LISST-SS
—test results and issues—

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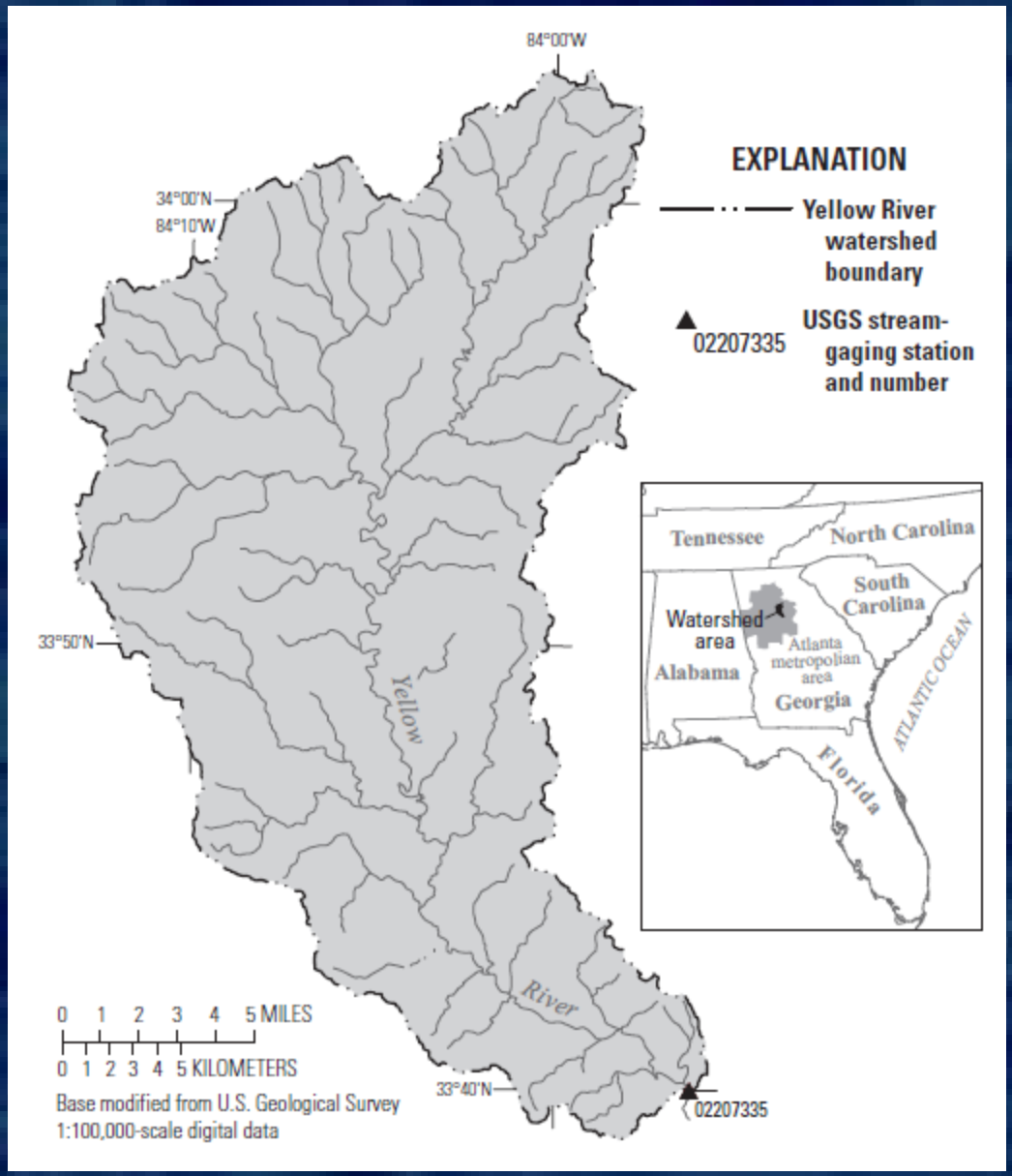
LISST WEB-EX

water.usgs.gov/fisp

Yellow River at Gees Mill Road near Metro Atlanta, GA, 02207335



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Yellow River at Gees Mill Road near Metro Atlanta, GA, 02207335

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Yellow River at Gees Mill Road near Metro Atlanta, GA, 02207335

Yellow River at Gees Mill Road near Metro Atlanta, GA

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Laboratory analysis for mass concentration and percent finer than 63μm (251+ samples)

