Xcel Energy

PRAIRIE ISLAND NUCLEAR GENERATING PLANT

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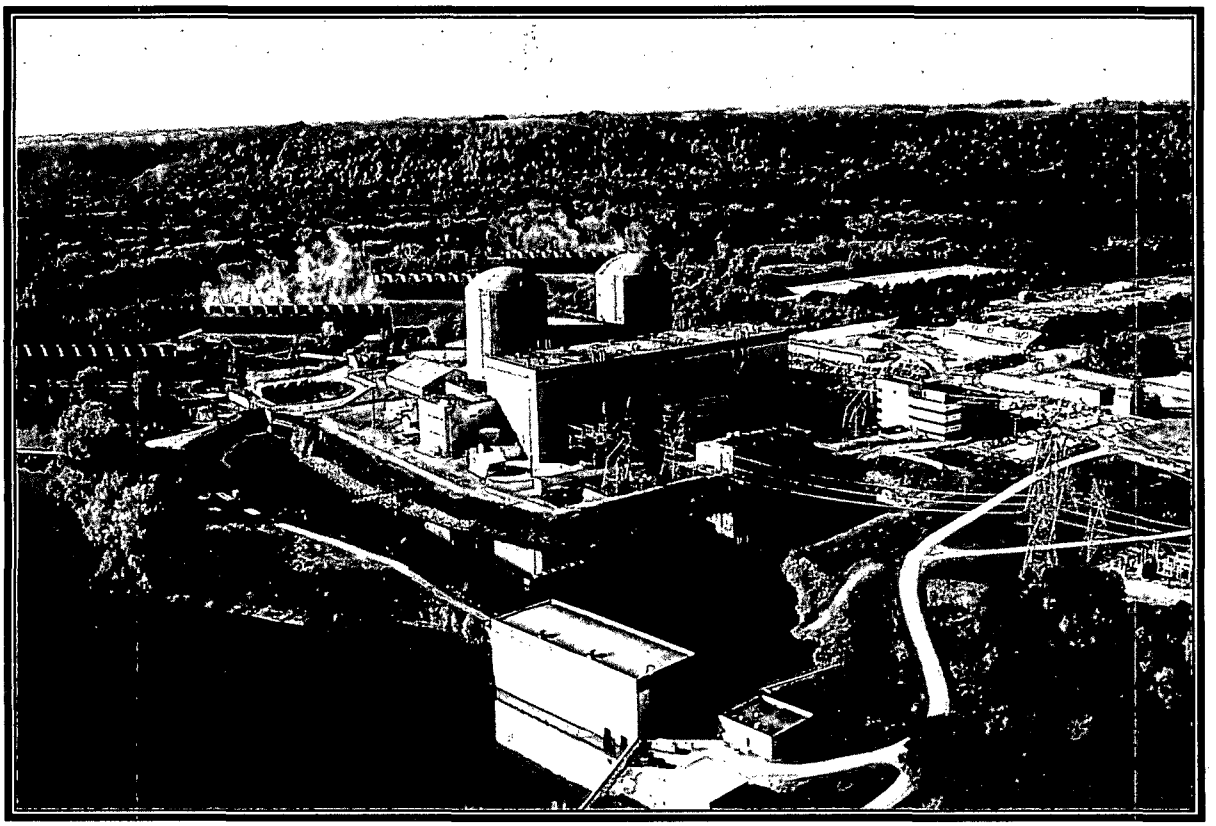
ADDITIONAL INFORMATION



Documents Requested During NRC Environmental Review

Surface Water

Binder 3 of 3

Prairie Island Nuclear Generating Plant
NRC Document Request List

Item Number	Document
Liz Wexler	
63	Bodensteiner, J. 1991
64	ESWQD. 2000.
65	ESWQD. 2001.
66	ESWQD. 2002.
67	ESWQD. 2003.
68	ESWQD. 2004.
69	ESWQD. 2005.
71	HDR. 1978.
72	NSP. 1981a.
73	NSP. 1981b.
74	NSP. 1983.
75	Corr Binder: Letter from Matt Langan, MNDNR, Aug 10, 2007
76	Corr Binder: Letter from John Stine, MDH, April 10, 2008
77	Corr Binder: Letter from Gary Wege, USFWS, June 20, 2007
78	Corr Binder: Letter from Terry Birkenstock, ACE, March 11 2008. If possible, include attachment (2002 Clam Chronicle.pdf)
79	Corr Binder: Email from Tom Lovejoy, WDNR, Aug 31, 2007
80	Report regarding fish kill in 2000
82	Letter to H. Krosch and D. Kriens from W. Jensen, Chlorination of Circ Water System Fish Loss Report, October 14
83	NUS Corporation. 1976.
84	Stone and Webster. 1983.
85	Xcel Energy, 2007, PINGP Environmental Monitoring and Ecological Studies Program 2006 Annual Report.
86	Xcel Energy, 2008, PINGP Environmental Monitoring and Ecological Studies Program 2007 Annual Report.
87	NPDES Filing Cooling Data (Binder 14)
89	From Aquatic Review Binder: ESE. 1999.
91	DMR: 5/21/98
92	DMR: 6/19/98
93	DMR: 10/21/98
94	DMR: 5/21/99
95	DMR: 7/20/01
96	DMR 11/21/01
97	DMR: 8/21/03
98	DMR: 5/20/05
101	Entire 316(b) Binder (Comprehensive Demonstration Study)
102	Plume Modeling of Discharge Canal Discharge Sluice Gate flow into the river

PRAIRIE ISLAND NUCLEAR GENERATING PLANT
ENVIRONMENTAL MONITORING
AND
ECOLOGICAL STUDIES PROGRAM

2007 ANNUAL REPORT

Prepared for

Northern States Power Company d/b/a Xcel Energy

Minneapolis, Minnesota

By

Environmental Services

Water Quality Department

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SECTION I

PRAIRIE ISLAND NUCLEAR GENERATING PLANT
ENVIRONMENTAL MONITORING PROGRAM
2007 ANNUAL REPORT

WATER TEMPERATURE AND FLOW

Report
by
B. D. Giese

Environmental Services
Water Quality Department

WATER TEMPERATURE AND FLOW

INTRODUCTION AND METHODS

The Mississippi River is the source-water body for circulating and cooling water systems at the Prairie Island Nuclear Generating Plant (PINGP). This report presents daily plant operating hours, river inlet temperatures, site discharge temperatures and flows (blowdown). Site discharge temperatures are determined by thermocouples located downstream at U.S. Army Corps of Engineers Lock and Dam 3. Plant inlet (ambient river) temperatures are determined by remote sensors located in Sturgeon Lake, and the main channel at Diamond Bluff. Inlet temperatures are also recorded from thermocouples located in front of the intake screenhouse, which are maintained for back-up. Data presented in this report are for environmental studies comparison, and are not intended as NPDES temperature compliance reporting.

Also presented in this report are daily and monthly average Mississippi River flows, as provided by U.S. Army Corps of Engineers at Lock and Dam 3. Other monthly averages reported include PINGP intake flows, and the percentage of Mississippi River water entering the plant.

RESULTS AND DISCUSSION

Daily average river inlet and site discharge temperature data are presented by month in Table 1. Daily Mississippi River flows recorded at Lock and Dam 3 ranged from 2,300 to 56,300 cfs in 2007 (Table 2). Daily mean site discharge flow (blowdown) from the PINGP external circulating water log ranged from 186 to 1,181 cfs (Table 1).

PINGP withdrew an annual average of 5.2 percent of the Mississippi River flow during 2007 (Table 3). Table 4 shows the monthly average Mississippi River flows for the years 1986 through 2007. The average river flow in 2007 was 16,700 cfs, which was lower than the average river flow of 21,700 cfs for years 1986-2006. The range of annual average river flows is 8,709 cfs in 1988 to 37,772 cfs in 1986.

Table 1. Monthly ambient river inlet temperatures, and site discharge temperatures and flows, with recorded operating hours for Units 1 and 2 at PINGP in 2007

DATE **JANUARY**	OPERATING HOURS UNIT 1	UNIT 2	RIVER INLET TEMP. (°F)	SITE DISCHARGE TEMP. (°F)	MEAN SITE DISCHARGE FLOW (BLOWDOWN-CFS)
1	24	24	37.6	37.1	862
2	24	24	37.3	37.2	862
3	24	24	37.5	37.4	862
4	24	24	38.0	37.6	862
5	24	24	38.7	38.2	855
6	24	24	38.5	37.5	855
7	24	24	38.3	37.1	855
8	24	24	37.2	36.7	862
9	24	24	35.1	36.2	862
10	24	24	35.8	35.9	862
11	24	24	36.2	35.9	855
12	24	24	36.1	35.3	862
13	24	24	35.4	34.6	862
14	24	24	35.7	36.1	862
15	24	24	35.9	37.1	862
16	24	24	35.4	36.7	862
17	24	24	35.7	36.3	862
18	24	24	33.1	36.4	862
19	24	24	35.6	35.9	862
20	24	24	32.3	36.0	862
21	24	24	35.5	35.5	862
22	24	24	35.4	35.9	855
23	24	24	35.3	35.6	862
24	24	24	35.3	35.2	855
25	24	24	35.0	35.8	855
26	24	24	35.3	35.5	855
27	24	24	35.0	35.8	849
28	24	24	35.4	35.6	841
29	24	24	35.0	35.6	855
30	24	24	35.3	36.2	855
31	24	24	35.3	35.6	862
	MONTHLY MINIMUM		32.3	34.6	841
	MONTHLY MAXIMUM		38.7	38.2	862
	MONTHLY MEAN		35.9	36.2	859

Table 1. **Monthly ambient river inlet temperatures, and site discharge temperatures and flows, with recorded operating hours for Units 1 and 2 at PINGP in 2007**

DATE **FEBRUARY**	OPERATING HOURS UNIT 1	UNIT 2	RIVER INLET TEMP. (°F)	SITE DISCHARGE TEMP. (°F)	MEAN SITE DISCHARGE FLOW (BLOWDOWN-CFS)
1	24	24	35.3	35.8	862
2	24	24	35.2	36.9	862
3	24	24	35.3	36.5	862
4	24	24	35.3	36.5	862
5	24	24	35.2	36.4	862
6	24	24	35.2	36.1	862
7	24	24	35.1	36.7	862
8	24	24	35.1	37.0	862
9	24	24	35.2	36.6	869
10	24	24	35.1	37.2	862
11	24	24	35.1	36.9	862
12	24	24	35.1	37.3	869
13	24	24	34.9	37.3	869
14	24	24	35.1	37.1	862
15	24	24	35.1	36.8	862
16	24	24	35.1	36.8	862
17	24	24	35.0	36.6	862
18	24	24	34.9	37.4	862
19	24	24	32.9	37.0	862
20	24	24	35.0	37.1	862
21	24	24	33.3	37.5	862
22	24	24	35.2	36.8	862
23	24	24	35.5	37.1	862
24	24	24	35.4	37.1	862
25	24	24	35.2	36.1	862
26	24	24	35.0	36.4	855
27	24	24	34.8	36.5	855
28	24	24	35.1	37.4	855
	MONTHLY MINIMUM		32.9	35.8	855
	MONTHLY MAXIMUM		35.5	37.5	869
	MONTHLY MEAN		35.0	36.8	862

Table 1. Monthly ambient river inlet temperatures, and site discharge temperatures and flows, with recorded operating hours for Units 1 and 2 at PINGP in 2007

DATE **MARCH**	OPERATING HOURS UNIT 1	UNIT 2	RIVER INLET TEMP. (°F)	SITE DISCHARGE TEMP. (°F)	MEAN SITE DISCHARGE FLOW (BLOWDOWN-CFS)
1	24	3.16	34.2	35.5	636
2	24	0	34.8	34.4	624
3	24	0	33.4	34.4	624
4	24	0	34.8	34.2	612
5	24	0	35.0	34.8	612
6	24	0	35.0	34.3	612
7	24	0	34.9	34.5	612
8	24	12.33	35.0	35.1	612
9	24	24	35.0	37.0	672
10	24	24	35.5	36.6	696
*11	23	23	35.9	36.2	696
12	24	24	36.5	37.1	696
13	24	24	36.5	38.0	696
14	24	24	36.8	37.1	760
15	24	24	37.8	36.8	760
16	24	24	36.7	36.7	862
17	24	24	38.0	38.0	869
18	24	24	37.4	36.6	869
19	24	24	37.3	35.6	869
20	24	24	37.0	35.6	875
21	24	24	35.9	35.8	862
22	24	24	37.7	35.6	862
23	24	24	38.8	37.2	862
24	24	24	40.4	38.4	875
25	24	24	42.3	40.2	868
26	24	24	43.6	42.4	889
27	24	24	46.2	45.4	932
28	24	24	47.6	44.7	985
29	24	24	46.6	44.2	985
30	24	24	47.7	44.8	991
31	24	24	47.1	44.9	991
MONTHLY MINIMUM			33.4	34.2	612
MONTHLY MAXIMUM			47.7	45.4	991
MONTHLY MEAN			38.4	37.8	786

* Daylight savings

Table 1. Monthly ambient river inlet temperatures, and site discharge temperatures and flows, with recorded operating hours for Units 1 and 2 at PINGP in 2007

DATE APRIL	OPERATING HOURS UNIT 1	UNIT 2	RIVER INLET TEMP. (°F)	SITE DISCHARGE TEMP. (°F)	MEAN SITE DISCHARGE FLOW (BLOWDOWN-CFS)
1	24	24	47.0	44.6	985
2	24	24	46.3	43.3	985
3	24	24	46.8	43.4	985
4	24	24	43.7	40.6	973
5	24	9.13	41.4	39.1	849
6	24	0	40.8	38.7	828
7	24	0	39.8	37.1	636
8	24	16.25	39.5	37.2	513
9	24	24	40.5	38.7	684
10	24	24	41.6	38.9	720
11	24	24	41.4	39.0	842
12	24	24	40.1	38.1	842
13	24	24	41.9	40.0	842
14	24	24	43.9	41.0	624
15	24	24	45.0	43.2	299
16	24	24	46.6	45.1	283
17	24	24	48.4	46.6	283
18	24	24	49.5	48.6	283
19	24	24	50.4	49.4	283
20	24	24	50.4	51.8	283
21	24	24	52.0	53.3	291
22	24	24	53.0	55.1	291
23	24	24	54.2	55.4	291
24	24	24	55.7	56.6	186
25	24	24	54.2	56.1	291
26	24	24	54.4	55.6	291
27	24	24	54.7	55.3	267
28	24	24	56.4	57.7	275
29	24	24	58.0	59.4	283
30	24	24	58.6	59.9	299
	MONTHLY MINIMUM		39.5	37.1	186
	MONTHLY MAXIMUM		58.6	59.9	985
	MONTHLY MEAN		47.9	47.0	526

Table 1. Monthly ambient river inlet temperatures, and site discharge temperatures and flows, with recorded operating hours for Units 1 and 2 at PINGP in 2007

DATE **MAY**	OPERATING HOURS UNIT 1	UNIT 2	RIVER INLET TEMP. (°F)	SITE DISCHARGE TEMP. (°F)	MEAN SITE DISCHARGE FLOW (BLOWDOWN-CFS)
1	24	24	59.1	59.4	291
2	24	24	60.0	60.7	283
3	24	24	60.4	61.5	283
4	24	24	61.2	60.5	283
5	24	24	59.6	59.8	283
6	24	24	58.5	58.6	291
7	24	24	58.2	58.0	291
8	24	24	59.1	58.8	291
9	24	24	61.3	62.1	291
10	24	24	63.6	64.5	291
11	3.72	24	65.2	66.2	283
12	0	24	64.7	65.4	283
13	0	24	63.2	64.1	283
14	0	24	63.5	64.8	283
15	0	24	66.1	66.8	291
16	0	24	62.4	63.9	291
17	0	24	62.5	63.4	283
18	0	24	63.7	64.2	283
19	8.75	24	63.6	64.9	283
20	24	24	64.1	64.8	275
21	24	24	62.3	63.6	275
22	24	24	64.0	65.4	315
23	24	24	66.4	67.9	395
24	24	24	66.8	67.8	419
25	24	24	64.0	65.1	243
26	24	24	64.3	65.2	275
27	24	24	62.8	63.4	291
28	24	24	64.0	64.4	291
29	24	24	66.0	67.2	331
30	24	24	67.1	68.1	315
31	24	24	67.6	68.8	304
	MONTHLY MINIMUM		58.2	58.0	243
	MONTHLY MAXIMUM		67.6	68.8	419
	MONTHLY MEAN		63.1	63.8	296

Table 1. Monthly ambient river inlet temperatures, and site discharge temperatures and flows, with recorded operating hours for Units 1 and 2 at PINGP in 2007

DATE JUNE	OPERATING HOURS UNIT 1	UNIT 2	RIVER INLET TEMP. (°F)	SITE DISCHARGE TEMP. (°F)	MEAN SITE DISCHARGE FLOW (BLOWDOWN-CFS)
1	24	24	69.5	70.8	338
2	24	24	68.9	69.9	384
3	24	24	68.6	69.7	384
4	24	24	68.8	69.9	373
5	24	24	68.4	69.3	373
6	24	24	66.6	69.2	384
7	24	24	67.2	67.5	384
8	24	24	67.5	68.3	396
9	24	24	67.3	68.0	396
10	24	24	68.8	69.6	384
11	24	24	70.1	71.6	430
12	24	24	71.7	72.9	526
13	24	24	73.0	74.2	570
14	24	24	74.1	75.3	570
15	24	24	75.3	76.2	600
16	24	24	78.1	79.1	744
17	24	24	77.7	78.9	783
18	24	24	79.2	80.7	875
19	24	24	74.9	76.5	783
20	24	24	72.4	73.9	783
21	24	24	74.5	75.6	783
22	24	24	74.7	75.9	783
23	24	24	73.0	74.2	783
24	24	24	74.5	75.7	783
25	24	24	75.6	77.4	783
26	24	24	76.4	78.4	783
27	24	24	79.3	80.7	882
28	24	24	76.7	77.4	776
29	24	24	76.1	77.2	783
30	24	24	75.6	77.5	783
	MONTHLY MINIMUM		66.6	67.5	338
	MONTHLY MAXIMUM		79.3	80.7	882
	MONTHLY MEAN		72.8	74.1	613

Table 1. Monthly ambient river inlet temperatures, and site discharge temperatures and flows, with recorded operating hours for Units 1 and 2 at PINGP in 2007

DATE **JULY**	OPERATING HOURS UNIT 1	UNIT 2	RIVER INLET TEMP. (°F)	SITE DISCHARGE TEMP. (°F)	MEAN SITE DISCHARGE FLOW (BLOWDOWN-CFS)
1	24	24	77.8	79.1	1164
2	24	24	75.9	78.3	1164
3	24	24	75.5	77.6	1165
4	24	24	75.4	77.5	1165
5	24	24	77.8	79.1	1165
6	24	24	77.7	79.6	1165
7	24	24	77.9	80.3	1149
8	24	24	80.5	81.5	1181
9	24	24	79.5	81.7	1181
10	24	24	79.6	82.0	1165
11	24	24	77.1	78.9	1149
12	24	24	76.3	78.1	1165
13	24	24	74.0	76.7	1165
14	24	24	75.2	78.0	1165
15	24	24	74.3	77.1	1165
16	24	24	75.8	78.2	1165
17	24	24	76.7	79.7	1165
18	24	24	77.4	80.7	1165
19	24	24	77.3	79.7	1165
20	24	24	77.5	79.0	1165
21	24	24	77.1	79.2	1149
22	24	24	76.5	79.7	1165
23	24	24	75.3	79.4	1165
24	24	24	75.3	79.7	1165
25	24	24	77.0	80.1	1165
26	24	24	78.1	81.3	1165
27	24	24	78.2	81.6	1181
28	24	24	78.8	81.7	1149
29	24	24	79.5	82.0	1149
30	24	24	80.1	82.3	1165
31	24	24	80.4	83.4	1165
	MONTHLY MINIMUM		74.0	76.7	1149
	MONTHLY MAXIMUM		80.5	83.4	1181
	MONTHLY MEAN		77.3	79.8	1164

Table 1. Monthly ambient river inlet temperatures, and site discharge temperatures and flows, with recorded operating hours for Units 1 and 2 at PINGP in 2007

DATE AUGUST	OPERATING HOURS UNIT 1	UNIT 2	RIVER INLET TEMP. (°F)	SITE DISCHARGE TEMP. (°F)	MEAN SITE DISCHARGE FLOW (BLOWDOWN-CFS)
1	24	24	80.6	83.5	1165
2	24	24	80.1	83.7	1165
3	24	24	79.5	82.3	1149
4	24	24	79.8	81.6	1149
5	24	24	76.4	80.0	1149
6	24	24	76.3	78.7	1149
7	24	24	77.6	80.7	1165
8	24	24	78.0	81.4	1165
9	24	24	77.7	81.8	1165
10	24	24	78.9	81.9	1165
11	24	24	79.1	82.5	1181
12	24	24	79.2	80.7	1165
13	24	24	78.3	81.0	1165
14	24	24	78.3	82.3	1181
15	24	24	77.8	79.7	1165
16	24	24	76.8	79.1	1165
17	24	24	77.3	79.4	1165
18	24	24	75.2	78.3	1165
19	24	24	70.5	75.3	1165
20	24	24	69.8	71.5	1165
21	24	24	69.4	72.4	1165
22	24	24	69.7	72.6	1165
23	24	24	70.6	72.4	1165
24	24	24	71.1	72.7	1165
25	24	24	70.7	72.9	1165
26	24	24	70.8	73.2	1165
27	24	24	69.5	74.0	1165
28	24	24	74.0	74.2	1165
29	24	24	74.1	73.7	1149
30	24	24	72.1	73.5	1165
31	24	24	74.2	74.2	1149
	MONTHLY MINIMUM		69.4	71.5	1149
	MONTHLY MAXIMUM		80.6	83.7	1181
	MONTHLY MEAN		75.3	77.8	1163

Table 1. **Monthly ambient river inlet temperatures, and site discharge temperatures and flows, with recorded operating hours for Units 1 and 2 at PINGP in 2007**

DATE **SEPTEMBER**	OPERATING HOURS UNIT 1	UNIT 2	RIVER INLET TEMP. (°F)	SITE DISCHARGE TEMP. (°F)	MEAN SITE DISCHARGE FLOW (BLOWDOWN-CFS)
1	24	24	75.4	75.3	1149
2	24	24	75.5	75.7	1165
3	24	24	76.3	76.2	1149
4	24	24	77.2	77.6	1165
5	24	24	78.1	78.5	1165
6	24	24	78.3	79.7	1165
7	24	24	78.6	79.1	1165
8	24	24	77.1	77.1	1165
9	24	24	75.4	75.9	1165
10	24	24	73.9	74.4	1165
11	24	24	72.4	73.8	1165
12	24	24	68.9	69.4	1165
13	24	24	68.4	70.0	1165
14	24	24	65.9	66.4	1165
15	24	24	63.9	64.0	1165
16	24	24	63.0	66.3	1165
17	24	24	65.5	67.3	1165
18	24	24	67.3	69.1	1181
19	24	24	67.4	66.9	1165
20	24	24	67.9	67.5	1165
21	24	24	68.7	69.3	1181
22	24	24	67.7	66.2	1165
23	24	24	67.7	67.5	1165
24	24	24	69.1	68.8	1181
25	24	24	70.3	69.4	1181
26	24	24	67.5	66.0	243
27	24	24	67.0	67.1	1165
28	24	24	67.0	65.7	1165
29	24	24	66.8	66.1	862
30	24	21.5	63.9	65.1	869
	MONTHLY MINIMUM		63.0	64.0	243
	MONTHLY MAXIMUM		78.6	79.7	1181
	MONTHLY MEAN		70.4	70.7	1115

Table 1. Monthly ambient river inlet temperatures, and site discharge temperatures and flows, with recorded operating hours for Units 1 and 2 at PINGP in 2007

DATE **OCTOBER**	OPERATING HOURS UNIT 1	UNIT 2	RIVER INLET TEMP. (°F)	SITE DISCHARGE TEMP. (°F)	MEAN SITE DISCHARGE FLOW (BLOWDOWN-CFS)
1	24	24	63.9	64.7	1165
2	24	24	63.6	65.2	1165
3	24	24	62.4	63.8	1165
4	24	24	62.4	64.3	1165
5	24	24	64.0	65.9	1181
6	24	24	65.2	67.1	1181
7	24	24	66.4	68.6	1181
8	24	24	67.2	69.1	1165
9	24	24	64.5	65.2	1149
10	24	24	59.8	60.1	1149
11	24	24	59.6	60.3	1149
12	24	24	59.3	59.7	1149
13	24	24	60.4	58.8	849
14	24	24	58.2	58.8	875
15	24	24	56.2	57.5	1164
16	24	24	55.8	56.7	1164
17	24	24	56.0	56.9	1165
18	24	24	56.9	58.5	1165
19	24	24	56.2	57.4	1165
20	24	24	55.0	56.4	1165
21	24	24	56.2	57.2	1165
22	24	24	55.5	55.6	1149
23	24	24	53.8	54.3	1132
24	24	24	53.3	53.2	1149
25	24	24	52.5	52.6	1149
26	24	24	51.9	51.6	1149
27	24	24	51.4	51.2	1149
28	24	24	49.5	50.5	1165
29	24	24	50.5	50.6	1165
30	24	24	50.6	50.6	1165
31	24	24	51.2	51.1	1165
	MONTHLY MINIMUM		49.5	50.5	849
	MONTHLY MAXIMUM		67.2	69.1	1181
	MONTHLY MEAN		57.7	58.5	1141

Table 1. **Monthly ambient river inlet temperatures, and site discharge temperatures and flows, with recorded operating hours for Units 1 and 2 at PINGP in 2007**

DATE **NOVEMBER**	OPERATING HOURS UNIT 1	UNIT 2	RIVER INLET TEMP. (°F)	SITE DISCHARGE TEMP. (°F)	MEAN SITE DISCHARGE FLOW (BLOWDOWN-CFS)
1	24	24	49.1	50.4	1165
2	24	24	49.0	49.8	1165
3	24	24	48.4	48.6	1164
*4	25	25	47.6	48.5	1149
5	24	24	47.6	48.1	1165
6	24	24	45.3	45.6	1096
7	24	24	44.1	45.1	1068
8	24	24	43.5	44.6	1054
9	24	24	42.8	44.1	1054
10	24	24	42.8	44.1	1068
11	24	24	42.8	44.1	1068
12	24	24	43.0	44.8	1068
13	24	24	42.2	43.7	1068
14	24	24	42.4	44.2	1068
15	24	24	41.0	42.1	1152
16	24	24	40.8	42.4	1152
17	24	24	40.7	42.0	1152
18	24	24	40.6	41.9	1152
19	24	24	40.8	42.1	1152
20	24	24	43.2	42.1	991
21	24	24	42.5	41.3	991
22	24	24	39.6	40.5	979
23	24	24	39.9	39.0	967
24	24	24	40.0	38.2	973
25	24	24	39.6	38.4	961
26	24	24	39.7	38.8	961
27	24	24	38.7	36.7	961
28	24	24	37.2	36.5	865
29	24	24	36.1	35.8	865
30	24	24	36.4	37.0	835
		MONTHLY MINIMUM	36.1	35.8	835
		MONTHLY MAXIMUM	49.1	50.4	1165
		MONTHLY MEAN	42.2	42.7	1051

* Daylight savings

Table 1. **Monthly ambient river inlet temperatures, and site discharge temperatures and flows, with recorded operating hours for Units 1 and 2 at PINGP in 2007**

DATE **DECEMBER**	OPERATING HOURS UNIT 1	UNIT 2	RIVER INLET TEMP. (°F)	SITE DISCHARGE TEMP. (°F)	MEAN SITE DISCHARGE FLOW (BLOWDOWN-CFS)
1	24	24	36.4	37.7	835
2	24	24	36.1	37.1	835
3	24	24	36.1	36.4	835
4	24	24	36.0	36.5	835
5	24	24	35.5	35.5	828
6	24	24	35.7	34.9	828
7	24	24	35.6	34.2	828
8	24	24	35.5	35.0	828
9	24	24	35.6	33.7	828
10	24	24	35.5	34.9	828
11	24	24	35.6	34.5	828
12	24	24	35.5	34.8	828
13	24	24	35.4	34.9	828
14	24	24	35.1	34.8	828
15	24	24	35.4	34.8	828
16	24	24	35.3	34.9	828
17	24	24	35.2	35.0	828
18	24	24	35.3	35.0	828
19	24	24	35.3	34.8	828
20	24	24	35.2	34.8	828
21	7	24	35.2	34.9	828
22	0	24	35.2	33.3	472
23	0	24	35.3	33.2	472
24	5	24	35.2	33.5	472
25	24	24	35.1	34.4	672
26	24	24	35.1	34.6	720
27	24	24	35.1	34.8	752
28	24	24	35.1	34.9	753
29	24	24	35.1	34.5	753
30	24	24	35.0	34.0	753
31	24	24	35.1	34.8	753
	MONTHLY MINIMUM		35.0	33.2	472
	MONTHLY MAXIMUM		36.4	37.7	835
	MONTHLY MEAN		35.4	34.9	774

Table 2 Daily 2007 Mississippi River Discharge Flow rate (cfs) at Lock Dam 3

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	10800	6400	5800	50700	33900	22400	11100	3900	9100	17000	31300	5100
2	10700	6300	6100	50800	33400	22300	11400	3200	6800	11200	30300	5600
3	9200	5800	6000	52600	33000	22500	8900	4800	7000	11600	29000	6700
4	10000	5800	5800	54200	32500	23500	9600	4800	6900	14800	26600	6700
5	10300	5700	5500	55600	31900	23300	10300	3900	6100	15300	26200	8300
6	11900	5500	5400	56300	30500	23200	10900	4000	4700	19600	24100	9900
7	11700	5000	5500	55300	31300	24300	10100	3900	6200	22300	22200	10100
8	11400	5000	5400	54000	30200	25500	7500	4000	7800	24300	20700	10500
9	10000	4900	5500	52300	29600	24900	6300	4000	6200	26700	20000	9400
10	9900	4900	6200	50700	29600	25600	8600	3900	4700	27800	19400	9300
11	7500	4900	7100	49300	29900	23700	8600	2300	4800	29000	17800	9700
12	7900	4900	7700	47000	29700	23100	7000	9200	4800	29200	17300	10300
13	7500	4900	10000	44300	28000	21200	6200	4600	4700	29400	17500	10200
14	6600	4900	14000	41900	28300	20400	5500	3100	5600	29400	17000	10300
15	5200	4900	18600	39700	28700	19100	5500	10900	6200	28200	17200	10100
16	5900	4800	21400	37700	25800	18400	5500	6100	4600	27500	15400	10000
17	6000	4900	24800	35900	25200	18300	5400	4700	4600	27000	15400	10000
18	6100	5000	26900	34300	23800	16500	5400	3100	4700	25900	15500	9900
19	6200	4900	28800	33100	23200	17000	6900	4700	8700	28700	14500	10100
20	6300	4900	31300	32700	22300	16800	5400	10600	10400	30100	15200	10300
21	6600	4900	35200	32300	20300	16200	5400	6600	10300	34400	15600	10300
22	7300	5100	35300	32000	20500	16500	4600	12200	14300	33500	13300	10300
23	7900	5100	34600	32500	19900	15800	3200	14500	8900	36300	12900	10500
24	8200	5000	35000	33000	21100	15200	3200	13200	11900	38300	13100	9300
25	7500	5800	37300	33500	21700	14900	4000	13200	10500	39800	13500	9400
26	7000	6300	39100	33700	20200	14800	4700	11500	10500	40100	12500	10500
27	6800	5800	42000	33200	18800	14500	7000	10100	11100	39800	12800	10400
28	6600	5800	44600	32500	21300	11300	4600	13000	11700	38400	12000	10400
29	6400		46900	32500	21700	10300	4600	14800	10100	36800	9000	10500
30	6500		48600	33500	22800	10400	4700	8900	8900	34500	6200	10200
31	6400		49600		22600		4700	9100		32700		10100
MIN	5200	4800	5400	32000	18800	10300	3200	2300	4600	11200	6200	5100
MAX	11900	6400	49600	56300	33400	25600	11400	14800	14300	40100	31300	10500
MEAN	8000	5300	22500	41900	26200	19100	6700	7300	7800	28400	17800	9500
YEAR M		56300										
YEAR MIN		2300										

Table 3 **2007 Percentage of mean monthly Mississippi River flow entering the Xcel Energy Prairie Island Generating Plant intake**

Month	Mean Plant Flow (cfs)	Mean River Flow (cfs)	Percentage of Mean River Flow Entering the Plant Intake
January	859	8000	10.74%
February	862	5300	16.26%
March	786	22500	3.49%
April	526	41900	1.26%
May	296	26200	1.13%
June	613	19100	3.21%
July	1164	6700	17.37%
August	1163	7300	15.93%
September	1115	7800	14.29%
October	1141	28400	4.02%
November	1051	17800	5.90%
December	774	9500	8.15%
Averages	863	16700	5.16%

Table 4. Mean Monthly Mississippi River Flow for 1986 - 2007, in cubic feet per second (cfs).

