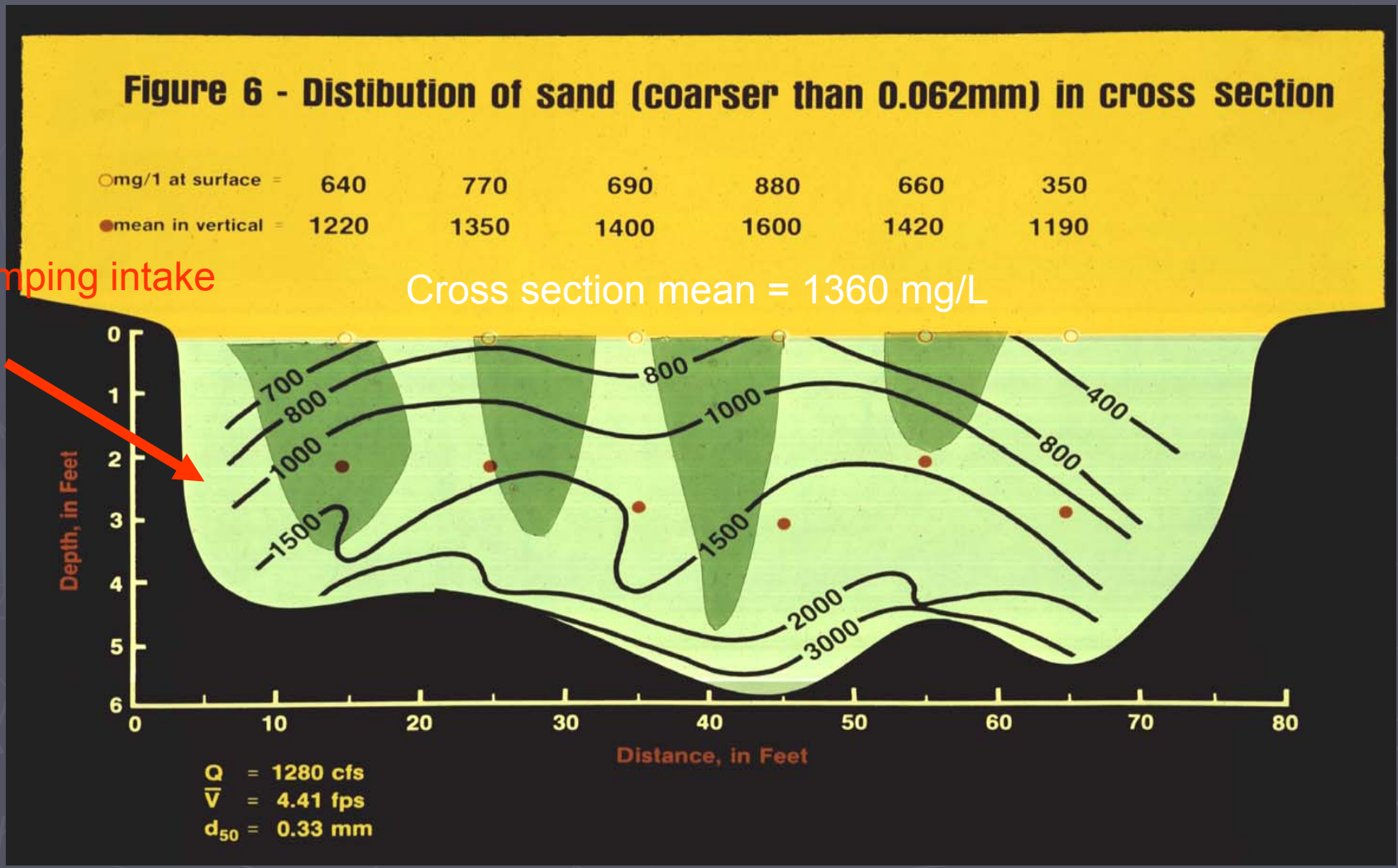
Distribution of sediment



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Error in Pumped Sample Collection

- Concentration in Sample

  930 + 800 = 1730 mg/L

- Mean Con. in cross section

  929 + 1360 = 2290 mg/L

Percent of mean actually sampled =

1730 / 2290 = **76%**

24% not collected during sampling

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TSS Analysis

- If TSS analysis is used to determine suspended sediment concentration.

