

South River TMDL Update

April 7, 2008

Point Sources

HSPF : Hydrologic Model

HSPF : Sediment Model

Jack Eggleston



Robert Brent



Point Source Summary

Point Sources in Model Facility name, downstream order	Model Reach	NPDES Permit	River Mile	1984-2007 Annualized			April 1, 2005 - March 31, 2007, Annualized		
				Average Disch. (cfs)	Sediment Load (Ton)		Average Disch. (cfs)	Total Sediment Load (Ton)	Total HG Load (g)
Stuarts Draft WWTP	1	VA0066877	38.9	1.686	3.7	1.1	1.671	1.5	1.1
Loth Spring	2	na	25.6	1.760	1.5	6.4	1.756	1.5	6.4
INVISTA/ former DuPont	-	-	25.0	14 (total)	29 (total)	325 (total)	15 (total)	31 (total)	561 (total)
outfall 001	2	VA0002160	"	4.816	12.4	142.5	6.523	17.2	402.9
outfall 003	2	VA0002160	"	0.066	0.4	2.9	0.066	0.4	2.8
outfall 004	2	na	"	0.014	0.4	0.5	0.014	0.3	0.5
outfall 008	2	na	"	0.375	4.5	87.1	0.374	4.2	89.0
outfall 009	2	na	"	0.137	1.0	10.1	0.111	0.8	8.1
outfall 010	2	na	"	0.050	2.3	10.2	0.040	1.9	8.2
outfall 011 (after 08/02)	2	VA0002160	"	0.011	2.1	44.1	0.002	0.4	21.8
outfall 012	2	na	"	0.001	0.0	0.0	0.000	0.0	0.0
outfall 013	2	na	"	0.003	0.0	0.1	0.007	0.0	0.3
outfall 014	2	na	"	0.003	0.0	0.1	0.005	0.0	0.3
Frew Pond, Baker Spring	2	na	"	7.911	5.9	25.5	7.025	5.9	25.4
Plant Site GW Discharge	2	na	"	0.501	0.0	1.5	0.501	0.0	1.5
Waynesboro WWTP	2	VA0025151	23.5	5.245	38.5	35.4	5.497	42.2	37.1
Genicom	3	VA0002402	21.9	0.141	0.0	0.0	0.196	0.0	0.0
Alcoa	5	VA0001767	4.4	2.845	19.6	46.5	2.486	12.7	40.6
Totals				25.554	90.1	369.9	26.272	88.6	646.1

- Revised from last meeting based on:
 - Corrected error
 - Allocation period

Legend

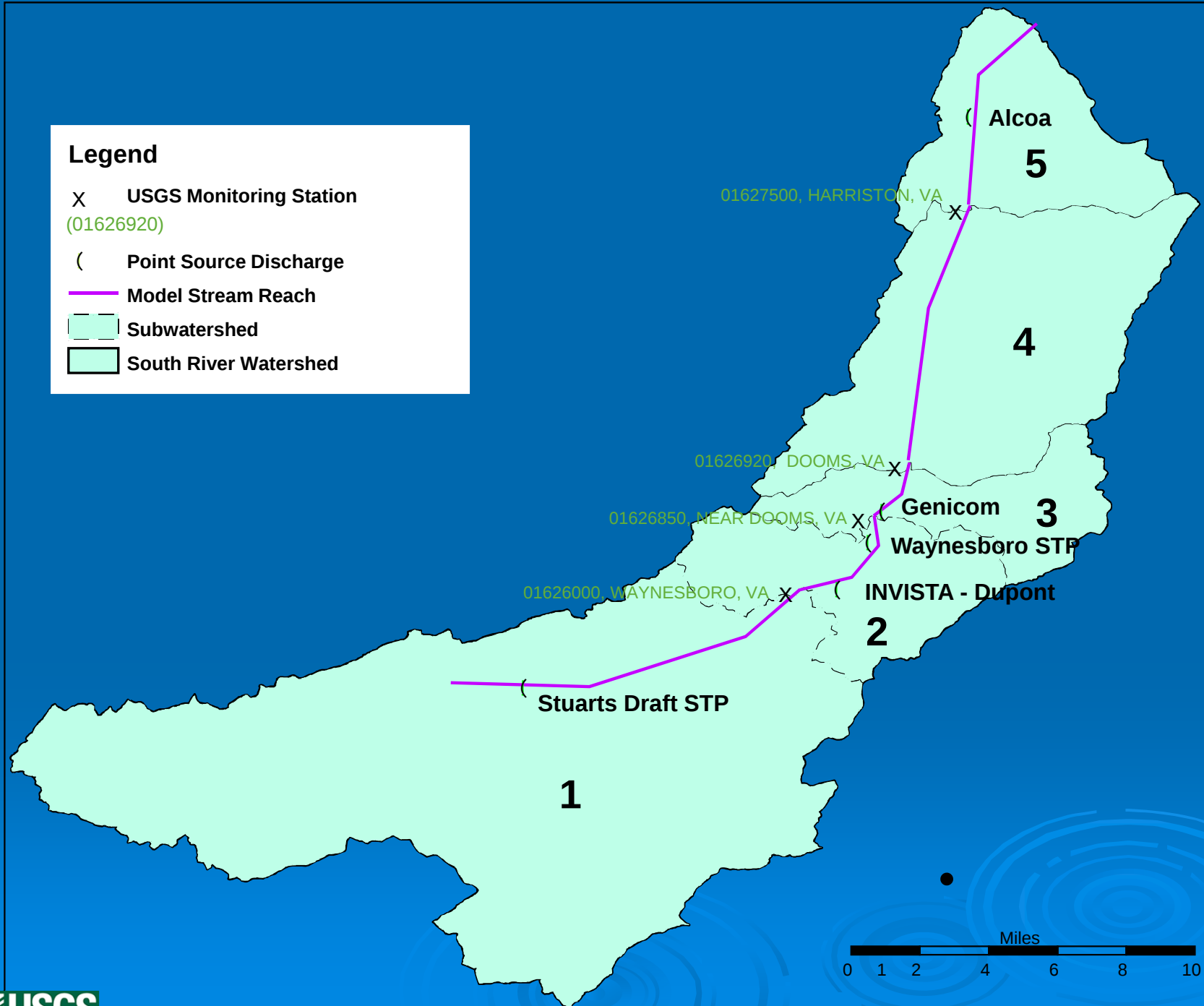
X USGS Monitoring Station
(01626920)