Month	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997
January	8,000	17,800	9,900	6,700	9,229	10,932	11,271	8,974	10,790	9,806	14,823
February	5,300	18,200	11,600	6,700	7,871	10,104	10,471	9,548	12,589	14,911	13,954
March	22,500	20,800	14,700	15,000	13,210	11,497	10,948	22,219	17,897	26,574	24,177
April	41,900	51,400	44,700	24,700	25,613	40,657	112,703	15,570	42,013	51,477	106,073
May	26,200	41,000	31,000	19,400	42,194	33,974	82,661	18,839	47,426	22,681	39,316
June	19,100	21,500	39,200	46,000	27,413	26,323	53,177	22,070	34,423	25,690	19,487
July	6,700	7,800	21,900	19,500	32,739	34,597	23,981	21,052	27,548	26,477	36,119
August	7,300	7,600	9,800	10,600	10,084	29,065	12,164	10,026	24,432	10,742	28,074
September	7,800	6,500	15,200	19,200	7,087	24,513	9,193	6,687	18,013	7,060	16,663
October	28,400	7,300	35,900	19,500	6,771	28,600	9,577	6,790	14,200	12,597	14,155
November	17,800	7,100	19,200	21,900	8,167	18,467	11,040	17,463	13,243	19,773	14,160
December	9,500	6,800	19,100	12,300	8,310	12,135	13,813	9,558	9,671	15,645	12,694
Averages	**16,700**	**17,800**	**22,700**	**18,500**	**16,557**	**23,405**	**30,083**	**14,066**	**22,687**	**20,286**	**28,308**

Month	1996	1995	1994	1993	1992	1991	1990	1989	1988	1987	1986
January	14,826	11,365	13,090	9,326	15,658	5,542	4,965	6,294	7,303	13,758	13,710
February	15,041	9,371	12,611	8,936	13,978	5,879	4,889	6,529	7,634	12,586	12,804
March	24,474	29,061	28,542	12,513	43,661	15,081	17,484	11,300	14,810	17,287	24,790
April	57,517	48,507	40,830	55,473	32,668	34,268	12,842	33,264	21,463	20,267	84,870
May	46,535	45,135	47,548	48,571	25,474	44,753	22,310	24,287	13,119	13,655	81,242
June	33,790	30,667	26,913	65,377	17,920	44,960	31,610	13,237	4,667	14,573	37,043
July	23,732	27,323	29,403	84,123	28,985	33,856	20,323	7,690	2,903	11,674	34,684
August	13,303	29,129	19,971	41,135	14,532	21,535	16,322	4,658	5,103	10,477	30,813
September	9,300	19,860	21,203	30,717	15,686	25,182	9,923	8,307	6,080	7,183	41,957
October	11,403	31,061	25,581	19,516	15,374	15,458	11,135	6,358	7,019	7,771	49,319
November	23,353	30,703	20,173	18,773	19,076	22,467	9,903	6,793	7,919	8,693	24,260
December	18,716	17,494	14,432	16,490	12,126	20,503	6,184	4,961	6,487	9,016	17,774
Averages	**24,333**	**27,473**	**25,025**	**34,246**	**21,262**	**24,124**	**13,991**	**11,140**	**8,709**	**12,245**	**37,772**

Note: Mean monthly river flow data for the years 1990, 1991 and 1992 have been adjusted to reflect the averages found in Table 2 of the corresponding annual report for each year.

SECTION II

PRAIRIE ISLAND NUCLEAR GENERATING PLANT
ENVIRONMENTAL MONITORING PROGRAM
2007 ANNUAL REPORT

SUMMARY OF THE 2007 FISH POPULATION STUDY

Report
by
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Environmental Services
Water Quality Department

SUMMARY OF THE 2007 FISH POPULATION STUDY

INTRODUCTION

To fulfill part of the continuing environmental monitoring requirements of the Prairie Island Nuclear Generating Plant, (PINGP), the Mississippi River fisheries population was sampled near Red Wing, Minnesota, May through October, 2007. The study area extends from 3.6 miles upstream of the plant (River mile 802) to 10.8 miles downstream of the plant (River mile 787.5), (Figure 1). The original objective of the study was to "determine existing ecological characteristics before plant operation and to assess any significant changes to the aquatic environment after operation" (NSP 1972). The objective was changed slightly after the plant became operational in 1973; to "determine environmental effects of the PINGP on the fish community in the Mississippi River and it's backwaters" (Hawkinson 1973). Presently, the objective is to monitor and assess the status of the fishery in the vicinity of the PINGP (Mueller 1994). Parameters analyzed and compared to previous years include species composition, length-weight regressions, percent contribution (fish/hr), length-frequency distributions, and catch per unit effort (CPUE) for selected species.

METHODS AND MATERIALS

Fish were collected using a Smith-Root SR-18 Electrofishing boat equipped with a 5.0 GPP electrofishing unit (Figure 6). The power source was a 5.0 GPP generator. The 5000 watt generator has a maximum output of 16 amps, and a range of 0-1000 volts. The generator has the capability to be either pulsed AC or DC with a pulse frequency of 7.5, 15, 30, 60, and 120 Hz. The annode consists of two umbrella arrays, each with six dropper cables. The 18 foot boat and dropper cables hung from the front of the boat serve as the cathode. Collection occurred during daylight hours with a pulsed direct current. Due to the constantly changing river conditions, Electrofisher output was varied to enhance the effectiveness.

Sampling was done monthly, May through October, within four established sectors of the study area (Figures 1-5). The runs within each sector are similar to previous years sampling to ensure a similar set of relative data indices for yearly comparison. At the end of each "run", the elapsed shocking time was recorded from a digital timer, which only tallied the seconds that the electrical field was energized. A run was terminated after approximately 450 seconds shocking time or when the end of the prescribed run was reached.

Stunned fish were captured with one-inch stretch mesh landing nets equipped with eight-foot insulated handles. Fish were placed in live-wells, supplied with river water constantly, until the end of each run. At the end of each run fish were identified, measured to the nearest millimeter (total length), weighed to the nearest 10 grams, and released. Parameters used to describe the

fisheries include species composition, length-weight regressions, percent contribution, length-frequency distributions, and catch per unit effort (CPUE). It is assumed that population dynamics and spatial distribution is represented by CPUE.

Electrofishing CPUE was computed as numbers of fish per hour for each sector. Length frequencies in 20 millimeter intervals were calculated for all fish species. Length-weight relationships were calculated using the length-weight formula:

$$\log W = \log a + b \log L,$$

where W is the weight in grams, a is the y axis intercept, b is the slope of the regression line, and L is the total length in millimeters.

RESULTS

Initial PINGP preoperational annual environmental reports simply listed all data collected without discussion or analysis (NSP 1972). Individual species were not discussed, due to the amount of data collected during initial sampling efforts. Representative species were selected in 1975 for abundance comparisons based on electrofishing data (Gustafson et. al. 1975), modified in 1986 after seining was eliminated (Donkers 1986), and in 1989 smallmouth and largemouth bass were added as they "have been seen more frequently in the electrofishing catch during recent years in the PINGP study area" (Mueller 1989).

Electrofishing collection methods changed before the 1982 sampling season. The mesh size of the dip nets was increased to one inch stretch mesh. The larger mesh size enabled small adult fish and some young of the year fish of certain species to avoid collection. Currently, individual gizzard shad, freshwater drum, and white bass less than 160 mm are not collected. Also, logperch and cyprinids (other than carp) are no longer collected, due to their small size (Donkers 1987). Therefore, a direct comparison of electrofishing CPUE prior to 1982 is inappropriate to later years.

Species collected in 2007 are compared to previous years in Table 1. A total of 7,521 fish, comprising 40 species, was collected in the 2007 survey (Table 2).

All species collected in 2007 are ranked according to electrofishing CPUE and listed in Table 2. Summaries for selected species (Tables 3-9) are based on electrofishing and trapnetting data for years 1977 through 1987, and on electrofishing data only for years 1988 through 2007, since trapnetting was discontinued after 1987 (Orr 1988). Annual CPUE for selected species is compared to previous years (Figures 15-22), by sector (Figures 23-30), and by date (Figures 31-38).

The top three abundant species, based on CPUE, was determined for each sector.

Sector One;	shorthead redhorse, freshwater drum, smallmouth bass
Sector Two;	bluegill, carp, shorthead redhorse
Sector Three;	smallmouth bass, white bass, carp
Sector Four;	white bass, freshwater drum, gizzard shad
Overall CPUE Average;	carp, smallmouth bass, white bass

Table 10 summarizes the percent contribution of historically predominant species in the annual catch. Length frequency distributions for selected species are illustrated by sector in Figures 7 through 14.

DISCUSSION

When dealing with a large river environment, a high degree of natural variability exists in habitat conditions and therefore, in fish distribution. Palmquist (1982) proposed the wide range in species abundance between study sectors was largely due to habitat preferences of a species rather than PINGP induced. A high degree of variability in species abundance exists within sectors from year to year. Differences in collection efficiency and year class strengths may explain this variability.

A qualitative and quantitative discussion for selected species, with respect to other years, includes: 1) CPUE, 2) rank, 3) percent composition of catch, 4) population condition as depicted by length-weight regression analysis, and 5) mean length.

Average mean length was calculated by splitting the length data for each species into 20 mm intervals and multiplying the number of fish in each interval by the median length of that interval (Example: The number of fish in the 260-279 mm interval was multiplied by 270 mm). Interval totals were summed, divided by the total number of fish, and rounded to the nearest 10 mm.

GIZZARD SHAD

Electrofishing CPUE for gizzard shad increased from 7.91 fish/hr in 2006 to 8.71 fish/hr in 2007 (Figure 15). CPUE decreased in sectors 2 and 3 from 2006 to 2007 (Figure 23). CPUE was also examined for each sampling month for 2007, with the highest occurring in Sector 4 in May (Figure 31).

Shad ranked seventh in 2007 (Table 2), and presently comprise five percent of the catch (Table 10). The general condition of gizzard shad, 2.829, falls into the range of previous years, 2.388 to

3.934 from 1982-2006 (Table 3). Carlander (1969) sites a population in Canton Lake, Oklahoma with a range in total fish length of 173 to 335 mm and a regression slope of 3.066 which compares well to the fish in this study. The mean length for gizzard shad (340 mm) is the same as 2006 (Table 3). The length frequency data indicates a range of approximately 170-470 mm, with peaks occurring at approximately 240, 310 and 380 mm (Figure 7).

FRESHWATER DRUM

Freshwater Drum CPUE for 2007, (22.52 fish/hour) increased from 16.61 fish/hr in 2006 (Figure 16). CPUE was higher in all sectors, except sector 2, when comparing 2007 to 2006 (Figure 24). The highest CPUE in a sector for any month occurred in sector 3 in May (Figure 32).

Freshwater drum CPUE ranked fourth in 2007 (Table 2). Presently, adult freshwater drum comprise 12 percent of the catch (Table 4).

The general condition of freshwater drum has remained relatively stable, as depicted by a regression slope of 3.054 in 2007, in comparison to a range of slopes of 2.598 to 3.276 from previous years of the study (Table 4). The mean length for freshwater drum was approximately 320 mm in 2007 (Table 4). The length frequency data for freshwater drum suggest that a peak occurs at approximately 310 mm (Figure 8).

SHORTHEAD REDHORSE

Electrofishing CPUE for shorthead redhorse has ranged from 7.07 to 25.94 fish/hour (Figure 17). CPUE for 2007 (20.11 fish/hr) is similar to values observed for 1997-2004 (Table 5). Historically, the CPUE within each sector is highly variable (Figure 25). The 2007 CPUE is also variable between sectors, ranging from 27.53 fish/hour in Sector 1, to 10.47 fish/hour in Sector 4 (Table 2). CPUE for each sector is highly variable during the collection year, with the highest CPUE occurring in Sector 1 in May (Figure 33).

Shorthead redhorse ranked fifth in 2007 (Table 2), comprising eleven percent of the catch (Table 5).

The general condition of shorthead redhorse has remained relatively stable, as depicted by a regression slope of 2.808 in 2007, in comparison to a range of slopes of 2.571 to 3.041 from previous years of the study (Table 5). The length-weight regression slope of shorthead redhorse in the vicinity of Prairie Island is about the same as that of another population of Upper Mississippi River shorthead redhorse as reported by Carlander (1969) as having a slope of 2.83. The mean length for shorthead redhorse at Prairie Island was approximately 330 mm in 2007

(Table 5). The length frequency data show that the main peaks occur at approximately 230 and 370 mm (Figure 9).

WHITE BASS

Electrofishing CPUE for white bass in 2007 (22.68 fish/hr) is higher than 2006, but is still the lowest recorded since 1996 (Table 6 and Figure 18). CPUE increased in all sectors, except sector 1, when comparing 2007 to 2006 (Figure 26). A large difference is evident when comparing CPUE upstream of Lock and Dam 3 to downstream of Lock and Dam 3 (Table 2). Overall CPUE appears cyclic (Figure 18) with year to year variability within each sector (Figure 26). Highest CPUE for any month sampled, occurred in Sector 3 in May with 140+ fish/hr (Figure 34).

White bass ranked third in 2007 (Table 2). Presently, white bass comprise 13 percent of the catch (Table 10).

The general condition of white bass has remained relatively stable, as depicted by a regression slope of 2.902 in 2007, in comparison to a range of slopes of 2.441 to 3.085 from previous years of the study (Table 6). The mean length for white bass is similar to the last eleven years (Table 6). The length frequency data shows that peaks occur for white bass at approximately 260 and 370 mm (Figure 10).

WALLEYE

Electrofishing CPUE for walleye in 2007 (3.76 fish/hour), although slightly higher than 2005 and 2006, is still low compared to the last 8 years previous to 2005 (Figure 19). CPUE increased in all sectors, except Sector 3, when comparing 2007 to 2006 (Figure 27). The highest CPUE for any sector in any month was Sector 3 in October (Figure 35).

Walleye ranked 12th in 2007 in overall catch abundance (Table 2). Presently, adult walleye comprise two percent of the catch (Table 7).

The general condition of walleye has remained relatively stable, as depicted by a regression slope of 3.200 in 2007, in comparison to a range of slopes of 2.852 to 3.352 from previous years of the study (Table 7). The mean length for walleye (440 mm) is less than 2005 and 2006, which were the highest recorded since the study began (Table 7). The length-frequency relationship indicates main peaks occurring at approximately 220 and 520 mm, with a lesser peak at approximately 360 mm (Figure 11).

SAUGER

Electrofishing CPUE for sauger was 5.38 fish/hr in 2007 (Table 8 and Figure 20). Sauger CPUE increased in all sectors in 2007 compared to 2006, except in sector 1 (Figure 28). Sector 3 had the highest CPUE in October of any sector in any month (Figure 36).

Sauger ranked ninth in 2007 (Table 2), comprising three percent of the catch (Table 8).

The general condition of sauger has remained relatively stable, as depicted by a regression slope of 3.283 in 2007, in comparison to a range of slopes of 2.648 to 3.356, in previous years of the study (Table 8). The mean length for sauger was approximately 250 mm in 2007, which is the lowest since 1998 (Table 8). The length frequency data exhibit a range from 130-550 mm, with peaks occurring at approximately 200, 250, 320 and 420 mm (Figure 12).

SMALLMOUTH BASS

Electrofishing CPUE for smallmouth bass in 2007 had the highest CPUE (23.02 fish/hr) recorded since the study began (Figure 21). CPUE in Sectors 1-4 appear cyclic (Figure 29) with curves appearing similar in shape to the curve for all sectors combined shown in Figure 21. CPUE increased in all sectors when comparing 2007 to 2006. The highest CPUE occurred in Sector 3 in October (Figure 37).

Smallmouth bass ranked second in 2007, which is the highest ranking recorded since the study began (Table 9), comprising 13 percent of the catch. Smallmouth bass have a length frequency range of approximately 80-470 mm, with peaks occurring at approximately 200 and 350 mm (Figure 13).

LARGEMOUTH BASS

Largemouth bass CPUE for 2007, (7.02 fish/hour), is the second highest recorded since the study began (Figure 22). The CPUE for Sector 1 was virtually zero for all sampling dates, while Sectors 2-4 have a little more variability (Figure 30). The highest CPUE occurred in Sector 4 in September (Figure 38).

Largemouth bass ranked eighth in 2007 (Table 9), comprising four percent of the catch. Historically, largemouth bass rank has varied greatly, ranging from 7th to 20th (Table 9).

The length frequency data indicates a range of 120-450 mm, with peaks occurring at 140 and 300 mm (Figure 14).

GENERAL

The ten most abundant species collected during 2007 in descending order, based on average CPUE for all sectors combined were: 1) carp, 2) smallmouth bass, 3) white bass, 4) freshwater drum, 5) shorthead redhorse, 6) bluegill, 7) gizzard shad, 8) largemouth bass, 9) sauger, and 10) black crappie (Table 2).

Total average CPUE for all species and sectors combined increased from 145.06 fish/hr in 2006 to 181.19 fish/hr in 2007 (Table 2).

LITERATURE CITED

Carlander, K. D. 1969. Handbook of Freshwater Fisheries Biology. Volume One. The Iowa State University Press, Ames, Iowa.

Carlander, K. D. 1977. Handbook of Freshwater Fisheries Biology. Volume Two. The Iowa State University Press, Ames, Iowa.

Donkers, C. A. 1986. Summary of the 1986 fish population study. IN: Prairie Island Nuclear Generating Plant Environmental Monitoring Program 1985 Annual Report. Northern States Power Company, Minneapolis, MN.

Donkers, C. A. 1987. Summary of the 1987 fish population study. IN: Prairie Island Nuclear Generating Plant Environmental Monitoring Program 1987 Annual Report. Northern States Power Company, Minneapolis, MN.

Giese, B. D. 2006. Summary of the 2006 fish population study. IN: Prairie Island Island Nuclear Generating Plant Environmental Monitoring Program 2006 Annual Report. Northern States Power Company, Minneapolis, MN.

Gustafson, S. P., J. L. Geise, and P. J. Diedrich. 1975. 1975 Progress Report on the Prairie Island Fish Population Study. IN: Environmental Monitoring and Ecological Studies Program, Prairie Island Nuclear Generating Plant, 1975 Annual Report. Northern States Power Company, Minneapolis, MN.

Hawkinson, B. W. 1973. 1973 Fish Population Study Progress Report of the Mississippi River Near Prairie Island July 1973-February 1974. IN: Environmental Monitoring and Ecological Studies Program, Prairie Island Nuclear Generating Plant, 1973 Annual Report. Northern States Power Company, Minneapolis, MN.

Mueller, K. N. 1989. Summary of the 1989 fish population study. IN: Prairie Island Nuclear Generating Plant Environmental Monitoring Program 1989 Annual Report. Northern States Power Company, Minneapolis, MN.

Mueller, K. N. 1994. Summary of the 1994 fish population study. IN: Prairie Island Nuclear Generating Plant Environmental Monitoring Program 1994 Annual Report. Northern States Power Company, Minneapolis, MN.

NSP. 1972. Environmental Monitoring and Ecological Studies Program for the Prairie Island Nuclear Generating Plant Near Red Wing, Minnesota. Prepared by: engineering Vice Presidential Staff Department, Northern States Power Company. February 1, 1970, revised May 1, 1972. Northern States Power Company, Minneapolis, MN.

Orr, D. J. 1988. Summary of the 1988 fish population study. IN: Prairie Island Nuclear Generating Plant Environmental Monitoring Program 1981 Annual Report. Northern States Power Company, Minneapolis, MN.

Palmquist, P. R. 1982. Summary of the 1982 fish population study. IN: Prairie Island Nuclear Generating Plant Environmental Monitoring Program 1982 Annual Report. Northern States Power Company, Minneapolis, MN.

Figure 1

PRAIRIE ISLAND FISHERIES POPULATION - STUDY AREA

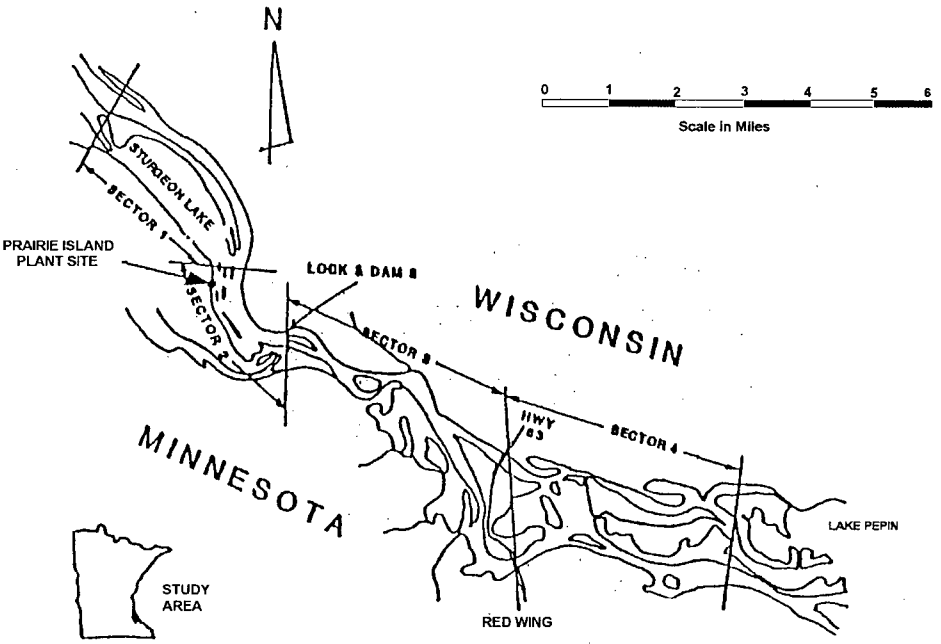
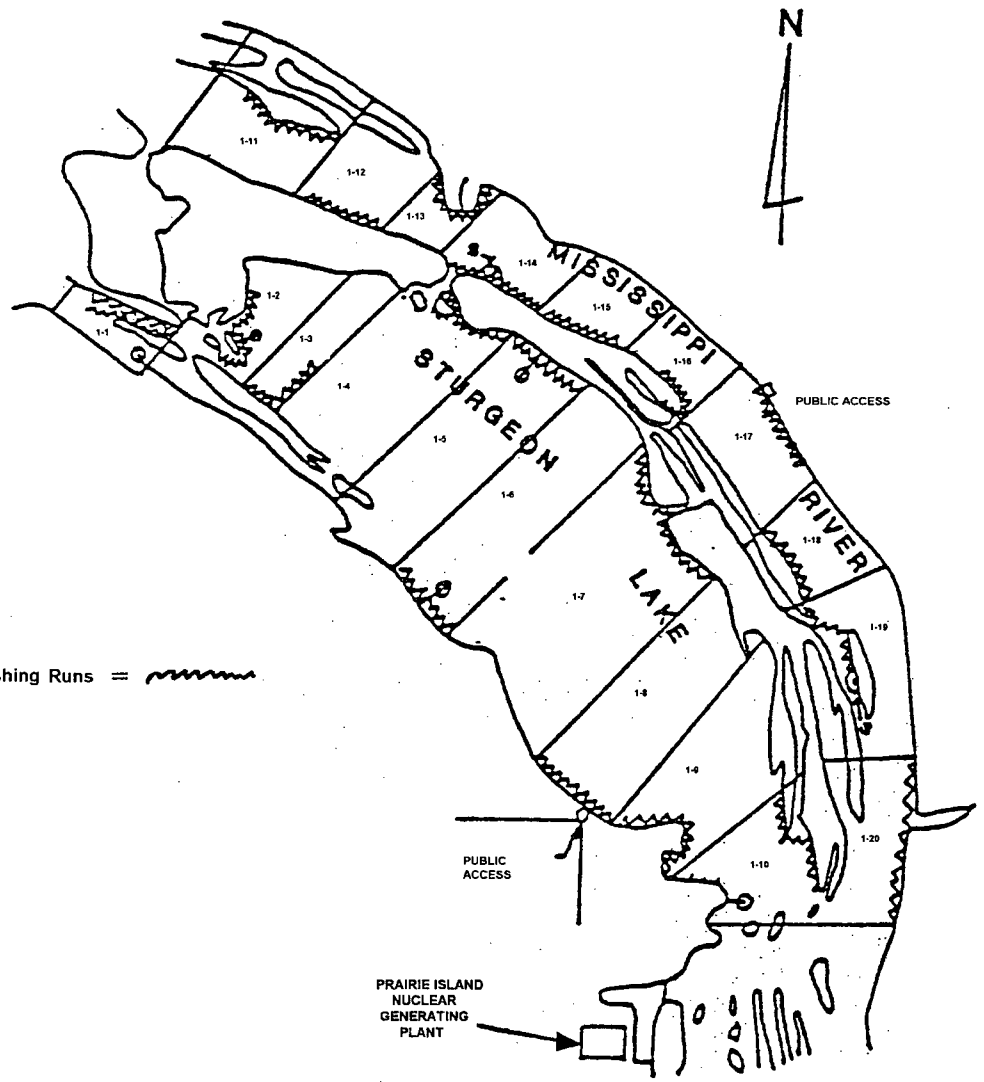


FIGURE 2.

PRAIRIE ISLAND FISHERIES POPULATION STUDY

Sampling Locations
Upstream
Sec 1 Runs 1-20



Electrofishing Runs =

Figure 3.

PRAIRIE ISLAND FISHERIES POPULATION STUDY
Sampling Locations
Plant Area
(Sec 2 Runs 1-10)

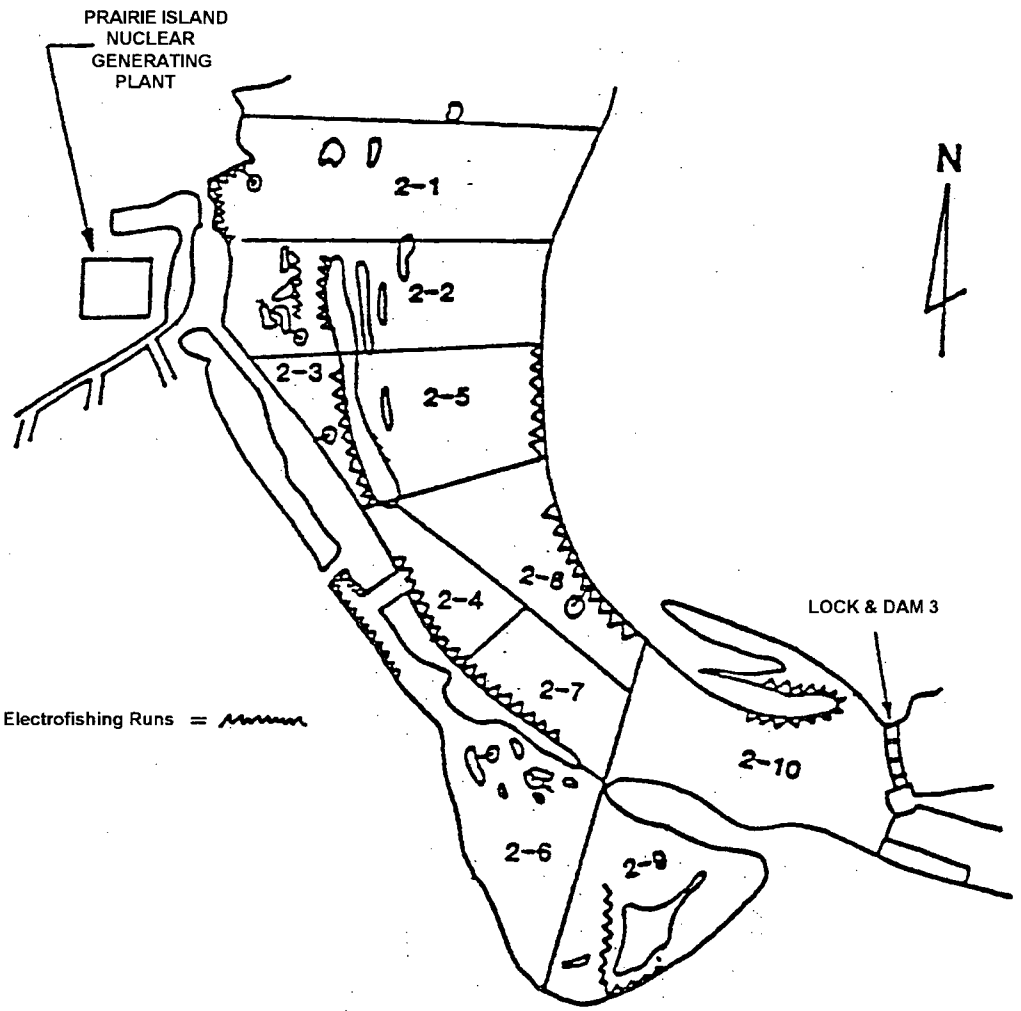
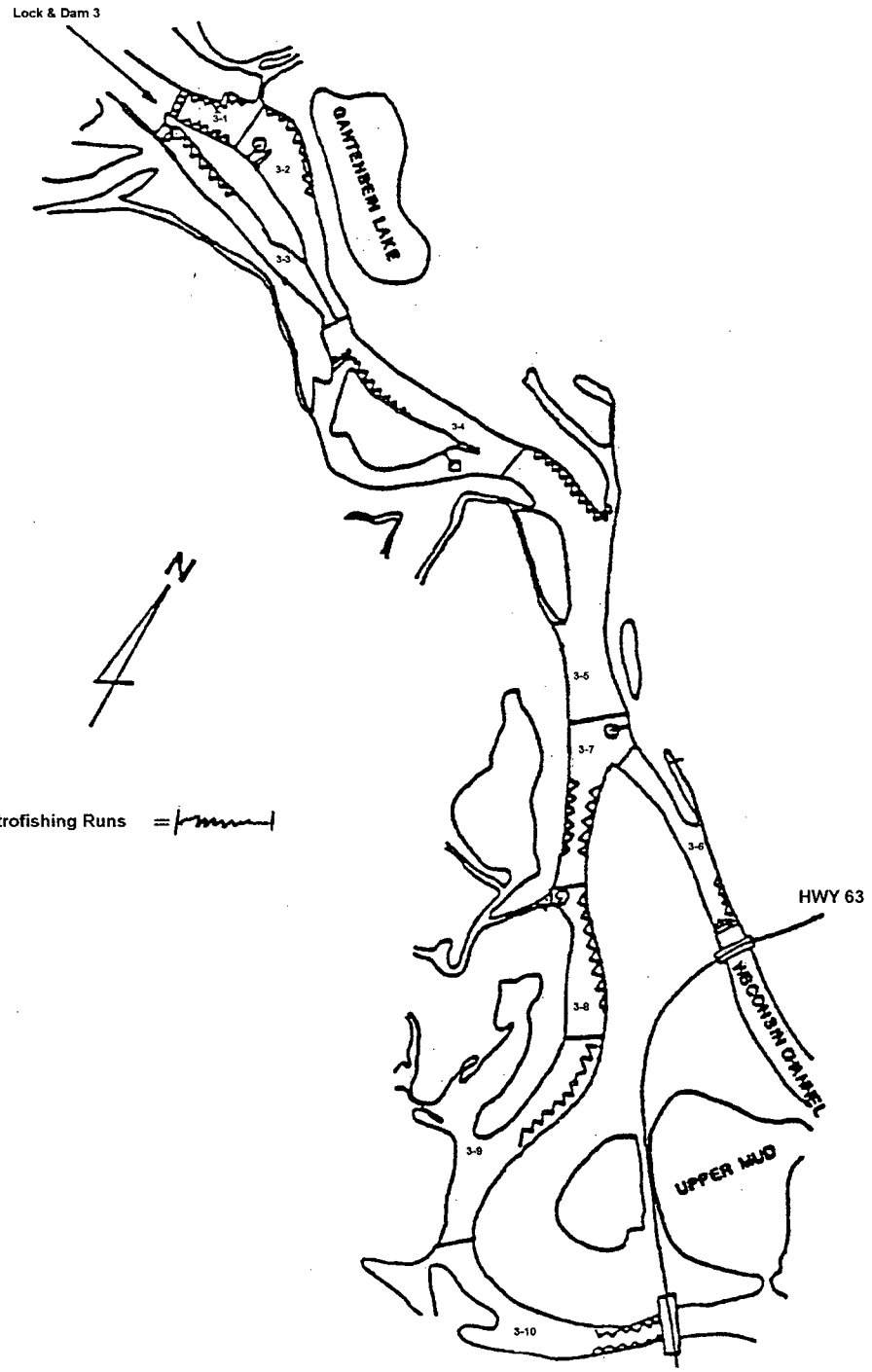


Figure 4.

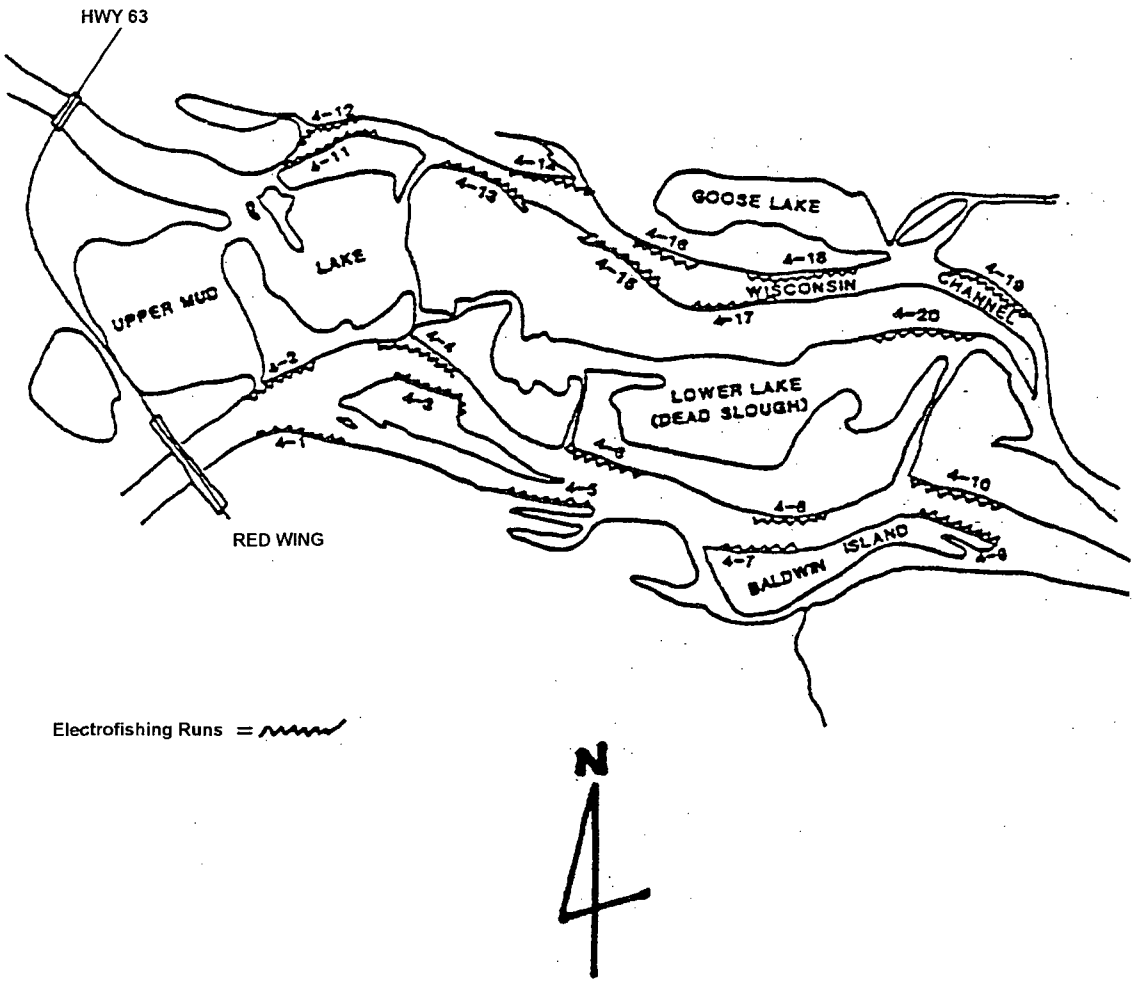
PRAIRIE ISLAND FISHERIES POPULATION STUDY
Sampling Locations
Downstream
(Sec 3 Runs 1-10)



Electrofishing Runs =

Figure 5.

