



SOUTH FLORIDA WATER MANAGEMENT DISTRICT

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PRO ERG

January 20, 2000

Dr. Garth Redfield
Lead Environmental Scientist
Environmental Monitoring & Assessment Department
South Florida Water Management District
P. O. Box 24680
West Palm Beach, FL 33416-4680

Dear Dr. Redfield:

SUBJECT: Third Quarter 1999 Report to Technical Oversight Committee and Quality Assessment Report for Water Quality Monitoring, July 1999-September 1999

Enclosed please find the third quarter 1999 graphs displaying:

- 1) the geometric mean of the total phosphorus (TP) concentration levels measured from September 1996 through September 1999 at the marsh stations within the Arthur R. Marshall Loxahatchee National Wildlife Refuge compared to the interim and long-term TP concentration levels;
- 2) the Shark River Slough 12-month moving flow-weighted mean TP concentration data for water years 1989 through 1999 compared to the interim and long-term discharge limits and, for the last 24 months, the 12-month moving average with the composite TP sample concentrations for each sampling event; and
- 4) the Taylor Slough and Coastal basins 12-month moving flow-weighted mean TP concentration data for water years 1989 through 1999 compared to the long-term 11 ppb discharge limit and, for the last 24 months, the 12-month moving average with the composite TP sample concentrations for each sampling event.

Also enclosed are copies of individual TP sample data from all sites and daily average flow data for Shark River Slough and Taylor Slough/Coastal Basin structures plus the third quarter 1999 Quality Assessment Report.

Geometric means calculated from TP concentrations measured in water samples collected in the Arthur R. Marshall Loxahatchee National Wildlife Refuge in July, August and September 1999 were 11.1, 12.7 and 10.3 ppb, respectively (Figure 1). Ten sites were sampled in July, eight in August and 14 in September. The average stage was 16.11 feet in July, 16.03 feet in August and 16.79 feet in September. The geometric mean of the TP concentrations in July was less than both the interim and long-term levels of 14.4 and 11.8 ppb, respectively. The August geometric mean concentration was less than the interim level of 15.1 ppb, but greater than the long-term level of 12.3 ppb. The September geometric mean exceeded the interim level (9.9 ppb) and the long-term level (8.4 ppb).

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The date for compliance with the interim concentration level was February 1, 1999. Since September was the second time within 12 consecutive sample collections the interim level was exceeded, the Settlement Agreement requires the TOC to review the data and forward their opinions and recommendations to their respective agencies for relevant action. The June 1999 geometric mean of 14.2 ppb exceeded the interim level of 11.7.

The 12 month flow-weighted mean TP concentration of waters entering Shark River Slough for Water Year 1999 was 9.5 ppb (**Figure 2**). This concentration was less than the interim limit of 9.8 ppb, but greater than the long-term limit of 8.2 ppb. The 12-month flow-weighted mean TP concentrations in July and August were 9.7 and 9.6 ppb, respectively. These values were below the interim discharge limits of 10.4 and 10.1 ppb, but above the long-term limits of 9.0 and 8.6 ppb, respectively.

The 12-month flow-weighted mean TP concentration of waters entering Taylor Slough and the Coastal Basins for Water Year 1999 was 6.7 ppb (**Figure 3**). This concentration was less than the long-term limit of 11 ppb as were the 9.4 and 8.5 ppb concentrations in July and August, respectively.

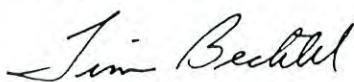
The frequency of composite samples for each sampling event exceeding 10 ppb within a given 12-month period was included in the Settlement Agreement as an additional aid in tracking compliance. For Shark River Slough, a frequency or percentage limit for samples greater than 10 ppb is based on observed flow. Taylor Slough and the Coastal Basins have a fixed limit of 53.1%. The following table presents the actual frequency exceedance and the calculated frequency limits for Shark River Slough and Taylor Slough.