(Point Source Discharge

Model Stream Reach

Subwatershed

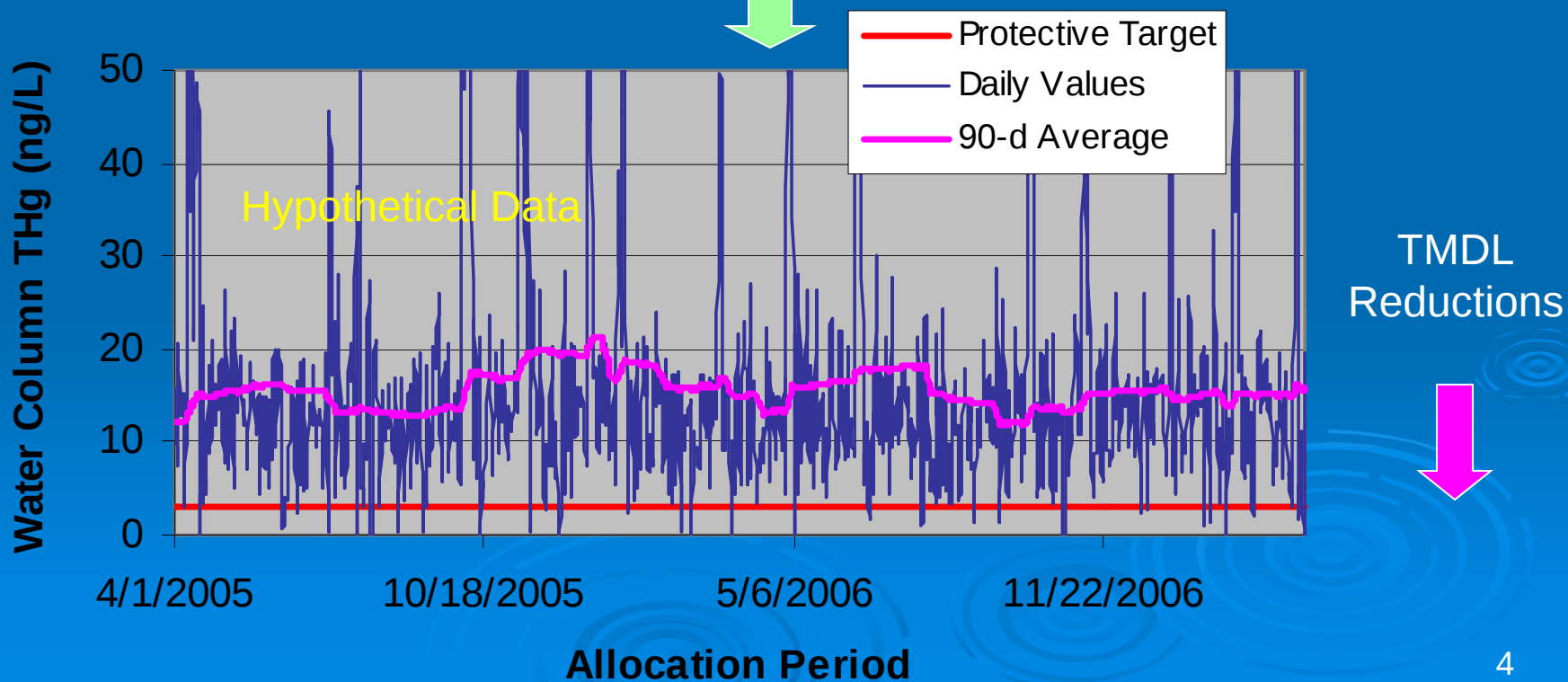
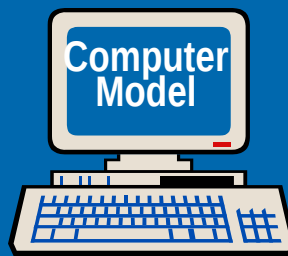
South River Watershed



Use of Point Source Data in the Model :