- From previous investigations

  TSS = 0.92(SSC) – 116

  TSS = 0.92 (1730) – 116 = 1480 mg/L

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Total error in sample data

- Actual mean concentration in cross section 2290 mg/L

  Concentration obtained 1480 mg/L

Final concentration, percent of actual mean

1480 / 2290 = **65%**

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Design of Sediment Monitoring Program #2

- Collect dip samples from the center of flow during peaks and recessions.
- Analysis using EPA/Standard Methods TSS laboratory analysis for determining suspended sediment concentration.
- Compute loads using sediment transport curve.

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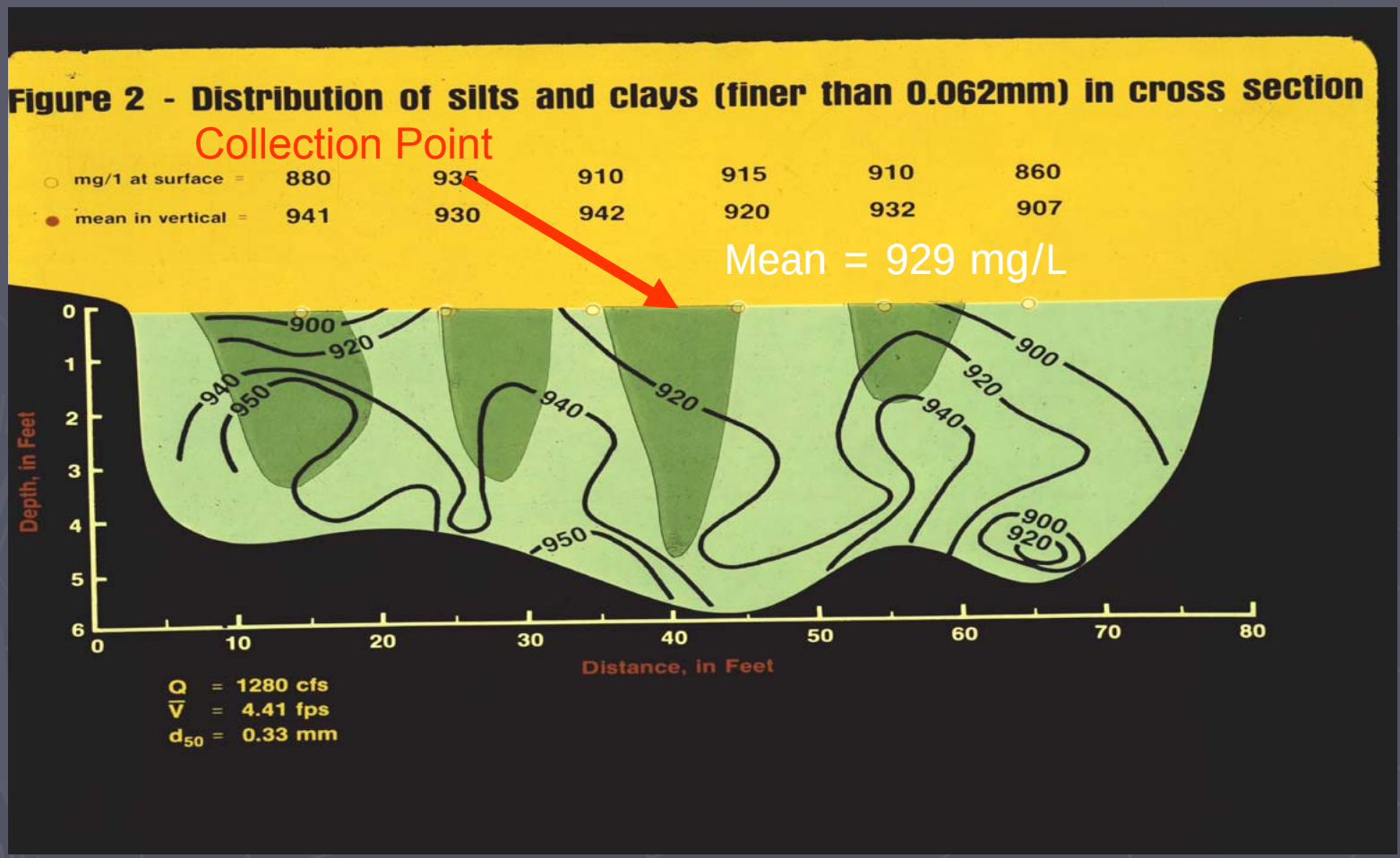
Distribution of sediment