<u>Year</u> <u>Ending</u>	<u>Shark River Frequency Exceedance</u>		<u>Taylor Slough Frequency Exceedance</u>	
	<u>Actual</u>	<u>Limit</u>	<u>Actual</u>	<u>Limit</u>
Oct 1998	64.0*	48.3	32.1	53.1
Nov 1998	64.0*	47.1	32.1	53.1
Dec 1998	59.3*	44.5	32.1	53.1
Jan 1999	55.6*	45.0	28.6	53.1
Feb 1999	55.6*	45.3	25.0	53.1
Mar 1999	51.9*	45.7	21.4	53.1
Apr 1999	51.9*	47.7	25.0	53.1
May 1999	48.0	49.9	28.6	53.1
Jun 1999	40.9	49.7	28.6	53.1
Jul 1999	41.7	46.7	25.0	53.1
Aug 1999	39.1	44.9	16.7	53.1
Sep 1999	39.1	42.9	12.1	53.1

*exceeded frequency limit

If you have questions regarding the reported results, please call me at 561-682-6392.

Sincerely,



Timothy J. Bechtel, Ph.D.
Senior Supervising Environmental Scientist
Environmental Monitoring and Assessment Department

Enclosure
TB/hm

Monthly Total Phosphorus Concentration Levels for Loxahatchee National Wildlife Refuge