Daily Point Source Loads

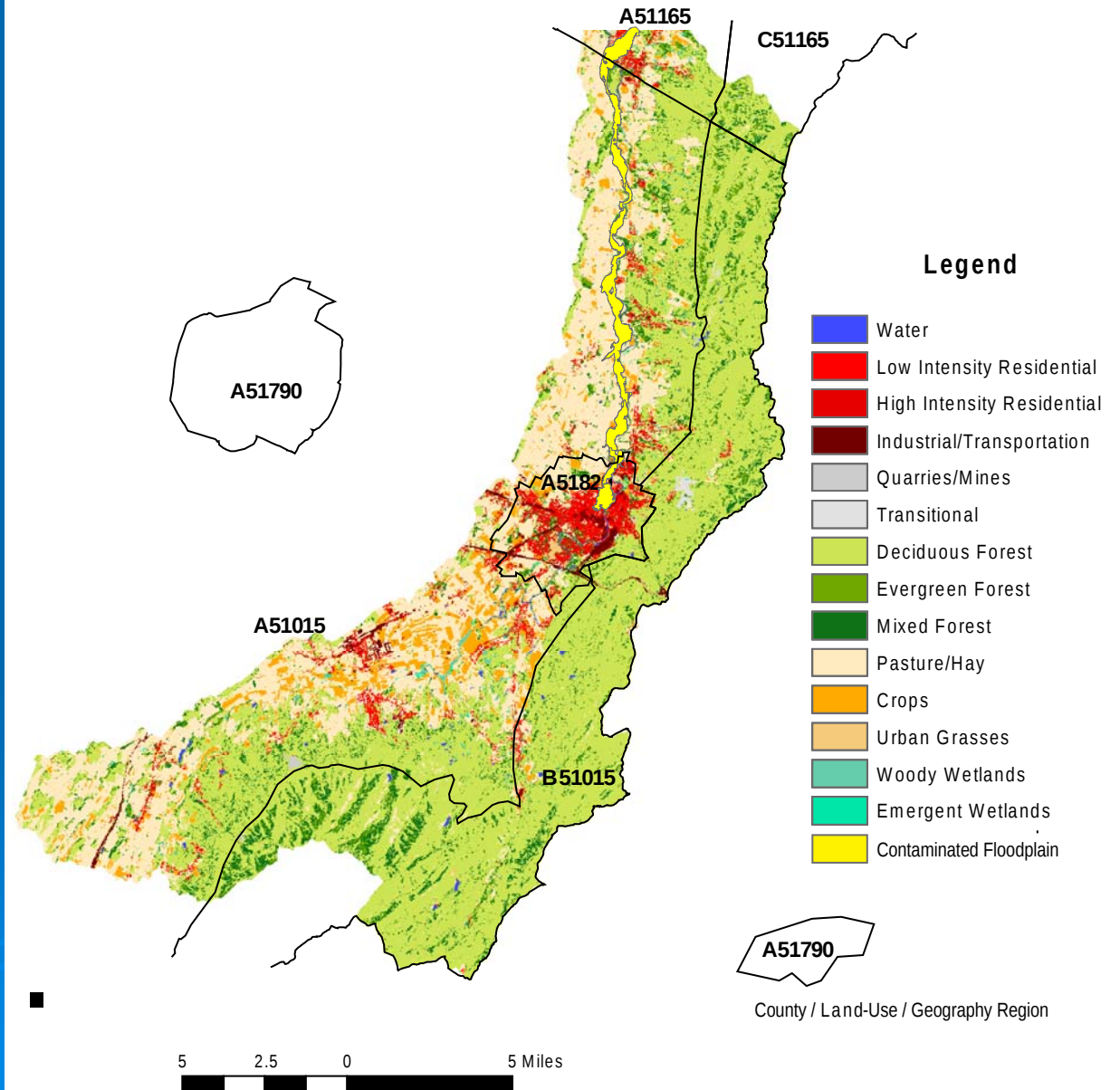
Loads From Other Sources



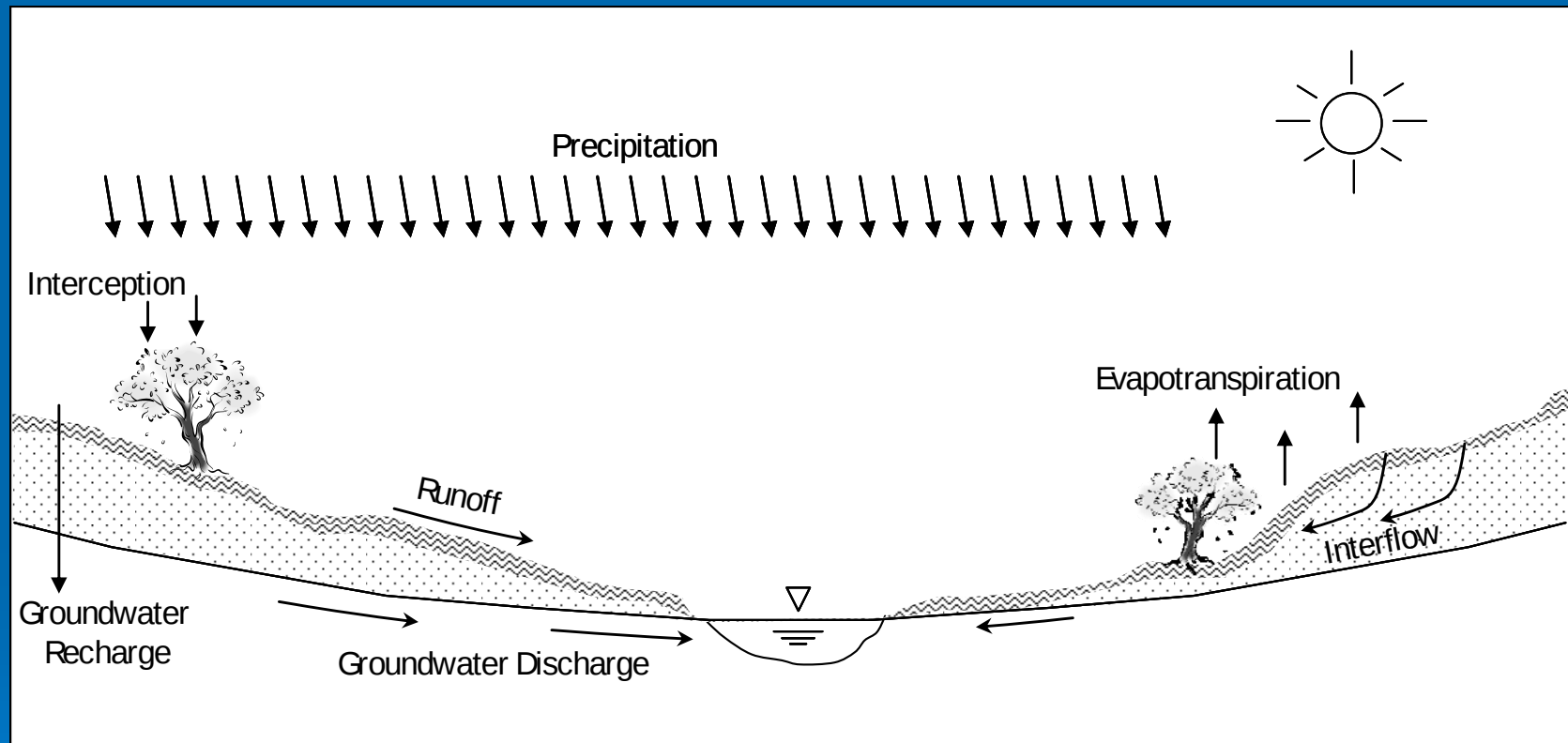
Hydrologic Response Units in Model :