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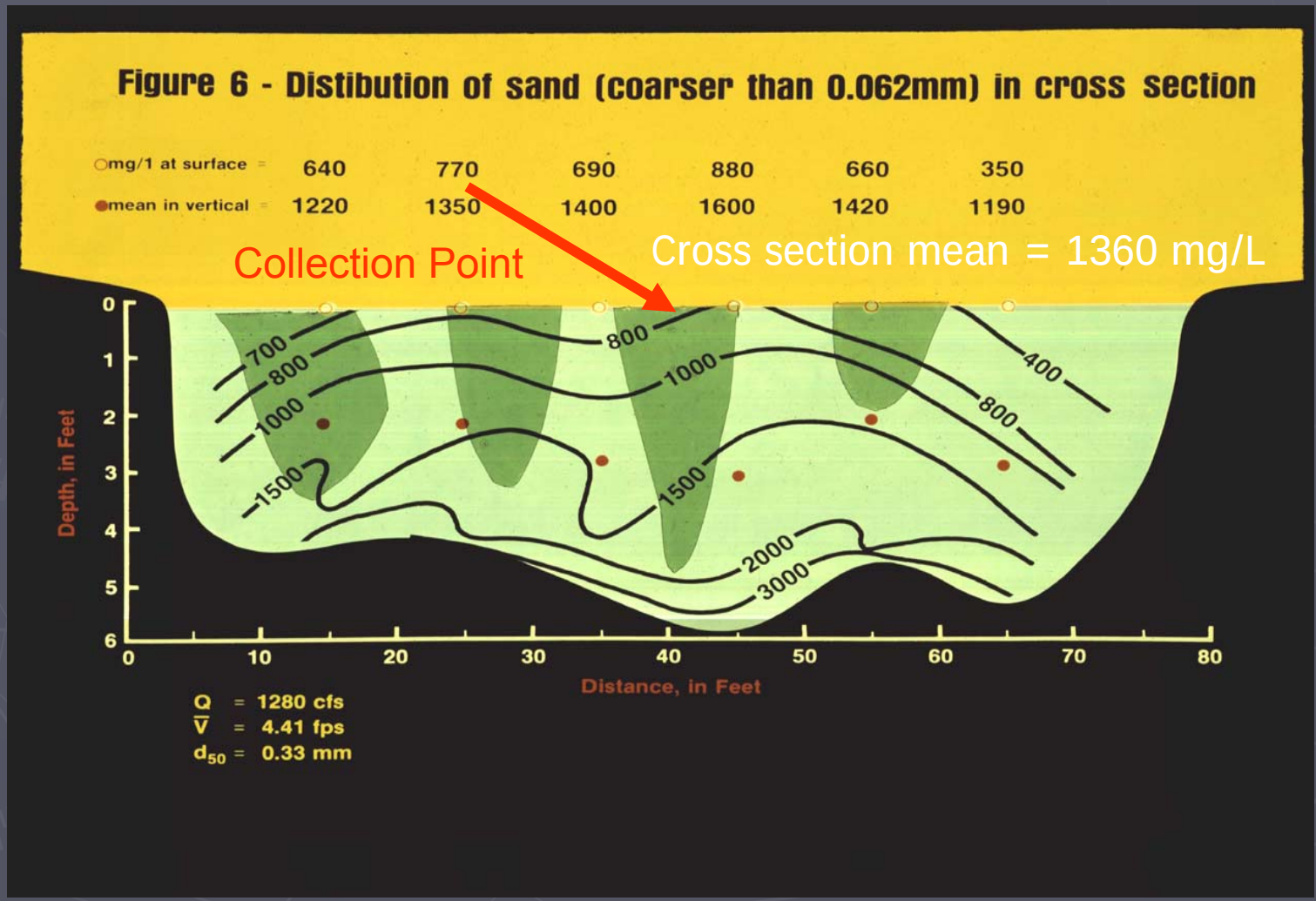
Distribution of sediment



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Error in Dip Sample Collection

- Concentration in Sample

  913 + 785 = 1690 mg/L

- Mean Con. in cross section

  929 + 1360 = 2290 mg/L

Percent of mean actually sampled =

1690 / 2290 = **74%**

26% not collected during sampling

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TSS Analysis

- If TSS analysis is used to determine suspended sediment concentration.