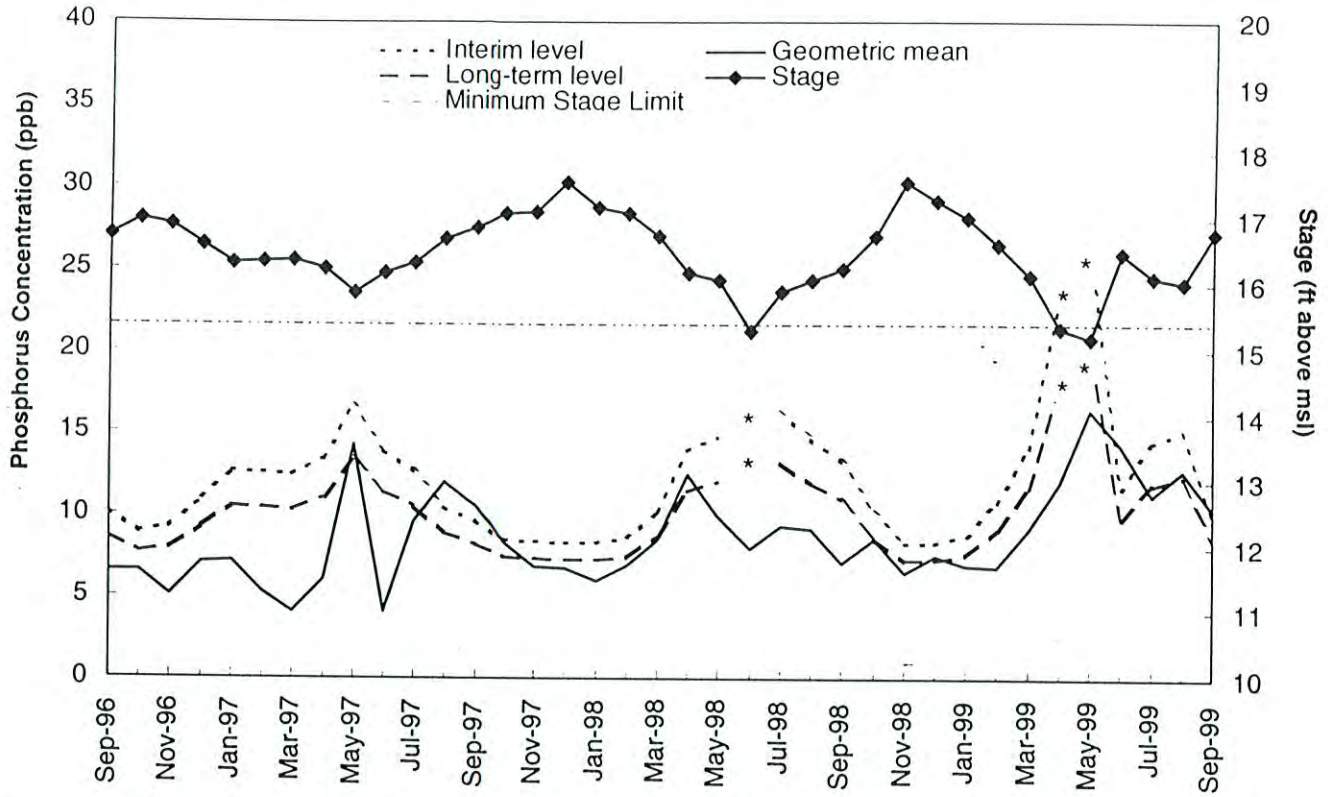


Figure 1. Observed monthly total phosphorus concentration levels for the Loxahatchee National Wildlife Refuge compared to the interim and long-term targets. The geometric means and targets are adjusted for fluctuations of water elevation.

Discharge Limits for Shark River Slough (S12A, S12B, S12C, S12D, and S333)