Determined by :
Land Use
County
Geography

26 land use categories
5 county/geography
regions = 130 HRUs



Major Hydrologic Processes Simulated in the Model



Major Sediment Processes Simulated in the Model

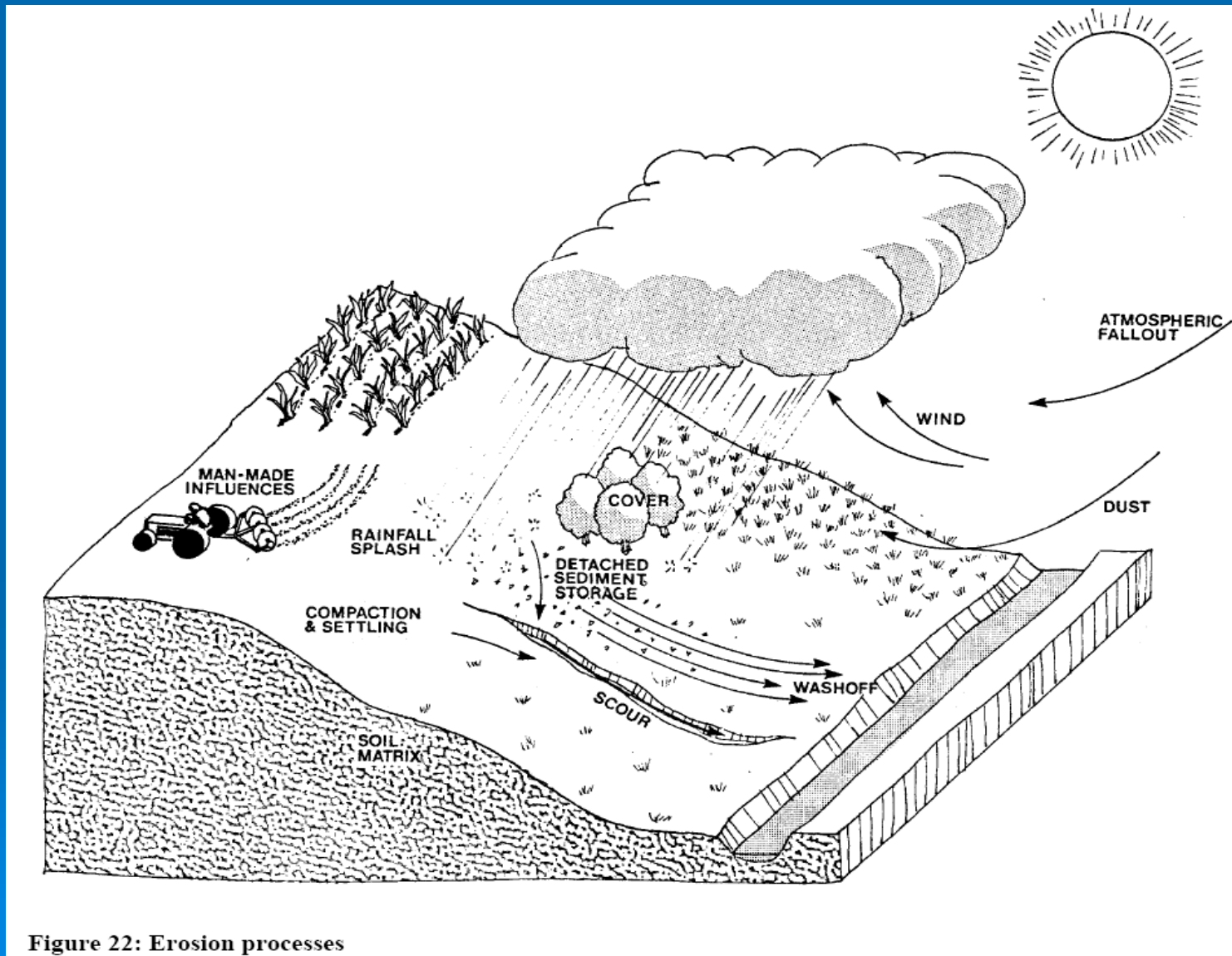
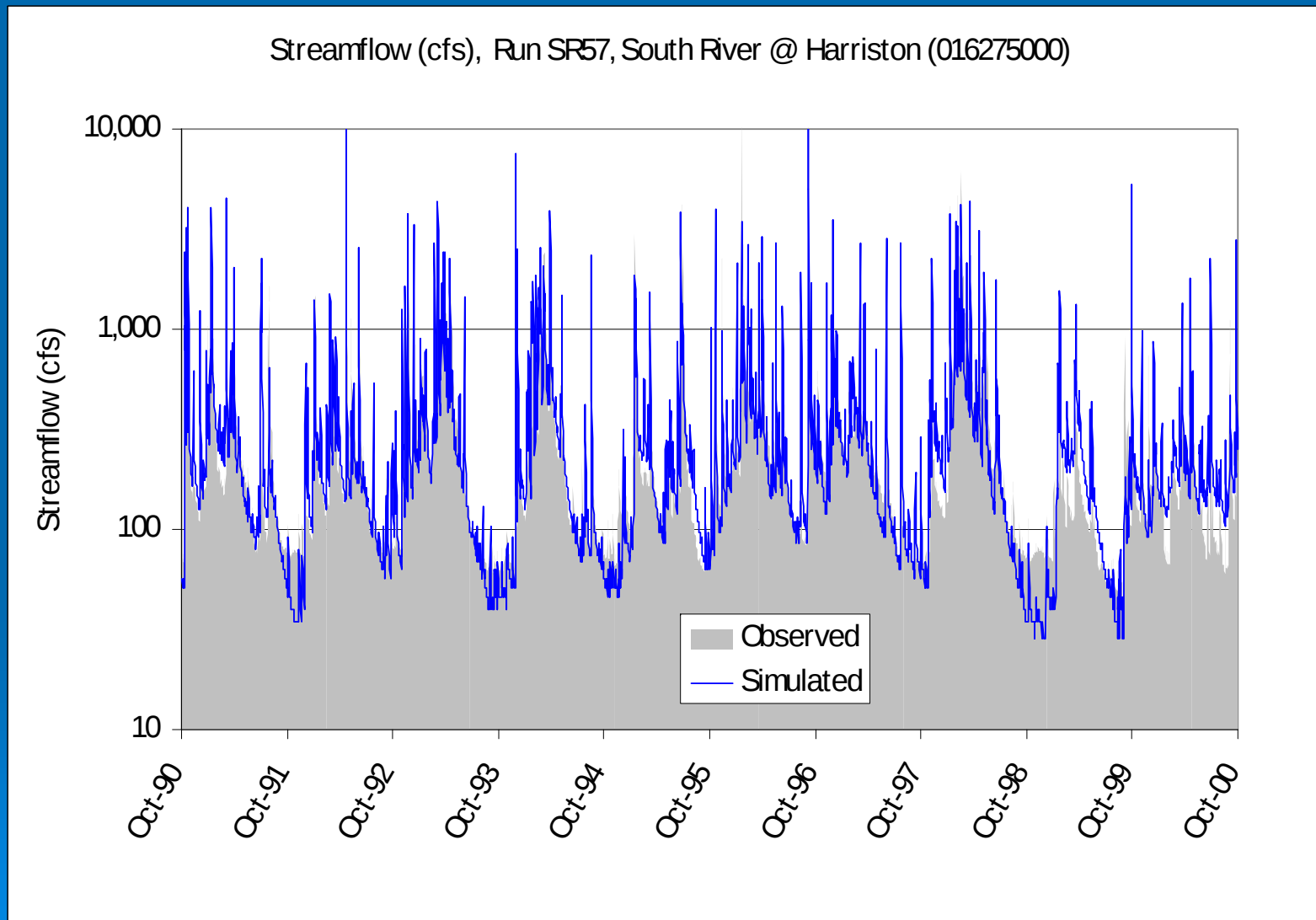
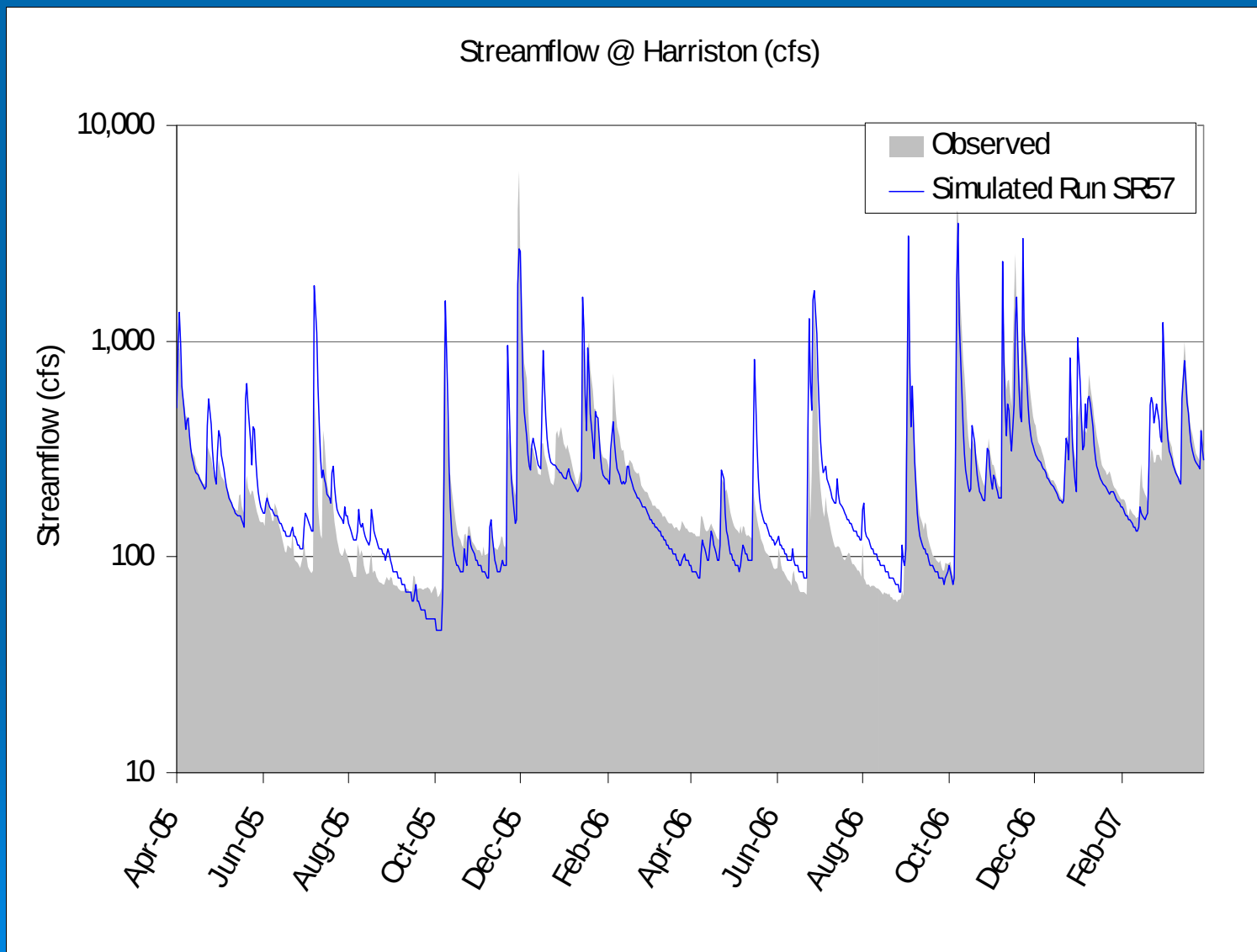