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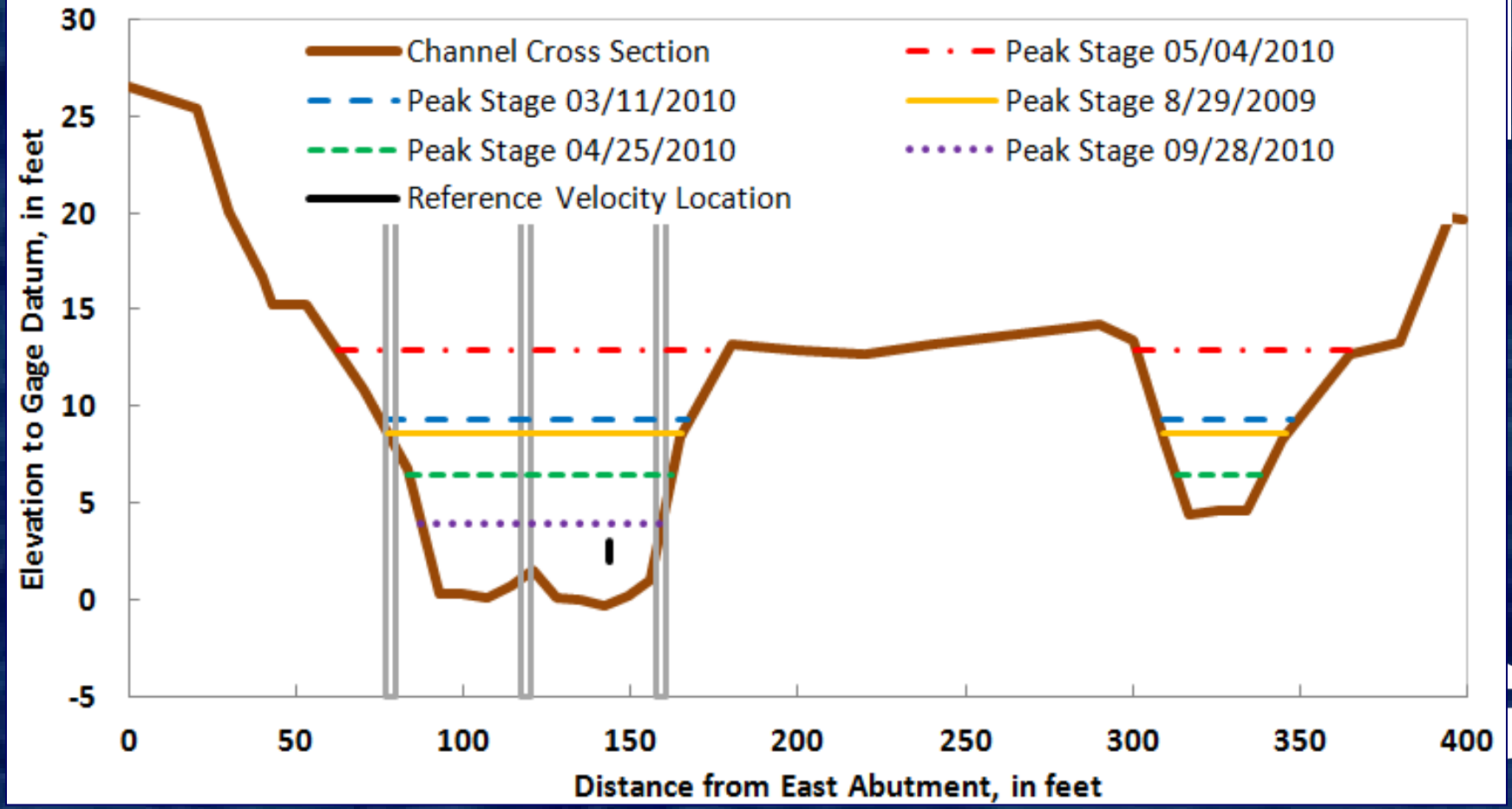
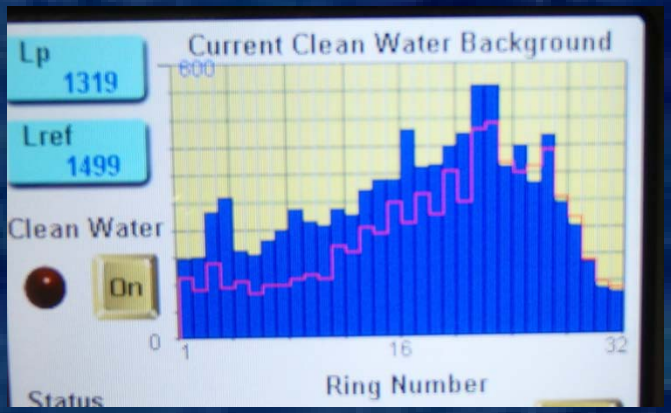
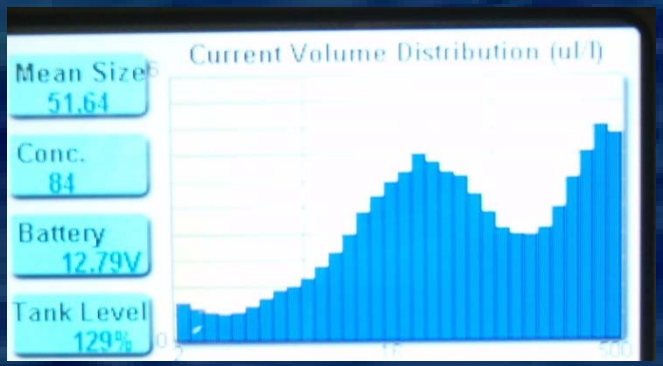
Yellow River at Gees Mill Road near Milton, GA, 02207335 Sept 23, 2009

