Sabattus River Data Report
August 2000 Survey
November 2001
DEPLW0446

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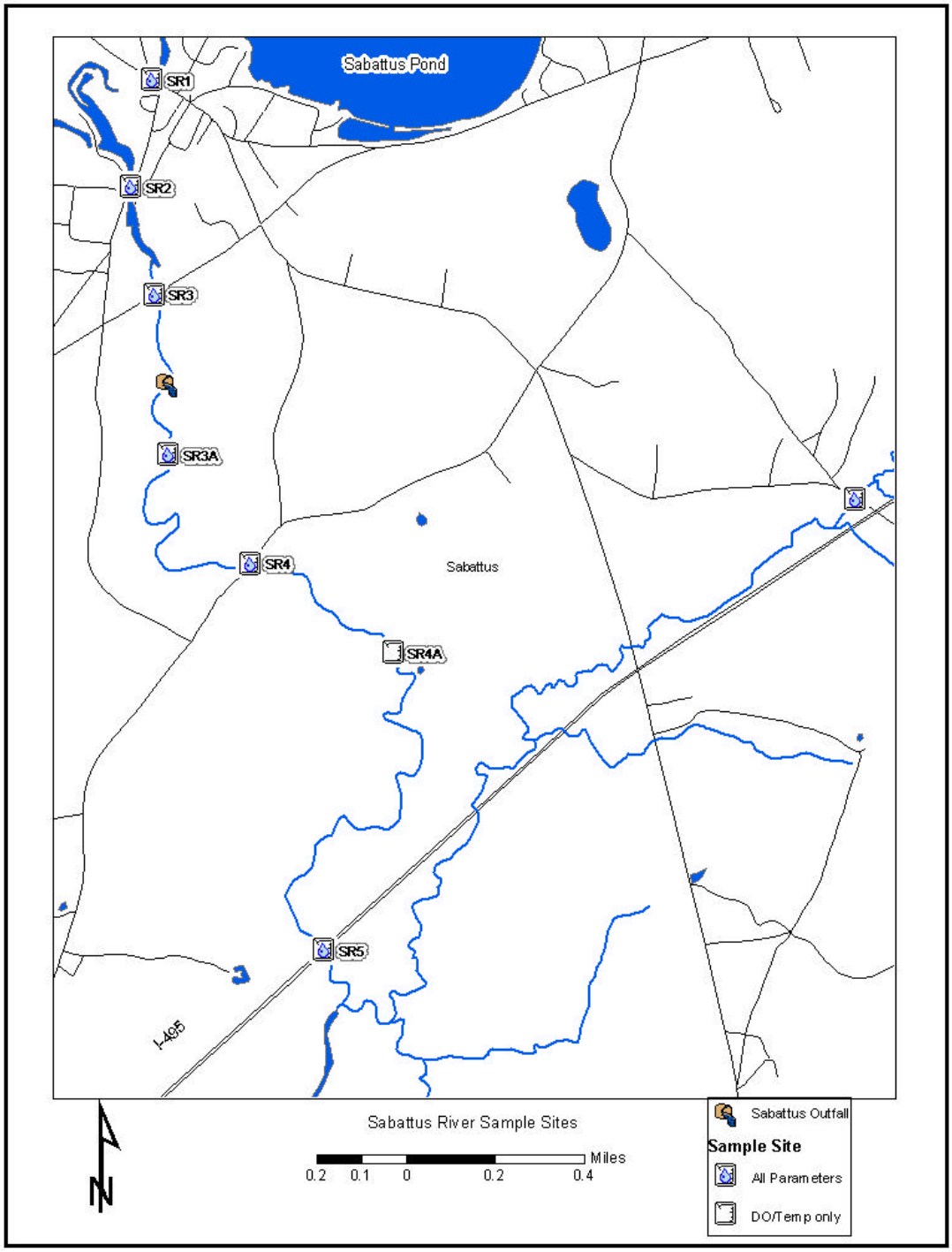
Sabattus Pond
SR1
SR2
SR3
SR3A
SR4
Sabattus
SR4A
SR5
I-495
Sabattus River Sample Sites
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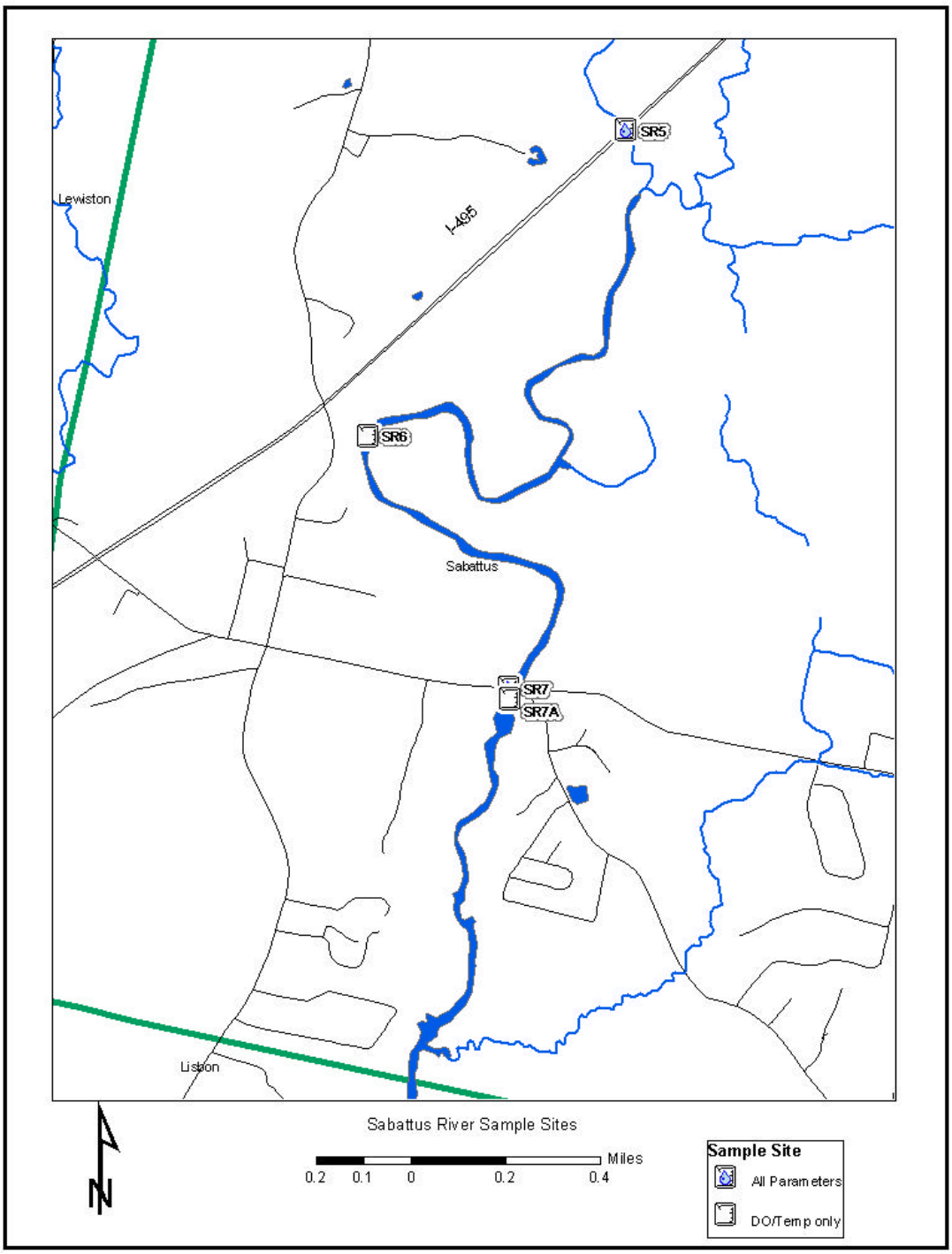
N
Sabattus Outfall
Sample Site
All Parameters
DO/Temp only