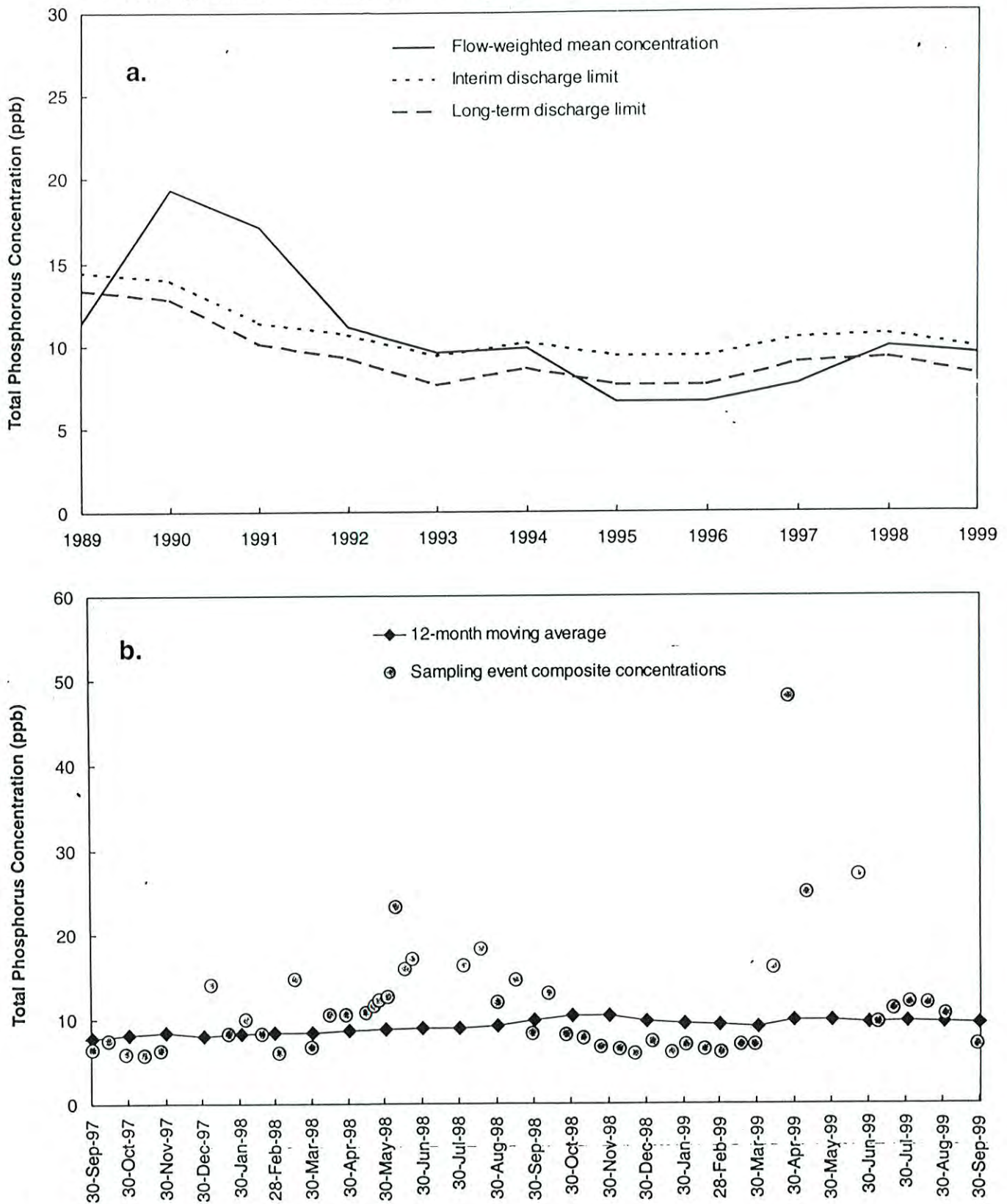


Figure 2. 12-month moving flow-weighted mean total phosphorus concentrations in the inflows to Everglades National Park (ENP) through Shark River Slough compared to the interim and long-term targets.
a. Concentrations at the end of each water year. **b.** 12-month moving average concentration at the end of each month and the composite concentration for each sampling event.

Discharge Limits for Taylor Slough (S332 and S175) and the Coastal Basins (S18C)