Event Begin Date	8/28/2009	3/10/2010	4/24/2010	5/3/2010	9/27/2010
Start and End Time, Month/Day	01:00 08/28 12:00 09/02	13:00 03/10 13:00 03/15	14:00 04/24 04:00 04/27	04:00 05/03 00:00 05/06	14:00 09/27 12:00 10/01
Peak Flow, cfs	1800	2640	1270	5070	368
Peak Stage, feet	8.56	9.36	6.43	12.85	3.89
Total Precipitation, inches	2.67	2.33	1.49	2.23	2.18
Total Runoff, inches	0.58	0.86	0.26	1.16	0.15
Event Duration, days	5.5	4.0	2.6	2.8	3.9

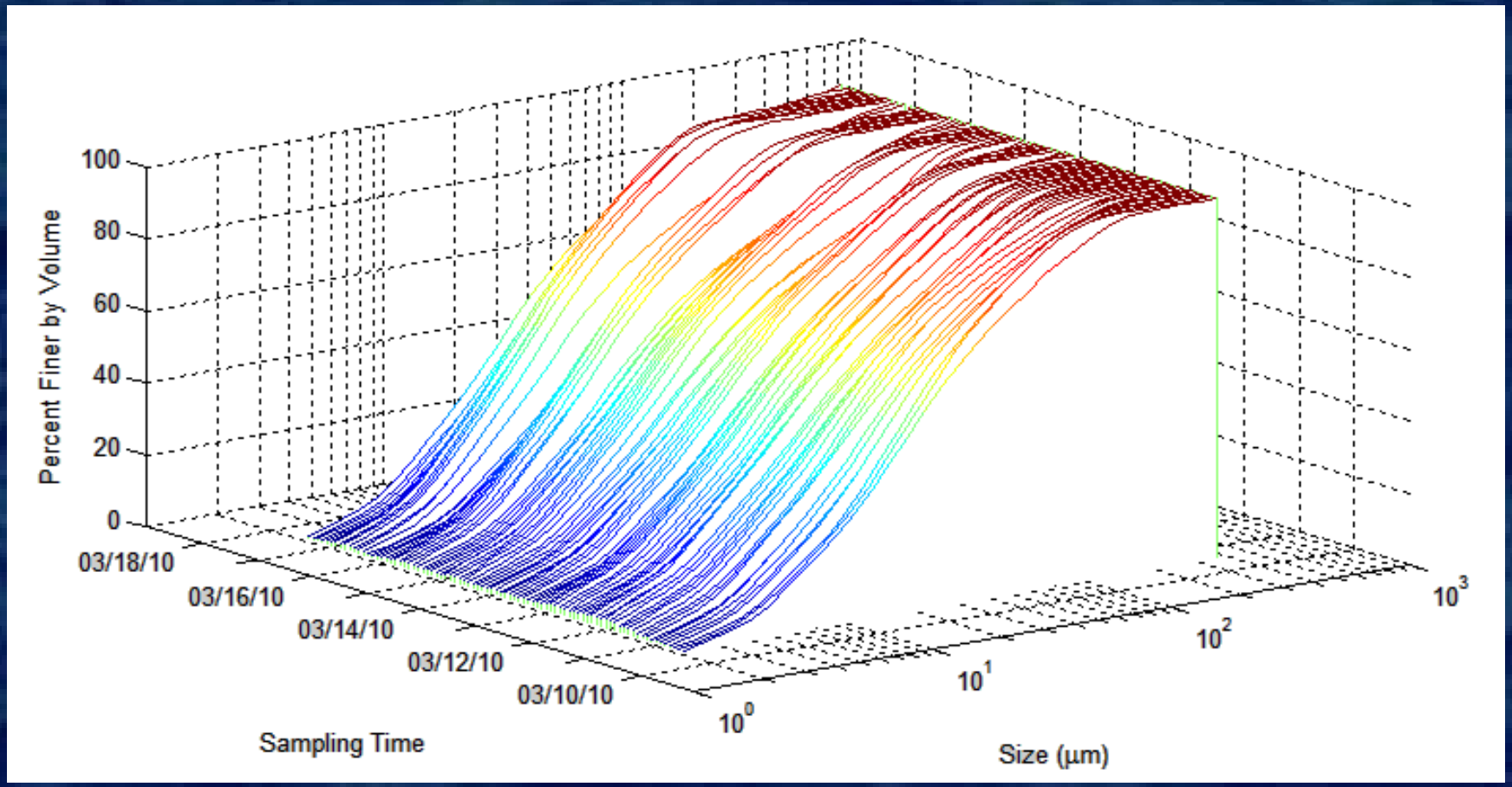


Laser-Diffraction Surrogates of SSC





Laser-Diffraction Surrogates of SSC Particle Size Distribution Time Series



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Laser-Diffraction Surrogates of SSC Particle Size Distribution