SR5
Lewiston
I-495
SR6
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SR7
SR7A
Lisbon
Sabattus River Sample Sites
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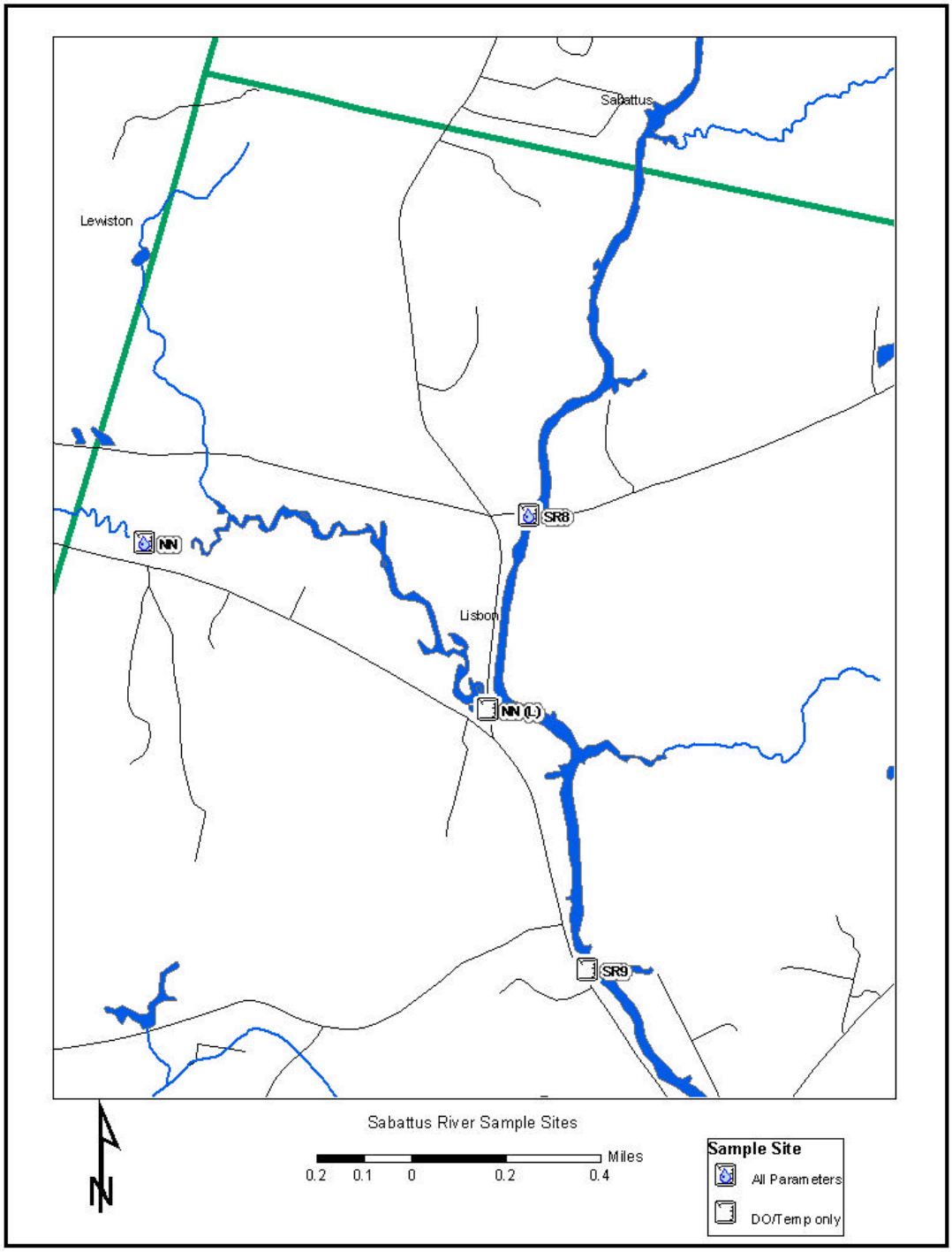
Sample Site
All Parameters
DO/Temp only