PRAIRIE ISLAND FISHERIES POPULATION STUDY
Sampling Locations
Downstream
(Sec 4 Runs 1-20)



Electrofishing Runs = ~~~~

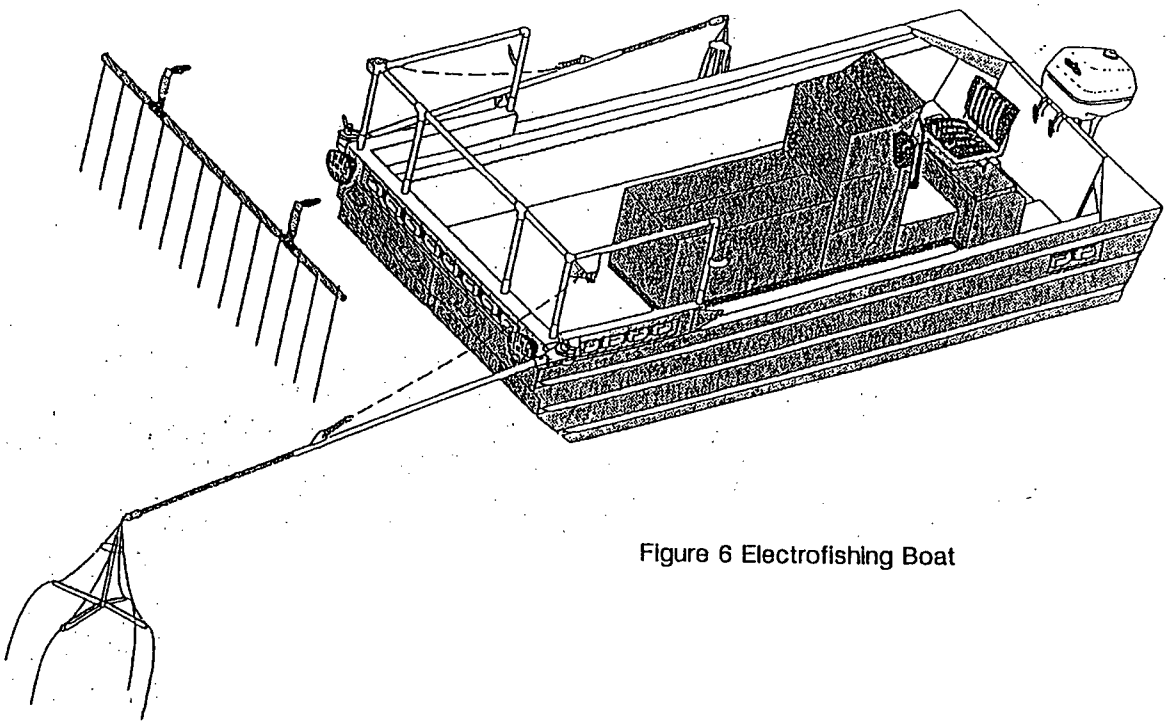


Figure 6 Electrofishing Boat

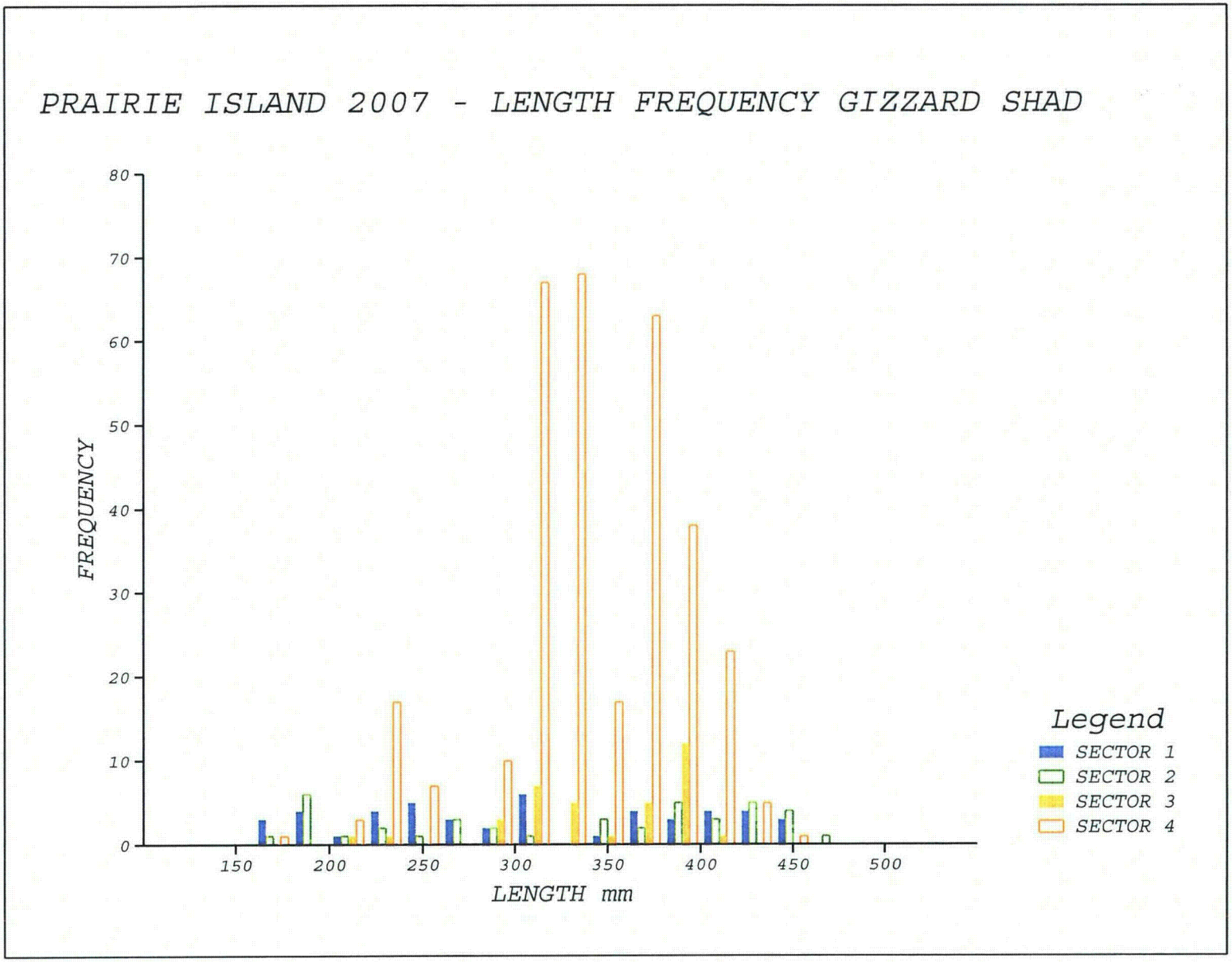

PRAIRIE ISLAND 2007 - LENGTH FREQUENCY GIZZARD SHAD
FREQUENCY
0
10
20
30
40
50
60
70
80
150
200
250
300
350
400
450
500
LENGTH mm
Legend
SECTOR 1
SECTOR 2
SECTOR 3
SECTOR 4

Figure 7

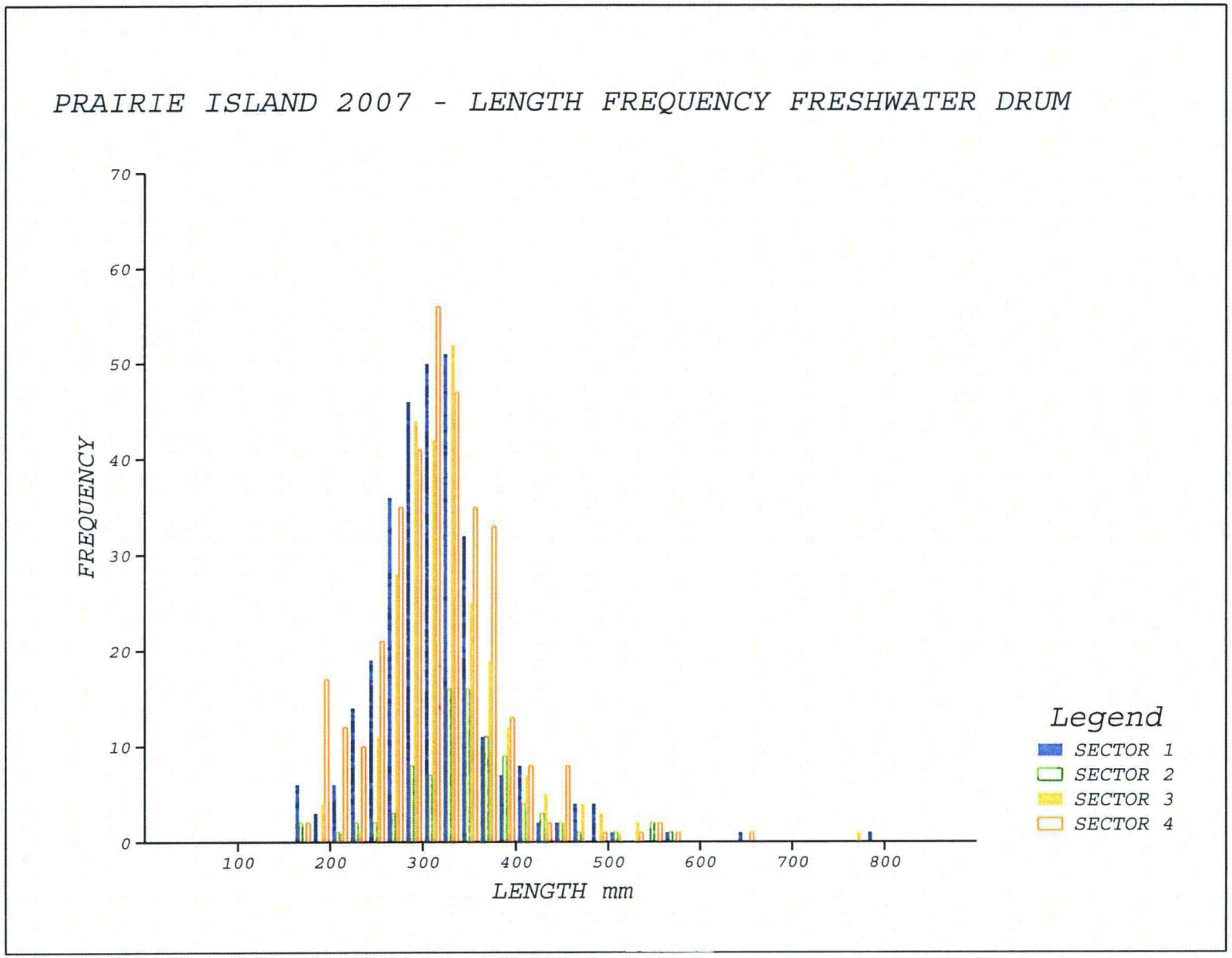

PRAIRIE ISLAND 2007 - LENGTH FREQUENCY FRESHWATER DRUM
FREQUENCY
0
10
20
30
40
50
60
70
100
200
300
400
500
600
700
800
LENGTH mm
Legend
SECTOR 1
SECTOR 2
SECTOR 3
SECTOR 4

Figure 8

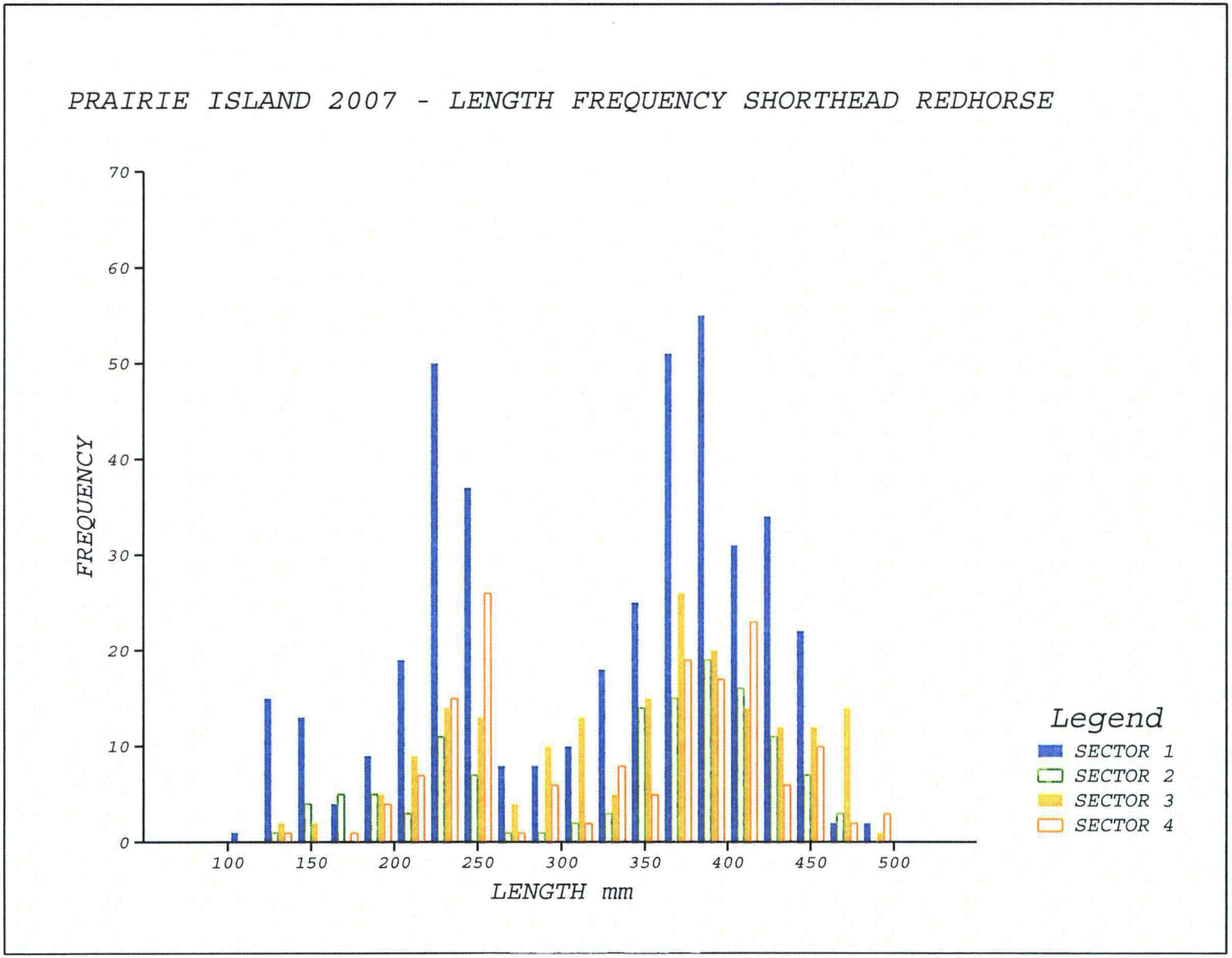

PRAIRIE ISLAND 2007 - LENGTH FREQUENCY SHORTHEAD REDHORSE
FREQUENCY
0
10
20
30
40
50
60
70
100
150
200
250
300
350
400
450
500
LENGTH mm
Legend
SECTOR 1
SECTOR 2
SECTOR 3
SECTOR 4

Figure 9

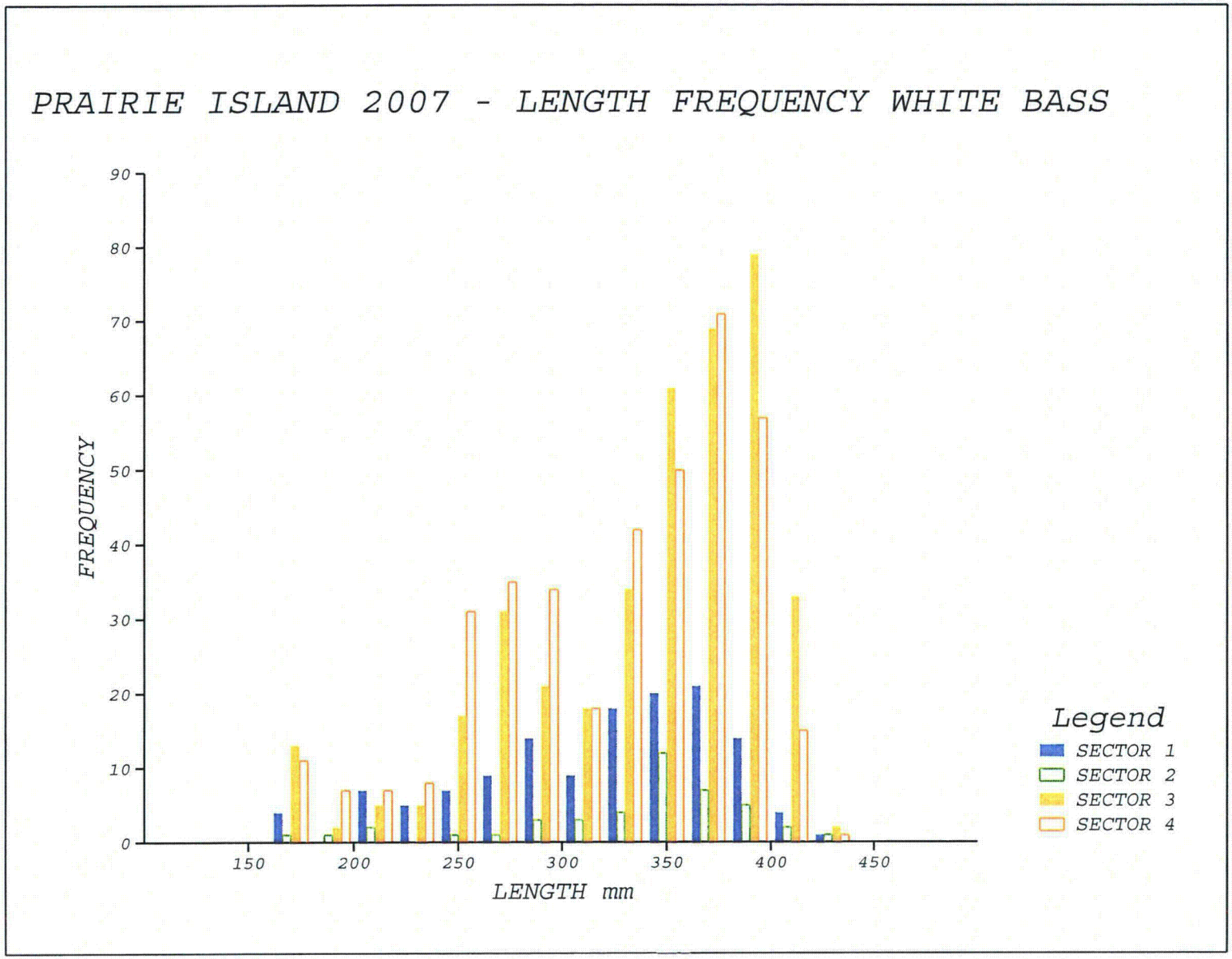

PRAIRIE ISLAND 2007 - LENGTH FREQUENCY WHITE BASS
FREQUENCY
0
10
20
30
40
50
60
70
80
90
150
200
250
300
350
400
450
LENGTH mm
Legend
SECTOR 1
SECTOR 2
SECTOR 3
SECTOR 4

Figure 10

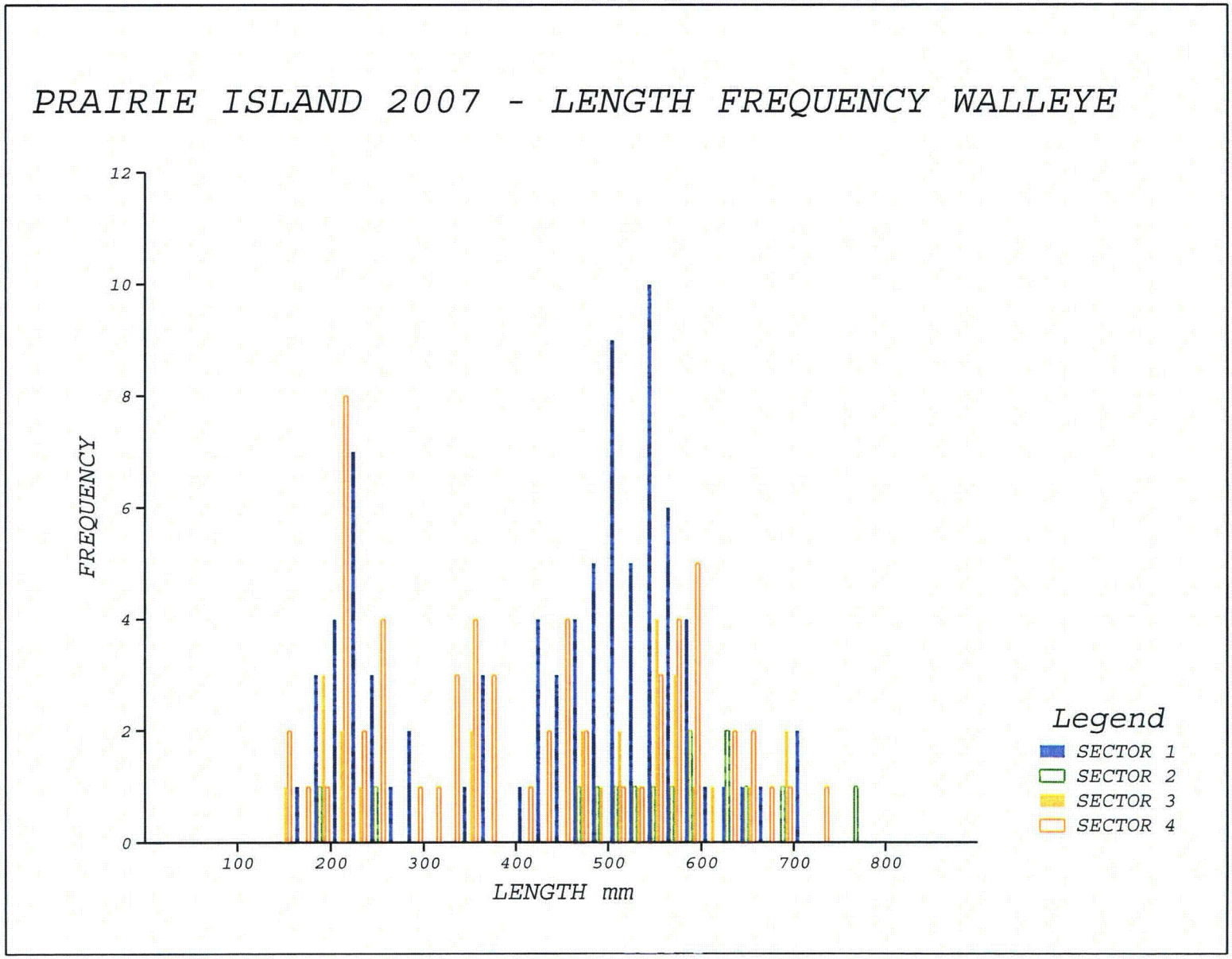

PRAIRIE ISLAND 2007 - LENGTH FREQUENCY WALLEYE
FREQUENCY
0
2
4
6
8
10
12
100
200
300
400
500
600
700
800
LENGTH mm
Legend
SECTOR 1
SECTOR 2
SECTOR 3
SECTOR 4

Figure 11

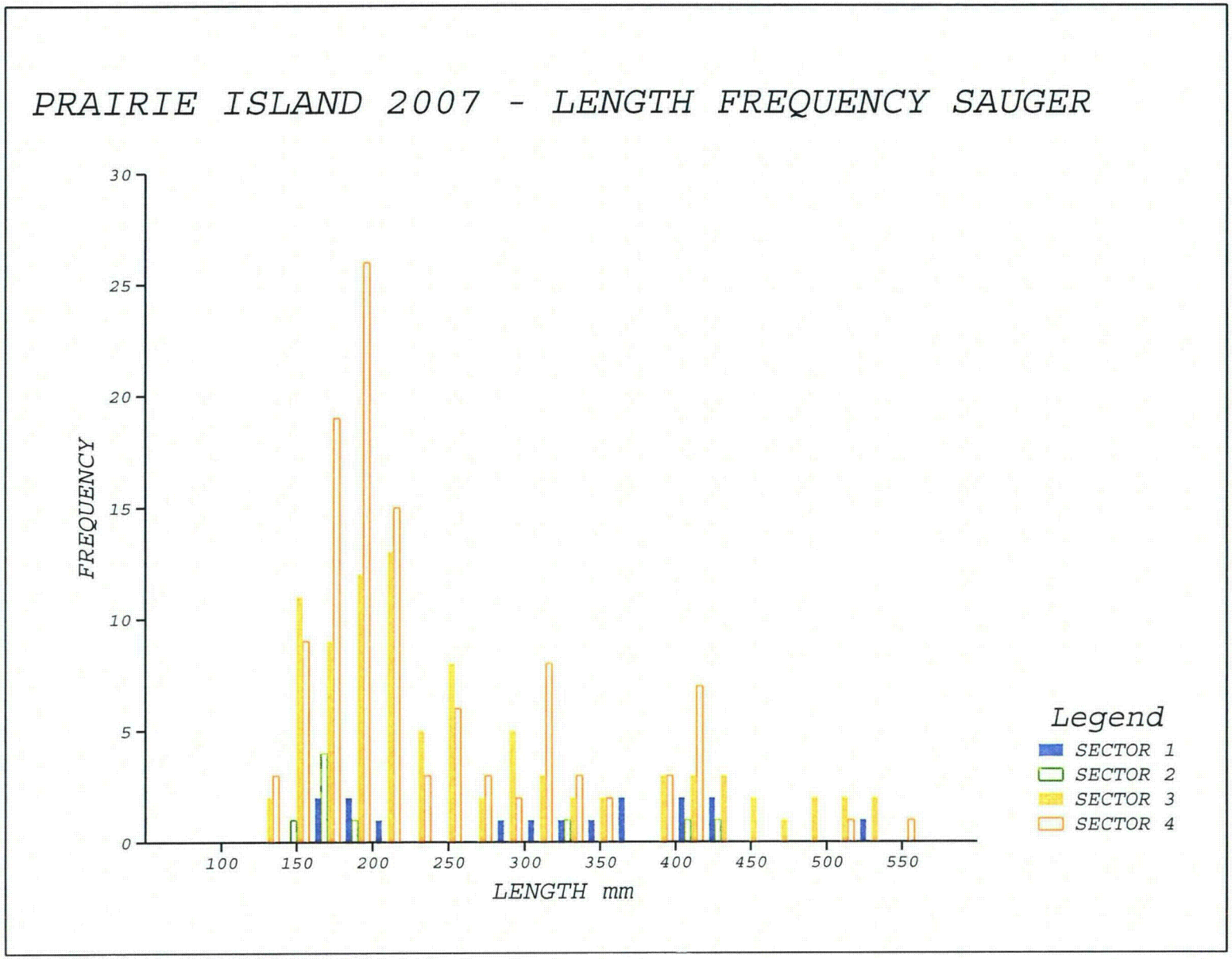

PRAIRIE ISLAND 2007 - LENGTH FREQUENCY SAUGER
FREQUENCY
0
5
10
15
20
25
30
100
150
200
250
300
350
400
450
500
550
LENGTH mm
Legend
SECTOR 1
SECTOR 2
SECTOR 3
SECTOR 4

Figure 12

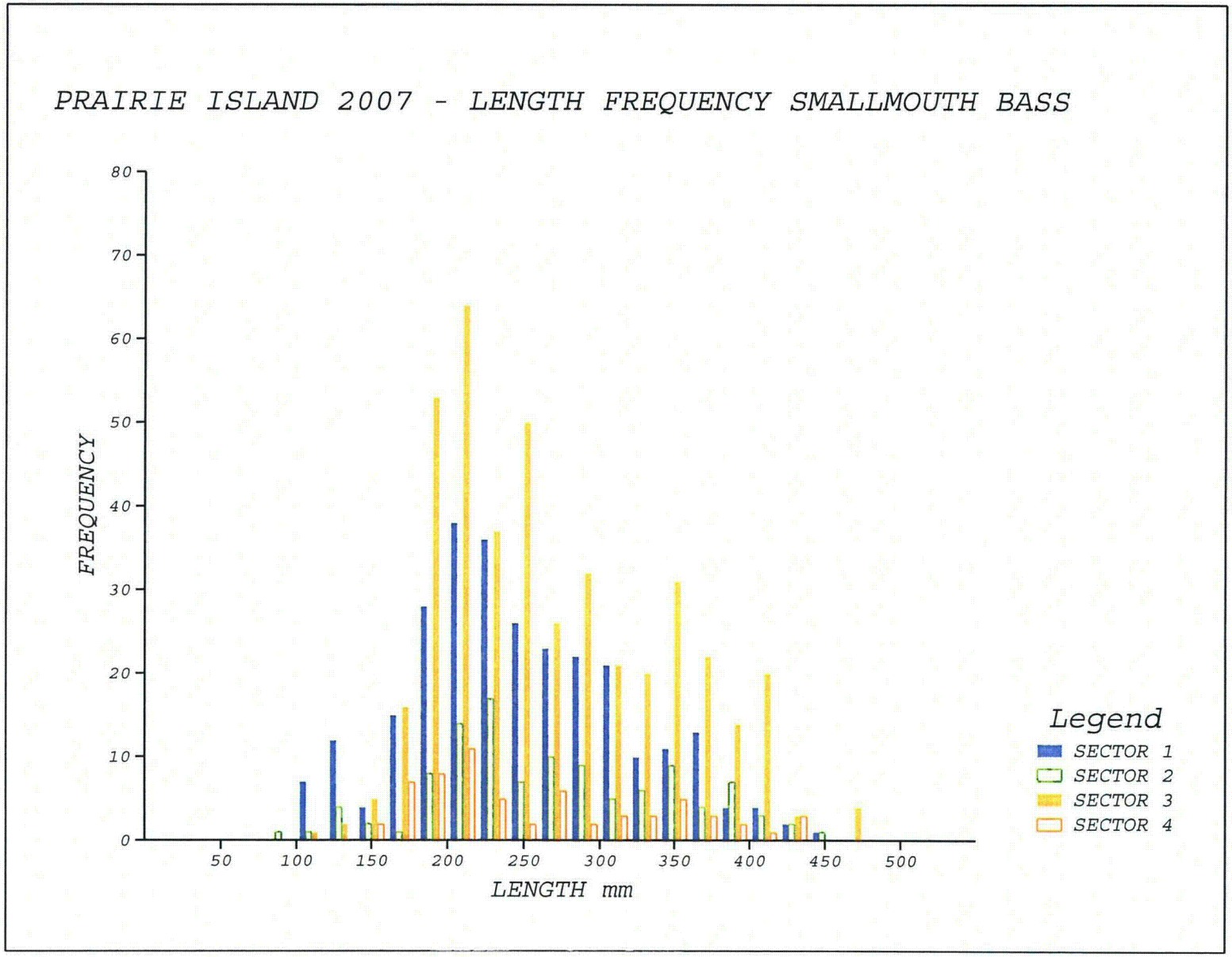

PRAIRIE ISLAND 2007 - LENGTH FREQUENCY SMALLMOUTH BASS
FREQUENCY
0
10
20
30
40
50
60
70
80
50
100
150
200
250
300
350
400
450
500
LENGTH mm
Legend
SECTOR 1
SECTOR 2
SECTOR 3
SECTOR 4

Figure 13

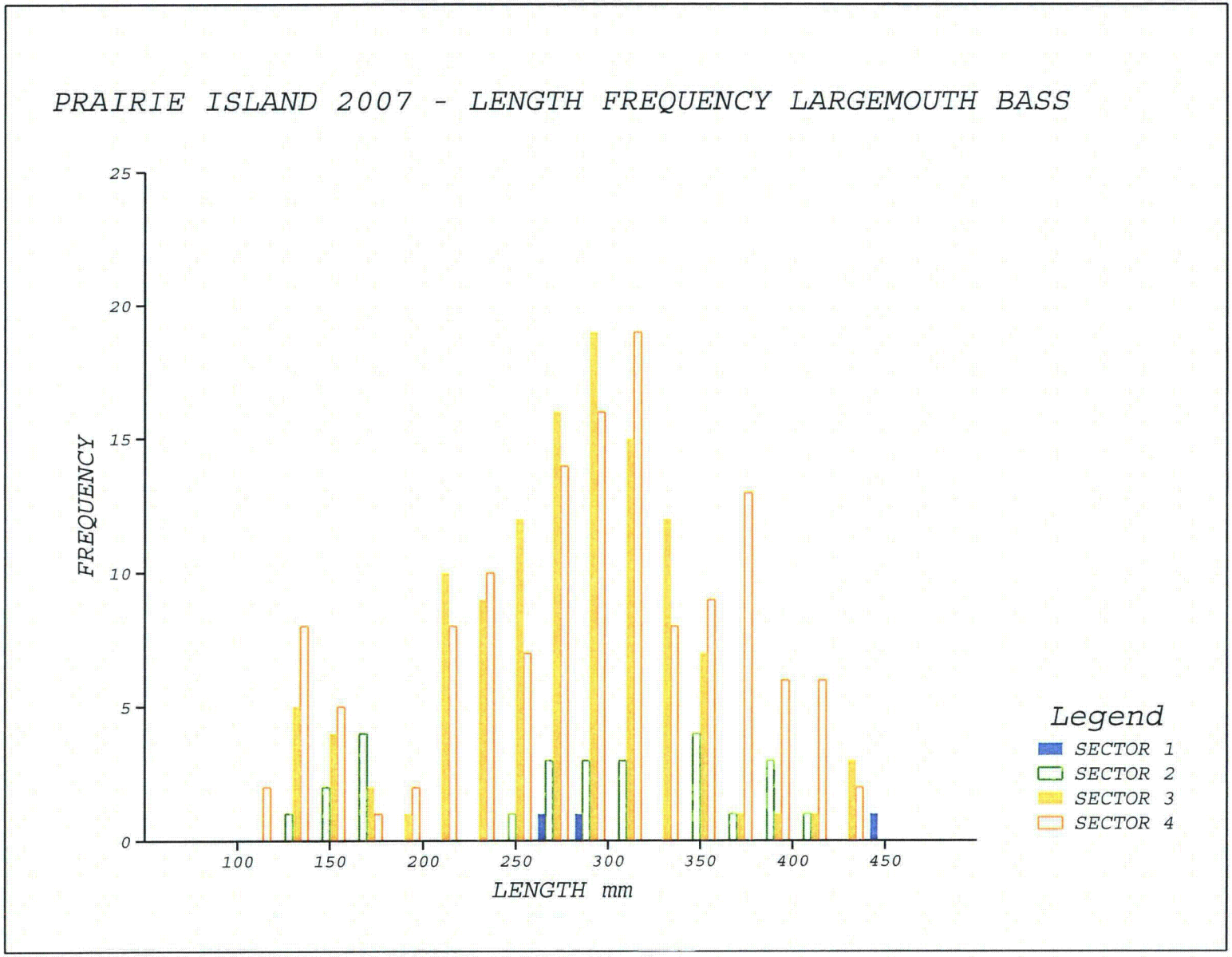

PRAIRIE ISLAND 2007 - LENGTH FREQUENCY LARGEMOUTH BASS
FREQUENCY
25
20
15
10
5
0
100
150
200
250
300
350
400
450
LENGTH mm
Legend
SECTOR 1
SECTOR 2
SECTOR 3
SECTOR 4

Figure 14

Figure 15. Electrofishing CPUE (fish/hour) for Gizzard shad for years 1982-2007 in the vicinity of PINGP.