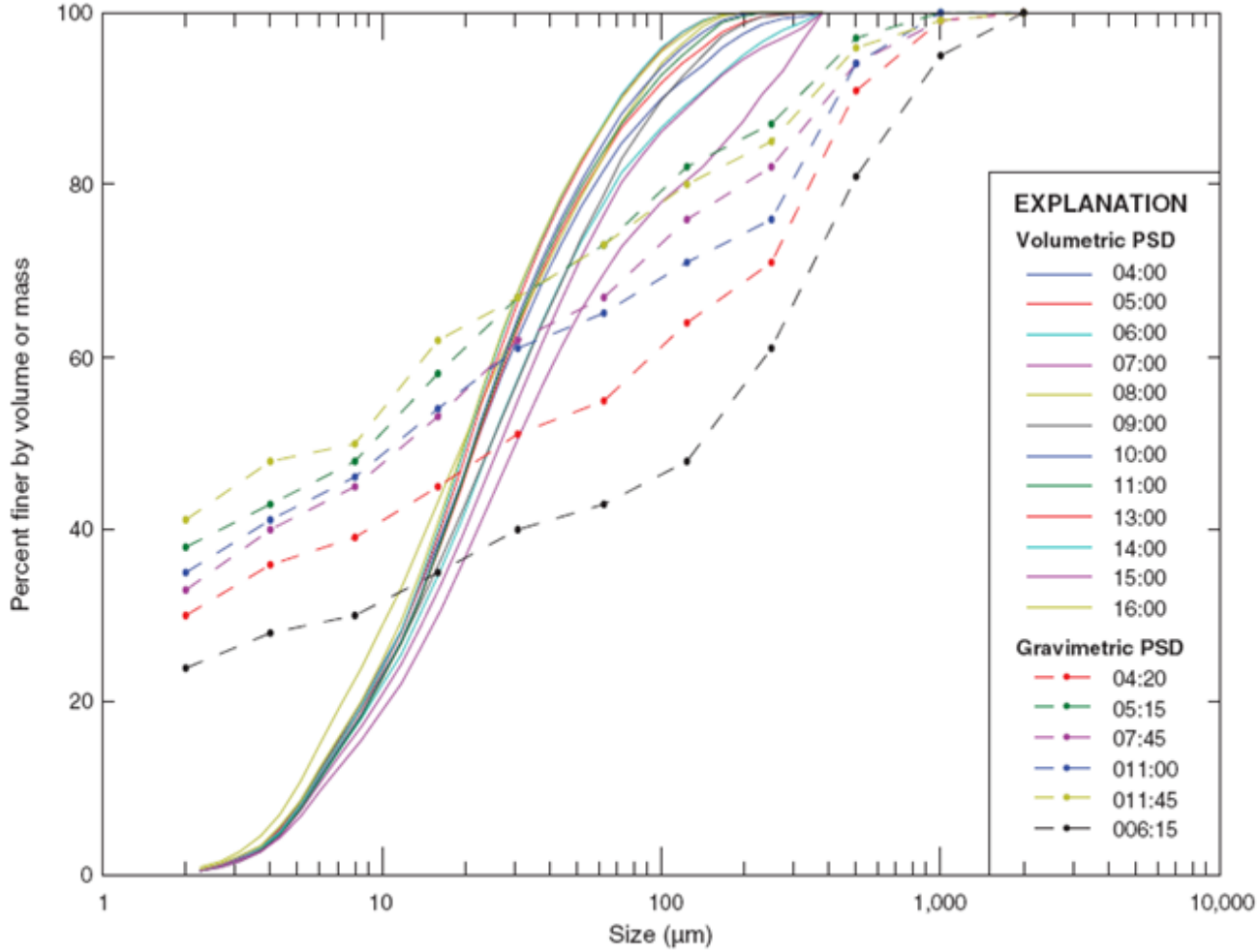

Figure 5.30 - Laser-diffraction volumetric and physical sample gravimetric particle size distributions, Yellow River at Gees Mill Road, April 25, 2010

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Laser-Diffraction