Sabattus
Lewiston
SR8
NN
Lisbon
NN (L)
SR9
Sabattus River Sample Sites
N
Miles
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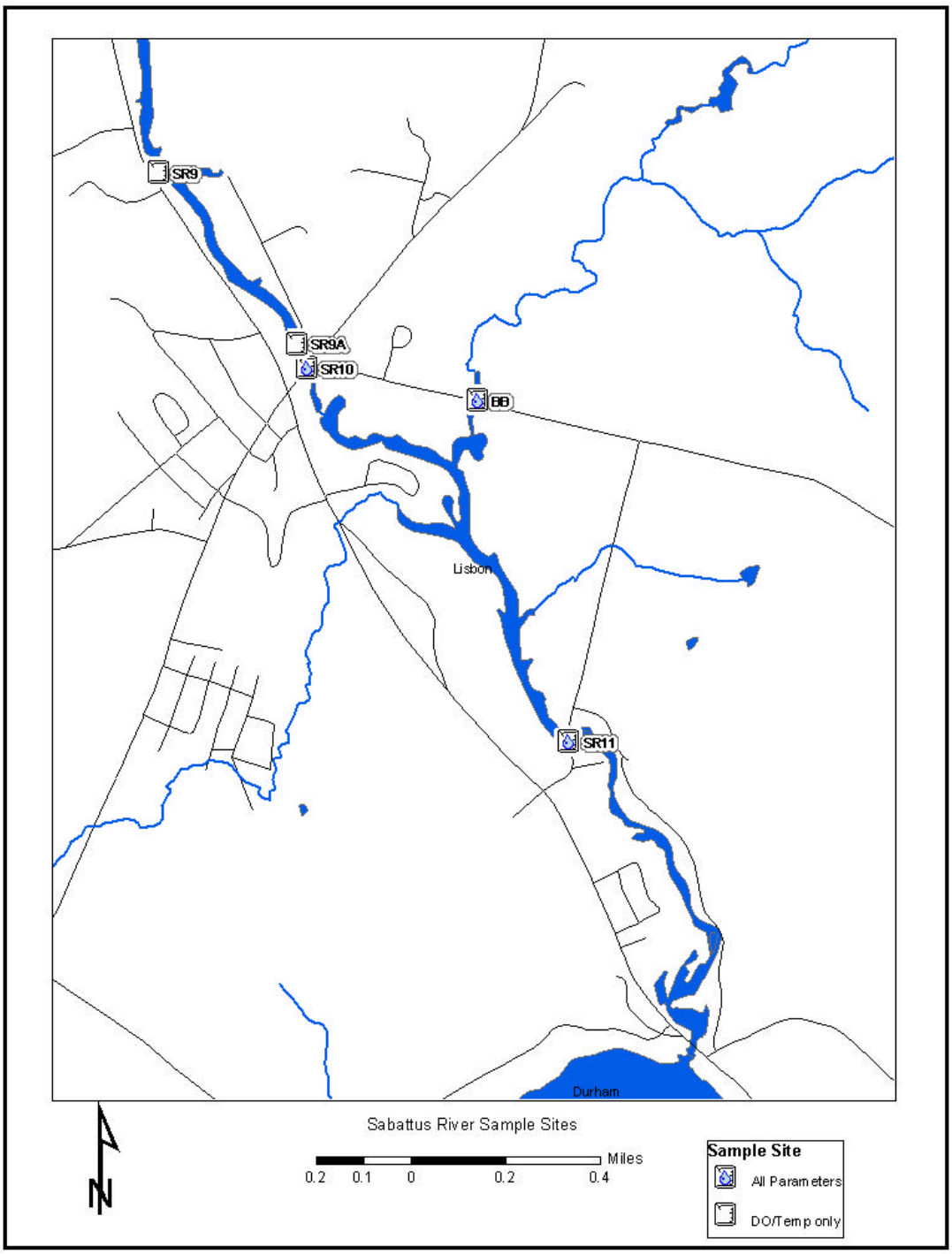
Sample Site
All Parameters
DO/Temp only