TSS = 0.92 (1680) – 116 = 1430 mg/L

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Total error in sample analysis

- Sampled concentration in cross section — 1680 mg/L
- Concentration obtained using TSS analysis — 1430 mg/L

Concentration, percent of sampled mean

1430 / 1680 = **85%**

15% reduction in concentration do to analysis method

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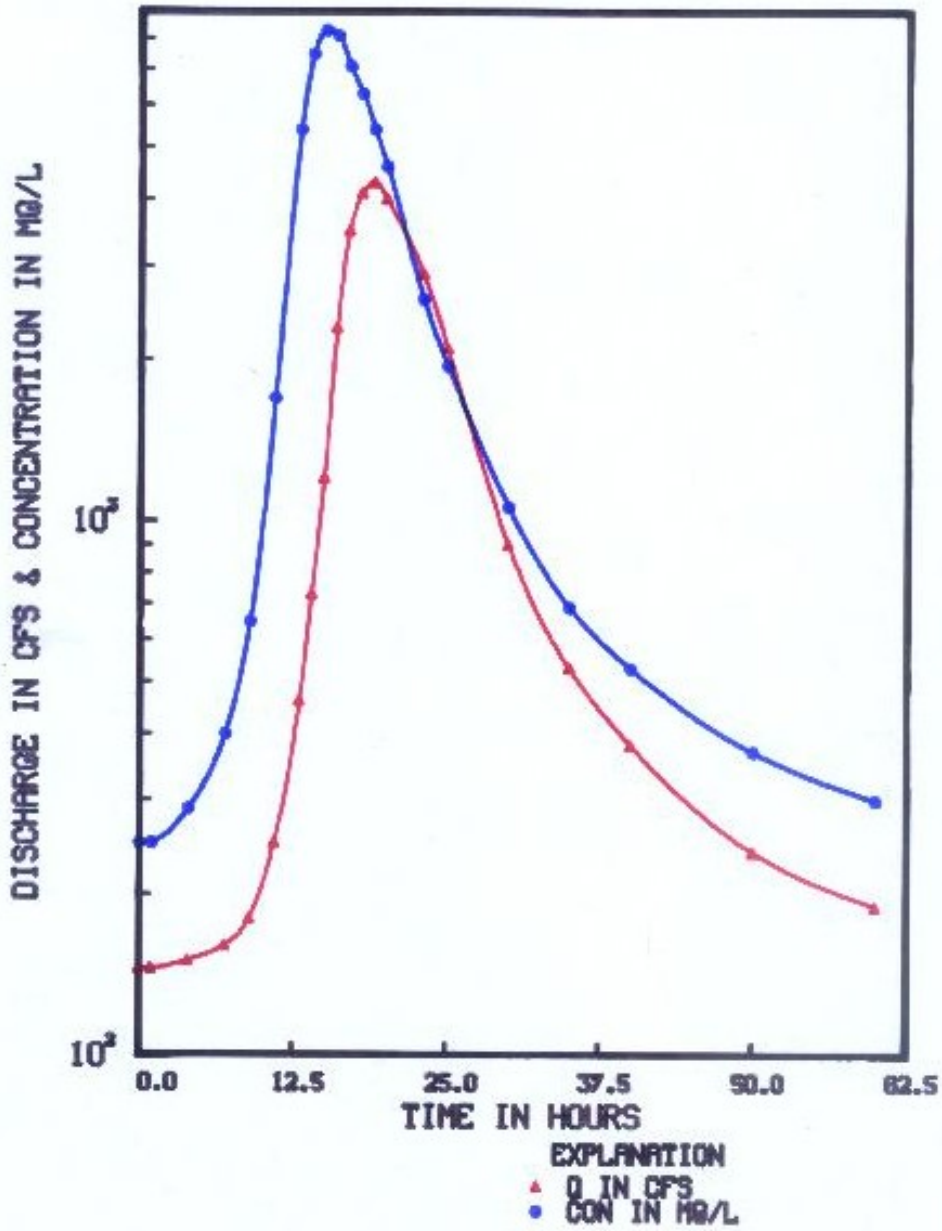
ADVANCED SEDIMENT PEAK