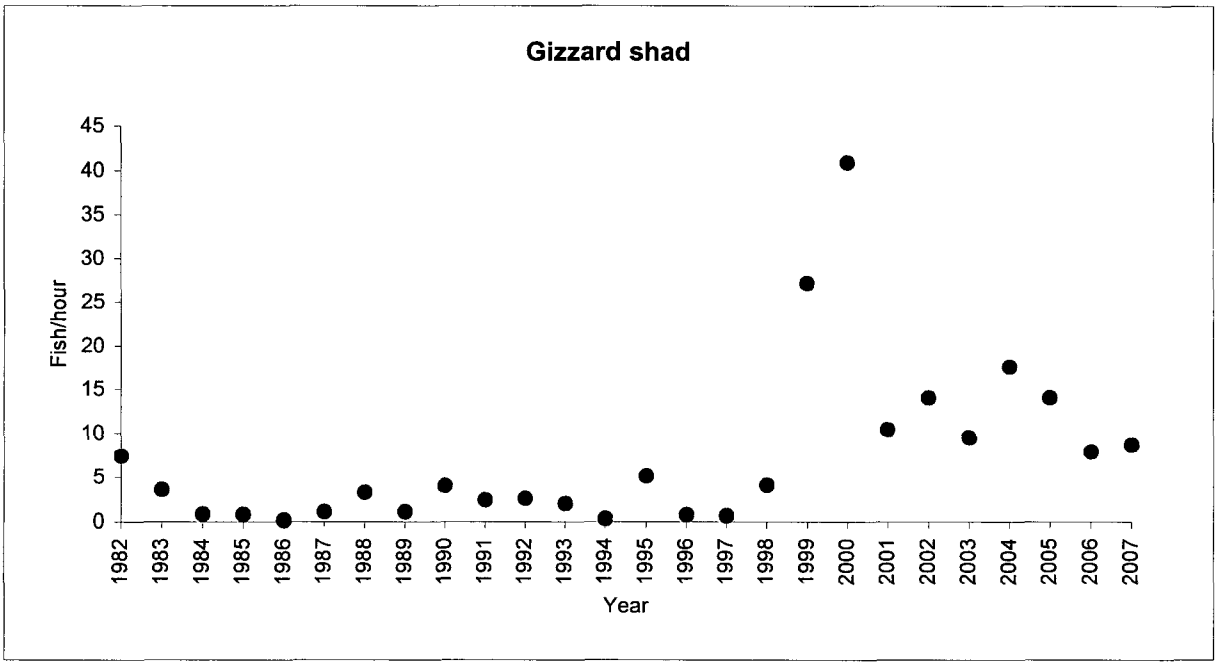


Figure 16. Electrofishing CPUE (fish/hour) for Freshwater drum for years 1982-2007 in the vicinity of PINGP.

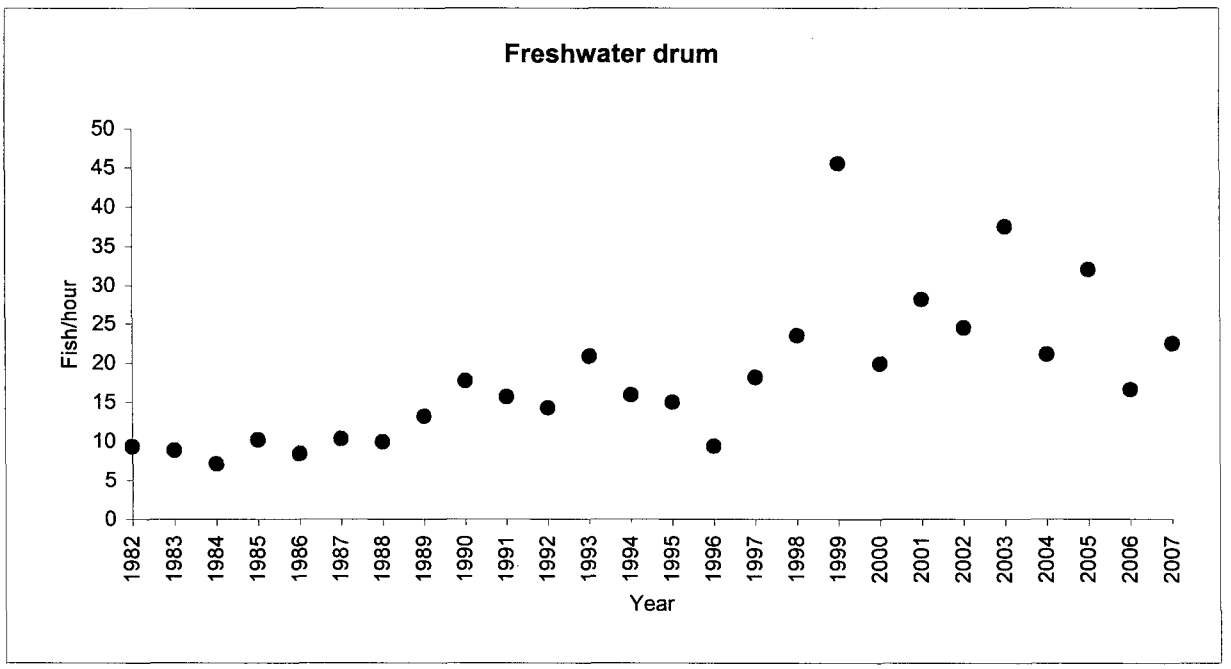


Figure 17. Electrofishing CPUE (fish/hour) for Shorthead redhorse for years 1982-2007 in the vicinity of PINGP.

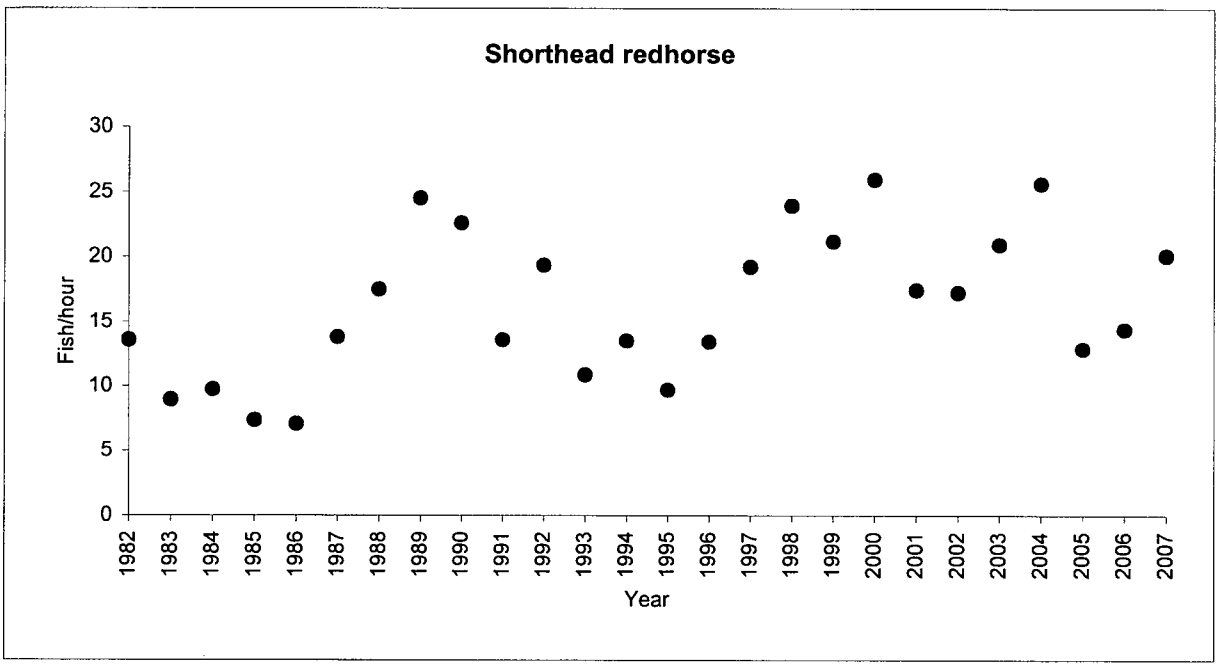


Figure 18. Electrofishing CPUE (fish/hour) for White bass for years 1982-2007 in the vicinity of PINGP.

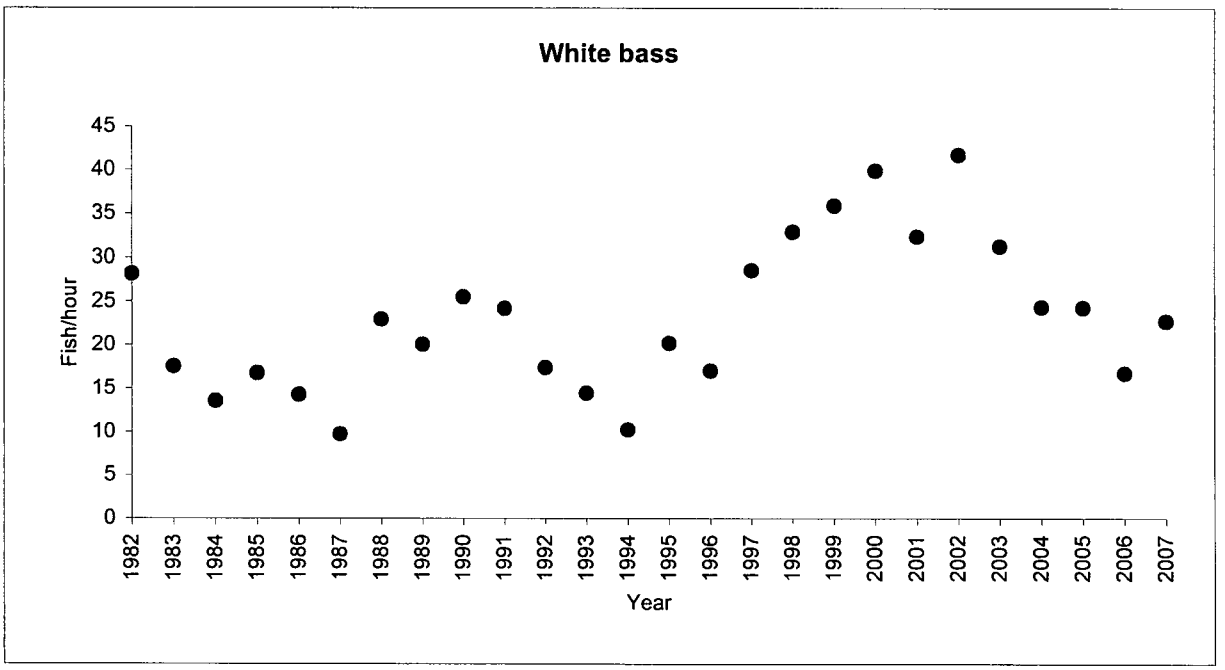


Figure 19. Electrofishing CPUE (fish/hour) for Walleye for years 1982-2007 in the vicinity of PINGP.

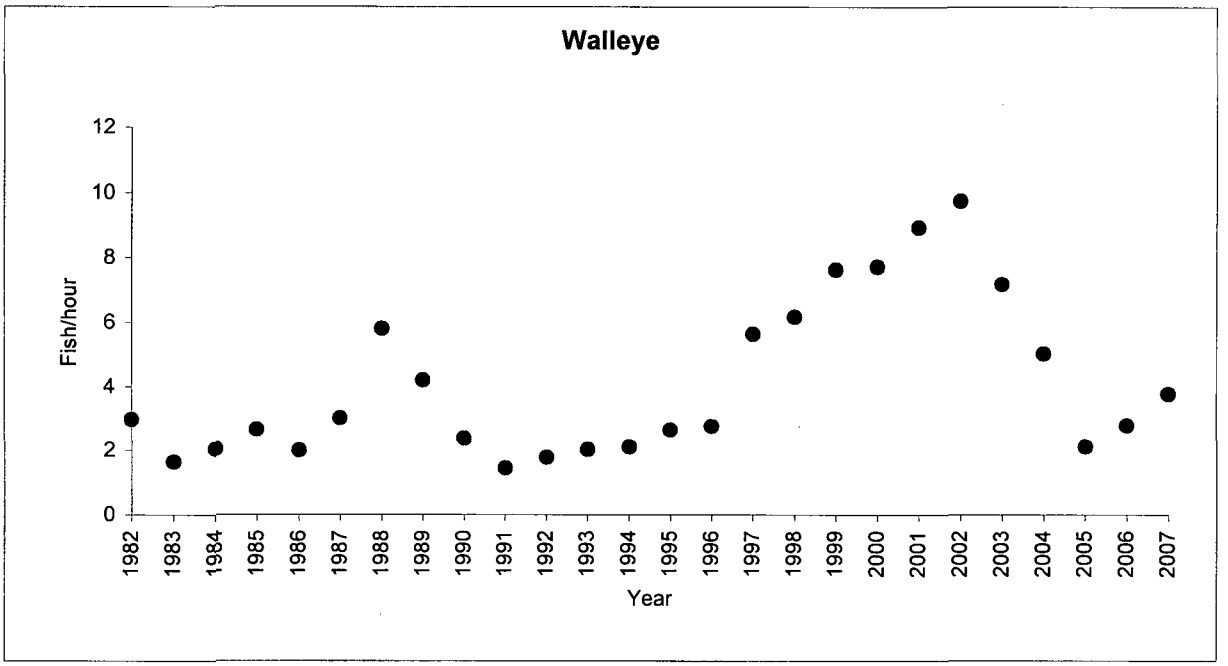


Figure 20. Electrofishing CPUE (fish/hour) for Sauger for years 1982-2007 in the vicinity of PINGP.

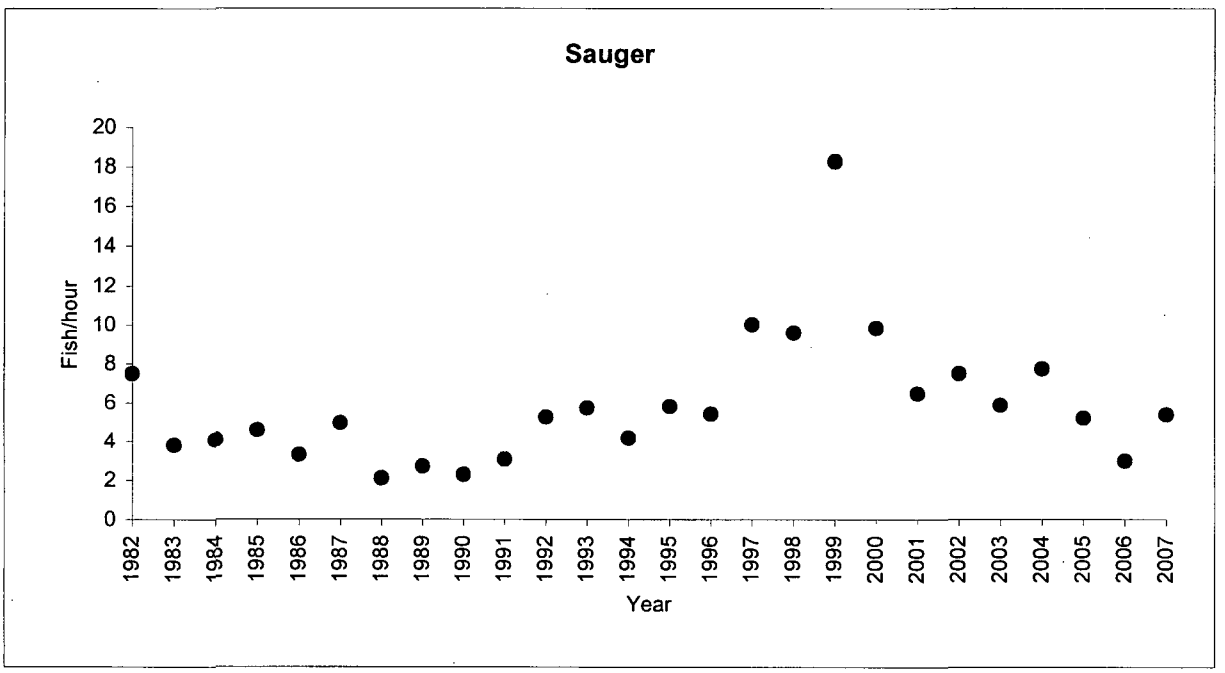


Figure 21. Electrofishing CPUE (fish/hour) for Smallmouth bass for years 1982-2007 in the vicinity of PINGP.

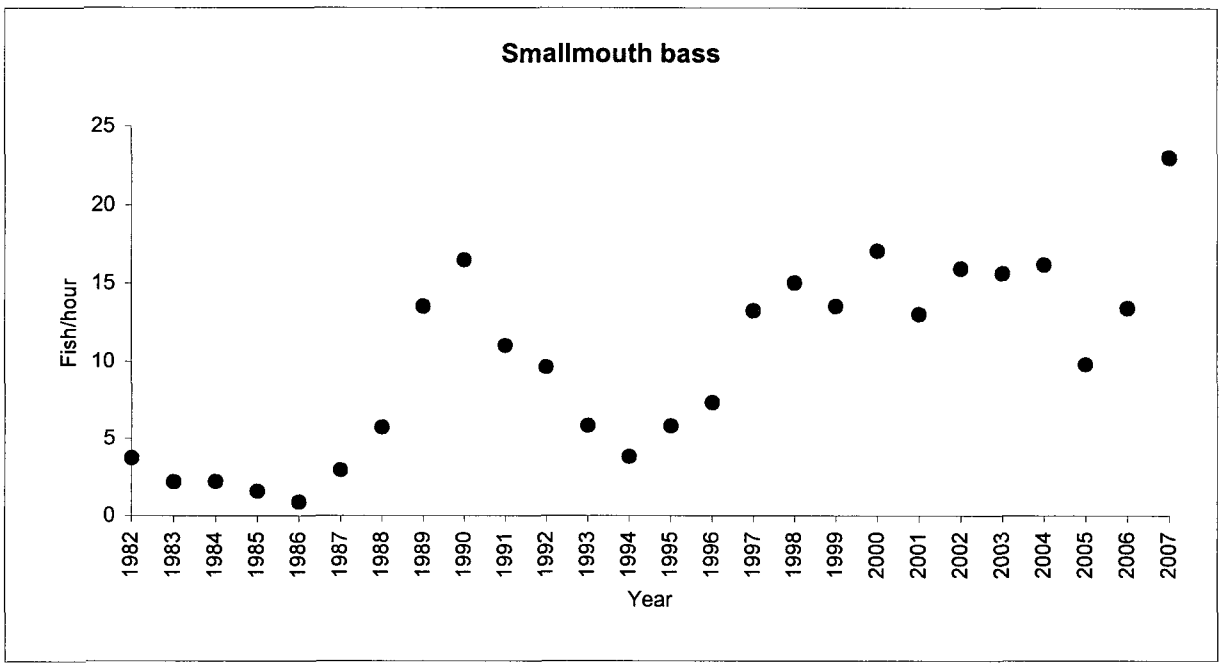


Figure 22. Electrofishing CPUE (fish/hour) for Largemouth bass for years 1982-2007 in the vicinity of PINGP.

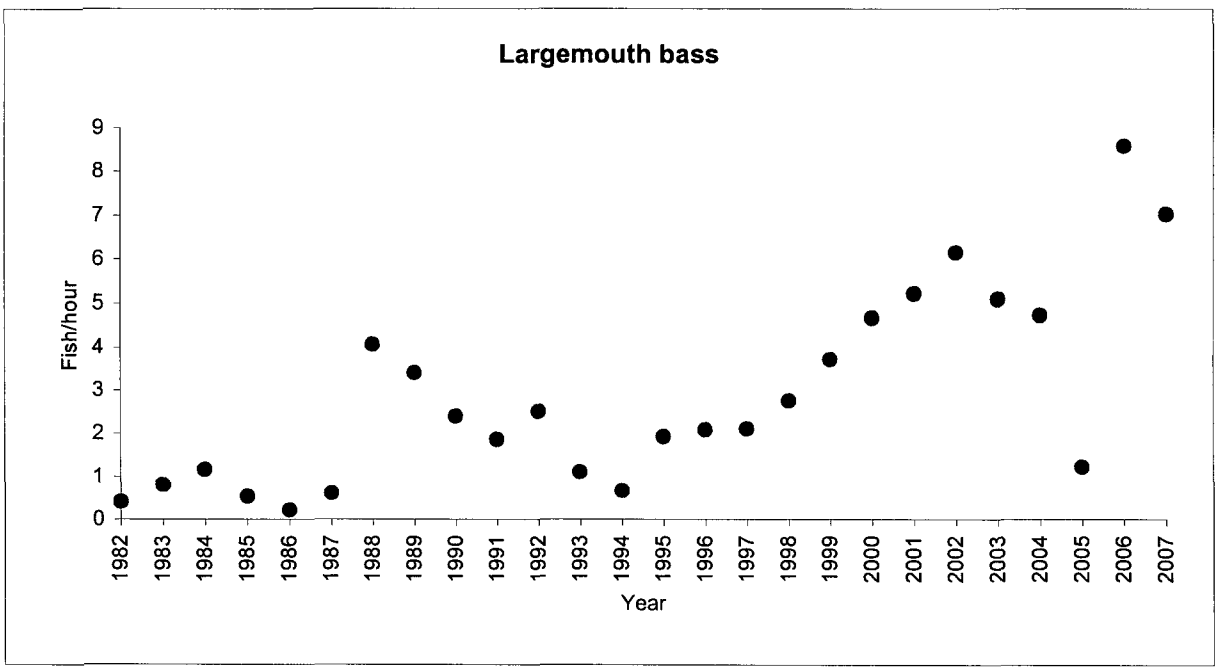


Figure 23. Electrofishing CPUE (fish/hour) by sector for Gizzard shad for years 1982-2007 in the vicinity of PINGP.

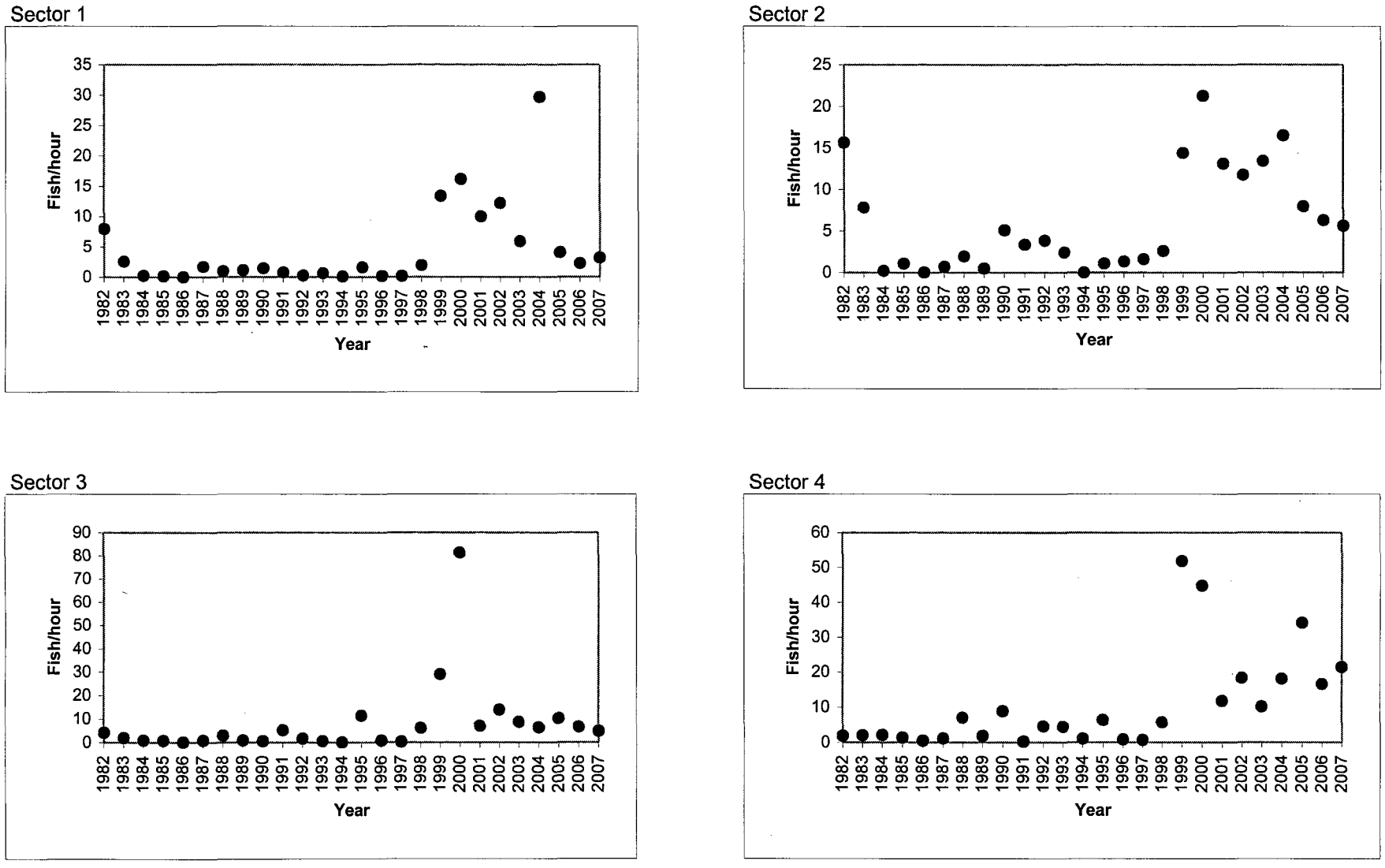


Figure 24. Electrofishing CPUE (fish/hour) by sector for Freshwater drum for years 1982-2007 in the vicinity of PINGP.

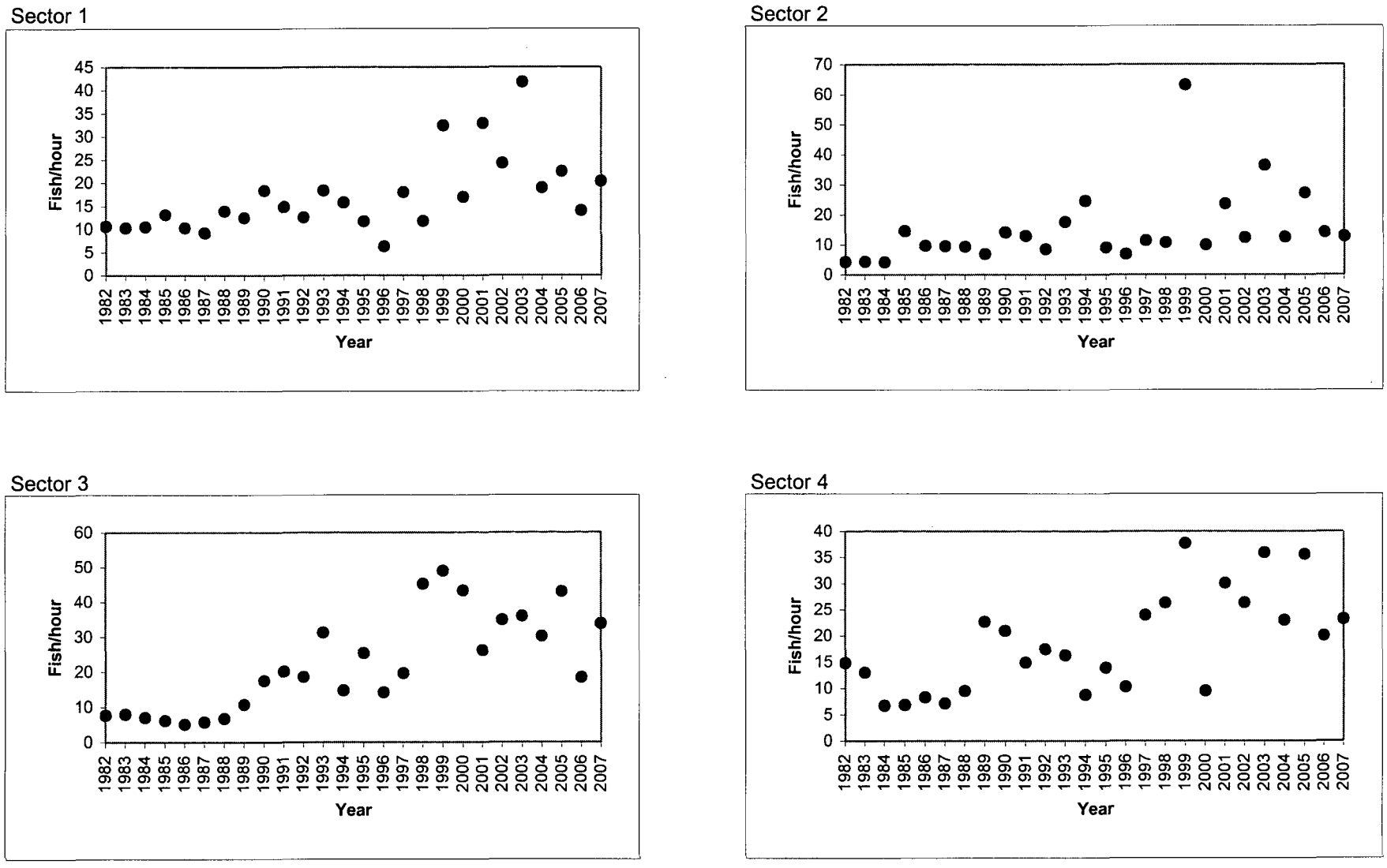


Figure 25. Electrofishing CPUE (fish/hour) by sector for Shorthead redhorse for the years 1982-2007 in the vicinity of PINGP.

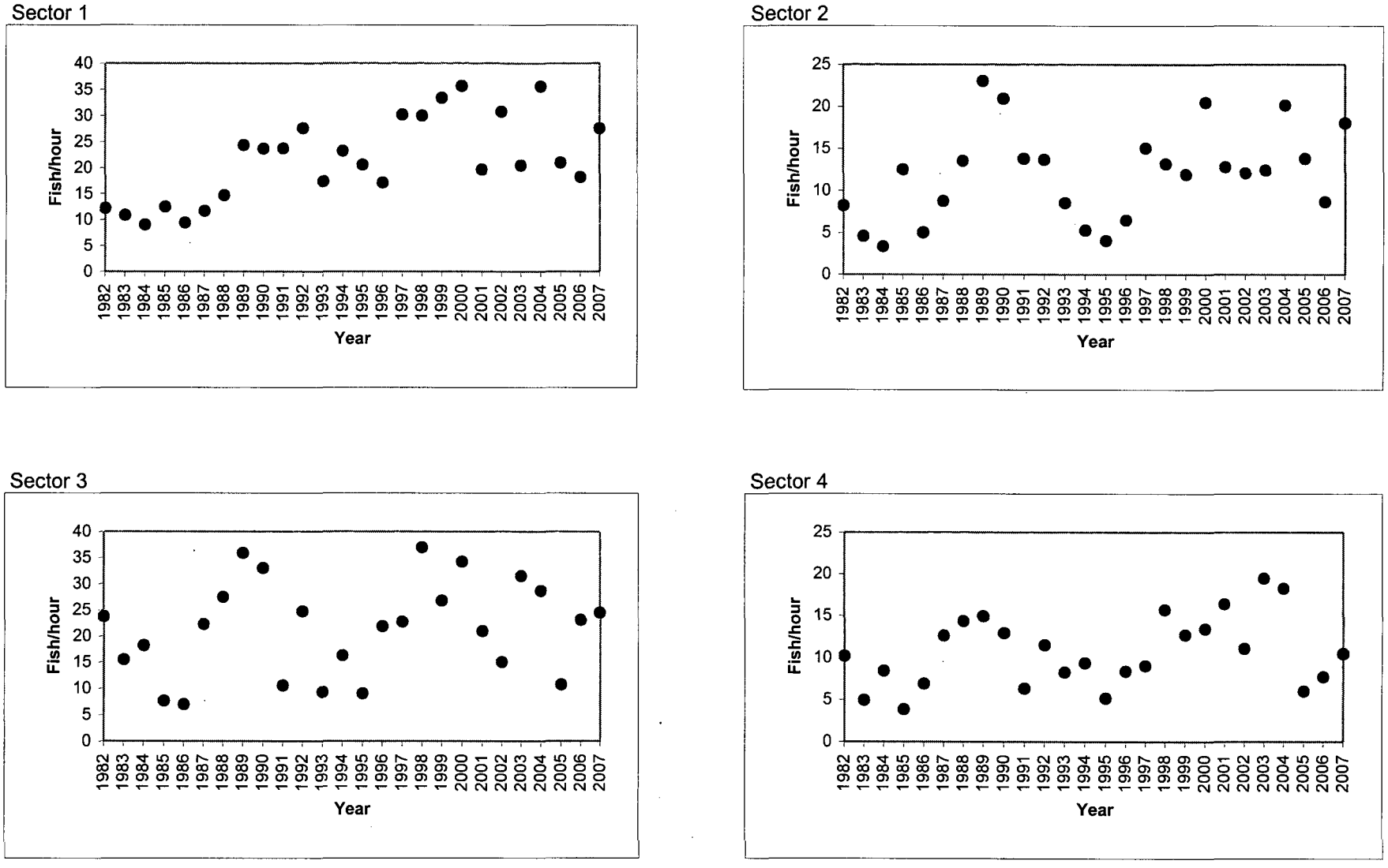


Figure 26. Electrofishing CPUE (fish/hour) by sector for White bass for years 1982-2007 in the vicinity of PINGP.