SR9
SR9A
SR10
BB
Lisbon
SR11
Durham
Sabattus River Sample Sites
Miles
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N
Sample Site
All Parameters
DO/Temp only

Introduction

The Sabattus River (class C to Lisbon urban limit, class B below) forms the outlet of Sabattus Pond and extends approximately 10 miles to the Androscoggin River. The town of Sabattus discharges treated wastewater (0.12 MGD) to the Sabattus River approximately one mile below the pond. Maine Electronics (0.079 MGD) discharges treated groundwater to the Sabattus in Lisbon. River flow is regulated at the outlet dam (minimum flow 2.5 cfs). The pond experiences algae blooms each year. A number of dams are located on the river. Water withdrawals for irrigation reduce river flows. These factors may contribute to DO problems. During 1994, non attainment of DO standards was measured at two sites.

A water quality study was initiated for the Sabattus River during the summer of 2000. The focus of the study is data collection for the development of a water quality model and TMDL for evaluating and addressing the impact of the discharge, as well as other factors, upon instream dissolved oxygen concentration. This study encompasses the river segment between Sabattus Pond and Lisbon Center, a distance of approximately 9.5 miles. The drainage area of the Sabattus River at the outlet of Sabattus Pond is 33.8 $mi.^2$ and at the confluence of the Androscoggin River is 73.8 $mi.^2$. The river segment above Lisbon is classified C, requiring among other standards, a minimum dissolved oxygen (DO) concentration of 5 ppm or 60% saturation, whichever is greater and a monthly average of 6.5 ppm. The remaining segment is classified B, requiring among other standards, a minimum DO concentration of 7 ppm or 75% saturation, whichever is greater. A minimum of two three-day intensive surveys is required for collection of sufficient data.