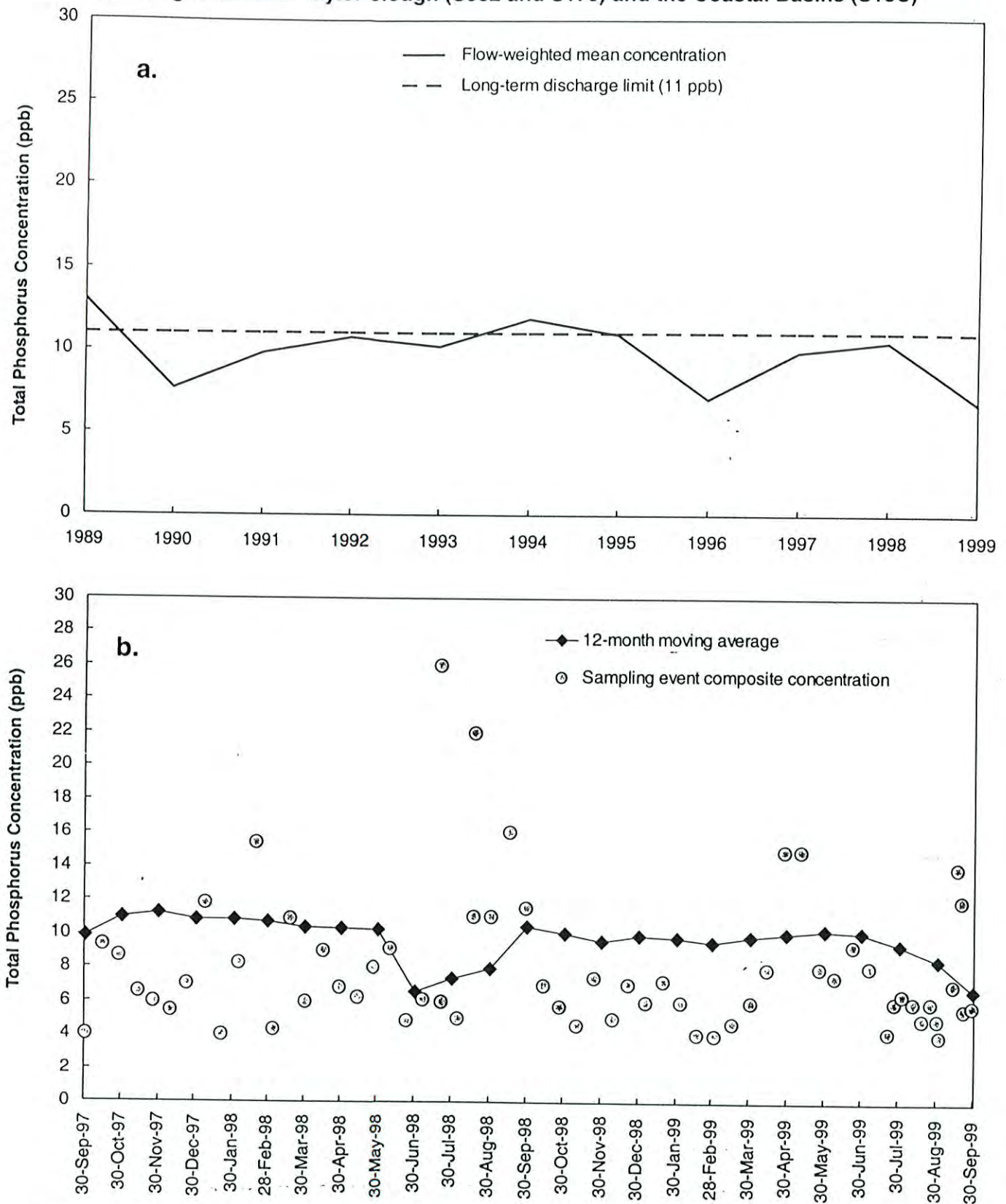


Figure 3. 12-month moving flow-weighted mean total phosphorus concentrations in the inflows to Everglades National Park (ENP) through Taylor Slough and the Coastal Basins compared to the long-term target. **a.** Concentrations at the end of each water year. **b.** 12-month moving average concentration at the end of each month and the composite concentration for each sampling event.

Loxahatchee TP sampling dates and concentrations

yyyymmdd	LOX3 LOX10	LOX4 LOX11	LOX5 LOX12	LOX6 LOX13	LOX7 LOX14	LOX8 LOX15	LOX9 LOX16
4/12/99	---	---	---	---	---	0.014	---
4/13/99	---	---	0.011	---	---	0.011	---
5/10/99	---	---	0.018	---	---	0.015	---
6/21/99	---	0.046	0.011	0.016	0.009	0.017	0.015
6/22/99	---	0.011	0.013	0.015	0.014	0.009	0.012
7/19/99	---	---	0.012	0.010	0.016	0.012	0.012
7/20/99	---	0.012	0.009	---	0.011	0.010	0.009
8/16/99	---	---	---	0.011	0.013	0.016	---
8/17/99	---	0.015	0.011	---	0.012	0.010	0.015
9/27/99	(LOX 3) 0.010 (LOX 10) 0.007	0.012	0.009	0.010	0.013	0.011	0.008
9/28/99	---	0.014	0.009	0.010	0.017	0.009	0.009

Shark River Slough TP Data

(Total Phosphorus in mg/L, ppm)

yyyymmdd	S12A	S12B	S12C	S12D	S333
19981012	0.013	0.009	0.009	0.020	0.010
19981026	0.006	0.006	0.010	0.008	0.010
19981109	0.010	0.006	0.007	0.008	0.008
19981123	0.005	0.006	0.007	0.008	0.009
19981208	0.005	0.007	0.006	0.007	0.008
19981221	0.006	0.005	0.006	0.006	0.006
19990104	0.007	0.007	0.007	0.007	0.010
19990120	0.007	0.009	0.006	0.006	0.006
19990201	0.010	0.009	0.007	0.007	0.007
19990216	0.008	0.006	0.006	0.006	0.007
19990301	0.009	0.008	0.006	0.006	0.006
19990317	0.011	0.008	0.008	0.009	0.007
19990329	0.012	0.011	0.010	0.008	0.007
19990413	0.023	0.018	0.013	0.016	0.016
19990426	0.060	0.030	0.027	0.028	0.048
19990510	0.029	0.021	0.018	0.017	0.025
19990525	0.028	0.024	0.019	0.018	0.016
19990607	0.029	0.020	0.020	0.022	0.020
19990622	0.021	0.019	0.027	0.027	-
19990707	0.007	0.008	0.011	0.011	0.011
19990720	0.008	0.010	0.011	0.013	0.017
19990802	0.011	0.012	0.010	0.013	0.016
19990817	0.009	0.010	0.013	0.013	0.023
19990901	0.010	0.009	0.010	0.012	0.008
19990928	0.007	0.007	0.007	0.007	0.008