Surrogates of SSC Particle Size Distribution

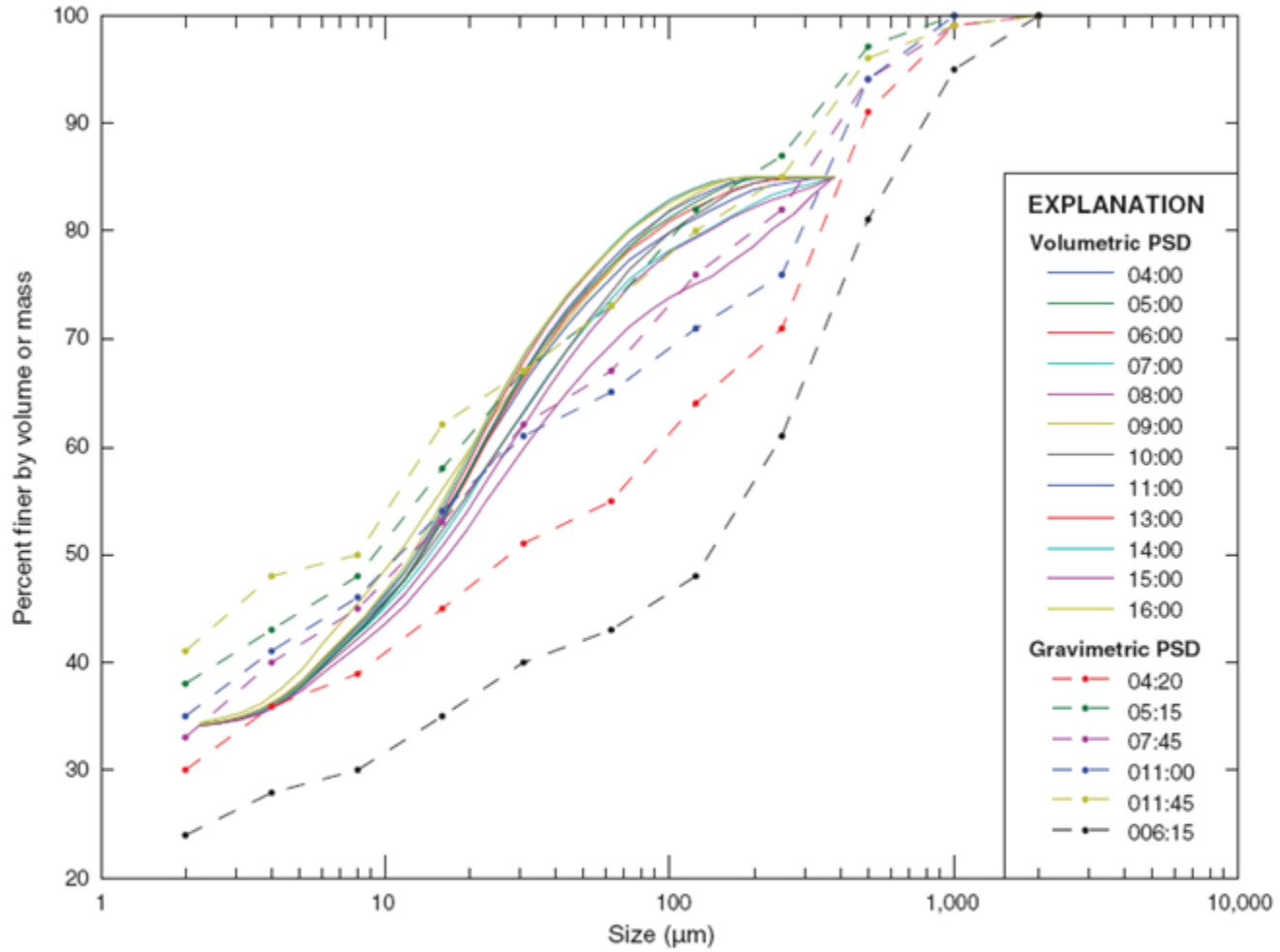

Figure 5.31 – Adjusted laser-diffraction volumetric and physical sample gravimetric particle size distributions, Yellow River at Gees Mill Road April 25, 2010