The initial survey was performed during August 2000. The technical design of the study is described in Sabattus River Work Plan, July 2000. This data report presents the results of this initial survey.

Hydrologic Data

As part of the data collection for developing a water quality model it is necessary to collect sufficient physical data for representation of the river hydrology. These data include sufficient river flow measurements during each survey to establish a flow balance for the study segment and transect measurements (widths and depths) at representative sites within the study segment. The following tables 1 and 2 present the flow and stage data. Table 3 presents the results from transect measurements.

Table 1 Flow Measurements

		Flow, cfs (stage, ft.)					
	DA, $mi.^2$	8/22/00	8/23/00	8/24/00	8/25/00	8/29/00	8/30/00
Sabattus River, Rt. 126 bridge	34.9	10.3(5.58)	(5.57)	(5.58)	(5.62)	7.8(5.65)	(5.68)
Barker Brook, Ridge St.	3.6	-	-	-	0.3	-	-
Noname Brook, Jordan Rd.	11.8	-	-	-	1.7*	-	-
Sabattus River, above Webster Rd.	67.1	17.5	-	21.5	-	-	11.8
Sabattus Treatment Plant (MGD)	-	0.063	0.057	0.054	0.063	0.061	0.059

*approximate

Table 2 Stage Measurements

	stage, ft.	
Location	08/30/00	Datum
Above falls at bridge	2.92	(left pier, from seam)
King Rd. bridge	11.05	(center of bridge, top of upstream railing)
Lisbon dam impoundment	5.1	(from top corner, see transect field notes)

Table 3 Transect Data

Transect	Width, ft.	Ave. depth, ft.	area, $ft.^2$	flow, cfs	vel., fps
T1	15.0	0.8	11.7	10.30	0.88
T2	35.5	2.6	92.7	10.30	0.11
T3	84.0	1.8	150.2	10.30	0.07
T4	60.0	2.7	163.8	10.30	0.06
T5	81.0	3.9	318.6	10.30	0.03
T6	44.0	1.2	54.5	10.50	0.19
T7	35.0	2.0	68.6	7.91	0.12
T8	34.0	0.8	28.2	8.00	0.28
T9	36.2	1.2	45.0	8.02	0.18
T10	34.0	1.7	57.0	8.09	0.14
T11	29.0	1.6	46.9	11.13	0.24
T12	29.0	0.6	18.3	11.25	0.62
T13	20.0	1.1	21.0	11.49	0.55
T14	34.0	1.6	55.7	8.38	0.15
T15	36.0	1.8	65.7	8.47	0.13
T16	37.0	1.2	44.4	8.56	0.19
T17	41.5	3.6	149.4	9.15	0.06
T18	48.8	4.5	219.1	9.29	0.04
T19	61.0	5.2	319.6	9.39	0.03
T20	47.0	3.8	176.9	9.46	0.05
T21	45.5	4.4	199.1	9.52	0.05
T22	45.0	4.7	209.8	9.64	0.05
T23	52.0	4.1	215.6	8.87	0.04
T24	74.0	3.8	281.2	9.08	0.03
T25	82.0	4.7	389.1	9.30	0.02
T26	92.0	4.9	449.3	9.68	0.02
T27	99.0	5.5	545.9	9.89	0.02
T28	98.0	6.4	625.1	11.49	0.02
T29	110.0	4.8	530.5	11.75	0.02
T30	132.0	4.4	581.7	12.00	0.02
T31	119.0	6.4	756.5	12.48	0.02

Ambient Chemical Data

The ambient chemical data collected during the August 2000 survey included dissolved oxygen (DO), temperature, total phosphorous (TP), orthophosphorous (PO4), total kjeldhal nitrogen (TKN), ammonia nitrogen (NH3), nitrite plus nitrate nitrogen (NOx), chlorophyll a (chl-a), ultimate carbonaceous biochemical oxygen demand (CBODu) and ultimate nitrogenous biochemical oxygen demand (NBODu). These parameters were sampled/measured during the early morning. These data are included on page A1 in the appendix. In addition, DO and temperature were also measured during the afternoon to capture diurnal effects. These data are included in tables starting on page A2 in the appendix (data from 1994 are also included). The following charts summarize the DO measurements from the August 2000 survey.