Shark River Slough Daily Flow in cfs

* denotes water quality sampling days.

yyyymmdd	S12A	S12B	S12C	S12D	S333
19990701	449.00	313.00	491.00	514.00	0.00
19990702	386.00	311.00	493.00	480.00	0.00
19990703	339.00	313.00	493.00	498.00	0.00
19990704	339.00	313.00	492.00	499.00	0.00
19990705	339.00	313.00	484.00	500.00	0.00
19990706	334.00	306.00	476.00	498.00	0.00
19990707*	327.00	301.00	509.00	496.00	0.00
19990708	320.00	293.00	584.00	493.00	0.00
19990709	314.00	291.00	628.00	494.00	0.00
19990710	314.00	287.00	621.00	490.00	0.00
19990711	314.00	285.00	617.00	491.00	0.00
19990712	314.00	285.00	615.00	493.00	0.00
19990713	314.00	282.00	610.00	493.00	0.00
19990714	313.00	278.00	604.00	490.00	0.00
19990715	318.00	281.00	608.00	494.00	0.00
19990716	317.00	279.00	610.00	498.00	49.00
19990717	322.00	286.00	620.00	505.00	104.00
19990718	333.00	289.00	626.00	508.00	103.00
19990719	335.00	285.00	621.00	511.00	38.00
19990720*	339.00	288.00	625.00	508.00	116.00
19990721	350.00	294.00	634.00	516.00	238.00
19990722	350.00	291.00	631.00	518.00	238.00
19990723	350.00	284.00	617.00	513.00	237.00
19990724	350.00	280.00	609.00	508.00	237.00
19990725	352.00	278.00	604.00	508.00	237.00
19990726	350.00	273.00	603.00	511.00	236.00
19990727	347.00	271.00	592.00	510.00	236.00
19990728	344.00	267.00	589.00	507.00	235.00
19990729	342.00	260.00	579.00	503.00	233.00
19990730	337.00	254.00	569.00	499.00	234.00
19990731	333.00	250.00	564.00	506.00	234.00
19990801	335.00	254.00	578.00	494.00	216.00
19990802*	337.00	255.00	579.00	494.00	201.00
19990803	338.00	260.00	582.00	499.00	214.00
19990804	331.00	252.00	569.00	495.00	92.00
19990805	327.00	257.00	573.00	503.00	3.50
19990806	324.00	259.00	574.00	503.00	0.00
19990807	322.00	260.00	579.00	512.00	0.00
19990808	316.00	257.00	573.00	511.00	0.00
19990809	312.00	255.00	567.00	504.00	0.00
19990810	306.00	255.00	563.00	505.00	0.00
19990811	299.00	250.00	556.00	501.00	0.00
19990812	293.00	248.00	555.00	503.00	0.00
19990813	289.00	248.00	552.00	500.00	0.00
19990814	285.00	247.00	548.00	498.00	0.00
19990815	280.00	245.00	543.00	495.00	0.00
19990816	274.00	243.00	536.00	490.00	0.00
19990817*	273.00	243.00	534.00	488.00	0.00
19990818	276.00	246.00	533.00	488.00	0.00
19990819	284.00	255.00	541.00	501.00	0.00
19990820	284.00	260.00	552.00	512.00	0.00
19990821	284.00	263.00	553.00	508.00	0.00
19990822	305.00	280.00	584.00	535.00	0.00
19990823	324.00	298.00	612.00	562.00	0.00