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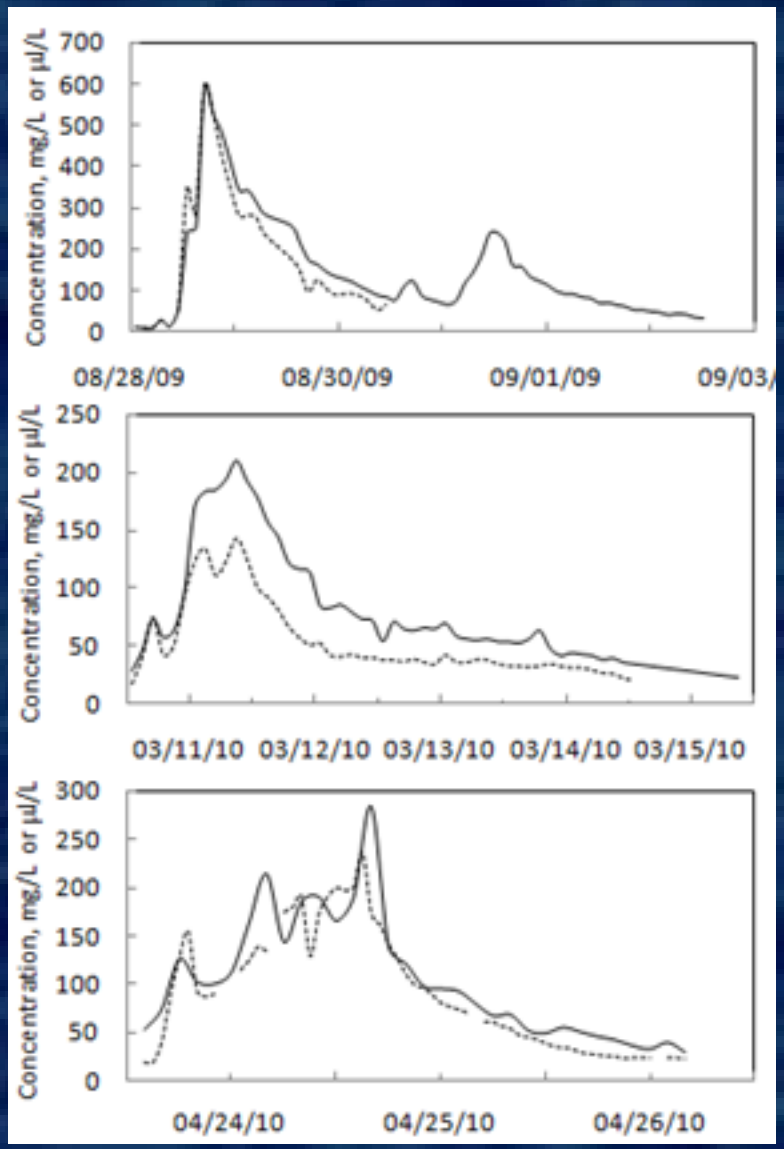
Laser-Diffraction Surrogates of SSC

Time series of cross section mass SSC_{XSEC} in mg/L (solid line) and fixed-point volumetric particle concentration in µl/L (dashed line)



	Ratio SSC to VPC	
Min:	2.45	
1st Qu.:	1.41	
Mean:	1.11	not = 2.65
Median:	1.12	
3rd Qu.:	0.94	
Max:	0.69	
Total N:	266	
NA's :	72	