Figure 1
Sabattus River Dissolved Oxygen
August 2000 Survey

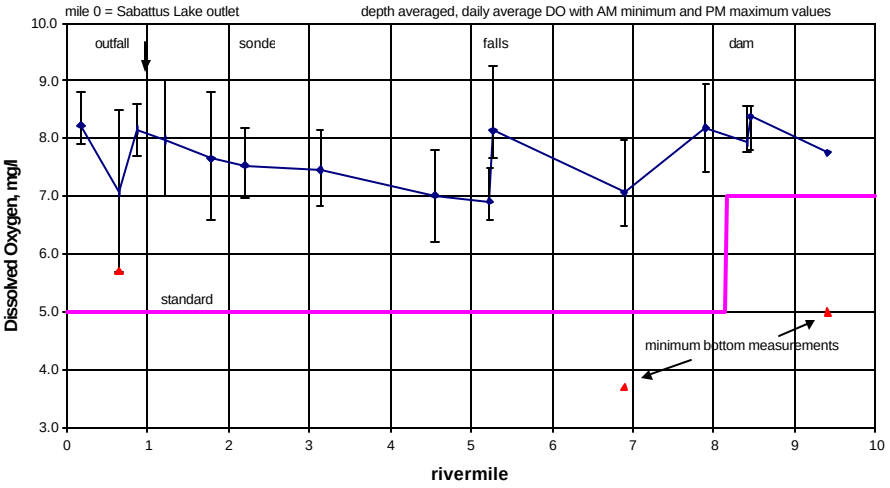