Figure 22: Erosion processes

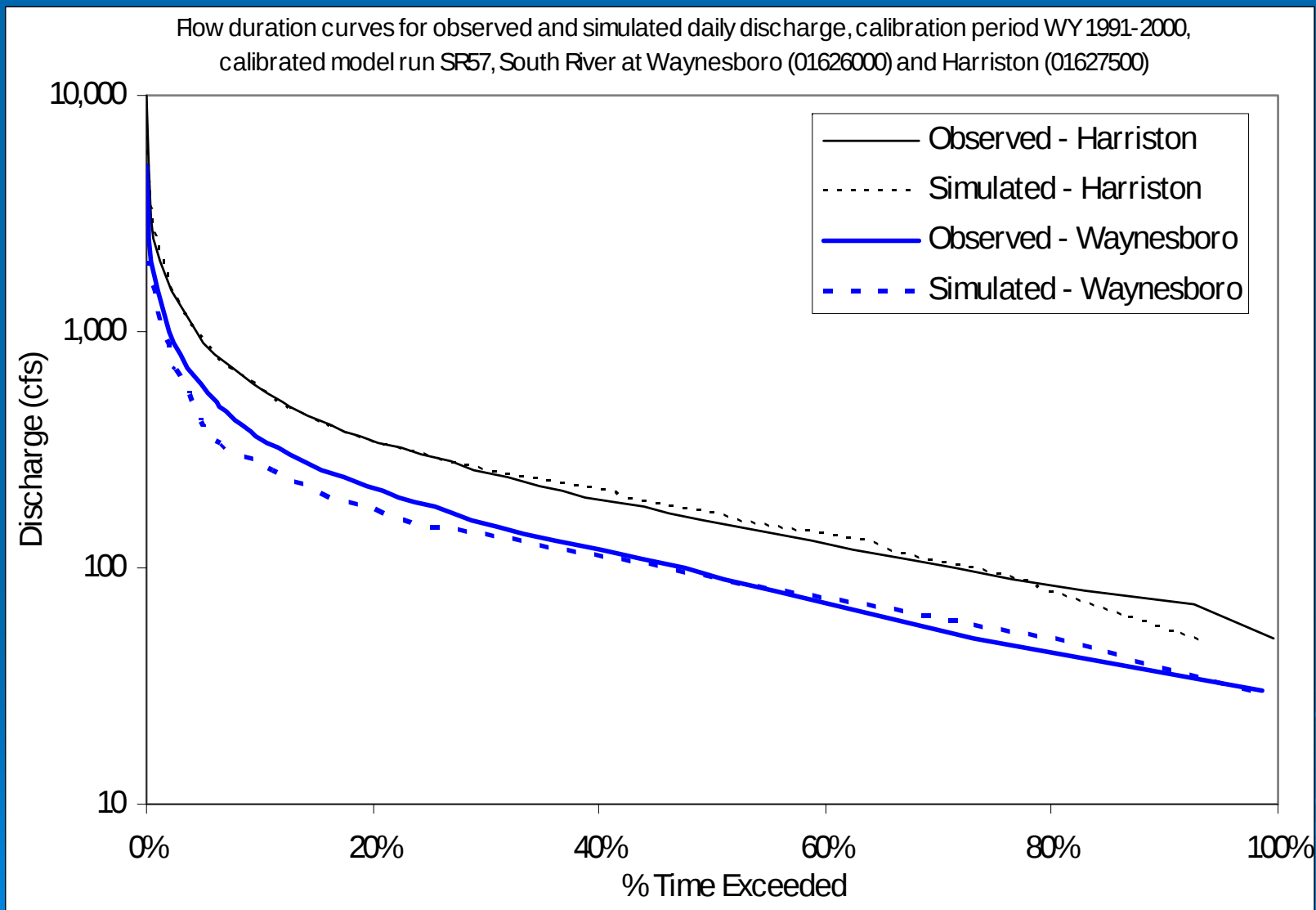
Stream Flow Timeseries, Calibration Period, Harriston