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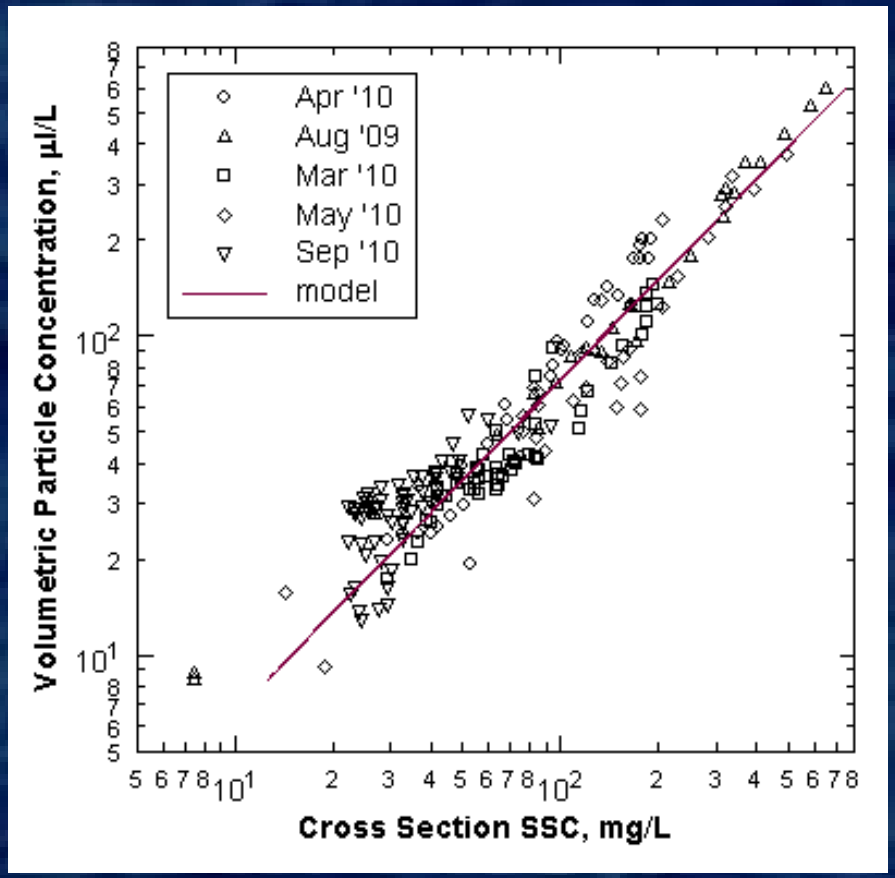
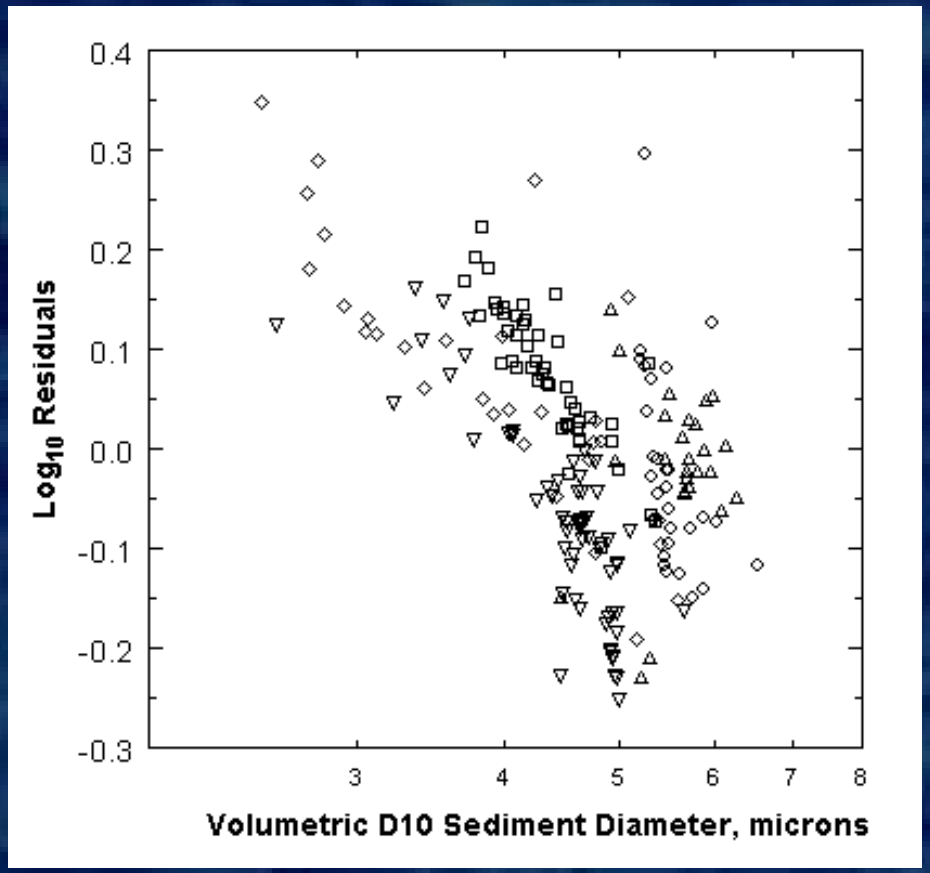
Laser-Diffraction Surrogates of SSC