19990824	326.00	298.00	616.00	576.00	0.00
19990825	334.00	303.00	625.00	585.00	0.00
19990826	340.00	309.00	626.00	573.00	0.00
19990827	345.00	311.00	628.00	565.00	0.00
19990828	344.00	309.00	616.00	554.00	0.00
19990829	339.00	305.00	606.00	545.00	0.00
19990830	345.00	306.00	600.00	542.00	0.00
19990831	349.00	309.00	610.00	557.00	0.00
19990901*	362.00	325.00	642.00	583.00	0.00
19990902	389.00	346.00	674.00	602.00	0.00
19990903	389.00	337.00	661.00	605.00	0.00
19990904	388.00	334.00	656.00	594.00	0.00
19990905	388.00	330.00	653.00	586.00	0.00
19990906	384.00	325.00	646.00	582.00	0.00
19990907	387.00	326.00	654.00	585.00	0.00
19990908	401.00	334.00	671.00	591.00	0.00
19990909	423.00	346.00	686.00	601.00	0.00
19990910	437.00	357.00	709.00	621.00	0.00
19990911	456.00	365.00	723.00	639.00	0.00
19990912	456.00	364.00	727.00	643.00	0.00
19990913	452.00	359.00	725.00	632.00	0.00
19990914	445.00	357.00	722.00	628.00	0.00
19990915	425.00	336.00	696.00	620.00	0.00
19990916	427.00	330.00	680.00	610.00	0.00
19990917	420.00	334.00	678.00	603.00	0.00
19990918	440.00	357.00	707.00	624.00	0.00
19990919	471.00	390.00	751.00	652.00	0.00
19990920	465.00	393.00	746.00	648.00	0.00
19990921	483.00	414.00	778.00	672.00	0.00
19990922	491.00	430.00	789.00	679.00	0.00
19990923	480.00	431.00	778.00	668.00	0.00
19990924	485.00	442.00	784.00	658.00	0.00
19990925	505.00	464.00	810.00	676.00	0.00
19990926	513.00	477.00	821.00	683.00	0.00
19990927	527.00	498.00	846.00	702.00	0.00
19990928*	525.00	502.00	840.00	698.00	0.00
19990929	513.00	506.00	836.00	688.00	0.00
19990930	501.00	508.00	829.00	681.00	0.00

Taylor Slough Water Quality

(Total Phosphorus in mg/L, ppm)

yyyymmdd	S175	S332	S18C
19981013	0.006	0.005	0.010
19981027	0.009	0.007	0.004
19981110	---	0.005	-0.004
19981124	0.006	0.007	0.008
19981209	0.005	0.005	0.011
19981222	0.012	0.007	0.005
19990105	0.006	0.006	0.006
19990119	0.005	0.007	0.008
19990202	0.005	0.006	0.004
19990216	0.006	0.004	0.006
19990302	0.004	0.004	-0.004
19990316	0.006	0.005	0.004
19990331	0.008	0.006	0.006
19990414	0.011	0.010	0.007
19990428	0.013	0.015	0.014
19990511	0.013	0.015	0.013
19990526	0.013	0.008	0.010
19990608	0.006	0.007	0.008
19990623	0.011	0.008	0.008
19990706	0.008	0.011	0.007
19990721	0.004	0.006	0.004
19990727	0.005	0.006	---
19990802	0.006	0.005	0.008
19990811	0.009	0.006	---
19990818	0.006	0.005	0.005
19990825	0.006	0.006	---
19990830	0.005	0.005	---
19990831	0.004	0.005	---
19990901	0.005	0.004	-0.004
19990902	0.006	0.006	---
19990903	0.006	0.009	---
19990906	0.010	0.007	---
19990907	0.007	0.006	---
19990908	0.006	0.007	---
19990909	0.007	0.008	---
19990910	0.006	0.016	---
19990913	0.007	0.010	---
19990916	0.008	0.009	0.014
19990920	0.012	0.022	---
19990922	0.005	0.006	---
19990929	0.004	0.005	0.007