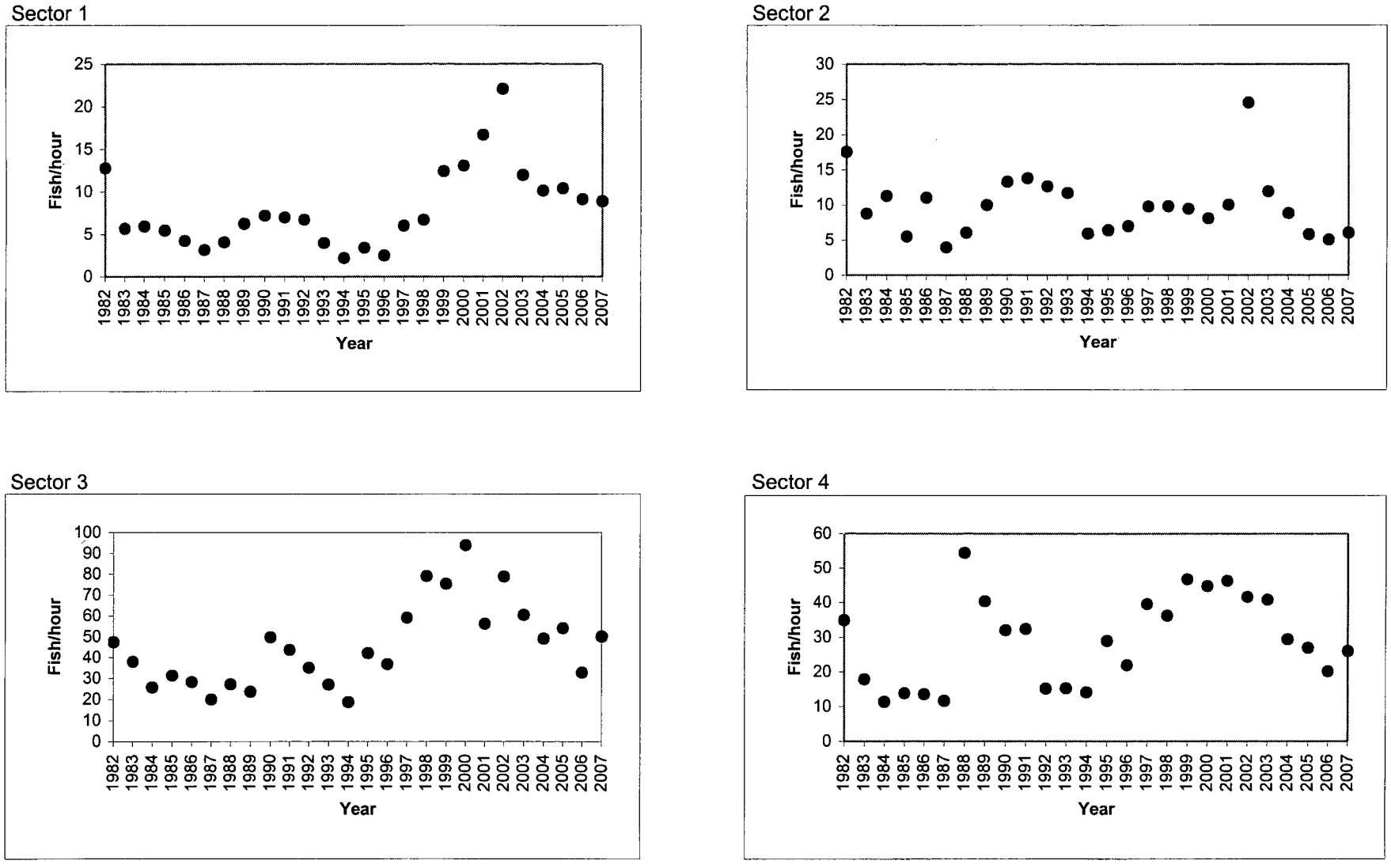
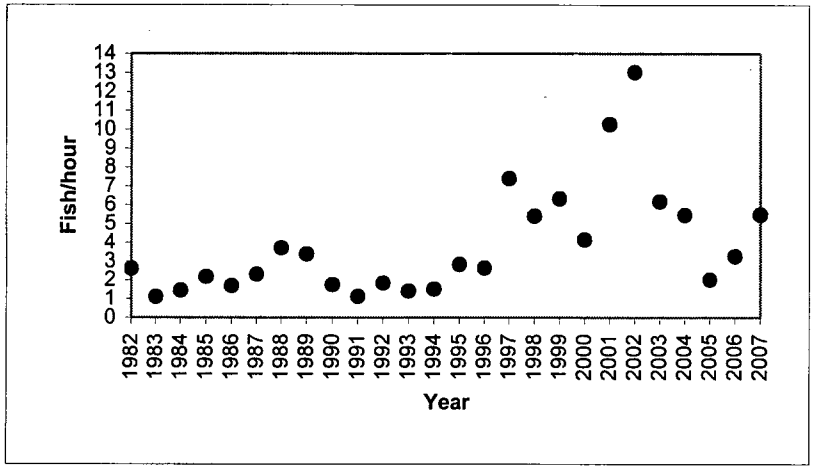
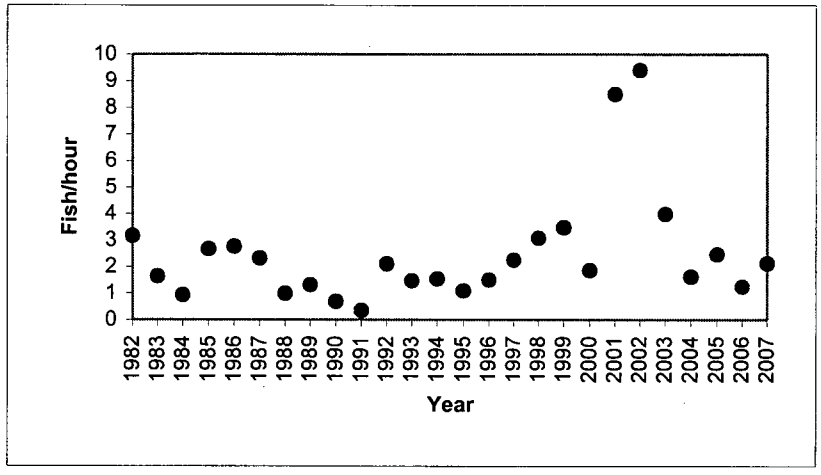


Figure 27. Electrofishing CPUE (fish/hour) by sector for Walleye for years 1982-2007 in the vicinity of PINGP.

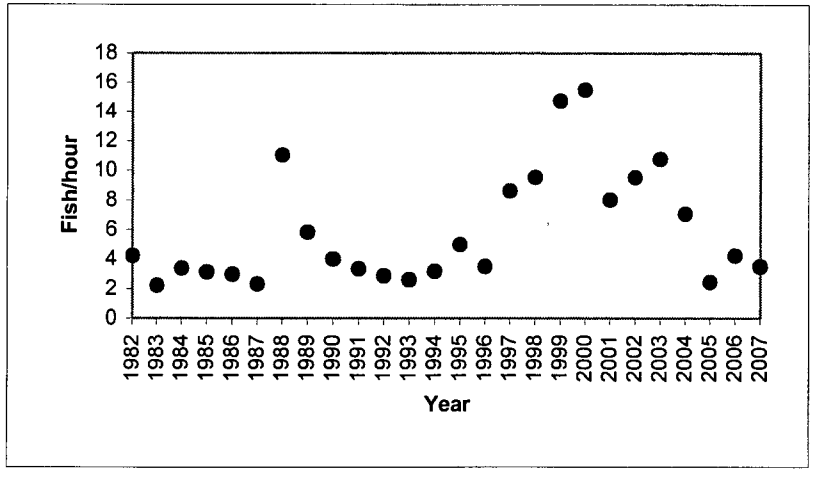
Sector 1



Sector 2



Sector 3



Sector 4

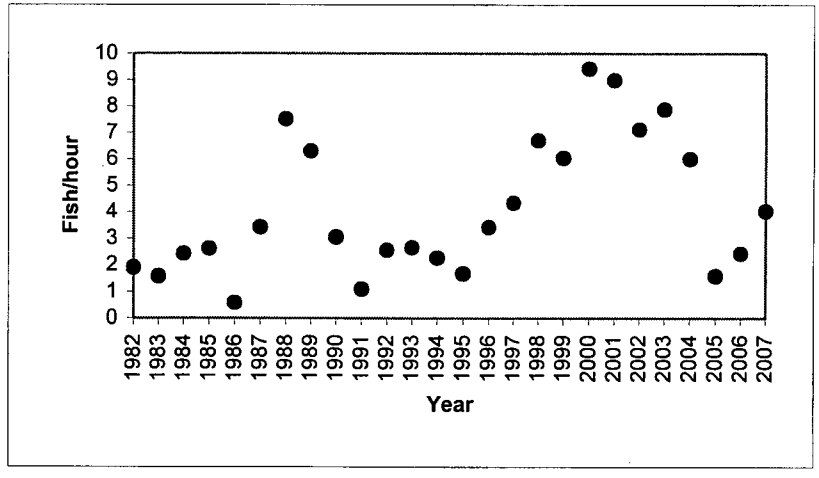
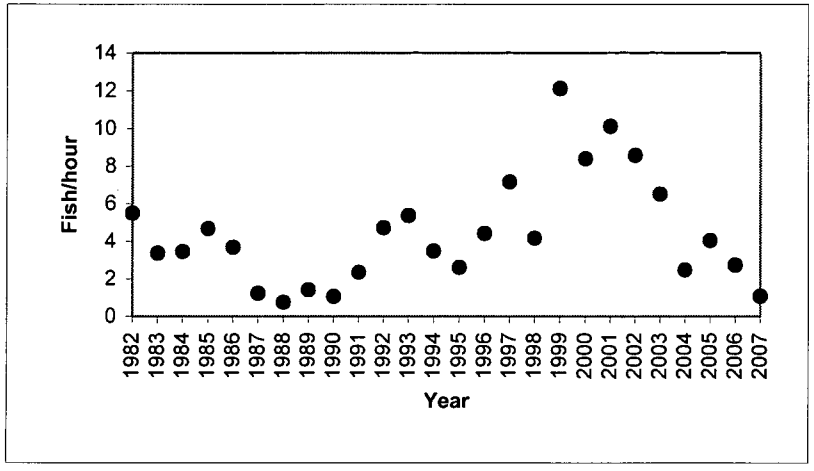
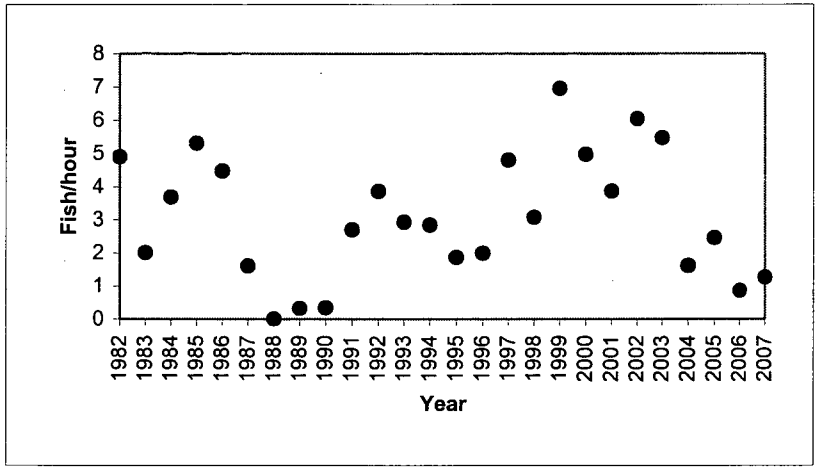


Figure 28. Electrofishing CPUE (fish/hour) by sector for Sauger for years 1982-2007 in the vicinity of PINGP

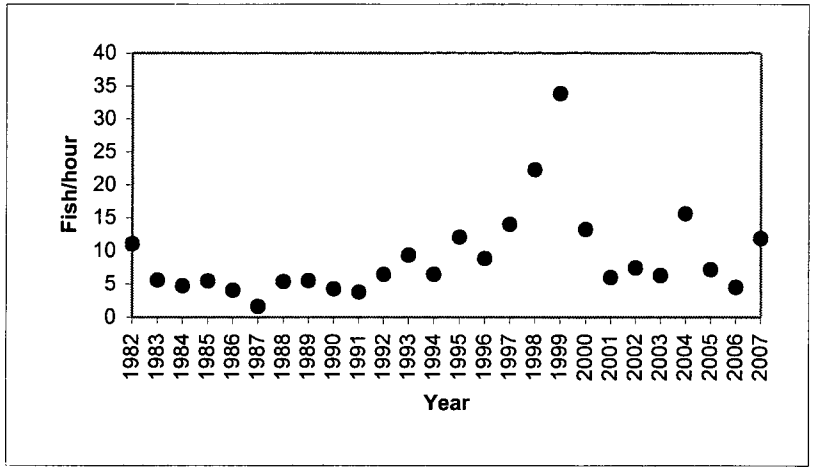
Sector 1



Sector 2



Sector 3



Sector 4

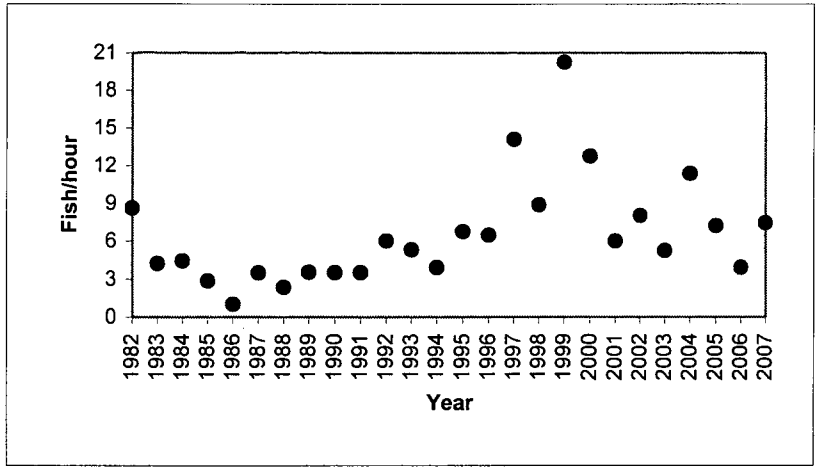


Figure 29. Electrofishing CPUE (fish/hour) by sector for Smallmouth bass for years 1982-2007 in the vicinity of PINGP.

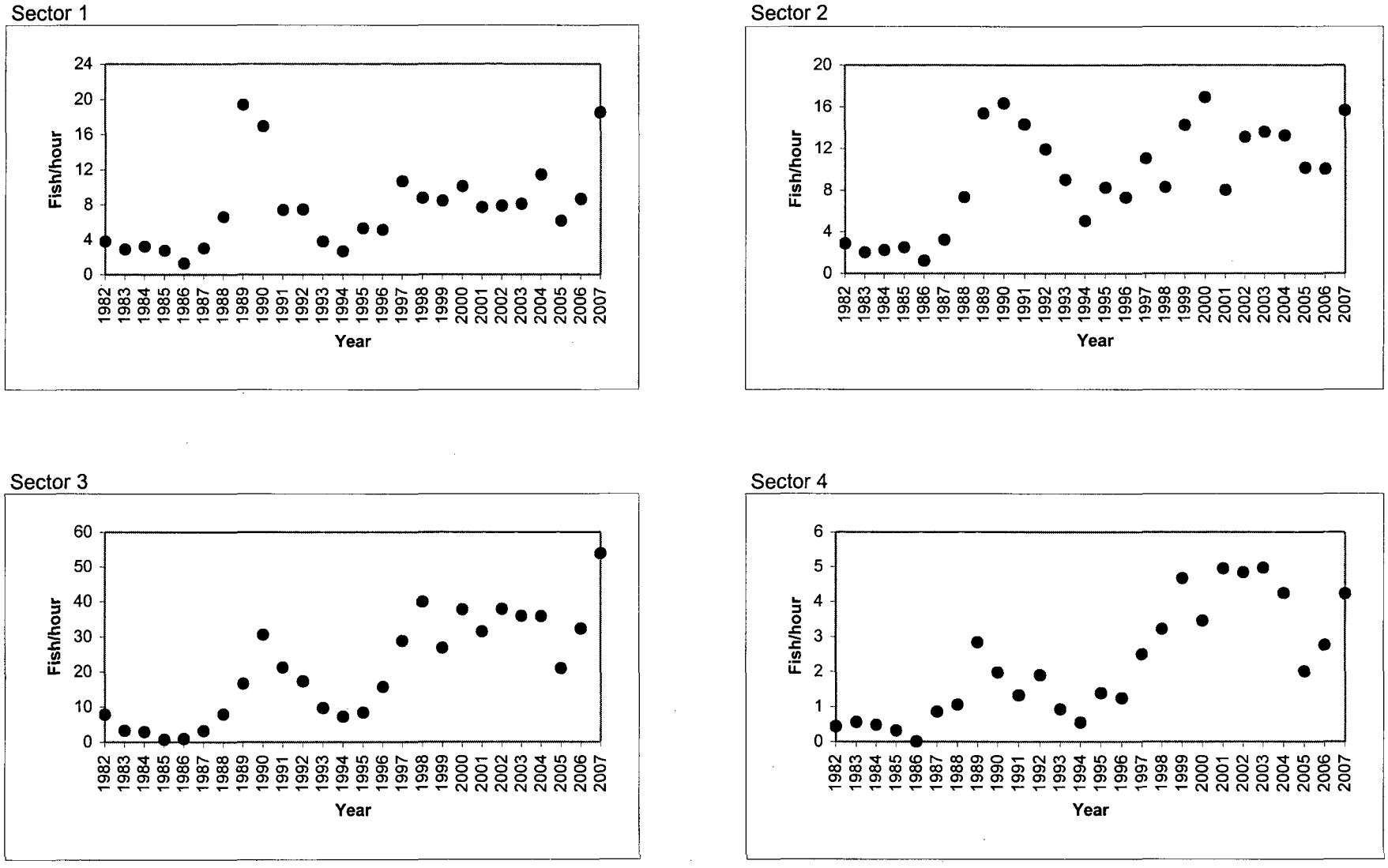
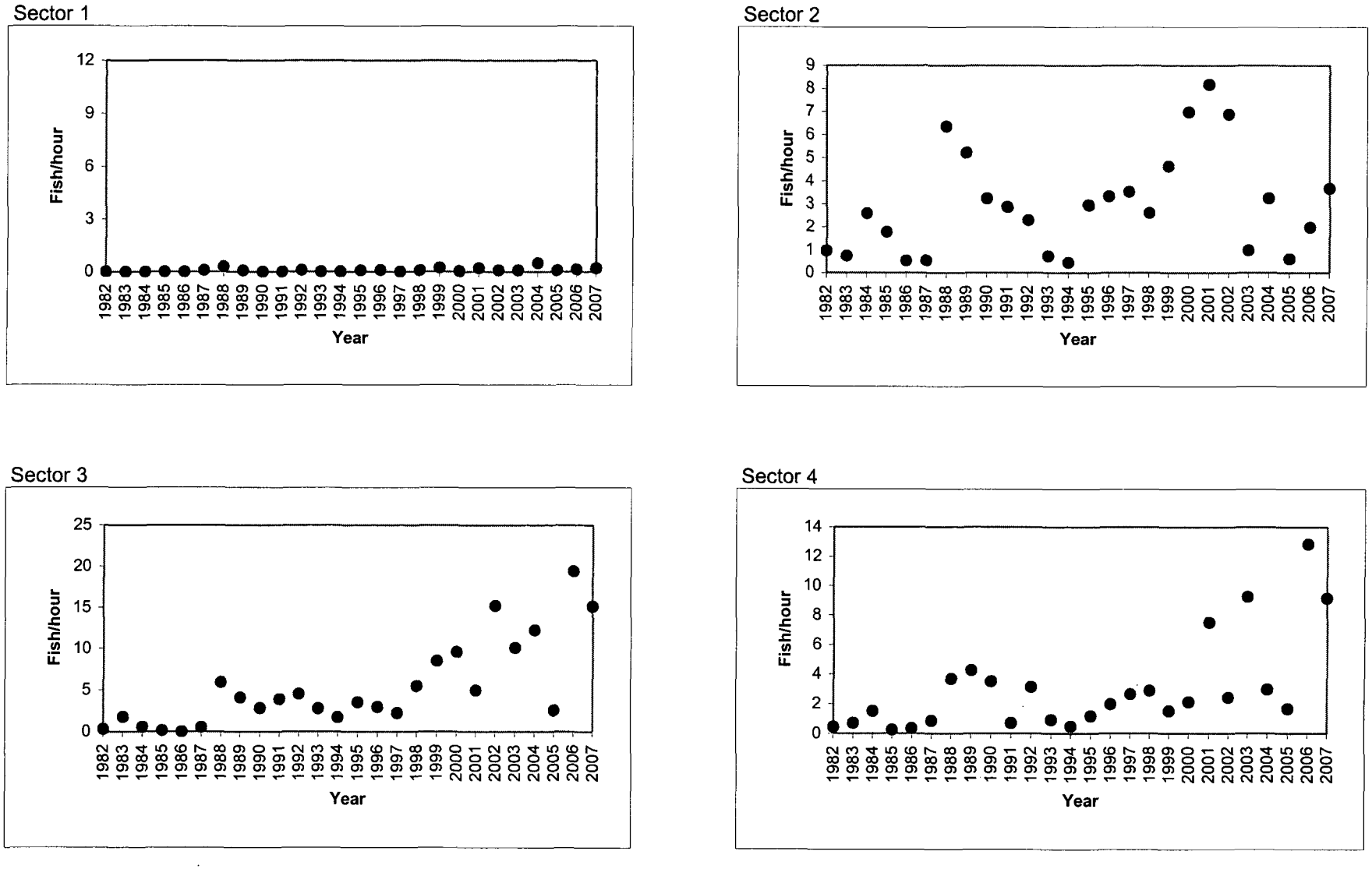


Figure 30. Electrofishing CPUE (fish/hour) by sector for Largemouth bass for years 1982-2007 in the vicinity of PINGP.



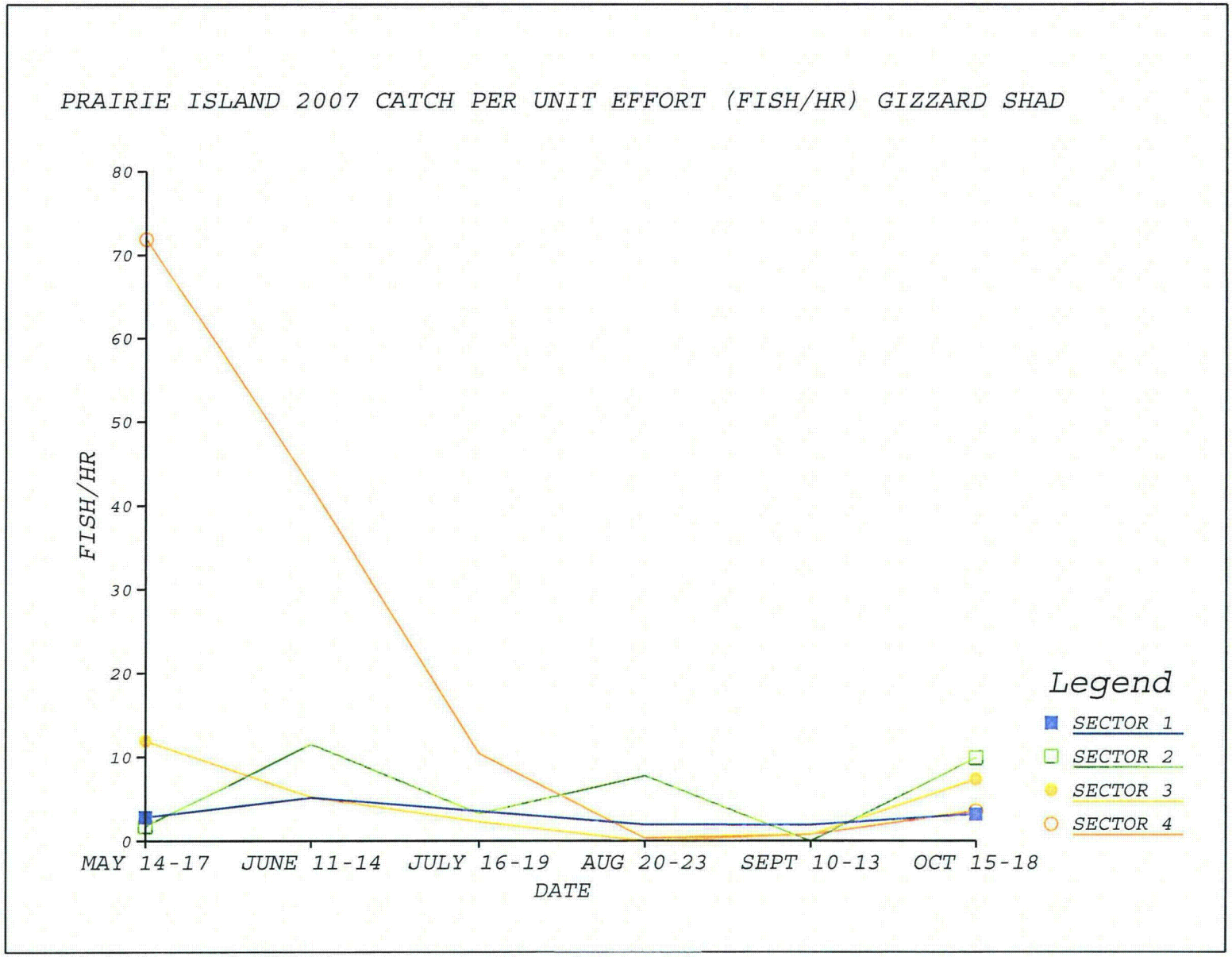

PRAIRIE ISLAND 2007 CATCH PER UNIT EFFORT (FISH/HR) GIZZARD SHAD
FISH/HR
80
70
60
50
40
30
20
10
0
MAY 14-17
JUNE 11-14
JULY 16-19
AUG 20-23
SEPT 10-13
OCT 15-18
DATE
Legend
SECTOR 1
SECTOR 2
SECTOR 3
SECTOR 4

Figure 31

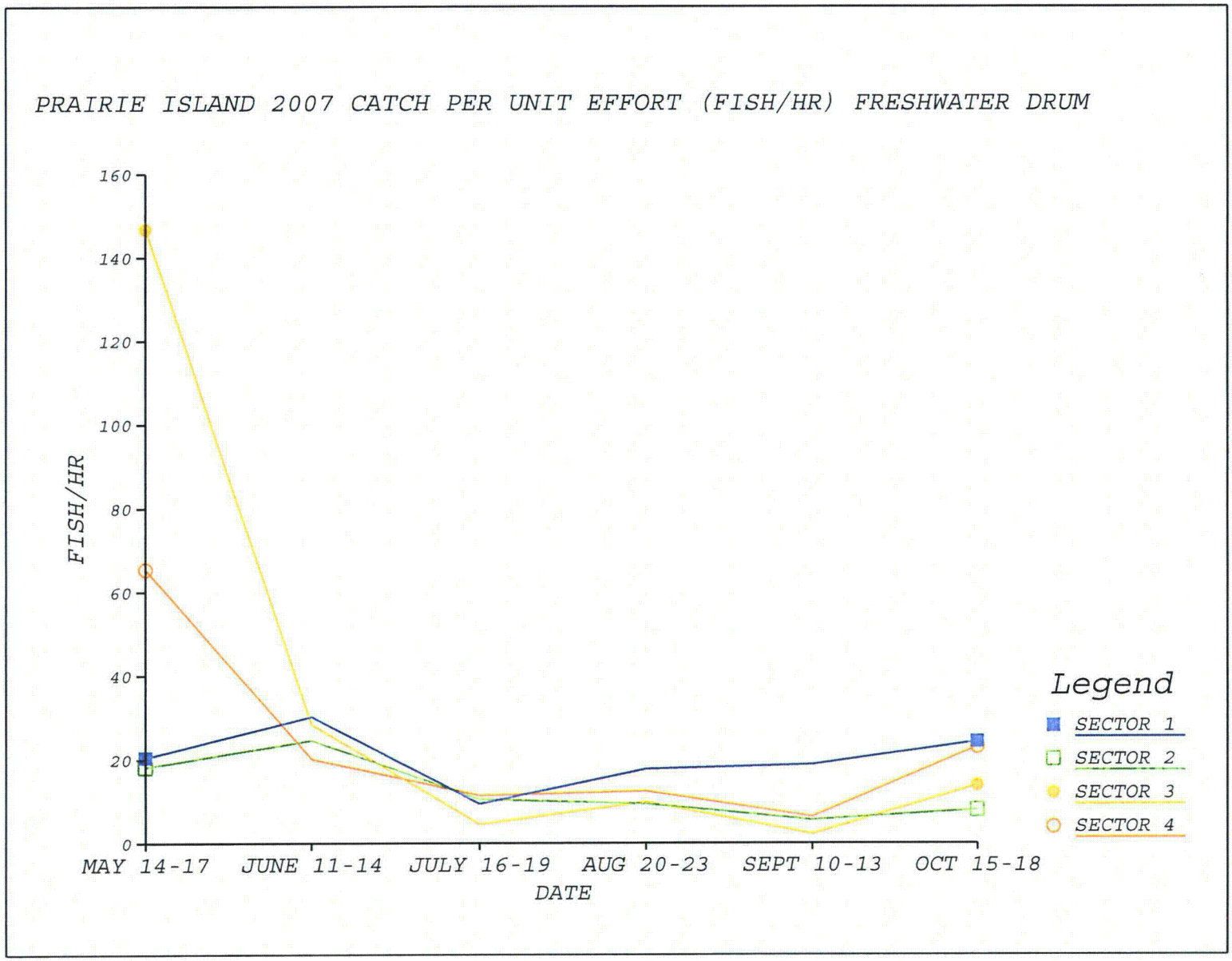

PRAIRIE ISLAND 2007 CATCH PER UNIT EFFORT (FISH/HR) FRESHWATER DRUM
FISH/HR
160
140
120
100
80
60
40
20
0
MAY 14-17
JUNE 11-14
JULY 16-19
AUG 20-23
SEPT 10-13
OCT 15-18
DATE
Legend
SECTOR 1
SECTOR 2
SECTOR 3
SECTOR 4

Figure 32

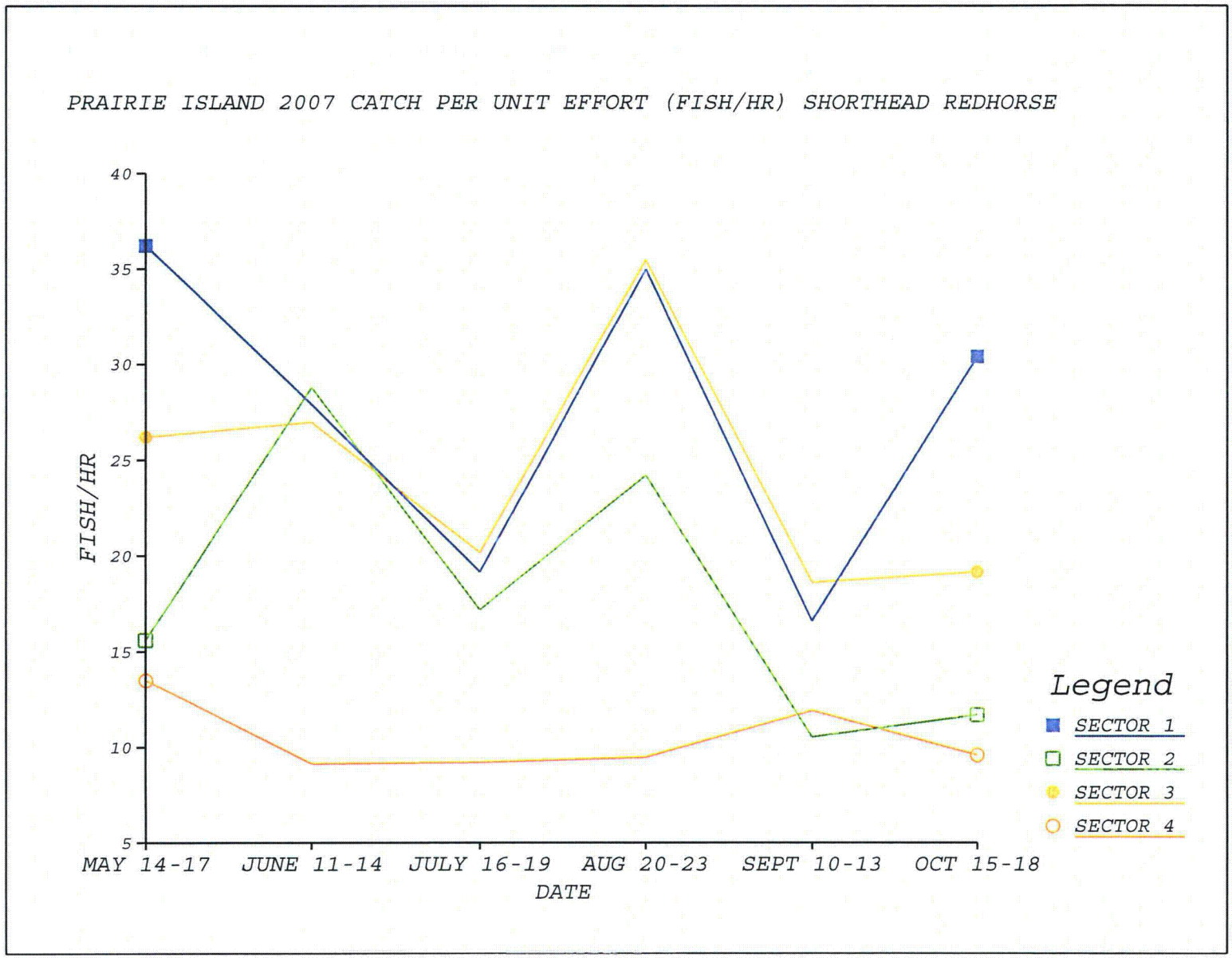

PRAIRIE ISLAND 2007 CATCH PER UNIT EFFORT (FISH/HR) SHORTHEAD REDHORSE
FISH/HR
40
35
30
25
20
15
10
5
MAY 14-17
JUNE 11-14
JULY 16-19
AUG 20-23
SEPT 10-13
OCT 15-18
DATE
Legend
SECTOR 1
SECTOR 2
SECTOR 3
SECTOR 4