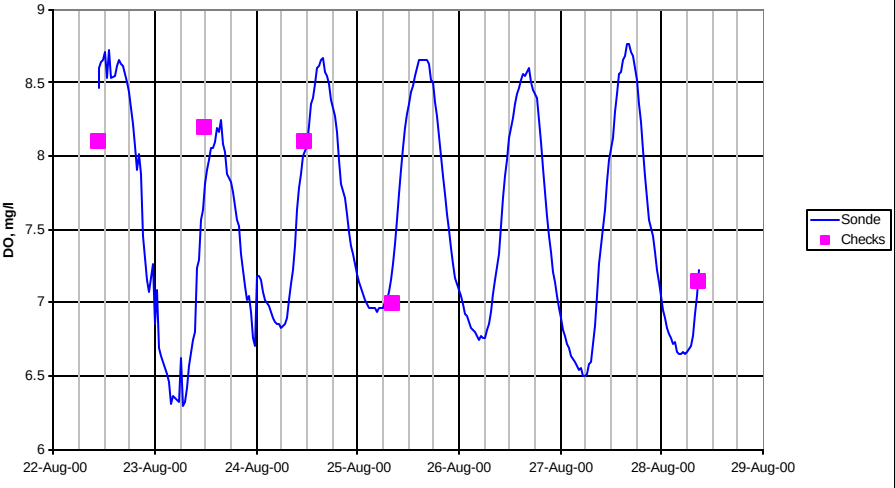
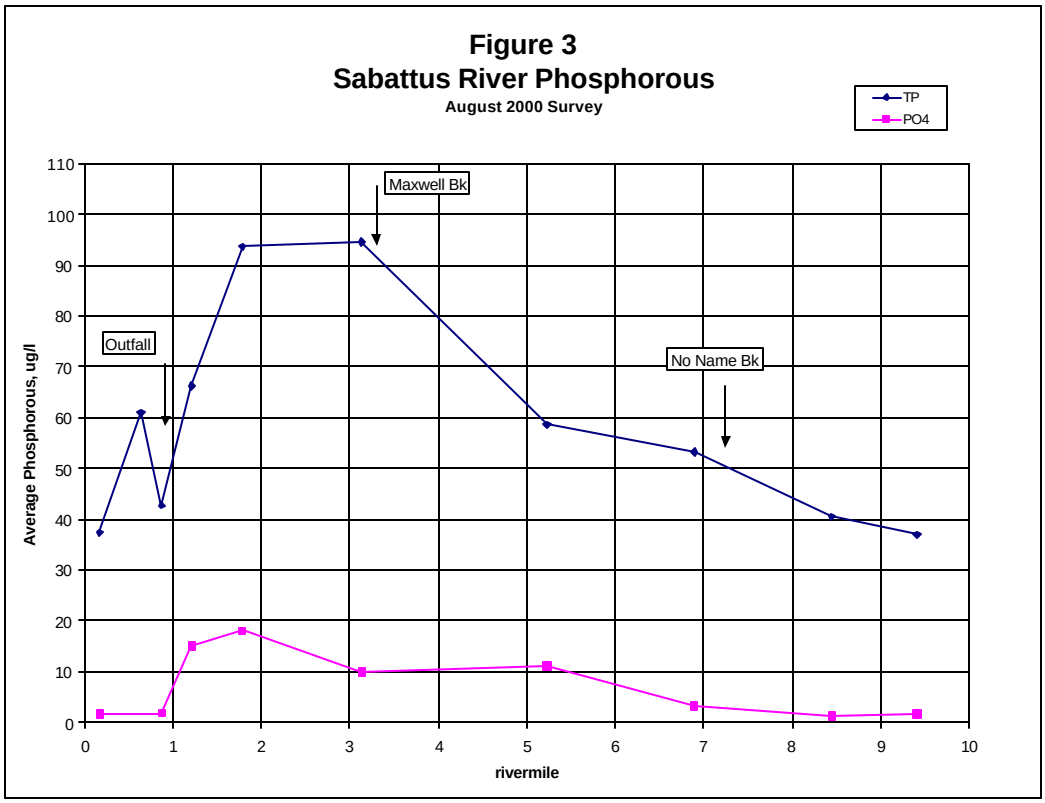
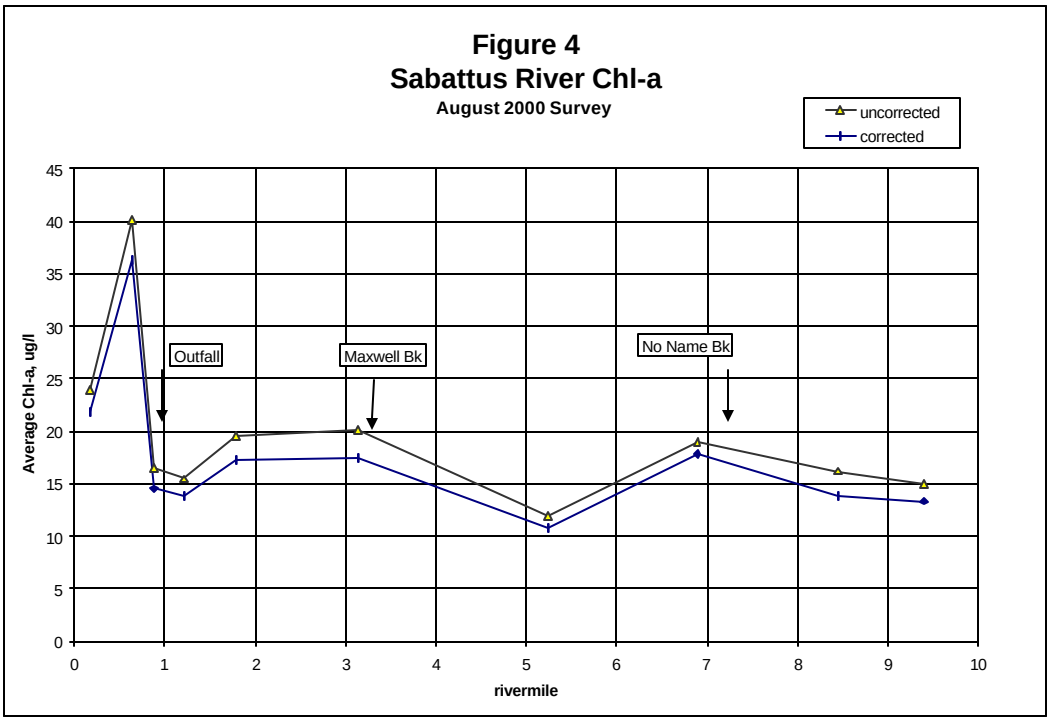