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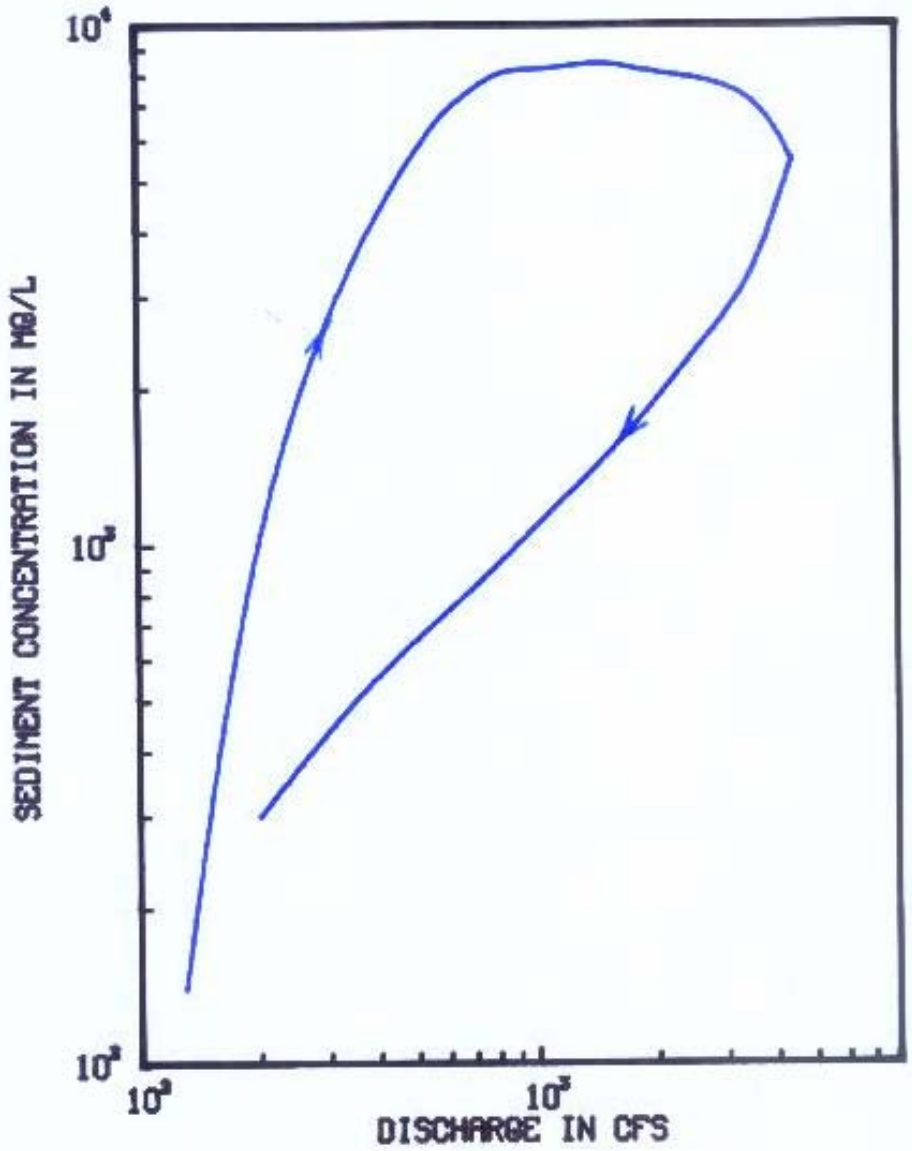
SEDIMENT TRANSPORT CURVE
ADVANCED SEDIMENT PEAK