Taylor Slough Daily Flow in cfs

* denotes water quality sampling days.

yyyymmdd	S175	S332	S18C
19990701	457.49	184.09	584.00
19990702	457.28	184.82	474.00
19990703	459.19	184.82	572.00
19990704	439.68	184.82	850.00
19990705	443.17	184.82	556.00
19990706*	447.84	184.83	469.00
19990707	413.36	184.83	407.00
19990708	320.79	183.61	369.00
19990709	320.04	184.82	320.00
19990710	206.79	184.82	297.00
19990711	200.52	159.50	331.00
19990712	9.39	161.59	315.00
19990713	0.00	64.21	259.00
19990714	21.63	46.09	237.00
19990715	9.11	69.78	232.00
19990716	6.26	46.41	193.00
19990717	0.00	159.59	164.00
19990718	0.00	137.76	218.00
19990719	0.00	112.97	199.00
19990720	0.00	26.53	218.00
19990721*	0.00	25.23	200.00
19990722	0.00	46.53	142.00
19990723	0.00	5.26	167.00
19990724	0.00	5.24	168.00
19990725	0.00	1.94	137.00
19990726	0.00	48.88	185.00
19990727*	0.00	103.96	200.00
19990728	0.00	75.43	158.00
19990729	0.00	58.32	0.00
19990730	0.00	31.20	0.00
19990731	0.00	0.00	0.00
19990801	0.00	34.96	0.00
19990802*	2.12	264.47	244.00
19990803	0.00	388.14	232.00
19990804	0.00	307.32	247.00
19990805	0.00	293.55	260.00
19990806	0.00	229.45	267.00
19990807	0.00	164.40	243.00
19990808	0.00	137.17	223.00
19990809	0.00	88.81	133.00
19990810	0.00	107.82	207.00
19990811*	0.00	112.95	151.00
19990812	0.00	75.54	149.00
19990813	0.00	289.81	123.00
19990814	0.00	470.03	145.00
19990815	0.00	525.82	164.00
19990816	0.00	492.16	194.00
19990817	0.00	471.47	113.00
19990818*	0.00	437.87	106.00
19990819	0.07	478.10	149.00
19990820	0.00	537.12	296.00
19990821	13.05	535.60	259.00
19990822	179.86	536.73	507.00
19990823	392.46	532.27	739.00
19990824	348.89	537.22	626.00

19990825	355.26	536.97	725.00
19990826	333.86	536.79	728.00
19990827	89.43	537.03	622.00
19990828	0.00	537.08	481.00
19990829	0.00	537.00	215.00
19990830*	0.00	134.48	273.00
19990831*	0.00	0.00	173.00
19990901*	0.00	0.00	97.00
19990902*	0.00	0.00	134.00
19990903*	0.00	0.00	269.00
19990904	0.00	0.00	119.00
19990905	0.00	0.00	0.00
19990906*	0.00	0.00	88.00
19990907*	0.00	0.00	175.00
19990908*	0.00	0.00	229.00
19990909*	0.00	0.00	382.00
19990910*	0.00	0.00	287.00
19990911	0.00	0.00	392.00
19990912	0.00	0.00	497.00
19990913*	332.82	0.00	606.00
19990914	497.49	314.90	646.00
19990915	250.79	114.15	388.00
19990916*	0.00	0.00	325.00
19990917	0.00	0.00	354.00
19990918	0.00	0.00	369.00
19990919	0.00	0.00	417.00
19990920*	210.99	0.00	465.00
19990921	510.80	337.46	592.00
19990922*	416.83	536.28	682.00
19990923	345.68	515.77	508.00
19990924	373.23	373.15	531.00
19990925	351.45	456.73	733.00
19990926	346.77	523.71	882.00
19990927	337.78	533.76	904.00
19990928	322.23	531.43	728.00
19990929*	171.72	506.42	544.00
19990930	93.54	537.46	455.00