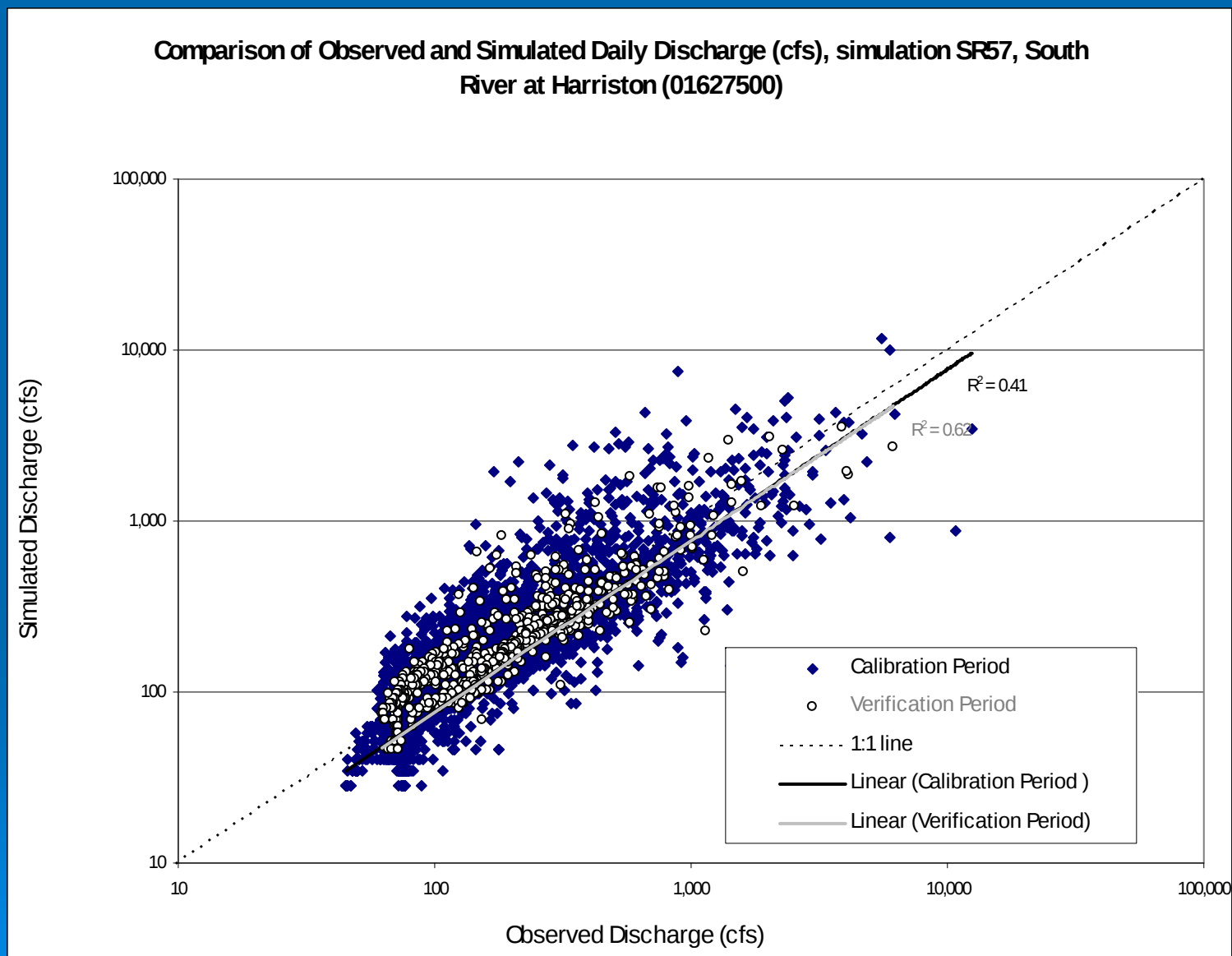
Stream Flow Timeseries, Verification Period, Harriston