Figure 33

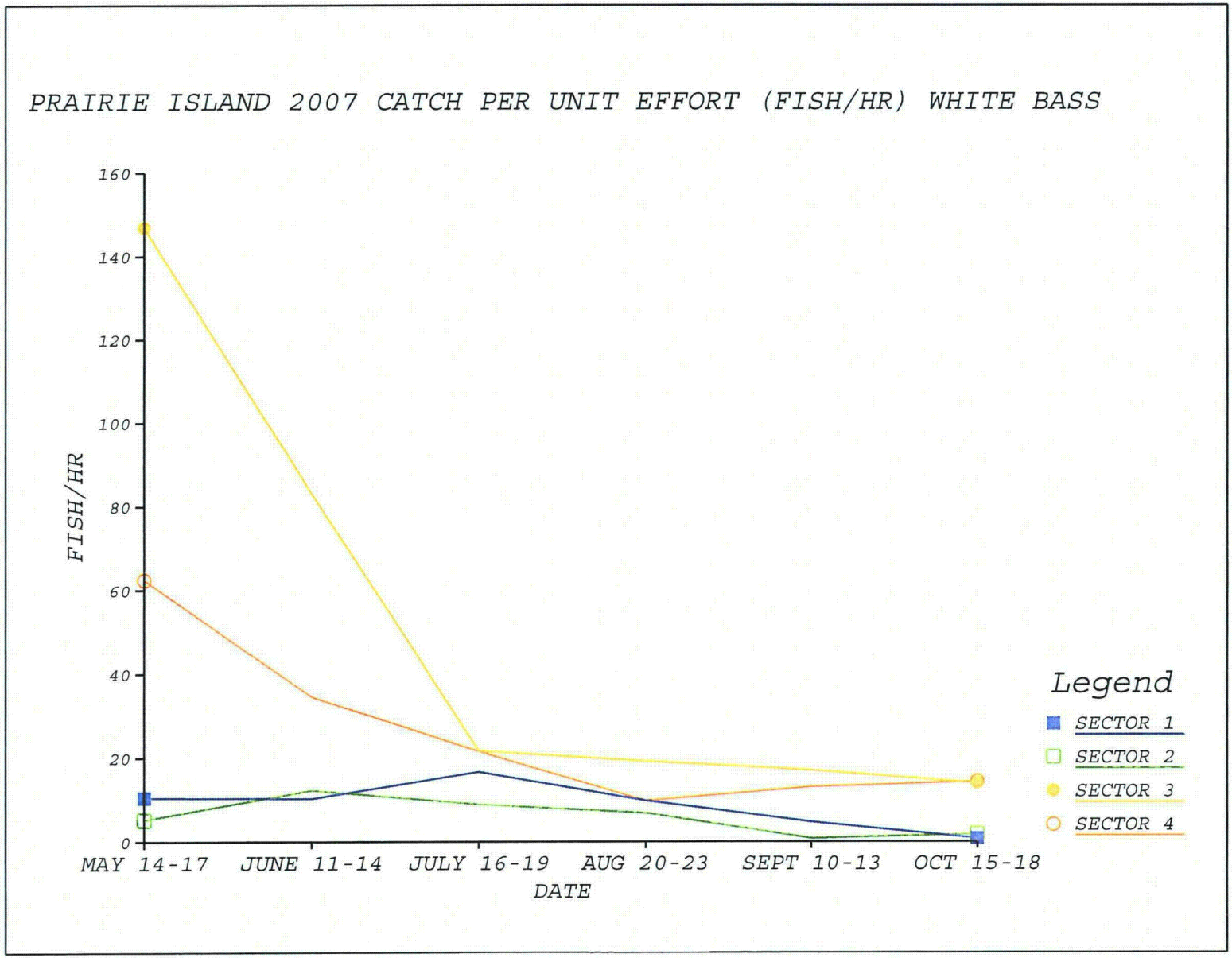

PRAIRIE ISLAND 2007 CATCH PER UNIT EFFORT (FISH/HR) WHITE BASS
FISH/HR
160
140
120
100
80
60
40
20
0
MAY 14-17
JUNE 11-14
JULY 16-19
AUG 20-23
SEPT 10-13
OCT 15-18
DATE
Legend
SECTOR 1
SECTOR 2
SECTOR 3
SECTOR 4

Figure 34

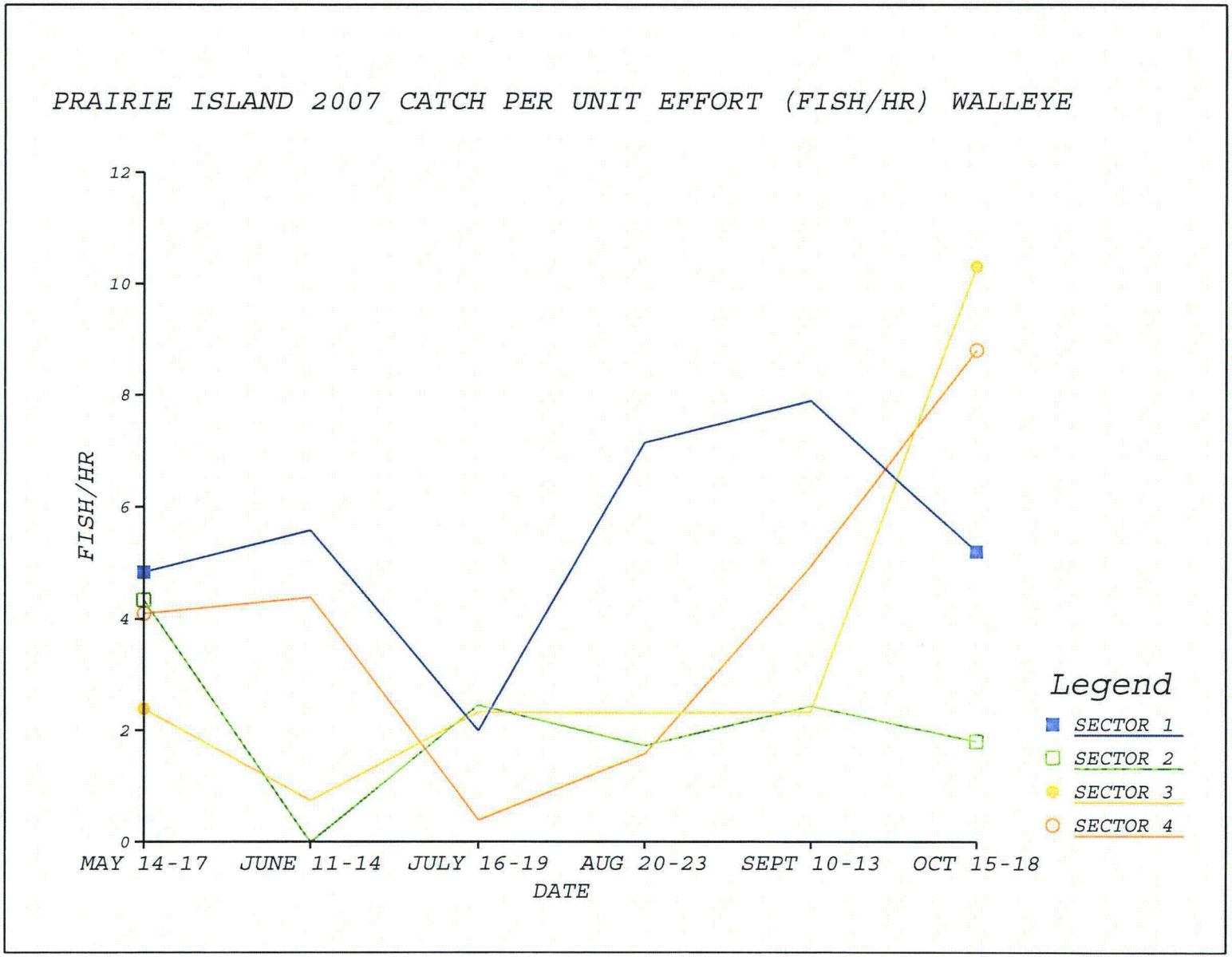

PRAIRIE ISLAND 2007 CATCH PER UNIT EFFORT (FISH/HR) WALLEYE
FISH/HR
12
10
8
6
4
2
0
MAY 14-17
JUNE 11-14
JULY 16-19
AUG 20-23
SEPT 10-13
OCT 15-18
DATE
Legend
SECTOR 1
SECTOR 2
SECTOR 3
SECTOR 4

Figure 35

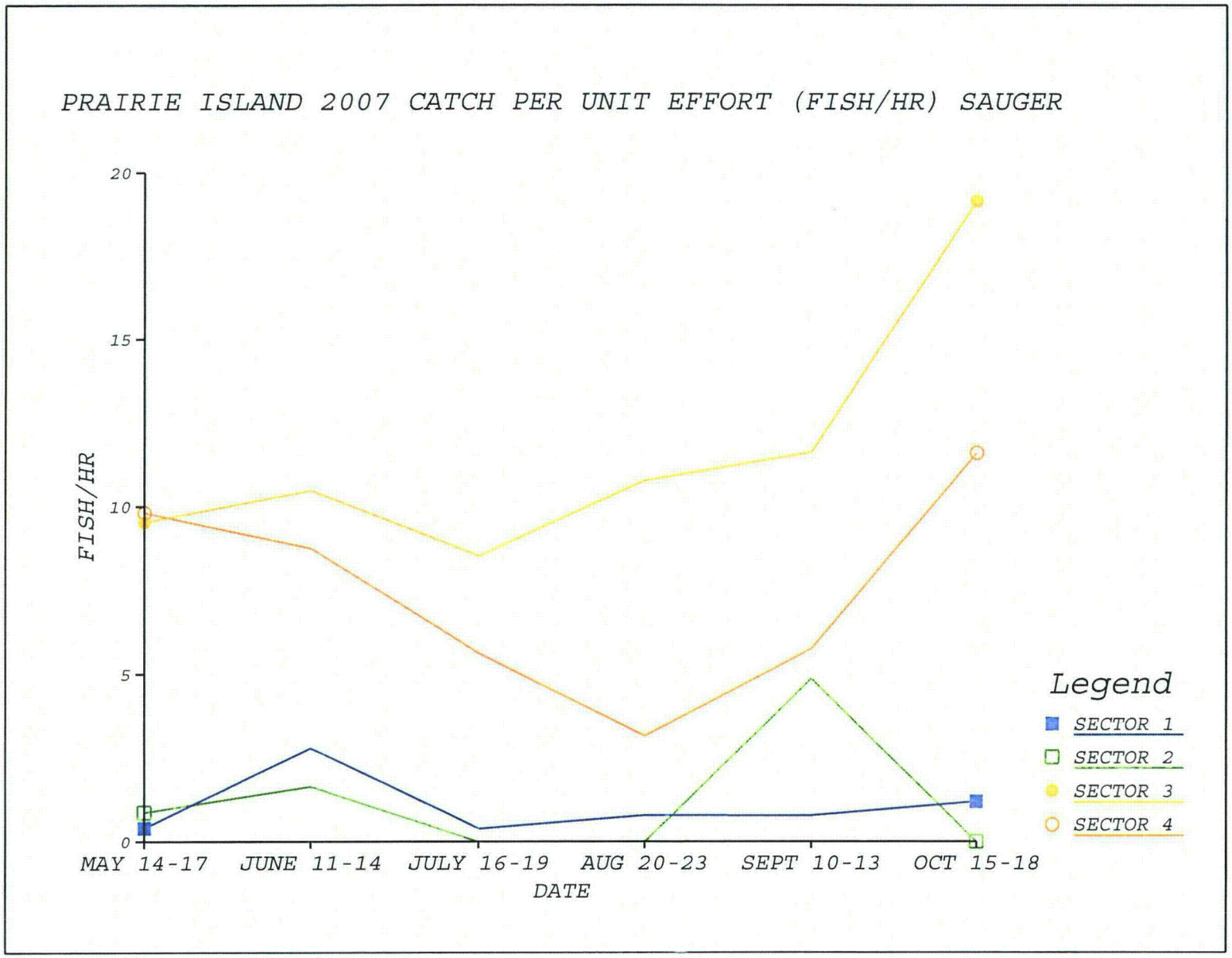

PRAIRIE ISLAND 2007 CATCH PER UNIT EFFORT (FISH/HR) SAUGER
FISH/HR
20
15
10
5
0
MAY 14-17
JUNE 11-14
JULY 16-19
AUG 20-23
SEPT 10-13
OCT 15-18
DATE
Legend
SECTOR 1
SECTOR 2
SECTOR 3
SECTOR 4

Figure 36

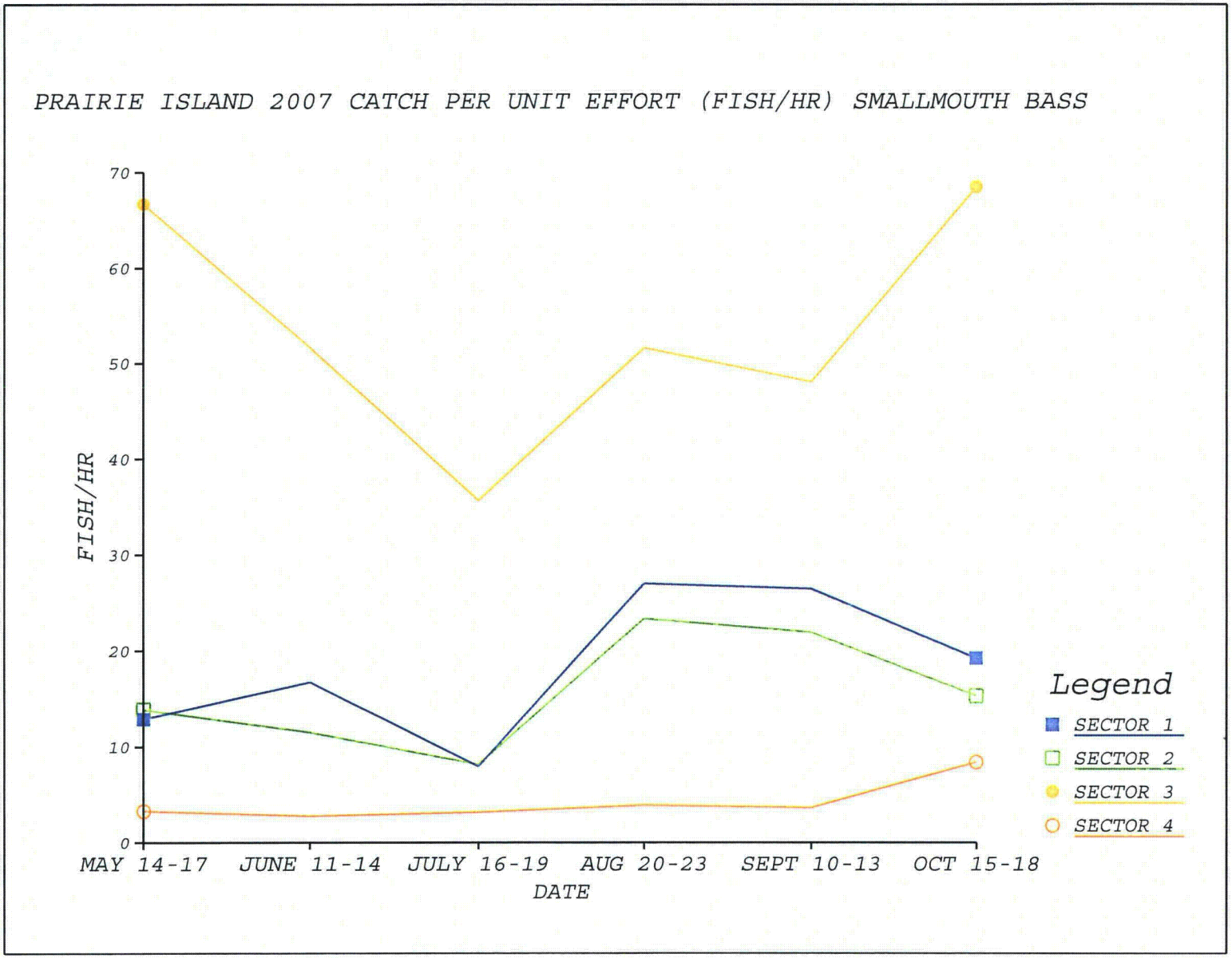

PRAIRIE ISLAND 2007 CATCH PER UNIT EFFORT (FISH/HR) SMALLMOUTH BASS
FISH/HR
70
60
50
40
30
20
10
0
MAY 14-17
JUNE 11-14
JULY 16-19
AUG 20-23
SEPT 10-13
OCT 15-18
DATE
Legend
SECTOR 1
SECTOR 2
SECTOR 3
SECTOR 4

Figure 37

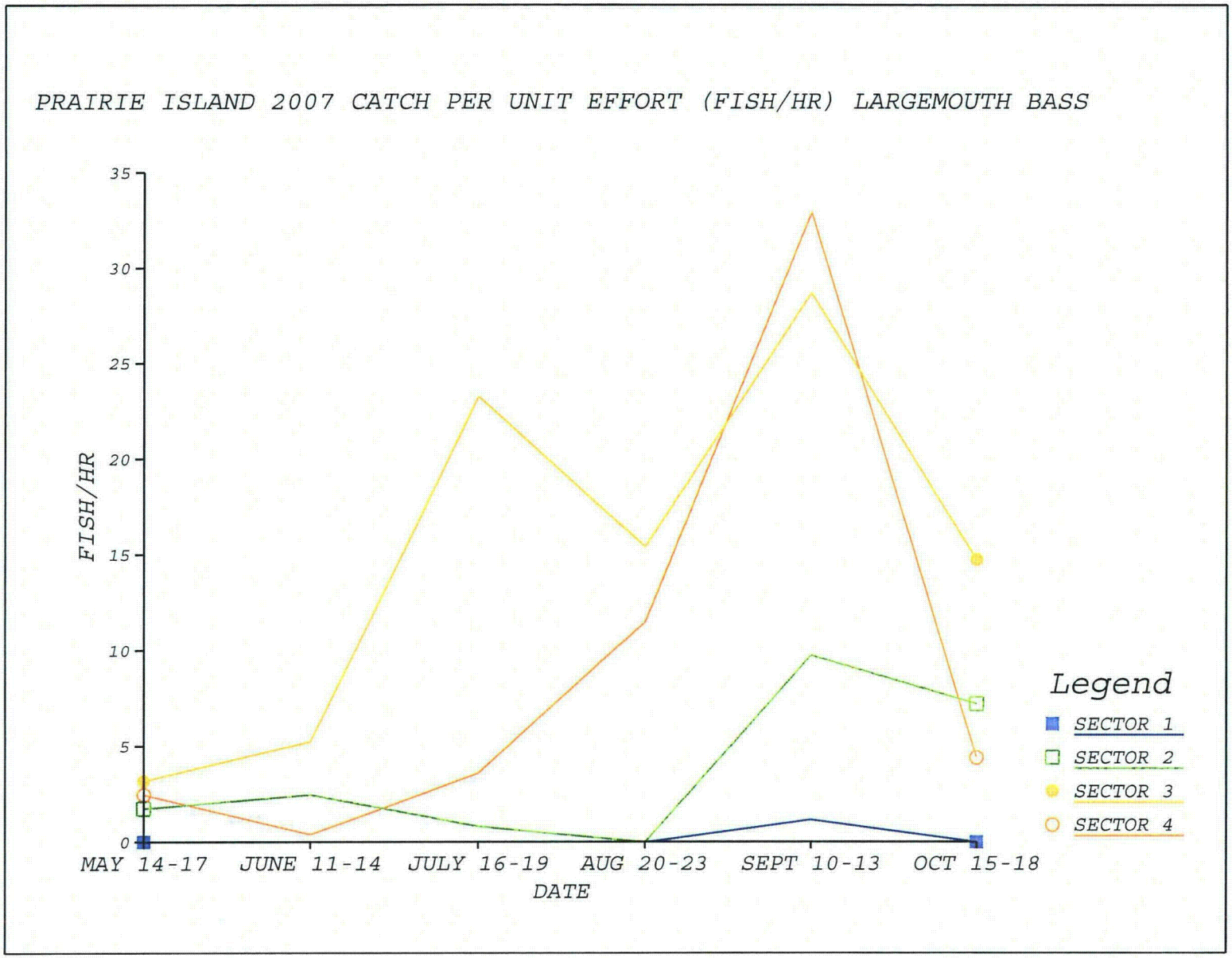

PRAIRIE ISLAND 2007 CATCH PER UNIT EFFORT (FISH/HR) LARGEMOUTH BASS
FISH/HR
35
30
25
20
15
10
5
0
MAY 14-17
JUNE 11-14
JULY 16-19
AUG 20-23
SEPT 10-13
OCT 15-18
DATE
Legend
SECTOR 1
SECTOR 2
SECTOR 3
SECTOR 4

Figure 38

Table 1. Species of fish captured In the Mississippi River in the vicinity of the Prairie Island Nuclear Generating Plant 1983-2007.

Species	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07
Chestnut lamprey *Ichthyomyzon castaneus*	x	x							x	x			x			x	x		x	x	x			x	
Silver lamprey *Icthyomyzon unicuspus*					x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x
Paddlefish *Polyodon spathula*															x								x		
Longnose gar *Lepisosteus osseus*	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Shortnose gar *Lepisosteus platostomus*	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Bowfin *Amia calva*	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
American eel *Anguilla rostrata*	x	x		x	x	x	x	x	x	x	x	x	x	x			x	x		x			x		
Gizzard shad *Dorosoma cepedianum*	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Goldeye *Hiodon alosoides*	x		x		x	x					x			x	x	x	x				x	x	x		
Mooneye *Hiodon tergisus*	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Brown trout *Salmo trutta*				x									x		x		x		x	x	x		x	x	
Northern pike *Esox lucius*	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Musky *Esox masquinongy*																		x	x			x			x
Carp *Cyprinus carpio*	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Carpsucker Species *Carpiodes species*		x					x																		
River carpsucker *Carpiodes carpio*	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Quillback *Carpiodes cyprinus*	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Highfin carpsucker *Carpiodes velifer*			x	x	x	x	x	x	x	x	x	x	x	x	x					x	x	x	x		x

Table 1 (cont.) Species of fish captured In the Mississippi River in the vicinity of the Prairie Island Nuclear Generating Plant 1983-2007.

Species	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07
White sucker *Catostomus commersoni*	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x		x	
Blue sucker *Cycleptus elongatus*	x			x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Northern hogsucker *Hypentelium nigricans*	x														x			x							x
Smallmouth buffalo *Ictiobus bubalus*	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Bigmouth buffalo *Ictiobus cyprinellus*	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Spotted sucker *Minytrema melanops*	x	x		x		x	x			x												x	x	x	
Silver redhorse *Moxostoma anisurum*	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
River redhorse *Moxostoma carinatum*		x	x		x		x	x	x	x		x	x			x	x	x	x	x	x	x	x	x	x
Golden redhorse *Moxostoma erythrurum*	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Greater redhorse *Moxostoma valenciennesi*		x		x		x		x							x	x			x		x				
Shorthead redhorse *Moxostoma macrolepidotum*	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Black bullhead *Ictalurus melas*	x	x	x	x	x	x				x							x	x		x					
Yellow bullhead *Ictalurus natalis*					x	x	x					x	x												
Brown bullhead *Ictalurus nebulosus*	x																								
Channel catfish *Ictalurus punctatus*	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Flathead catfish *Pylodictus olivaris*	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Burbot *Lota lota*	x	x			x					x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
White bass *Marone chrysops*	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Table 1 (cont.) Species of fish captured In the Mississippi River in the vicinity of the Prairie Island Nuclear Generating Plant 1983-2007.

Species	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	OO	O1	O2	O3	O4	O5	O6	O7
Rock bass *Ambloplites rupestris*	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Green sunfish *Lepomis cyanellus*	x	x			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Pumpkinseed *Lepomis gibbosus*							x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Orangespotted sunfish *Lepomis humilis*																x		x	x			x		x	x
Bluegill *Lepomis macrochirus*	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Smallmouth bass *Micropterus dolomieui*	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Largemouth bass *Micropterus salmoides*	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
White crappie *Pomoxis annularis*	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Black crappie *Pomoxis nigromaculatus*	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Yellow perch *Perca flavens*	x	x	x		x	x	x	x	x	x	x	x	x		x	x	x		x	x	x	x	x	x	x
Sauger *Sander canadense*	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Walleye *Sander vitreum*	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Saugeye *S. vitreum x S. canadense*															x	x	x		x	x	x	x	x		x
Freshwater drum *Aplodinotus grunniens*	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Lake sturgeon *Acipenser fulvescens*																					x				x
Bluegill x Greensunfish *L. macrochirus x L. cyanellus*																									x
Greensunfish x Pumpkinseed *L. cyanellus x L. gibbosus*																									x

Table 2. Electrofishing CPUE (fish/hour) for each sector in the vicinity of PINGP and total number of each species collected during 2007. Species are listed in descending order according to average CPUE.

Rank	Species	Sector 1	Sector 2	Sector 3	Sector 4	Average	Number collected
1	Carp	17.95	27.92	34.24	14.70	23.70	955
2	Smallmouth bass	18.42	15.65	53.78	4.23	23.02	872
3	White bass	8.84	6.06	49.82	25.98	22.68	953
4	Freshwater drum	20.28	12.83	33.73	23.23	22.52	1006
5	Shorthead redhorse	27.53	18.05	24.40	10.47	20.11	889
6	Bluegill (BG)	1.86	37.93	18.91	9.06	16.94	580
7	Gizzard shad	3.13	5.64	4.60	21.48	8.71	443
8	Largemouth bass	0.20	3.67	15.07	9.13	7.02	283
9	Sauger	1.06	1.27	11.75	7.45	5.38	228
10	Black crappie	2.19	6.91	1.92	7.45	4.62	208
11	Quillback carpsucker	3.99	6.91	3.07	3.76	4.43	189
12	Walleye	5.45	2.12	3.45	4.03	3.76	184
13	Silver redhorse	4.19	4.51	2.04	3.56	3.58	164
14	Green sunfish (GSF)	0.07	9.03	1.53	0.13	2.69	79
15	Smallmouth buffalo	1.33	1.83	2.43	2.22	1.95	85
16	Flathead catfish	0.33	2.12	3.58	0.94	1.74	62
17	Channel catfish	1.46	3.10	0.13	0.47	1.29	52
18	White crappie	0.07	3.38	0.26	0.74	1.11	38
19	Bowfin	0.00	0.14	1.28	1.81	0.81	38
20	Rock bass	0.93	0.28	0.64	0.47	0.58	28
21	Bigmouth buffalo	0.60	0.14	1.02	0.54	0.58	26
22	River carpsucker	0.13	1.41	0.51	0.20	0.56	19
23	Northern pike	0.13	0.00	0.77	0.74	0.41	19
24	Longnose gar	0.27	0.00	0.38	0.60	0.31	16
25	Yellow perch	0.20	0.85	0.00	0.20	0.31	12
26	Blue sucker	0.33	0.56	0.00	0.34	0.31	14
27	Pumpkinseed (Pump)	0.00	0.42	0.38	0.40	0.30	12
28	Shortnose gar	0.00	0.56	0.38	0.20	0.29	10
29	Golden redhorse	0.07	0.14	0.13	0.60	0.24	12
30	Mooneye	0.33	0.14	0.13	0.34	0.23	12
31	River redhorse	0.00	0.28	0.51	0.07	0.22	7
32	Silver lamprey	0.00	0.28	0.38	0.13	0.20	7
33	Northern hog sucker	0.00	0.00	0.77	0.00	0.19	6
34	BG x GSF	0.00	0.42	0.26	0.00	0.17	5
35	Orange spotted sunfish	0.00	0.28	0.00	0.00	0.07	2
36	Highfin carpsucker	0.00	0.00	0.13	0.07	0.05	2
37	Musky	0.00	0.14	0.00	0.00	0.04	1
38	Lake sturgeon	0.00	0.00	0.13	0.00	0.03	1
39	GSF x Pump	0.00	0.00	0.13	0.00	0.03	1
40	Saugeye	0.00	0.00	0.00	0.07	0.02	1
	Totals	121.34	174.98	272.63	155.81	181.19	7521

Table 3. Fisheries summary for Gizzard shad 1977-2007.

YEAR	ELECTRO CPUE Fish/hr	TRAPNET CPUE Fish/hr	CATCH COMP (%)	N	MEAN LENGTH	LENGTH WEIGHT REGRESSION
1977	7.92	0.61	4	135	NA	LOG W=3.101 LOG L-5.163
1978	10.20	0.20	5	73	NA	LOG W=3.068 LOG L-5.078
1979	1.81	0.06	1	NA	NA	NA
1980	10.83	0.14	7	NA	NA	NA
1981	23.03	0.38	9	917	216	LOG W=2.748 LOG L-4.348
1982	7.39	0.09	3	276	329	LOG W=2.917 LOG L-4.741
1983	3.57	0.26	2	155	355	LOG W=3.029 LOG L-5.049
1984	0.84	0.08	1	48	281	LOG W=2.684 LOG L-4.171
1985	0.81	0.01	1	31	325	LOG W=2.388 LOG L-3.431
1986	0.14	0.06	<1	13	274	LOG W=3.248 LOG L-5.634
1987	1.08	0.05	1	55	256	LOG W=3.030 LOG L-5.046
1988	3.25	NA	3	139	288	LOG W=2.629 LOG L-4.015
1989	1.07	NA	<1	47	323	LOG W=3.025 LOG L-5.021
1990	3.99	NA	3	170	326	LOG W=2.956 LOG L-4.857
1991	2.39	NA	4	198	338	LOG W=2.601 LOG L-3.940
1992	1.82	NA	1.8	91	357	LOG W=3.459 LOG L-6.127
1993	1.99	NA	1.9	62	375	LOG W=2.920 LOG L-4.728
1994	0.28	NA	<1	14	394	LOG W=3.371 LOG L-5.955
1995	5.10	NA	4	204	272	LOG W=2.625 LOG L-4.073
1996	0.76	NA	<1	27	330	LOG W=3.275 LOG L-5.666
1997	0.66	NA	<1	23	400	LOG W=3.934 LOG L-7.373
1998	4.07	NA	2	176	260	LOG W=3.104 LOG L-5.218
1999	27.12	NA	12	1222	290	LOG W=2.981 LOG L-4.988
2000	40.85	NA	17	1634	290	LOG W=3.274 LOG L-5.697
2001	10.43	NA	6	455	340	LOG W=3.767 LOG L-6.967
2002	14.02	NA	7	612	350	LOG W=3.200 LOG L-5.518
2003	9.51	NA	5	373	380	LOG W=3.469 LOG L-6.198
2004	17.60	NA	10	859	290	LOG W=2.863 LOG L-4.607
2005	14.06	NA	9	682	350	LOG W=3.072 LOG L-5.147
2006	7.91	NA	5	437	340	LOG W=2.854 LOG L-4.585
2007	8.71	NA	5	443	340	LOG W=2.829 LOG L-4.526

Table 4. Fisheries summary for Freshwater drum 1977-2007.

YEAR	ELECTRO CPUE Fish/hr	TRAPNET CPUE Fish/hr	CATCH COMP (%)	N	MEAN LENGTH	LENGTH WEIGHT REGRESSION
1977	7.49	5.27	13	569	NA	LOG W=2.947 LOG L-4.756
1978	11.97	6.28	17	422	NA	LOG W=2.911 LOG L-4.710
1979	7.47	5.22	21	360	NA	LOG W=3.068 LOG L-5.100
1980	5.89	3.83	18	520	NA	LOG W=3.052 LOG L-5.026
1981	30.88	4.76	12	1146	267	LOG W=2.891 LOG L-4.625
1982	9.30	11.00	24	2225	293	LOG W=2.888 LOG L-4.625
1983	8.80	8.18	22	1626	287	LOG W=3.001 LOG L-4.927
1984	7.07	6.21	20	1212	288	LOG W=2.598 LOG L-3.919
1985	10.15	7.92	31	1712	293	LOG W=2.846 LOG L-4.452
1986	8.33	0.39	22	856	310	LOG W=3.089 LOG L-5.139
1987	10.29	3.75	16	940	312	LOG W=2.874 LOG L-4.603
1988	9.85	NA	8	419	280	LOG W=2.722 LOG L-4.205
1989	13.17	NA	11	570	294	LOG W=2.908 LOG L-4.707
1990	17.70	NA	13	724	297	LOG W=3.008 LOG L-4.957
1991	15.68	NA	12	596	305	LOG W=2.955 LOG L-4.824
1992	14.23	NA	11	539	320	LOG W=2.967 LOG L-4.829
1993	20.83	NA	18	584	334	LOG W=3.063 LOG L-5.053
1994	15.92	NA	14	495	332	LOG W=3.072 LOG L-5.086
1995	14.96	NA	12	605	317	LOG W=3.124 LOG L-5.243
1996	9.33	NA	8	374	300	LOG W=3.061 LOG L-5.093
1997	18.18	NA	10	812	300	LOG W=3.090 LOG L-5.159
1998	23.47	NA	11	983	320	LOG W=3.171 LOG L-5.344
1999	45.53	NA	17	1745	320	LOG W=3.138 LOG L-5.289
2000	19.88	NA	8	776	310	LOG W=3.077 LOG L-5.161
2001	28.17	NA	15	1279	330	LOG W=3.212 LOG L-5.480
2002	24.45	NA	12	1062	320	LOG W=3.155 LOG L-5.346
2003	37.51	NA	19	1595	350	LOG W=3.276 LOG L-5.637
2004	21.12	NA	12	928	310	LOG W=3.080 LOG L-5.131
2005	32.02	NA	22	1342	330	LOG W=3.129 LOG L-5.238
2006	16.61	NA	11	873	320	LOG W=3.258 LOG L-5.546
2007	22.52	NA	12	1006	320	LOG W=3.054 LOG L-5.053

Table 5. Fisheries summary for Shorthead redhorse 1977-2007.