Figure 2
Sabattus River Dissolved Oxygen
Recording Sonde, Site 4A mile 2.2



The following figures present the Phosphorous and chlorophyll data from the August 2000 survey:

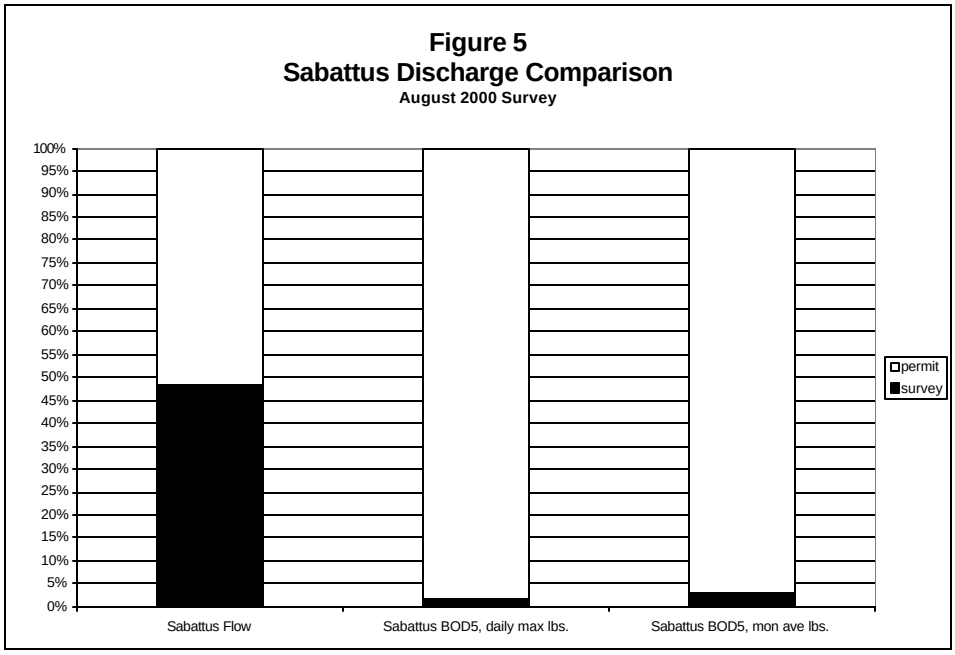




Effluent Data

The Sabattus treatment plant effluent was also sampled during the study for total phosphorous (TP), orthophosphorous (PO4), total kjeldhal nitrogen (TKN), ammonia nitrogen (NH3), nitrite plus nitrate nitrogen (NOx), ultimate carbonaceous biochemical oxygen demand (CBODu) and ultimate nitrogenous biochemical oxygen demand (NBODu) and 5 day biochemical demand (BOD5). The samples were collected as 24 hour composites. These data are included on page A1 in the appendix.

In general the effluent BOD5 and flow were well below permit requirements (see following chart).



Quality Control

Proper quality control should be followed to assure that all of the data that will be collected are good data. Dissolved oxygen meters were calibrated initially before sampling and checked periodically throughout the day. In addition, the meters of adjacent sampling teams were cross checked both prior to sampling and after completion of sampling to assure the readings from one portion of the river to another are consistent and accurate. The dissolved oxygen readings should agree to within 0.3 ppm and temperatures to within 2^{o} C. The results of the cross checks are shown on page A12 of the appendix.

The three-day surveys included ambient and effluent field duplicates. A comparison of the duplicate results is presented in the appendix. In general, the average duplicate variation was within 20%. TBOD, NBOD, CBOD and final NOx duplicates averaged within 15% while NH3, NOx and TP averaged within 10%. The single BOD5 duplicate agreed within 20%. The duplicates for PO4 showed an average variation of 48.5% (ranging from 2.4% to 100%), but in terms of concentration the maximum difference was 2 ug/l. Lab QAQC is available on request.

Discussion

Based upon the 2000 data the Sabattus River attained DO criteria at all sites except for individual bottom measurements at impounded sites (SR2, SR8, SR11). Significant diurnal DO variation was measured (greater than 2 mg/l) at most sites, indicative of plant growth effects. River flow during the survey was three to four times greater than the minimum flow at the lake outlet. The flow and BOD5 loading from the Sabattus treatment plant were at a fraction of the permit levels.

High chl-a concentrations were measured below the lake outlet and elevated phosphorous concentrations were measured below the treatment plant.

At least one more survey dataset is required for the calibration of a water quality model for the Sabattus River. It is anticipated that this survey would be performed during the summer of 2002. Additional considerations for the second survey should include:

(1) Lower river flow, nearer the minimum flow specified at the lake outlet dam.
(2) Sampling of the Maxwell Brook tributary at the turnpike or Rt. 9.
(3) Considering using a boat for site SR9, which had been sampled from the bank
(4) Use second sonde at an additional site

Appendix