Simulated and Observed Flow Duration Curves, Harriston



Simulated and Observed Flows, Harriston



Hydrologic Model Calibration Criteria, South River @ Harriston

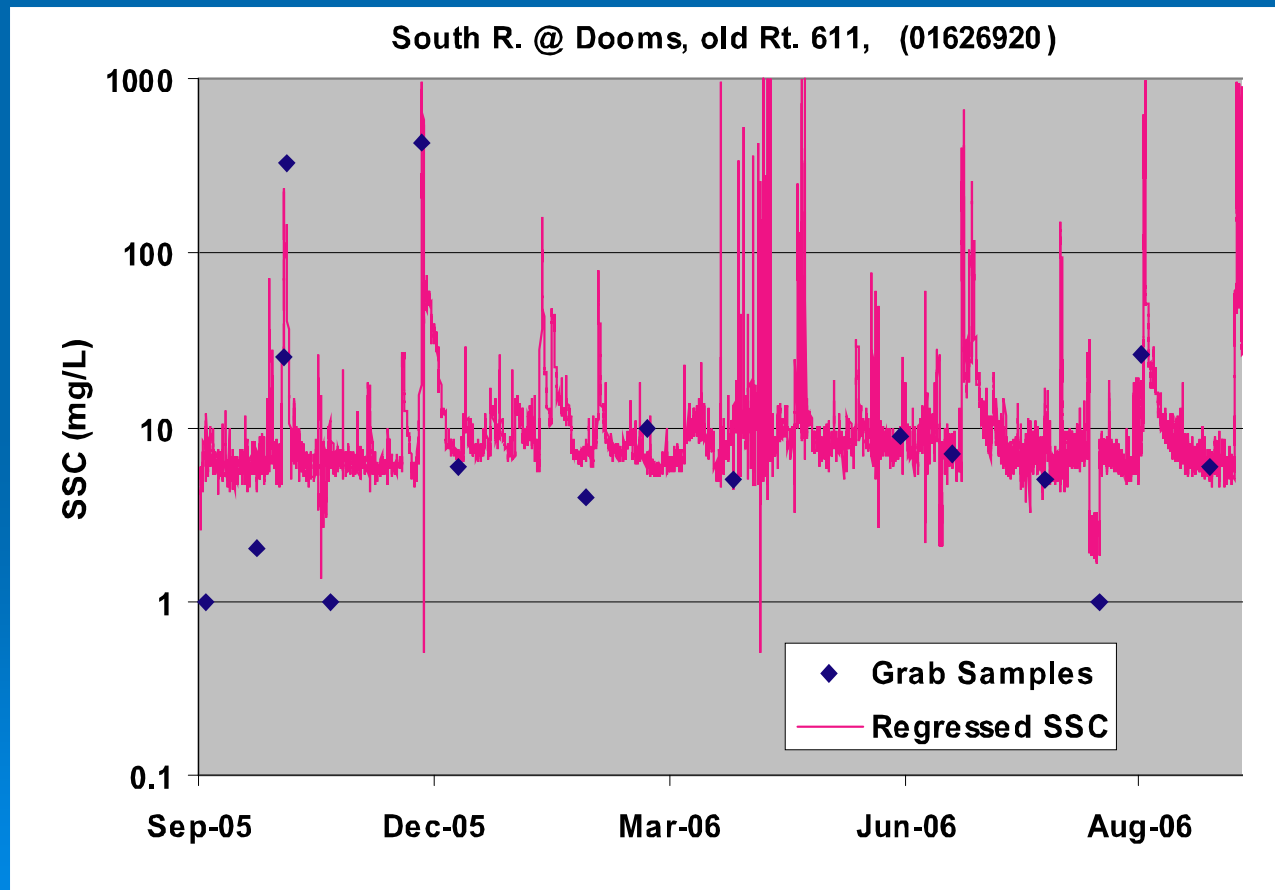
Runoff Category	Criterion (percent)	Calibration Period October 1, 1990-September 30, 2000			Verification Period April 1, 2005, March 31, 2007		
		Observed (in)	Simulated (in)	%Error	Observed (in)	Simulated (in)	%Error
Total runoff	±10	185.1	193.8	4.7%	35.3	34.3	-2.8%
Highest 10-percent flow	±10	81.5	87.1	6.8%	13.8	13.0	-5.5%
Lowest 50-percent flow	±15	31.5	31.4	-0.3%	7.0	7.2	2.1%
Winter runoff	±15	63.0	64.3	2.1%	10.8	10.2	-5.7%
Spring runoff	±15	63.6	66.4	4.4%	7.6	7.8	3.0%
Summer runoff	±15	26.2	29.6	12.8%	4.2	6.3	49.9%
Fall runoff	±15	32.2	33.5	4.1%	12.7	10.0	-21.2%
Total Storm Volume	±20	19.0	17.4	-8.6%	9.9	9.4	-5.2%

Sediment Model Simulations

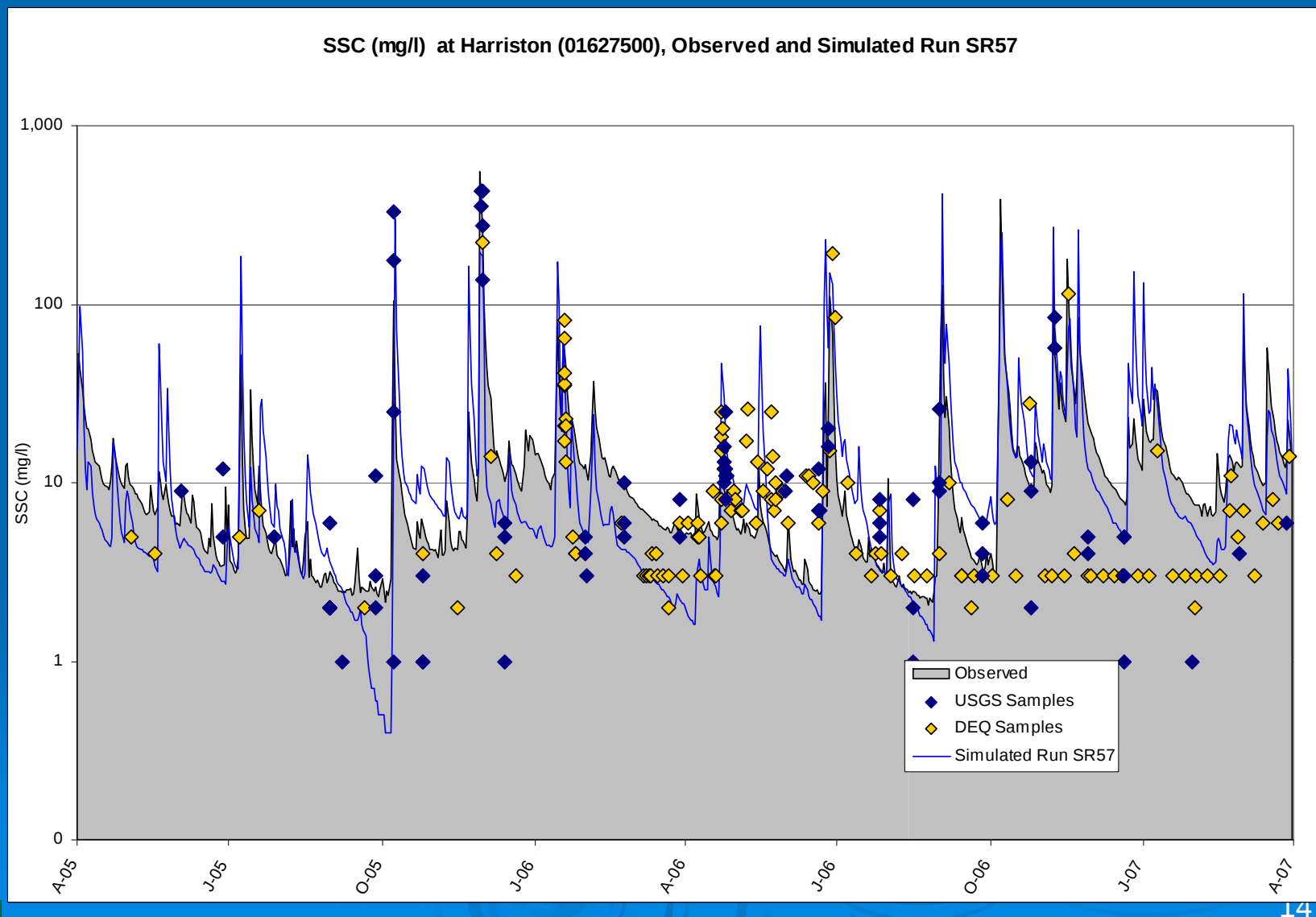
Linear Regression provides 'Observed' suspended sediment concentrations (SSC)
'Observed' SSC used for comparison and calibration