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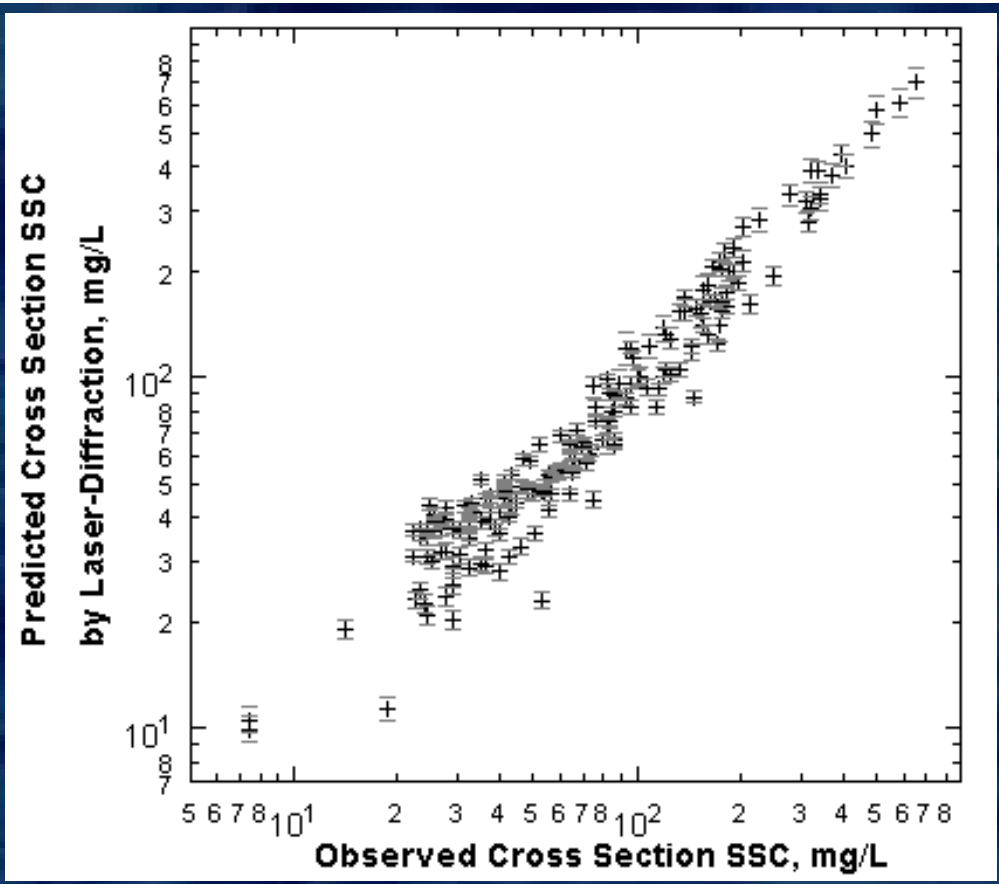
Laser-Diffraction Surrogates of SSC

Explan-atory Variables	R^2	DF	Res Std Err	Res Std Err %	R^2_{pred}	Linear Regression Model
VPC	0.90	192	0.115	30	0.90	$SSC_{XS} = 1.640\ VPC^{0.957}$
VPC D10	0.94	190	0.093	24	0.94	$SSC_{XS} = 5.221\ VPC^{1.010}\ D10^{-0.902}$



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Conclusions re: Laser-Diffraction as a Surrogate of Suspended Sediment Concentration

- High-temporal resolution volumetric PSD data are uniquely valuable to infer dynamic sediment source and transport conditions; and to evaluate other surrogates
- Synergy of surrogate metrics is valuable.
- Laser-diffraction size detection limits are a significant limitation for measurement of environmental VPC and SSC
- Dynamic PSD outside measured range means variable VPC~SSC
- Volumetric PSD data (i.e. D10, D90) can be used to adjust for unmeasured fractions
- For LISST-Streamside, “VPC” is not true volumetric particle concentration.

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Conclusions re: Laser-Diffraction as a Surrogate of Suspended Sediment Concentration

- Fluvial suspended sediment concentration can be determined by high-resolution laser-diffraction metrics with much greater accuracy than using traditional SSC ~ streamflow discharge ratings. R^2 improved from 0.57 to 0.94; and model residual standard error improved from 73% to 24%.

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