YEAR	ELECTRO CPUE Fish/hr	TRAPNET CPUE Fish/hr	CATCH COMP (%)	N	MEAN LENGTH	LENGTH WEIGHT REGRESSION
1977	5.39	1.58	5	259	NA	LOG W=2.902 LOG L-4.691
1978	2.96	1.09	4	125	NA	LOG W=2.978 LOG L-4.917
1979	2.08	0.45	3	67	NA	LOG W=3.041 LOG L-5.090
1980	6.08	0.70	7	137	NA	LOG W=2.894 LOG L-4.678
1981	11.67	1.34	7	686	376	LOG W=2.791 LOG L-4.428
1982	13.56	0.92	7	675	392	LOG W=2.814 LOG L-4.496
1983	8.96	0.79	6	454	387	LOG W=2.849 LOG L-4.590
1984	9.74	0.51	7	435	386	LOG W=2.571 LOG L-3.840
1985	7.36	0.51	7	374	389	LOG W=2.787 LOG L-4.415
1986	7.07	0.19	8	319	398	LOG W=2.911 LOG L-4.730
1987	13.80	1.24	12	722	403	LOG W=2.860 LOG L-4.608
1988	17.48	NA	13	667	381	LOG W=2.696 LOG L-4.176
1989	24.52	NA	17	902	370	LOG W=2.792 LOG L-4.448
1990	22.60	NA	14	838	361	LOG W=2.825 LOG L-4.544
1991	13.58	NA	11	538	355	LOG W=2.784 LOG L-4.443
1992	19.35	NA	14	721	403	LOG W=2.841 LOG L-4.587
1993	10.86	NA	10	332	382	LOG W=3.011 LOG L-4.991
1994	13.51	NA	14	505	389	LOG W=2.872 LOG L-4.655
1995	9.67	NA	8	450	364	LOG W=2.925 LOG L-4.808
1996	13.42	NA	11	551	380	LOG W=2.897 LOG L-4.719
1997	19.21	NA	10	833	350	LOG W=2.982 LOG L-4.960
1998	23.94	NA	12	1047	360	LOG W=2.982 LOG L-4.960
1999	21.17	NA	9	931	350	LOG W=3.016 LOG L-5.050
2000	25.94	NA	11	1099	360	LOG W=2.905 LOG L-4.760
2001	17.43	NA	9	777	370	LOG W=3.039 LOG L-5.101
2002	17.23	NA	9	781	370	LOG W=2.954 LOG L-4.892
2003	20.92	NA	11	878	390	LOG W=3.033 LOG L-5.071
2004	25.63	NA	15	1141	360	LOG W=2.948 LOG L-4.855
2005	12.85	NA	9	562	350	LOG W=2.833 LOG L-4.544
2006	14.38	NA	10	731	370	LOG W=2.772 LOG L-4.375
2007	20.11	NA	11	889	330	LOG W=2.808 LOG L-4.481

Table 6. Fisheries summary for White bass 1977-2007.

YEAR	ELECTRO CPUE Fish/hr	TRAPNET CPUE Fish/hr	CATCH COMP (%)	N	MEAN LENGTH	LENGTH WEIGHT REGRESSION
1977	7.76	6.73	19	565	NA	LOG W=2.441 LOG L-3.529
1978	7.11	5.67	17	369	NA	LOG W=2.956 LOG L-4.813
1979	3.49	3.02	13	217	NA	LOG W=3.055 LOG L-5.057
1980	2.48	1.97	9	183	NA	LOG W=3.064 LOG L-5.022
1981	30.88	5.39	20	1996	240	LOG W=2.842 LOG L-4.498
1982	28.11	0.07	18	1722	286	LOG W=2.909 LOG L-4.677
1983	17.50	4.52	17	1277	300	LOG W=3.041 LOG L-5.021
1984	13.53	2.89	15	435	304	LOG W=2.571 LOG L-3.840
1985	16.75	1.39	14	768	308	LOG W=2.773 LOG L-4.337
1986	14.23	1.63	18	732	325	LOG W=2.926 LOG L-4.716
1987	9.70	1.44	10	589	321	LOG W=3.027 LOG L-4.958
1988	22.90	NA	20	1009	242	LOG W=2.855 LOG L-4.525
1989	20.00	NA	15	819	266	LOG W=2.945 LOG L-4.765
1990	25.49	NA	16	941	295	LOG W=2.913 LOG L-4.697
1991	24.15	NA	18	886	310	LOG W=2.911 LOG L-4.696
1992	17.36	NA	11	577	338	LOG W=2.967 LOG L-4.829
1993	14.42	NA	12	390	328	LOG W=2.939 LOG L-4.750
1994	10.20	NA	10	360	339	LOG W=2.911 LOG L-4.671
1995	20.16	NA	16	809	267	LOG W=3.026 LOG L-4.975
1996	16.99	NA	14	660	320	LOG W=3.066 LOG L-5.068
1997	28.53	NA	15	1159	300	LOG W=3.054 LOG L-5.038
1998	32.90	NA	16	1314	320	LOG W=3.085 LOG L-5.106
1999	35.91	NA	14	1461	300	LOG W=3.011 LOG L-4.942
2000	39.90	NA	16	1602	320	LOG W=2.963 LOG L-4.830
2001	32.37	NA	17	1436	320	LOG W=2.967 LOG L-4.821
2002	41.69	NA	21	1656	320	LOG W=3.042 LOG L-5.013
2003	31.22	NA	16	1272	330	LOG W=2.977 LOG L-4.829
2004	24.29	NA	14	1011	310	LOG W=3.029 LOG L-4.960
2005	24.21	NA	16	982	330	LOG W=2.947 LOG L-4.742
2006	16.71	NA	12	845	330	LOG W=2.886 LOG L-4.594
2007	22.68	NA	13	953	330	LOG W=2.902 LOG L-4.630

Table 7. Fisheries summary for Walleye 1977-2007.

YEAR	ELECTRO CPUE Fish/hr	TRAPNET CPUE Fish/hr	CATCH COMP (%)	N	MEAN LENGTH	LENGTH WEIGHT REGRESSION
1977	1.36	0.37	1	20	NA	LOG W=3.137 LOG L-5.377
1978	1.54	0.96	2	28	NA	LOG W=3.056 LOG L-5.197
1979	1.57	0.31	2	34	NA	LOG W=3.225 LOG L-5.640
1980	1.20	0.13	1	22	NA	LOG W=3.250 LOG L-5.693
1981	3.53	0.39	2	189	335	LOG W=3.082 LOG L-5.240
1982	2.96	0.16	1	135	415	LOG W=3.097 LOG L-5.293
1983	1.63	0.21	1	90	432	LOG W=3.095 LOG L-5.295
1984	2.04	0.11	2	93	378	LOG W=2.852 LOG L-4.615
1985	2.64	0.13	2	119	413	LOG W=3.159 LOG L-5.461
1986	1.99	0.15	2	101	404	LOG W=3.085 LOG L-5.269
1987	3.00	0.09	2	132	386	LOG W=3.151 LOG L-5.446
1988	5.80	NA	5	234	450	LOG W=3.103 LOG L-5.272
1989	4.19	NA	3	173	408	LOG W=3.140 LOG L-5.379
1990	2.36	NA	2	95	420	LOG W=3.214 LOG L-5.594
1991	1.44	NA	1	52	477	LOG W=3.318 LOG L-5.870
1992	2.30	NA	1	82	403	LOG W=3.257 LOG L-5.727
1993	2.00	NA	2	60	465	LOG W=3.001 LOG L-5.020
1994	2.11	NA	2	74	439	LOG W=3.261 LOG L-5.720
1995	2.63	NA	2	107	333	LOG W=3.208 LOG L-5.586
1996	2.75	NA	2	118	360	LOG W=3.159 LOG L-5.467
1997	5.63	NA	3	248	400	LOG W=3.215 LOG L-5.617
1998	6.16	NA	3	272	420	LOG W=3.148 LOG L-5.440
1999	7.63	NA	3	308	440	LOG W=3.238 LOG L-5.690
2000	7.72	NA	3	325	460	LOG W=3.250 LOG L-5.717
2001	8.93	NA	5	399	400	LOG W=3.296 LOG L-5.837
2002	9.75	NA	5	415	390	LOG W=3.257 LOG L-5.744
2003	7.18	NA	4	304	450	LOG W=3.253 LOG L-5.726
2004	5.02	NA	3	232	440	LOG W=3.175 LOG L-5.494
2005	2.11	NA	1	86	510	LOG W=3.225 LOG L-5.633
2006	2.77	NA	2	147	510	LOG W=3.352 LOG L-5.964
2007	3.76	NA	2	184	440	LOG W=3.200 LOG L-5.559

Table 8. Fisheries summary for Sauger 1977-2007.

YEAR	ELECTRO CPUE Fish/hr	TRAPNET CPUE Fish/hr	CATCH COMP (%)	N	MEAN LENGTH	LENGTH WEIGHT REGRESSION
1977	0.77	0.40	1	20	NA	LOG W=2.984 LOG L-4.991
1978	2.43	0.38	2	38	NA	LOG W=3.100 LOG L-5.354
1979	1.57	0.30	2	24	NA	LOG W=3.009 LOG L-5.158
1980	1.79	0.17	2	16	NA	LOG W=3.169 LOG L-5.509
1981	7.28	0.29	4	NA	NA	NA
1982	7.50	0.17	4	329	256	LOG W=2.864 LOG L-4.773
1983	3.80	0.25	3	188	285	LOG W=3.013 LOG L-5.144
1984	4.07	0.19	3	182	262	LOG W=2.648 LOG L-4.202
1985	4.57	0.21	4	199	283	LOG W=2.996 LOG L-5.019
1986	3.29	0.24	4	178	294	LOG W=3.336 LOG L-5.936
1987	4.94	0.12	2	114	262	LOG W=3.177 LOG L-5.556
1988	2.10	NA	2	79	236	LOG W=2.683 LOG L-4.285
1989	2.70	NA	2	104	237	LOG W=3.208 LOG L-5.639
1990	2.29	NA	2	92	291	LOG W=3.070 LOG L-5.277
1991	3.07	NA	2	117	308	LOG W=3.155 LOG L-5.507
1992	5.24	NA	4	196	297	LOG W=3.029 LOG L-5.191
1993	5.71	NA	5	168	262	LOG W=2.950 LOG L-4.976
1994	4.16	NA	4	145	280	LOG W=3.153 LOG L-5.484
1995	5.80	NA	5	233	243	LOG W=3.090 LOG L-5.369
1996	5.41	NA	5	228	270	LOG W=3.142 LOG L-5.475
1997	9.99	NA	5	437	270	LOG W=3.065 LOG L-5.294
1998	9.57	NA	5	386	250	LOG W=3.190 LOG L-5.596
1999	18.26	NA	7	756	260	LOG W=3.262 LOG L-5.788
2000	9.81	NA	4	435	280	LOG W=3.306 LOG L-5.892
2001	6.47	NA	3	308	310	LOG W=3.356 LOG L-6.015
2002	7.50	NA	4	329	280	LOG W=3.350 LOG L-6.018
2003	5.86	NA	3	247	300	LOG W=3.281 LOG L-5.842
2004	7.75	NA	4	333	270	LOG W=3.232 LOG L-5.678
2005	5.20	NA	3	233	290	LOG W=3.163 LOG L-5.505
2006	2.98	NA	2	163	280	LOG W=3.042 LOG L-5.203
2007	5.38	NA	3	228	250	LOG W=3.283 LOG L-5.794

Table 9. Smallmouth and largemouth bass electrofishing CPUE (fish/hr) and rank, 1981-2007.

	Smallmouth Bass		Largemouth Bass	
Year	CPUE	Rank	CPUE	Rank
1981	4.65	9	0.58	20
1982	3.72	7	0.41	18
1983	2.17	8	0.80	11
1984	2.19	7	1.16	11
1985	1.56	8	0.54	15
1986	0.85	9	0.21	20
1987	2.94	7	0.61	16
1988	5.72	7	4.06	9
1989	13.52	4	3.40	10
1990	16.44	5	2.39	9
1991	11.03	5	1.87	11
1992	9.61	5	2.50	11
1993	5.80	6	1.10	14
1994	3.83	7	0.65	15
1995	5.81	5	1.93	12
1996	7.31	5	2.08	10
1997	13.23	5	2.10	15
1998	15.01	5	2.75	14
1999	13.51	7	3.71	13
2000	17.02	6	4.67	11
2001	13.01	5	5.21	11
2002	15.91	5	6.14	11
2003	15.59	5	5.09	11
2004	16.15	6	4.73	10
2005	9.77	6	1.22	17
2006	13.39	5	8.57	7
2007	23.02	2	7.02	8

Table 10. Species composition expressed as % of total annual catches for PINGP fisheries studies, electrofishing and trapnetting combined for 1981-1987, and electrofishing only for 1988 through 2007.

Year	Carp	White bass	Freshwater Drum	Sauger	Black Crappie	Shorthead Redhorse	Walleye	Gizzard Shad	Total %
1981	17	20	12	4	15	7	2	9	86
1982	23	18	24	4	9	7	1	3	89
1983	18	17	22	3	16	6	1	2	85
1984	26	15	20	3	12	7	2	1	86
1985	20	14	31	4	9	7	2	1	87
1986	21	18	22	4	9	8	2	<1	84
1987	27	10	16	2	11	12	2	1	81
1988*	23	20	8	2	3	13	5	3	77
1989*	20	15	11	2	1	17	3	<1	70
1990*	20	16	13	1	<1	14	1	3	69
1991*	24	18	12	2	1	11	1	4	73
1992*	26	12	11	4	1	14	2	2	72
1993*	28	12	18	5	<1	10	2	2	76
1994*	34	10	14	4	<1	14	2	<1	78
1995*	30	16	12	5	1	8	2	4	78
1996*	34	14	8	5	2	11	2	<1	76
1997*	29	15	10	5	1	10	3	<1	73
1998*	23	16	11	5	2	12	3	2	74
1999*	17	14	17	7	3	9	3	12	82
2000*	16	16	8	4	2	11	3	17	77
2001*	15	17	15	3	2	9	5	6	72
2002*	14	21	12	4	2	9	5	7	74
2003*	13	16	19	3	1	11	4	5	72
2004*	14	14	12	4	1	15	3	10	73
2005*	14	16	22	3	<1	9	1	9	74
2006*	16	12	11	2	3	10	2	5	61
2007*	13	13	12	3	3	11	2	5	62

*Electrofishing only

Given to NRC
8/20/08

Xcel Energy Prairie Island Nuclear Generating Plant

Design and Construction Technology Plan

Submitted in Accordance with the NPDES Final Regulations to Establish Requirements for Cooling Water Intake Structures at Phase II Existing Facilities

NPDES Permit #MN0004006

October 23, 2006

Prepared by:

Xcel Energy
Environmental Services

collection trough. Removal of the fish and organisms is accomplished on the upward travel side with a low-pressure (10 psi) inside spray when fine mesh is used and with a low-pressure (20 psi) outside spray when coarse mesh is used. Debris is removed by a backside interior high-pressure (50 psi for fine mesh and 100 psi for coarse mesh) spray system. The organisms and debris washed off the traveling water screens collect in a fish return trough and a debris trough that combine into a common trough and is returned to the river through a buried pipe approximately 2200 feet long. The pipe discharges into the Mississippi River at a point approximately 1500 feet south of the intake screen house (see Figure 7).

A deicing system is utilized to distribute warm water across the inside face of the intake structure to prevent formation of ice on the exposed surfaces (Figure 10).

3.2 Intake Flows and Velocities

Pre-modification

The flow rates and resulting velocities under the pre-modified intake's barrier wall are given in Table 3 on the right. Pre-modification velocities at the trash racks and traveling screens are included in Table 4.

Table 3. Flow Rates and Velocities, Two Unit Operation (Full Load)

Operating Mode	Flow Rate (cfs)		Velocity Under Barrier Wall (fps)
	From River	Recycle Canal	
Closed-Loop	188	1312	0.3
Helper	750	750	1
Open Cycle	1500	0	2.1

Table 4. Approach Velocity to Trash Rack and Traveling Screens
(based on total plant flow of 1500 cfs)

Water Level	Velocity (fps)	
	At Racks	At Screens
Normal Water Level (674.5 ft)	1.2	1.3
Low Water Level (673.5 ft)	1.2	1.4

Post-modification Intake Flows and Velocities

The design of the post-modified intake screen house structure minimizes the impact of the PINGP on aquatic organisms in the Mississippi River. The approach canal to the intake screen house is 575 feet wide and extends from the main flow of the river (see Figure 8). The canal is

designed for a maximum flow of 3360 cfs. Actual flow is limited to a maximum of 1410 cfs resulting in a flow rate of less than 1 fps. The system design requirements change based on various times of the year and screen mesh size.

During 1983 and 1984 velocity profiles were conducted at flow rates specified in the NPDES permit. Design criteria for the fine mesh screen states the average face velocity through the gross area of the screen material should not exceed 0.5 fps based on low water level and a discharge rate of 800 cfs. All flow measurements were less than or equal to 0.2 meters per second (0.6 fps). Most data points recorded were less than 0.1 meters per second (0.3 fps). The average velocity of the water approaching the fine mesh screen was determined to be within the design criteria for all discharge flows measured (150 cfs to 1145 cfs) (NSP, 1984).

Intake velocities were also measured in 2003 and are included in Table 5 (Staley, 2004). One set of measurements was taken at 1006 cfs discharge and the other at 815 cfs. Both sets were taken while the traveling screens were in the coarse-mesh mode of operations. Intake velocities measured during 1006 cfs blowdown averaged 0.388 fps to 0.599 fps across all eight bays. Intake velocities averaged 0.337 fps to 0.427 fps across all eight bays measured during 815 cfs blowdown. The study concluded that intake flows are not outside design requirements and average flows do not differ substantially between intake screen bays.

Table 5. Post-modification Velocity Profiles - Velocities Obtained From The Following Report: Approach Canal Dredging Project (White Paper Report) April 15, 2004

Blowdown (cfs)	River Level (ft)	Average Velocity At Center of Bays (fps)								Average Velocity Across All Bays (fps)
		128	127	126	125	124	123	122	121	
1006	674.6	0.388	0.557	0.599	0.415	0.522	0.420	0.490	0.454	0.481
815	674.6	0.337	0.373	0.349	0.427	0.356	0.346	0.356	0.349	0.362

Blowdown (cfs)	River Level (ft)	Average Calculated Through-Screen Velocity* (Coarse Mesh) (fps)								Average Through-Screen Velocity For All Screens (fps)
		128	127	126	125	124	123	122	121	
1006	674.6	0.807	1.159	1.246	0.864	1.086	0.874	1.020	0.945	1.000
815	674.6	0.701	0.776	0.726	0.888	0.741	0.720	0.741	0.726	0.752

Blowdown (cfs)	River Level (ft)	Average Calculated Through-Screen Velocity* (Fine Mesh) (fps)								Average Through-Screen Velocity For All Screens (fps)
		128	127	126	125	124	123	122	121	
1006	674.6	0.899	1.291	1.388	0.962	1.210	0.973	1.135	1.052	1.114
815	674.6	0.781	0.864	0.809	0.989	0.825	0.802	0.825	0.809	0.838

*Equation used for Calculation: TSV = Q/(D*OA*TW*K)

Where:

TSV = Through Screen Velocity

Q = Flow Rate (Calculated from velocities at center of bays, Q = V*A)

D = Water Depth (River Level - Bottom of Bays = 26.1 ft)

OA = Open Area of Screen (Obtained from Table, .610 coarse and .548 fine)

TW = Nominal Tray Width, (10 ft)

K = Through Flow Screen Constant (396)

3.3 PINGP Water Appropriation and NPDES/SDS Permit Allowances

In accordance with the National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) permit, PINGP's intake flows are controlled indirectly by imposing limitations on the circulating water (SD-001) discharge flows. The discharge restrictions are presented in Table 6 and, as shown, are implemented during the spawning season. The goal of these restrictions is to minimize the impingement of fish, larval fish, and eggs on vertical traveling screens.

Table 6. NPDES Discharge Limitations

Date	Discharge Restriction (MGD)	River Flow (cfs)
April 15 - 30	194 (300 cfs)	≥ 15,000
	97 (150 cfs)	< 15,000
May 1 - 31	194 (300 cfs)	NA
June 1 - 15	259 (400 cfs	NA
June 16 - 30	517.5 (800 cfs)	NA
July – April 14	Not restricted	NA

ent Data Analysis

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PI Lab

Environmental
Science &
Engineering, Inc.

A CILCORP Company

Prairie Island Impingement Data Analysis

Prepared for:
Northern States Power Company
Minneapolis, Minnesota

Prepared by:
Environmental Science & Engineering, Inc.
St. Louis, Missouri

September 16, 1996

ESE Project No. 5196-094-0300

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Appendix A Density, Environmental and Operational Data

1.0 Introduction

The Prairie Island Nuclear Generating Plant (PI) is a two-unit power plant located on the Mississippi River north of Red Wing, Minnesota. PI came on-line in 1973 and has an operating capacity of 1,120 MW. Operationally, cooling water at PI is withdrawn from the Mississippi River first through an intake screenhouse into the intake canal, then into the plant screenhouse. After passage through the plant, water is released into the discharge basin, where it is directed to either the cooling towers or directly to the distribution basin. Once in the distribution basin, water can be directed to the recycle canal, to the discharge canal, or to both canals. Water in the discharge canal is discharged (blowdown) into the Mississippi River upstream of Lock and Dam No. 3. Water discharged to the river and that which is lost due to evaporation is made up from the river through the intake screenhouse.

Entrainment of larval and juvenile fish during the spring and summer is minimized through the installation of fine mesh screens (0.5 mm) on the eight traveling screens in the intake screenhouse, and through decreased withdrawal which is regulated through restrictions in the Northern States Power (NSP) National Pollutant Discharge Elimination System (NPDES) permit. Some blowdown limits during the spring have been changed based on environmental monitoring data. Presently, the NPDES permit restricts the blowdown to 300 cubic feet per second (cfs) beginning April 1. During the period of April 15 to 30, NSP can maintain a blowdown of 300 cfs conditional upon river flow (i.e., above 15,000 cfs). Under lower river flow (below 15,000 cfs), NSP must reduce its blowdown to 150 cfs. Blowdown during the month of May is restricted to 300 cfs. In June, the blowdown rate is stepwise increased to 400 cfs on June 1 and to 800 cfs on June 16. Beginning July 1 the plant operates full open cycle, with no recirculation and with a maximum river water appropriation of 1410 cfs. However, the operation of the plant must not raise the average temperature of the receiving water by more than 5°F above ambient at Lock and Dam No. 3.

Coordination with representatives of the Minnesota Pollution Control Agency (MPCA) and the Minnesota and Wisconsin Departments of Natural Resources (MDNR and WDNR) has been conducted in an effort to modify restrictive blowdown limits. NSP has proposed that the timing of the limits be tied to either the actual appearance of larval fish or to a predictor of larval fish abundances (e.g., river temperature and/or river flow). As a result of this coordination, it was requested (by the agencies) that an independent review of the historical data be conducted.

Environmental Science & Engineering, Inc. (ESE) was contracted by NSP to conduct an analysis of historical impingement data in an effort to establish a protective blowdown restriction start date

correlated to biological, operational, and environmental factors rather than an arbitrary calendar date. In order to develop a defensible data review, an historical analysis of impingement data from 1984 to present was conducted. The objectives of this data analysis were to:

- Examine the relationship between impingement densities and river flow and river temperature; and
- Establish an implementation date for reducing plant blowdown that corresponds to changing river conditions.

ESE addressed these objectives utilizing intensive statistical analyses to identify the significant environmental factors that were correlated to impingement densities. River temperature, river flow, river stage, blowdown, percent river intake, daytime larval density, and nighttime larval density were analyzed. In addition, specific analyses of burbot and walleye/sauger impingement densities were conducted to determine specific potential impacts to these species of concern. Specific analyses was focused on walleye and sauger since they are a primary sport fish species in the area and on burbot since they are the earliest spawners.

2.0 Materials and Methods

2.1 Impingement Summarization

Larval impingement data for all study years was summarized to determine species composition, annual peak densities, and inflection points of larval densities towards increasing impingement densities. The data was first examined to identify potential irregularities in species composition and life stages of larval collections that may have been caused by localized spawning within the intake bays. Some species resident within the intake appear to spawn much earlier than natural due to the warming influences of the plant's deicing line and the recycle canal. These larvae do not reflect the natural larval drift drawn into the intake from the river and backwater ecosystem. Life history data relative to spawning temperatures was also utilized to make inferences regarding the presence of unnatural occurrences. Diagnosis of unnatural occurrences was limited to the month of April (typically early to mid-April). Exclusion of data was determined based on river temperature and the life stage. Fish excluded from the analysis that were impinged in April included juvenile catfish, juvenile and adult cyprinids, adult percids, and carp pro-larvae (impinged during early April).

Inflection Point Identification

The annual data from 1984 to 1989 was analyzed to determine the inflection point for each year. Data from 1990 to 1996 were not used since samples were not collected or were only collected during the month of April as per the modified environmental monitoring program. The inflection point was considered the point at which impingement densities began a sustained increase towards substantially higher daily impingement estimates during each study year. The inflection point is defined as (1) the point where subsequent densities demonstrate a trend of increasing value for at least two subsequent sampling events, and (2) where densities are consistently above a value of 0.75 per 100 cubic meters (100m^3).

The intent of the identification of the inflection point process was to develop and maintain standardized criteria for the selection of the inflection point within each year. The first criterion measures for sustained increases in density factoring in density fluctuations by requiring two subsequent higher densities. Whereas the second criterion, a minimum density of 0.75/100m^3, was used to eliminate the selection of "false" inflection points (i.e., an inflection point that is not followed by an overall trend towards substantially higher daily impingement estimates). For example, during 1987 sustained increases in density were achieved during early to mid-April (April 10, 13, and 15 had densities of 0.52, 0.53, and 0.75/100m^3, respectively), thus meeting the requirements of the first criterion (see Appendix A Tables). However, these sustained increases

were represented by very few larvae (April 10--4 larvae, April 13--4 larvae, and April 15--6 larvae) and consequently, low densities. Furthermore, these sustained low densities were followed by continued low densities or zero densities (April 16 through 27, densities ranged from 0.00 to 0.25/100m^3) thus not representing an overall trend towards substantially higher daily impingement estimates. To account for these "false" inflection points, it was determined that a minimum density requirement was needed to filter out sustained density values encountered early during the sampling period that did not reflect the actual inflection point. Upon review of the density data presented in Section 3.0, a minimum density of 0.75/100m^3 was established. A minimum density of 0.75/100m^3 appeared to offset the effects of any false inflection points.

Annual peak impingement densities were also determined for 1984 to 1989 collections. Peak density was defined as the highest impingement density which occurred during each sample year. Inflection points and annual peaks were determined for both day and night impingement densities.

2.2 Statistical Analysis

ESE utilized regression and Pearson's correlation analyses to determine significant statistical relationships of inflection and annual peak timing with environmental and operational parameters. With regression the intent was to establish and estimate dependence of one variable upon another [i.e., describe the dependence of variable Y (larval density) on an independent variable X (temperature, river flow, etc.)]. Regression equations lend support to hypotheses regarding the possible causation of changes in Y (density) by changes in X (temperature, flow, etc.) for purposes of prediction and for purposes of explaining some of the variation of Y by X (Sokal and Rohlf, 1969). Correlation analyses were utilized to establish and estimate association (interdependence) between two variables (i.e., temperature and river flow, river flow and river stage, etc.). Impingement densities were analyzed in relation to river temperature, river flow, river stage, daily average plant discharge (blowdown), and the percentage of Mississippi River flow entering through the intake. Total annual day and night impingement densities were analyzed separately. Due to the modified environmental monitoring program since 1990, only impingement data from 1984 through 1989 were utilized for this statistical analysis.

2.2.1 Trend Analysis

The initial analysis consisted of a correlation of the overall trend in density over the period of record and the relationship between density and selected environmental and operational parameters. This assessment entailed the correlation (using regression analysis) of environmental/operational parameters (independent variables) to overall trends in larval fish impingement density (dependent variable) to both the inflection point and to the annual peak in

density. Pearson's correlations were conducted to determine significant relationships among the independent environmental parameters.

To achieve linearity and a normal distribution, the dependent (density) data was transformed using a Log (Y+1) transformation. A Log (Y+1) transformation was opted for over a Log Y transformation to account for zero densities.

2.2.2 Interval Analysis

The second step in the analysis utilized an interval based analysis to determine potential relationships between the trend in values of environmental parameters prior to the inflection point, and the trend in density immediately following the inflection point. This analysis was conducted for total day and night density, walleye/sauger day density, and burbot day density. The objective of this analysis was to identify environmental parameters that could be used to predict the inflection point.

The data set utilized for this analysis included fish and egg density and environmental/operational data for all study years from 1984 to 1989. Based upon a review of available NSP data, environmental/operational parameters included the following:

- Intake temperature;
- River flow;
- Blowdown; and
- Percent river flow.

River stage data was excluded from this analysis due to the lack of the data for the years of the study.

The analysis was performed using environmental and operational data for the 30-day interval preceding the inflection point. The analysis of a 30-day interval preceding the inflection point was established assuming that the environmental factor(s) or cue(s) which may be directly related to the inflection point occur within the 30 days before the inflection point. The assumption is based on the fact that fish respond to environmental cues (temperature, river flow, etc.) to begin their reproductive cycle (spawning - incubation - hatching - larval stages). Examination of a 30-day interval preceding the inflection point allowed for a period of sustained environmental conditions for spawning and incubation. Incubation periods for common fish species (carp, gizzard shad, white bass, catostomids, and channel catfish) ranged from 1 to 10 days dependent upon temperature (Auer, 1982). Whether a cue that was related to the inflection point was a single environmental factor, a combination of environmental factors, an operational factor, or no factor,

it would have occurred within a 30-day interval. Thus, a 30-day interval would be sufficient to account for spawning and incubation and fluctuations that may be caused by changing environmental conditions.

The environmental/operational data was divided into subsets of 10-day intervals (each containing five data points) with a 5-day overlap between intervals for a total of six 10-day intervals:

- Interval A — 5 days prior to the inflection point to 5 days after the inflection point.
- Interval B — 10 days prior to the inflection point to the inflection point.
- Interval C — 15 days prior to the inflection point to 5 days before the inflection point.
- Interval D — 20 days prior to the inflection point to 10 days before the inflection point.
- Interval E — 25 days prior to the inflection point to 15 days before the inflection point.
- Interval F — 30 days prior to the inflection point to 20 days before the inflection point.

Each data subset was then correlated using multiple regression with the density data within a 10-day interval (5 sample dates) following the inflection point. The resulting R^2 and "F" values from the multiple regression were used to determine the interval(s) and the environmental parameters(s) that were most strongly correlated to the inflection point and increasing trend in density. R^2 is defined as the coefficient of multiple determination. The value indicates the proportion of total variation of Y which is explained by the regression. The higher the R^2, the more variation is accounted for by the regression equation.

Using the results of the multiple regression, a linear regression was conducted on the parameter with the greatest "F" value for the interval demonstrating the strongest correlation with the trend in density data. The result of this analysis produced a predictive equation. The predictive equation (if significant) was then used to identify critical environmental parameters that may be used as an advance cue for spawning, and ultimately, the inflection point.

Inverse prediction (estimating X from Y) was used to estimate the specific environmental cue (specific temperature, flow rate, blowdown, etc.) related to the inflection point. Confidence limits (95 percent) were calculated based on the procedure provided in Box 14.7 in Sokal and Rohlf (1969). These confidence limits are not symmetrical around the estimate X, but another value which is close to X (Sokal and Rohlf, 1969). A 95 percent confidence interval refers to the percentage of all (not just samples collected at Prairie Island) possible samples that result in an

As a result of the interval analysis, an interval was identified that was most strongly correlated with the inflection point and increasing trend in density. This interval can be used to identify the number of days between the environmental cue and the resulting inflection point.

Night total density data was analyzed in a similar manner as the day data. However, night data was more limited (e.g., 1986 and 1989 data are completely excluded due to limitations of night sampling data in April during these years) resulting in a weaker, less conclusive analysis in comparison to the day total density data.

2.3 Evaluation of Walleye/Sauger and Burbot Impingement

A similar analysis was conducted as described for the total density data analysis to determine inflection points and the intervals which can best be used to predict the resulting walleye/sauger and burbot inflection points. Day density data was exclusively used due to the incompleteness of April night density data.

Determination of the inflection point for burbot and walleye/sauger density data was based on different criteria than that which was used for the total density data. The initial appearance of burbot in impingement samples was used as the inflection point due to the overall lack of burbot impingement data and very low impingement densities. The inflection point for walleye/sauger data was determined to be the sampling date closest to the mid-point between the date of initial appearance and the date of peak density. These criteria were substituted for criteria used for the total density because walleye/sauger density was typically low and these larvae were collected during a brief period in comparison to the larvae of the total community. Consequently, circumstances where walleye/sauger density exceeded a reasonable threshold (e.g., $0.75/100m^3$) and increased in two consecutive sampling periods were rare.

Table A-7. 1984 Sampling Dates, Burbot Impingement Densities, Environmental, and Operational Data.

Date	Day Density	Night Density	River Temp.	River Flow	River Stage	Blowdown	% River Flow
4-16			48.5	60,500	677.5	188	0.3
4-18			50.3	59,200	677.0	188	0.3
4-23			50.7	55,000	677.0	188	0.3
4-25			54.4	51,000	676.4	188	0.4
4-27			57.8	46,500	675.8	210	0.5
4-30			46.9	46,200	675.5	188	0.4
5-2	0.093	0.093	50.0	48,500	676.1	338	0.7
5-4	0.046		54.0	54,000	677.0	338	0.6
5-7			54.7	57,500	677.0	338	0.6
5-9			49.8	54,500	677.1	338	0.6
5-11			56.8	59,000	677.5	338	0.6
5-14			57.3	59,000	677.4	338	0.6
5-16			58.9	57,000	677.0	338	0.6
5-18			65.3	54,000	677.0	338	0.6
5-21			67.4	47,500	675.8	338	0.7
5-23			66.1	44,000	675.4	375	0.9
5-25			64.5	41,000	675.0	338	0.8
5-28			63.6	37,500	674.3	338	0.9
5-30			66.4	32,106	674.1	363	1.1
6-1			68.0	30,040	673.9	442	1.5
6-4			69.1	26,010	674.0	438	1.7
6-6			72.2	25,830	673.6	456	1.8
6-8			72.6	29,342	673.5	503	1.7
6-11			69.6	33,385	674.0	438	1.3
6-13			72.0	43,500	675.4	438	1.0
6-15			70.3	63,500	678.0	468	0.7
6-18			70.1	79,900	679.5	808	1.0
6-20			71.6	79,900	679.4	808	1.0
6-22			73.0	79,000	679.4	836	1.1
6-25			73.5	78,200	679.3	838	1.1
6-27			73.9	75,500	679.0	838	1.1
6-29			75.4	73,500	678.6	838	1.1
7-2			76.4	65,800	678.5	1187	1.8
7-4			76.7	62,000	678.0	1183	1.9
7-6			75.4	54,000	677.0	1183	2.2
7-9			72.9	44,700	675.3	1183	2.6
7-11			74.2	41,400	674.9	1183	2.9
7-13			77.5	37,800	674.9	1183	3.1
7-16			76.0	33,480	674.0	1183	3.5
7-18			74.2	32,448	673.4	1183	3.6
7-20			77.0	31,046	673.4	1183	3.8
7-23			78.8	26,809	673.8	1183	4.4
7-25			78.7	23,348	673.8	1183	5.1
7-27			78.3	21,822	673.3	1183	5.4
7-30			77.5	16,492	673.3	1183	7.2
8-1			76.9	15,300	673.3	1183	7.7
8-3			78.4	16,025	674.0	1183	7.4
8-6			80.3	13,760	673.5	1183	8.6
8-8			79.4	21,293	673.5	1183	5.6
8-10			78.7	22,134	673.5	1183	5.3
8-13			77.5	16,354	673.7	1183	7.2
8-15			79.4	14,344	673.7	1183	8.2
8-17			80.1	13,200	673.8	1183	9.0
8-20			78.5	11,024	673.8	1183	10.7
8-22			75.0	7,460	674.0	1183	15.6
8-24			73.7	8,994	674.5	1183	13.2
8-27			75.1	9,607	674.5	1183	12.3
8-29			77.5	11,480	674.5	1183	10.3
8-31			73.1	8,556	674.5	1183	13.8

Table A-8. 1984 Sampling Dates, Walleye/Sauger Impingement Densities, Environmental, and Operational Data.