Regression Model 1: $SSC = 4.0 + 41.6(\text{Turbidity}) + 1.1(dQ/dt)$

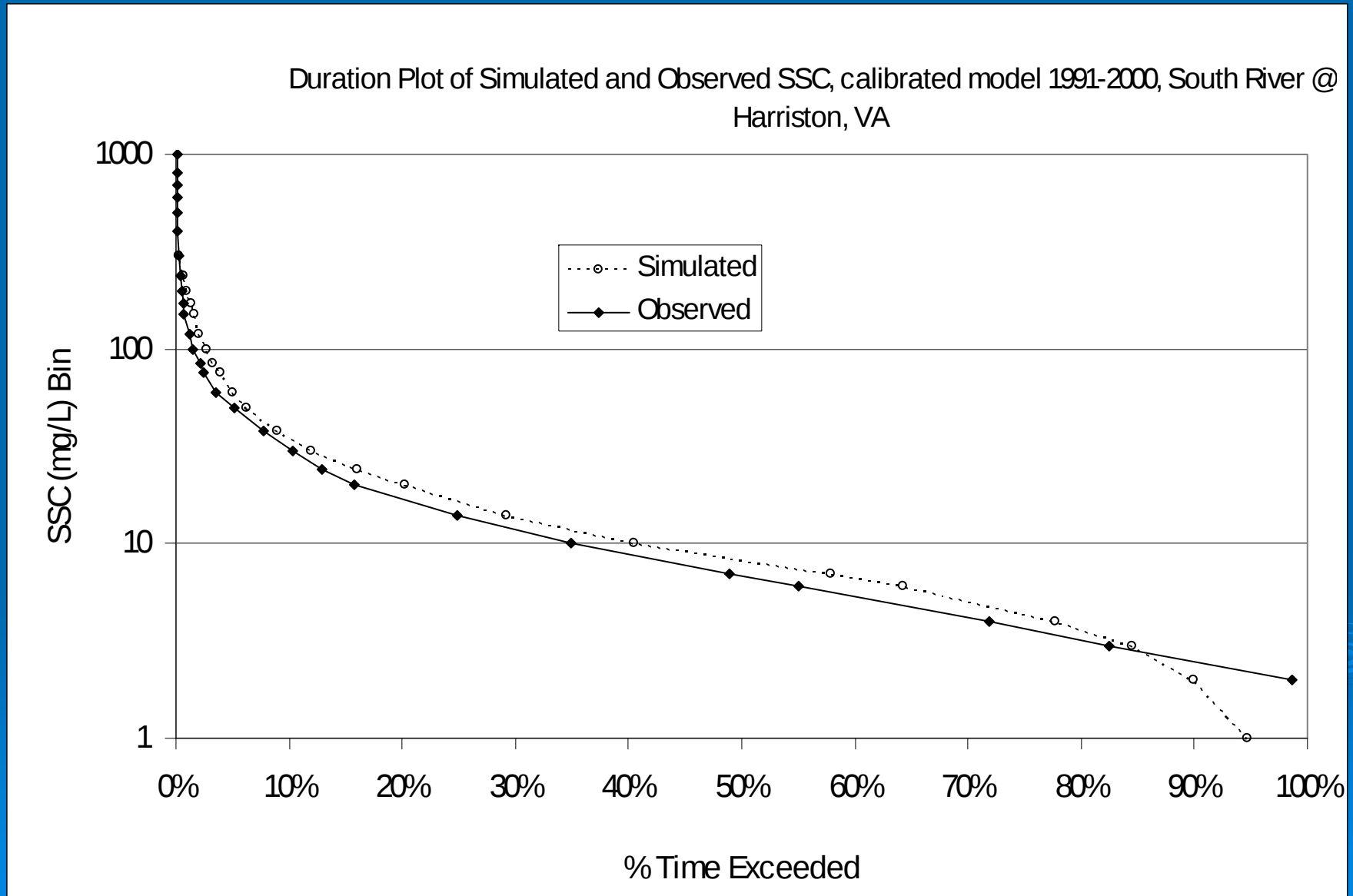
Regression Model 2: $SSC = -0.8 + 0.08Q + 1.34|Q - Q_{1\text{hour}}|$



Suspended Sediment Conc (SSC), South R. @Harriston Verification Period



SSC Duration Curves South R. @ Harriston



Sediment Model Calibration Criteria, South River @ Harriston

		Criterion (percent)	Calibration Period October 1, 1990-September 30, 2000			Verification Period April 1, 2005 - March 31, 2007		
			Observed	Simulated	% Error	Observed	Simulated	% Error
SSC (mg/L)	90 %tile	±30%	29.4	30.8	4.8%	24.5	30.1	22.6%
	50 %tile	±30%	6.6	7.8	18.5%	7.6	6.5	-15.0%
Sediment Flux (tons)	Total	±10%	125,527	123,266	-1.6%	29,887	35,138	17.6%
	Top 10 %	±30%	113,593	113,859	0.2%	26,287	31,734	20.7%
	Btm 50%	±30%	1,003	1,110	10.6%	533	489	-8.3%

Up Next – Modeling Mercury Transport