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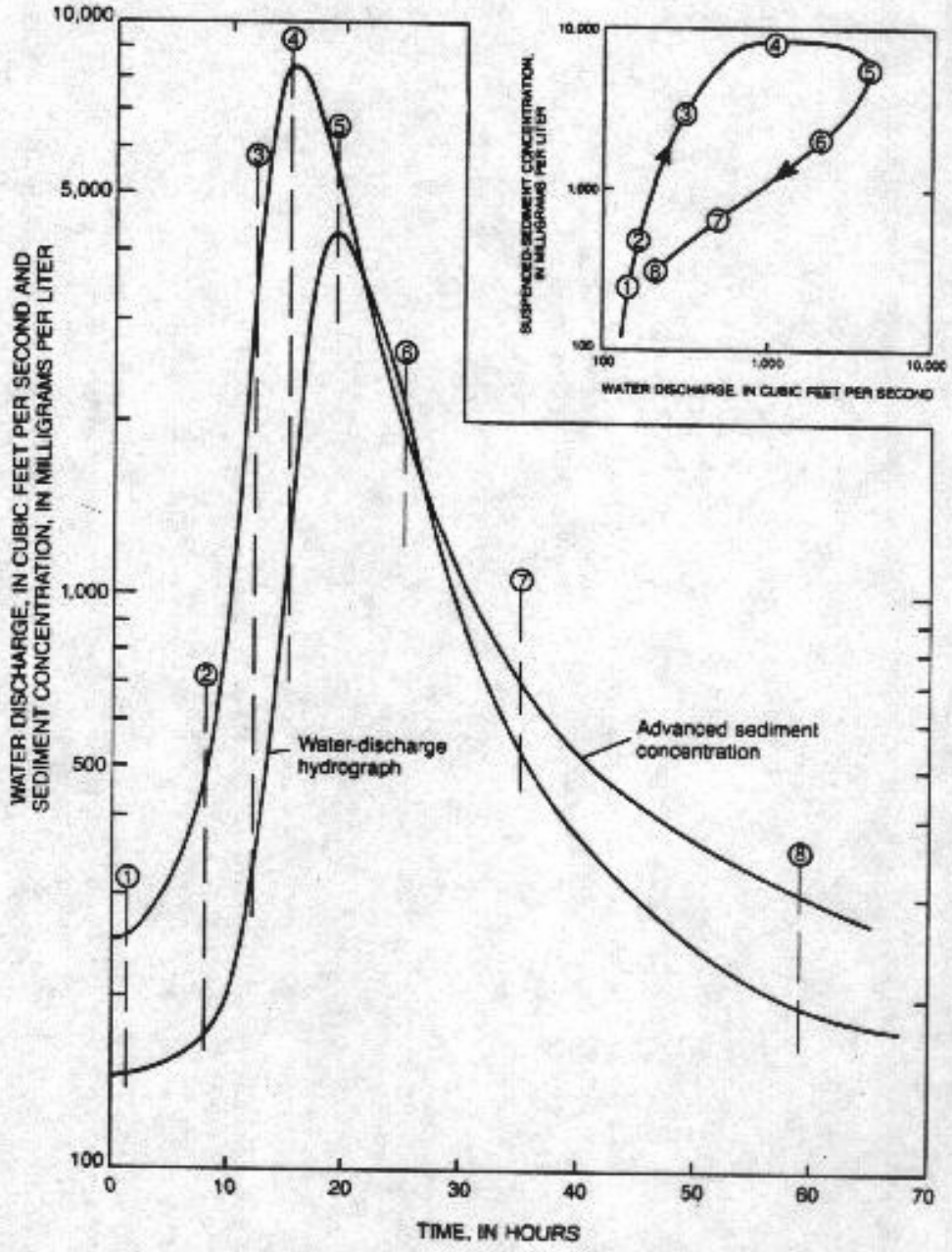

Sediment concentration peak preceding the water discharge peak.

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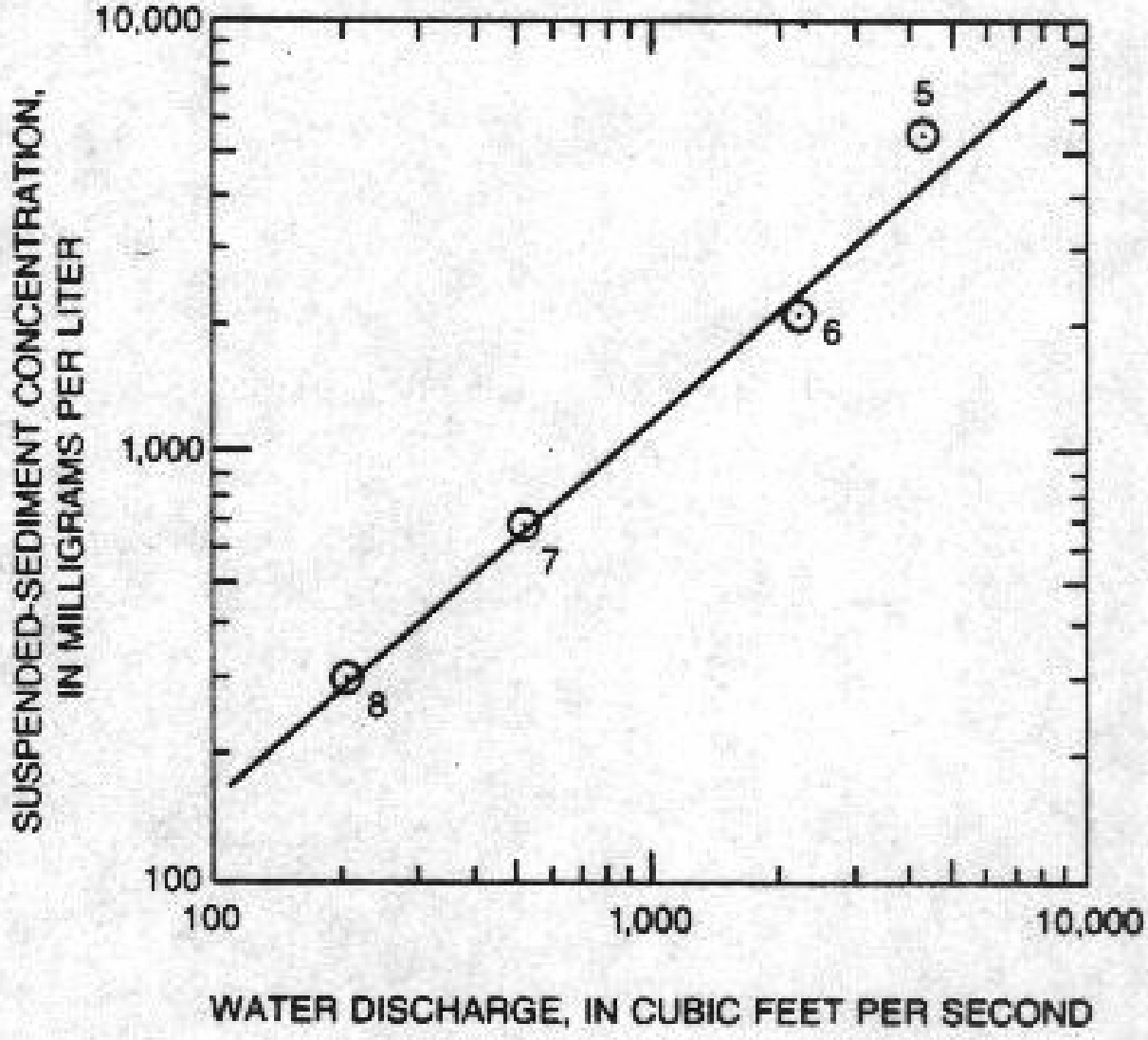

Figure 7.--Sediment-tra sport curve based on recession samples for a site where the sediment concentration peak precedes the water discharge peak (see fig. 5).

Differences in Load Estimates

in Tons

DAY	Hydrograph	Transport Curve
1	325,000	244,000
2	84,600	84,600
Total	409,600	328,600
Error		-20%

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Potential Errors

Source of error	Error %	Cumulative Error %
Sampling	- 24	
Analysis	-15	-38
Transport curve	-20	-58
Total possible error		-58

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Solutions

- Pumped or single vertical samples must be correlated to mean sediment concentration in the stream by collecting depth and width isokinetic samples.
- Use ASTM D-3977 standard for analysis of samples for suspended sediment concentration.
- Collect samples over the entire hydrograph covering all stages and seasons.

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Thank You

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