Date	Day Density	Night Density	River Temp.	River Flow	River Stage	Blowdown	% River Flow
4-16			48.5	60,500	677.5	188	0.3
4-18			50.3	59,200	677.0	188	0.3
4-23			50.7	55,000	677.0	188	0.3
4-25			54.4	51,000	676.4	188	0.4
4-27			57.8	46,500	675.8	210	0.5
4-30	0.186		46.9	46,200	675.5	188	0.4
5-2	0.186	0.186	50.0	48,500	676.1	338	0.7
5-4	3.203	4.132	54.0	54,000	677.0	338	0.6
5-7	3.482	2.925	54.7	57,500	677.0	338	0.6
5-9	2.182	2.461	49.8	54,500	677.1	338	0.6
5-11	7.382	2.089	56.8	59,000	677.5	338	0.6
5-14	0.279	0.418	57.3	59,000	677.4	338	0.6
5-16	0.975	0.557	58.9	57,000	677.0	338	0.6
5-18	0.696	0.743	65.3	54,000	677.0	338	0.6
5-21	1.995	1.361	67.4	47,500	675.8	338	0.7
5-23	1.067		66.1	44,000	675.4	375	0.9
5-25	0.186	0.139	64.5	41,000	675.0	338	0.8
5-28	0.209		63.6	37,500	674.3	338	0.9
5-30	0.070		66.4	32,106	674.1	363	1.1
6-1			68.0	30,040	673.9	442	1.5
6-4	0.054		69.1	26,010	674.0	438	1.7
6-6			72.2	25,830	673.6	456	1.8
6-8			72.6	29,342	673.5	503	1.7
6-11			69.6	33,385	674.0	438	1.3
6-13			72.0	43,500	675.4	438	1.0
6-15			70.3	63,500	678.0	468	0.7
6-18			70.1	79,900	679.5	808	1.0
6-20			71.6	79,900	679.4	808	1.0
6-22			73.0	79,000	679.4	836	1.1
6-25			73.5	78,200	679.3	838	1.1
6-27			73.9	75,500	679.0	838	1.1
6-29			75.4	73,500	678.6	838	1.1
7-2			76.4	65,800	678.5	1187	1.8
7-4			76.7	62,000	678.0	1183	1.9
7-6			75.4	54,000	677.0	1183	2.2
7-9			72.9	44,700	675.3	1183	2.6
7-11			74.2	41,400	674.9	1183	2.9
7-13			77.5	37,800	674.9	1183	3.1
7-16			76.0	33,480	674.0	1183	3.5
7-18			74.2	32,448	673.4	1183	3.6
7-20			77.0	31,046	673.4	1183	3.8
7-23			78.8	26,809	673.8	1183	4.4
7-25			78.7	23,348	673.8	1183	5.1
7-27			78.3	21,822	673.3	1183	5.4
7-30			77.5	16,492	673.3	1183	7.2
8-1			76.9	15,300	673.3	1183	7.7
8-3			78.4	16,025	674.0	1183	7.4
8-6			80.3	13,760	673.5	1183	8.6
8-8			79.4	21,293	673.5	1183	5.6
8-10			78.7	22,134	673.5	1183	5.3
8-13			77.5	16,354	673.7	1183	7.2
8-15			79.4	14,344	673.7	1183	8.2
8-17			80.1	13,200	673.8	1183	9.0
8-20			78.5	11,024	673.8	1183	10.7
8-22			75.0	7,460	674.0	1183	15.6
8-24			73.7	8,994	674.5	1183	13.2
8-27			75.1	9,607	674.5	1183	12.3
8-29			77.5	11,480	674.5	1183	10.3
8-31			73.1	8,556	674.5	1183	13.8

Table A-9. 1985 Sampling Dates, Burbot Impingement Densities, Environmental, and Operational Data.

Date	Day Density	Night Density	River Temp.	River Flow	River Stage	Blowdown	% River Flow
4-19			58.6	38,400	674.5	325	0.8
4-22			61.9	34,500	674.2	305	0.9
4-23			61.9	32,800	674.2	240	0.7
4-24			60.1	35900	-	188	0.5
4-25			59.8	38,700	-	188	0.5
4-26			57.9	42,500	675.4	188	0.4
4-29	0.078		59.0	59,800	677.6	188	0.3
5-1			60.2	64,800	678.3	338	0.5
5-3			62.3	63,500	678.0	378	0.6
5-6			63.6	56,400	677.3	318	0.6
5-8			65.6	51,500	676.5	313	0.6
5-10			68.2	46,200	675.7	362	0.8
5-13			65.2	39,700	674.5	278	0.7
5-15			64.5	37,300	674.0	338	0.9
5-17			62.3	36,400	674.5	338	0.9
5-20			65.8	39,800	674.5	338	0.8
5-22			67.1	39,900	674.5	338	0.8
5-24			67.1	38,500	674.4	338	0.9
5-29			67.0	31,700	674.0	338	1.1
5-31			67.4	29,950	674.0	338	1.1
6-3			64.9	33,500	673.6	466	1.4
6-5			65.7	35,100	674.0	438	1.2
6-7			67.9	33,600	-	438	1.3
6-10			68.8	32,600	-	438	1.3
6-12			66.9	30,100	673.8	434	1.4
6-14			68.0	29,124	673.5	434	1.5
6-17			67.9	29,106	673.8	838	2.9
6-19			67.9	29,580	673.8	838	2.8
6-21			69.5	28,200	673.7	838	3
6-24			71.8	26,700	673.8	838	3.1
6-26			74.8	22,800	673.9	838	3.7
6-28			73.4	28,300	674.0	838	3
7-1			74.6	35,500	674.0	1128	3.2
7-3			75.3	34,400	673.8	1188	3.5
7-5			74.8	34,800	673.8	1188	3.4
7-8			77.8	33,295	674.0	1188	3.6
7-10			78.1	31,500	673.6	1188	3.8
7-12			77.8	27,591	673.3	1188	4.3
7-15			77.2	22,100	673.4	1188	5.4
7-17			77.0	20,100	-	1188	5.9
7-19			77.3	18,300	673.8	1118	6.5
7-22			77.1	18,800	673.8	1188	6.3
7-24			74.5	18,600	673.8	1188	6.4
7-26			76.3	23,606	673.6	1188	5
7-29			76.4	21,300	673.5	1188	5.6
7-31			73.7	21,700	674.0	1188	5.5
8-2			75.9	20,300	673.7	1150	5.7
8-5			73.6	18,250	673.4	1150	6.3
8-7			76.1	16,900	673.6	1150	6.8
8-9			74.8	14,400	673.4	1150	8
8-12			71.6	14,100	673.4	1150	8.2
8-14			72.5	20,800	673.8	1150	5.5
8-16			72.9	20,100	673.6	1150	5.7
8-19			68.9	21,300	673.8	1150	5.4
8-21			68.5	19,400	673.6	1150	5.9
8-23			68.0	18,000	673.5	1150	6.4
8-26			69.4	17,000	673.6	1150	6.8
8-28			70.2	15,700	674.5	1150	7.3

Table A-10. 1985 Sampling Dates, Walleye/Sauger Impingement Densities, Environmental, and Operational Data.

Date	Day Density	Night Density	River Temp.	River Flow	River Stage	Blowdown	% River Flow
4-19			58.6	38,400	674.5	325	0.8
4-22			61.9	34,500	674.2	305	0.9
4-23			61.9	32,800	674.2	240	0.7
4-24	0.626		60.1	35900	-	188	0.5
4-25	0.543		59.8	38,700	-	188	0.5
4-26	0.084		57.9	42,500	675.4	188	0.4
4-29			59.0	59,800	677.6	188	0.3
5-1	0.441	0.046	60.2	64,800	678.3	338	0.5
5-3	0.062		62.3	63,500	678.0	378	0.6
5-6	0.185		63.6	56,400	677.3	318	0.6
5-8			65.6	51,500	676.5	313	0.6
5-10	0.260	0.108	68.2	46,200	675.7	362	0.8
5-13	0.212		65.2	39,700	674.5	278	0.7
5-15		0.100	64.5	37,300	674.0	338	0.9
5-17	0.035	0.037	62.3	36,400	674.5	338	0.9
5-20	0.035		65.8	39,800	674.5	338	0.8
5-22			67.1	39,900	674.5	338	0.8
5-24			67.1	38,500	674.4	338	0.9
5-29			67.0	31,700	674.0	338	1.1
5-31			67.4	29,950	674.0	338	1.1
6-3			64.9	33,500	673.6	466	1.4
6-5			65.7	35,100	674.0	438	1.2
6-7			67.9	33,600	-	438	1.3
6-10			68.8	32,600	-	438	1.3
6-12			66.9	30,100	673.8	434	1.4
6-14			68.0	29,124	673.5	434	1.5
6-17			67.9	29,106	673.8	838	2.9
6-19			67.9	29,580	673.8	838	2.8
6-21			69.5	28,200	673.7	838	3
6-24			71.8	26,700	673.8	838	3.1
6-26			74.8	22,800	673.9	838	3.7
6-28			73.4	28,300	674.0	838	3
7-1			74.6	35,500	674.0	1128	3.2
7-3			75.3	34,400	673.8	1188	3.5
7-5			74.8	34,800	673.8	1188	3.4
7-8			77.8	33,295	674.0	1188	3.6
7-10			78.1	31,500	673.6	1188	3.8
7-12			77.8	27,591	673.3	1188	4.3
7-15			77.2	22,100	673.4	1188	5.4
7-17			77.0	20,100	-	1188	5.9
7-19			77.3	18,300	673.8	1118	6.5
7-22			77.1	18,800	673.8	1188	6.3
7-24			74.5	18,600	673.8	1188	6.4
7-26			76.3	23,606	673.6	1188	5
7-29			76.4	21,300	673.5	1188	5.6
7-31			73.7	21,700	674.0	1188	5.5
8-2			75.9	20,300	673.7	1150	5.7
8-5			73.6	18,250	673.4	1150	6.3
8-7			76.1	16,900	673.6	1150	6.8
8-9			74.8	14,400	673.4	1150	8
8-12			71.6	14,100	673.4	1150	8.2
8-14			72.5	20,800	673.8	1150	5.5
8-16			72.9	20,100	673.6	1150	5.7
8-19			68.9	21,300	673.8	1150	5.4
8-21			68.5	19,400	673.6	1150	5.9
8-23			68.0	18,000	673.5	1150	6.4
8-26			69.4	17,000	673.6	1150	6.8
8-28			70.2	15,700	674.5	1150	7.3

Table A-11. 1986 Sampling Dates, Walleye/Sauger Impingement Densities, Environmental, and Operational Data.

Date	Day Density	Night Density	River Temp.	River Flow	River Stage	Blowdown	% River Flow
4-18			54.5	78700	679.2	188	0.2
4-21			53.8	72300	678.7	188	0.3
4-23			56.1	69600	678.4	188	0.3
4-24			54.3	68400	678.3	188	0.3
4-25			58.3	66100	678.2	188	0.3
4-28			62.1	65700	678.2	215	0.3
4-29	0.062		61.1	67500	678.5	190	0.3
4-30			62.7	74400	678.9	193	0.3
5-1	0.540		61.4	85000	679.7	349	0.4
5-2	0.346		59.9	88200	680.2	340	0.4
5-5	0.278		63.9	94800	680.6	339	0.4
5-7	1.250		64.7	93300	680.4	339	0.4
5-9	0.278		63.4	88100	680.0	339	0.4
5-12	1.157		63.6	84200	679.7	339	0.4
5-14	0.694		65.2	89600	681.2	339	0.4
5-16	0.694		66.5	97600	680.9	339	0.3
5-19	0.231		66.5	95500	680.6	339	0.4
5-21			67.1	85900	679.7	339	0.4
5-23			68.1	74500	678.7	339	0.5
5-27			70.3	56900	677.2	339	0.6
5-30			75.8	49600	676.2	379	0.8
6-2			74.5	42800	675.0	413	1.0
6-4			74.5	39700	674.4	431	1.1
6-6			73.9	36700	673.9	438	1.2
6-9			75.2	33050	673.8	445	1.3
6-11			73.3	32300	673.8	453	1.4
6-13			73.1	33300	673.8	438	1.3
6-16			75.5	35700	674.3	761	2.1
6-18			76.9	33800	673.7	838	2.5
6-20			81.1	33700	673.9	838	2.5
6-23		0.187	79.3	35700	674.2	838	2.3
6-25			77.5	40000	674.9	838	2.1
6-27			79.7	43200	675.3	838	1.9
6-30			76.9	45000	675.4	838	1.9
7-2			76.0	44000	675.4	1158	2.6
7-7			82.4	36200	673.8	1158	3.2
7-9			81.6	32500	673.6	1158	3.6
7-11			79.3	29700	673.6	1158	3.9
7-14			78.0	30400	673.8	1158	3.8
7-16			79.4	31500	674.0	1363	4.3
7-18			84.3	33400	673.9	1188	3.6
7-21			82.9	35300	674.5	1188	3.3
7-23			83.7	35000	674.7	1188	3.4
7-25			83.5	35100	674.4	1188	3.4
7-28			79.6	33500	674.2	1188	3.5
7-30			83.1	32700	674.2	1188	3.6
8-1			82.2	34800	674.2	1188	3.4
8-4			79.8	32400	674.0	1188	3.7
8-6			80.2	30800	673.9	1188	3.9
8-8			79.7	29900	674.0	1188	4.0
8-11			77.4	32000	674.0	1188	3.7
8-13			75.4	31400	674.0	1188	3.8
8-15			77.4	31900	673.7	1188	3.7
8-18			79.1	30000	674.1	1188	4.0
8-20			77.5	29200	674.0	1188	4.1
8-22			74.3	27900	673.6	1188	4.3
8-29			61.3	30210	673.8	1158	3.8

Table A-12. 1987 Sampling Dates, Burbot Impingement Densities, Environmental, and Operational Data.

Date	Day Density	Night Density	River Temp.	River Flow	River Stage	Blowdown	% River Flow
4-6	0.204		47.7	24,200	673.6	307	1.3
4-8			51.8	22,800	673.5	212	0.9
4-10	0.520		55.5	20,800	673.6	181	0.9
4-13	0.529		57.0	20,000	673.6	178	0.9
4-15	0.751		-	19,300	673.6	188	1.0
4-16	0.115		-	20,000	673.8	178	0.9
4-20			64.0	18,400	673.8	188	1.0
4-22			58.3	18,200	673.7	188	1.0
4-24			60.0	17,400	673.7	188	1.1
4-27			62.1	16,000	673.8	188	1.2
4-29			63.8	14,900	673.6	188	1.3
5-1		0.025	61.2	13,900	673.8	308	2.2
5-4			62.3	13,700	673.8	338	2.5
5-6			64.7	14,300	673.8	338	2.4
5-8			66.5	13,000	673.7	338	2.6
5-11			70.4	7,400	674.5	353	4.8
5-13			68.2	11,900	674.2	338	2.8
5-15			68.8	11,600	674.0	338	2.9
5-18			71.4	8,100	674.2	338	4.2
5-20			67.2	8,200	674.4	329	4.0
5-22			67.6	11,500	674.5	338	2.9
5-27			68.9	20,900	674.1	345	1.7
5-29			70.9	23,300	674.0	371	1.6
6-1			73.6	24,200	674.0	478	2.0
6-3			71.7	23,300	673.6	453	1.9
6-5			72.9	22,200	673.8	459	2.1
6-8			76.6	20,500	673.3	759	3.7
6-10			72.8	17,600	673.6	671	3.8
6-12			74.5	15,300	673.7	703	4.6
6-17			-	9,800	674.0	1023	10.4
6-19			-	8,900	674.4	1008	11.3
6-24			80.9	7,400	674.3	1034	14.0
6-26			76.9	11,100	674.5	982	8.8
6-29			76.5	8,800	674.4	1093	12.4
7-1			78.0	10,600	674.1	1213	11.4
7-6			76.5	9,900	674.8	1183	11.9
7-8			79.0	8,900	674.6	1183	13.3
7-10			81.1	8,100	674.4	1163	14.4
7-13			77.1	7,700	674.5	1088	14.1
7-15			77.4	7,700	674.4	1118	14.5
7-17			78.3	8,400	674.5	1163	13.8
7-20			82.2	11,900	674.4	1163	9.8
7-22			83.0	12,600	674.7	1163	9.2
7-24			81.3	22,700	674.7	1163	5.1
7-27			82.0	20,400	674.0	1168	5.7
7-29			82.0	19,400	673.8	1438	7.4
7-31			84.9	14,500	673.6	1288	8.9
8-3			85.9	15,200	673.5	1191	7.8
8-5			80.1	12,000	673.8	1188	9.9
8-7			79.4	10,200	674.3	1188	11.6
8-10			79.1	14,500	674.3	1188	8.2
8-12			79.0	8,500	674.0	1188	14.0
8-14			76.4	8,300	674.6	1188	14.3
8-17			78.0	13,100	674.6	1188	9.1
8-19			-	11,400	674.6	1188	10.4
8-21			-	8,200	674.4	1188	14.5
8-24			-	7,800	674.8	1149	14.7
8-26			-	9,700	674.4	1163	12.0
8-28			70.8	7,500	674.5	1138	15.2
8-31			70.4	10,500	674.5	1138	10.8
9-2			71.2	5,500	674.5	1138	20.7

Table A-13. 1987 Sampling Dates, Walleye/Sauger Impingement Densities, Environmental, and Operational Data.

Date	Day Density	Night Density	River Temp.	River Flow	River Stage	Blowdown	% River Flow
4-6			47.7	24,200	673.6	307	1.3
4-8			51.8	22,800	673.5	212	0.9
4-10			55.5	20,800	673.6	181	0.9
4-13			57.0	20,000	673.6	178	0.9
4-15			-	19,300	673.6	188	1.0
4-16			-	20,000	673.8	178	0.9
4-20			64.0	18,400	673.8	188	1.0
4-22			58.3	18,200	673.7	188	1.0
4-24			60.0	17,400	673.7	188	1.1
4-27	0.125		62.1	16,000	673.8	188	1.2
4-29	0.751		63.8	14,900	673.6	188	1.3
5-1	1.835	3.158	61.2	13,900	673.8	308	2.2
5-4	0.139	0.418	62.3	13,700	673.8	338	2.5
5-6	0.557	0.975	64.7	14,300	673.8	338	2.4
5-8	0.557	0.209	66.5	13,000	673.7	338	2.6
5-11	0.467	0.133	70.4	7,400	674.5	353	4.8
5-13	0.627	0.070	68.2	11,900	674.2	338	2.8
5-15	0.209		68.8	11,600	674.0	338	2.9
5-18			71.4	8,100	674.2	338	4.2
5-20			67.2	8,200	674.4	329	4.0
5-22	0.100		67.6	11,500	674.5	338	2.9
5-27			68.9	20,900	674.1	345	1.7
5-29			70.9	23,300	674.0	371	1.6
6-1			73.6	24,200	674.0	478	2.0
6-3			71.7	23,300	673.6	453	1.9
6-5			72.9	22,200	673.8	459	2.1
6-8			76.6	20,500	673.3	759	3.7
6-10			72.8	17,600	673.6	671	3.8
6-12			74.5	15,300	673.7	703	4.6
6-17			-	9,800	674.0	1023	10.4
6-19			-	8,900	674.4	1008	11.3
6-24			80.9	7,400	674.3	1034	14.0
6-26			76.9	11,100	674.5	982	8.8
6-29			76.5	8,800	674.4	1093	12.4
7-1			78.0	10,600	674.1	1213	11.4
7-6			76.5	9,900	674.8	1183	11.9
7-8			79.0	8,900	674.6	1183	13.3
7-10			81.1	8,100	674.4	1163	14.4
7-13			77.1	7,700	674.5	1088	14.1
7-15			77.4	7,700	674.4	1118	14.5
7-17			78.3	8,400	674.5	1163	13.8
7-20			82.2	11,900	674.4	1163	9.8
7-22			83.0	12,600	674.7	1163	9.2
7-24			81.3	22,700	674.7	1163	5.1
7-27			82.0	20,400	674.0	1168	5.7
7-29			82.0	19,400	673.8	1438	7.4
7-31			84.9	14,500	673.6	1288	8.9
8-3			85.9	15,200	673.5	1191	7.8
8-5			80.1	12,000	673.8	1188	9.9
8-7			79.4	10,200	674.3	1188	11.6
8-10			79.1	14,500	674.3	1188	8.2
8-12			79.0	8,500	674.0	1188	14.0
8-14			76.4	8,300	674.6	1188	14.3
8-17			78.0	13,100	674.6	1188	9.1
8-19			-	11,400	674.6	1188	10.4
8-21			-	8,200	674.4	1188	14.5
8-24			-	7,800	674.8	1149	14.7
8-26			-	9,700	674.4	1163	12.0
8-28			70.8	7,500	674.5	1138	15.2
8-31			70.4	10,500	674.5	1138	10.8
9-2			71.2	5,500	674.5	1138	20.7

Table A-14. 1988 Sampling Dates, Burbot Impingement Densities, Environmental, and Operational Data.

Date	Day Density	Night Density	River Temp.	River Flow	River Stage	Blowdown	% River Flow
4-8	0.167		50.6	24,600	673.8	188	0.8
4-11			49.6	27,400	673.8	188	0.7
4-13			52.6	28,300	673.8	188	0.7
4-15	0.167		48.8	25,700	673.8	188	0.7
4-18			47.5	22,800	673.7	310	1.4
4-20	0.164		49.7	17,700	673.6	191	1.1
4-22	0.417		49.7	16,800	673.7	188	1.1
4-25	0.250		51.1	16,700	673.6	188	1.1
4-27	0.250		47.9	14,000	673.7	188	1.3
4-28	0.083		50.4	13,500	673.6	188	1.4
4-29			53.1	11,500	673.7	188	1.6
5-2		0.146	59.5	12,900	673.8	323	2.5
5-4	0.107	0.178	61.6	14,100	673.7	439	3.1
5-6			64.9	13,500	673.6	297	2.2
5-9			61.2	11,800	674.4	313	2.7
5-11			62.3	15,300	674.2	298	1.9
5-13			61.9	16,900	674.1	313	1.9
5-16			60.0	18,300	673.9	488	2.7
5-18			62.7	15,800	673.7	318	2.0
5-20			64.6	14,400	673.7	318	2.2
5-23			69.9	13,000	673.6	338	2.6
5-25			69.0	6,000	674.3	314	5.2
5-27			71.1	10,900	674.3	418	3.8
6-1			76.7	8,100	674.3	445	5.5
6-3			75.1	6,800	674.4	439	6.5
6-6			78.2	6,900	674.4	513	7.4
6-8			79.5	5,400	674.5	531	9.8
6-10			75.5	4,600	674.5	418	9.1
6-13			76.0	3,900	674.5	447	11.5
6-15			76.9	3,200	674.7	518	16.2
6-17			76.5	4,400	674.6	838	19.0
6-20			79.8	4,300	674.6	838	19.5
6-22			79.6	3,600	674.7	838	23.3
6-24			78.3	3,000	674.4	848	28.3
6-27			78.8	3,400	675.1	838	24.6
6-29			76.6	3,400	674.8	838	24.6
7-1			74.9	3,700	674.7	1120	30.3
7-6			79.1	2,800	674.5	1098	39.2
7-8			82.0	2,800	674.8	1138	40.6
7-11			79.6	2,800	674.9	1038	37.1
7-13			79.1	2,800	674.8	1113	39.8
7-15			80.8	3,100	674.9	1088	35.1
7-18			80.8	3,800	674.7	1088	28.6
7-20			77.0	2,800	674.7	1108	39.6
7-22			78.8	2,500	674.9	1118	44.7
7-25			76.5	2,900	675.0	1088	37.5
7-27			79.5	2,900	674.9	1088	37.5
7-29			80.8	2,800	674.7	1118	39.9
8-1			83.8	2,500	674.8	1118	44.7
8-3			83.3	1,600	674.7	1118	69.9
8-5			80.6	4,800	675.2	1118	23.3
8-8			80.5	3,900	675.0	1088	27.9
8-10			80.6	5,300	674.8	1138	21.5
8-12			81.2	3,800	674.8	1188	29.4
8-15			83.0	4,700	674.9	1138	24.2
8-17			85.0	6,300	675.0	1138	18.1
8-19			79.4	5,300	674.7	1088	20.5
8-22			76.8	4,700	674.8	1163	24.7
8-24			74.0	10,500	674.8	943	9.0
8-26			73.7	7,600	674.6	978	12.9
8-29			73.0	6,100	674.5	638	10.5
8-31			72.5	5,700	674.6	653	11.5

Table A-15. 1988 Sampling Densities, Walleye/Sauger Impingement Densities, Environmental, and Operational Data.

Date	Day Density	Night Density	River Temp.	River Flow	River Stage	Blowdown	% River Flow
4-8			50.6	24,600	673.8	188	0.8
4-11			49.6	27,400	673.8	188	0.7
4-13			52.6	28,300	673.8	188	0.7
4-15			48.8	25,700	673.8	188	0.7
4-18			47.5	22,800	673.7	310	1.4
4-20			49.7	17,700	673.6	191	1.1
4-22			49.7	16,800	673.7	188	1.1
4-25			51.1	16,700	673.6	188	1.1
4-27			47.9	14,000	673.7	188	1.3
4-28			50.4	13,500	673.6	188	1.4
4-29			53.1	11,500	673.7	188	1.6
5-2		0.194	59.5	12,900	673.8	323	2.5
5-4	0.178	0.321	61.6	14,100	673.7	439	3.1
5-6	0.685	0.158	64.9	13,500	673.6	297	2.2
5-9	0.150	0.100	61.2	11,800	674.4	313	2.7
5-11	0.053	0.421	62.3	15,300	674.2	298	1.9
5-13	0.050	0.100	61.9	16,900	674.1	313	1.9
5-16			60.0	18,300	673.9	488	2.7
5-18			62.7	15,800	673.7	318	2.0
5-20	0.049		64.6	14,400	673.7	318	2.2
5-23			69.9	13,000	673.6	338	2.6
5-25			69.0	6,000	674.3	314	5.2
5-27			71.1	10,900	674.3	418	3.8
6-1			76.7	8,100	674.3	445	5.5
6-3			75.1	6,800	674.4	439	6.5
6-6			78.2	6,900	674.4	513	7.4
6-8			79.5	5,400	674.5	531	9.8
6-10			75.5	4,600	674.5	418	9.1
6-13			76.0	3,900	674.5	447	11.5
6-15			76.9	3,200	674.7	518	16.2
6-17			76.5	4,400	674.6	838	19.0
6-20			79.8	4,300	674.6	838	19.5
6-22			79.6	3,600	674.7	838	23.3
6-24			78.3	3,000	674.4	848	28.3
6-27			78.8	3,400	675.1	838	24.6
6-29			76.6	3,400	674.8	838	24.6
7-1			74.9	3,700	674.7	1120	30.3
7-6			79.1	2,800	674.5	1098	39.2
7-8			82.0	2,800	674.8	1138	40.6
7-11			79.6	2,800	674.9	1038	37.1
7-13			79.1	2,800	674.8	1113	39.8
7-15			80.8	3,100	674.9	1088	35.1
7-18			80.8	3,800	674.7	1088	28.6
7-20			77.0	2,800	674.7	1108	39.6
7-22			78.8	2,500	674.9	1118	44.7
7-25			76.5	2,900	675.0	1088	37.5
7-27			79.5	2,900	674.9	1088	37.5
7-29			80.8	2,800	674.7	1118	39.9
8-1			83.8	2,500	674.8	1118	44.7
8-3			83.3	1,600	674.7	1118	69.9
8-5			80.6	4,800	675.2	1118	23.3
8-8			80.5	3,900	675.0	1088	27.9
8-10			80.6	5,300	674.8	1138	21.5
8-12			81.2	3,800	674.8	1188	29.4
8-15			83.0	4,700	674.9	1138	24.2
8-17			85.0	6,300	675.0	1138	18.1
8-19			79.4	5,300	674.7	1088	20.5
8-22			76.8	4,700	674.8	1163	24.7
8-24			74.0	10,500	674.8	943	9.0
8-26			73.7	7,600	674.6	978	12.9
8-29			73.0	6,100	674.5	638	10.5
8-31			72.5	5,700	674.6	653	11.5

Table A-16. 1989 Sampling Dates, Burbot Impingement Densities, Environmental, and Operational Data.

Date	Day Density	Night Density	River Temp.	River Flow	River Stage	Blowdown	% River Flow
4-4			41.6	33,200	673.7	188	0.6
4-6			45.1	33,227	673.8	183	0.6
4-7			44.7	33,500	673.7	186	0.6
4-11			40.8	38,500	674.4	188	0.5
4-13	0.085		-	38,700	674.3	185	0.5
4-14			46.1	37,700	674.2	188	0.5
4-18			49.1	33,000	673.9	188	0.6
4-20			-	33,200	674.0	202	0.6
4-21			54.2	32,500	674.0	188	0.6
4-25			56.5	27,600	673.8	188	0.7
4-27	0.228		56.8	27,400	673.8	206	0.8
5-2			53.4	27,800	674.0	308	1.1
5-4			54.9	27,700	674.0	313	1.1
5-9			56.0	26,600	673.7	288	1.1
5-11			61.4	26,800	673.8	313	1.2
5-16			68.7	24,100	673.5	313	1.3
5-17			67.9	21,200	673.3	338	1.6
5-18			67.0	19,900	673.6	364	1.8
5-19			66.1	20,300	673.6	334	1.6
5-23			70.6	15,800	674.0	480	3.0
5-25			68.8	19,900	673.6	438	2.2
5-30			63.9	29,400	673.8	338	1.1
6-1			66.8	27,100	673.8	338	1.2
6-2			67.0	23,900	673.7	404	1.7
6-6			71.5	18,100	673.8	438	2.4
6-8			70.6	15,100	673.7	438	2.9
6-13			67.5	11,100	673.9	438	3.9
6-15			67.2	9,900	674.2	418	4.2
6-20			74.5	9,700	675.1	838	8.6
6-22			72.6	9,500	674.3	838	8.8
6-27			76.5	11,500	674.4	798	6.9
6-29			77.0	12,300	674.1	806	6.6
7-3			81.1	12,500	674.1	1188	9.5
7-6			83.9	8,200	674.7	1138	13.9
7-11			83.7	8,100	674.2	1168	14.4
7-14			83.8	6,800	674.2	1148	16.9
7-18			80.6	6,100	674.4	1138	18.7
7-20			80.7	8,900	674.5	1168	13.1
7-25			82.2	4,600	674.6	1218	26.5
7-27			83.5	4,300	673.9	1218	28.3
8-1			80.7	6,800	674.7	1218	17.9
8-3			82.8	5,300	674.5	1218	23.0
8-8			77.2	3,900	674.4	1188	30.5
8-10			78.7	2,400	674.6	1188	49.5
8-15			75.9	5,900	674.8	1218	20.6
8-17			77.9	4,300	674.7	1188	27.6
8-22			74.6	4,700	674.7	1188	25.3
8-24			73.6	6,200	674.7	1218	19.6
8-29			72.0	5,400	674.7	1218	22.6
8-31			69.0	5,300	674.5	1163	21.9

Table A-17. 1989 Sampling Dates, Walleye/Sauger Impingement Densities, Environmental, and Operational Data.

Date	Day Density	Night Density	River Temp.	River Flow	River Stage	Blowdown	% River Flow
4-4			41.6	33,200	673.7	188	0.6
4-6			45.1	33,227	673.8	183	0.6
4-7			44.7	33,500	673.7	186	0.6
4-11			40.8	38,500	674.4	188	0.5
4-13			-	38,700	674.3	185	0.5
4-14			46.1	37,700	674.2	188	0.5
4-18			49.1	33,000	673.9	188	0.6
4-20			-	33,200	674.0	202	0.6
4-21			54.2	32,500	674.0	188	0.6
4-25			56.5	27,600	673.8	188	0.7
4-27			56.8	27,400	673.8	206	0.8
5-2	0.051		53.4	27,800	674.0	308	1.1
5-4	0.602		54.9	27,700	674.0	313	1.1
5-9	0.490		56.0	26,600	673.7	288	1.1
5-11	1.712		61.4	26,800	673.8	313	1.2
5-16	0.975		68.7	24,100	673.5	313	1.3
5-17	0.141		67.9	21,200	673.3	338	1.6
5-18	0.129		67.0	19,900	673.6	364	1.8
5-19	1.410		66.1	20,300	673.6	334	1.6
5-23	0.196		70.6	15,800	674.0	480	3.0
5-25	0.215		68.8	19,900	673.6	438	2.2
5-30			63.9	29,400	673.8	338	1.1
6-1			66.8	27,100	673.8	338	1.2
6-2			67.0	23,900	673.7	404	1.7
6-6			71.5	18,100	673.8	438	2.4
6-8			70.6	15,100	673.7	438	2.9
6-13			67.5	11,100	673.9	438	3.9
6-15			67.2	9,900	674.2	418	4.2
6-20			74.5	9,700	675.1	838	8.6
6-22			72.6	9,500	674.3	838	8.8
6-27			76.5	11,500	674.4	798	6.9
6-29			77.0	12,300	674.1	806	6.6
7-3			81.1	12,500	674.1	1188	9.5
7-6			83.9	8,200	674.7	1138	13.9
7-11			83.7	8,100	674.2	1168	14.4
7-14			83.8	6,800	674.2	1148	16.9
7-18			80.6	6,100	674.4	1138	18.7
7-20			80.7	8,900	674.5	1168	13.1
7-25			82.2	4,600	674.6	1218	26.5
7-27			83.5	4,300	673.9	1218	28.3
8-1			80.7	6,800	674.7	1218	17.9
8-3			82.8	5,300	674.5	1218	23.0
8-8			77.2	3,900	674.4	1188	30.5
8-10			78.7	2,400	674.6	1188	49.5
8-15			75.9	5,900	674.8	1218	20.6
8-17			77.9	4,300	674.7	1188	27.6
8-22			74.6	4,700	674.7	1188	25.3
8-24			73.6	6,200	674.7	1218	19.6
8-29			72.0	5,400	674.7	1218	22.6
8-31			69.0	5,300	674.5	1163	21.9

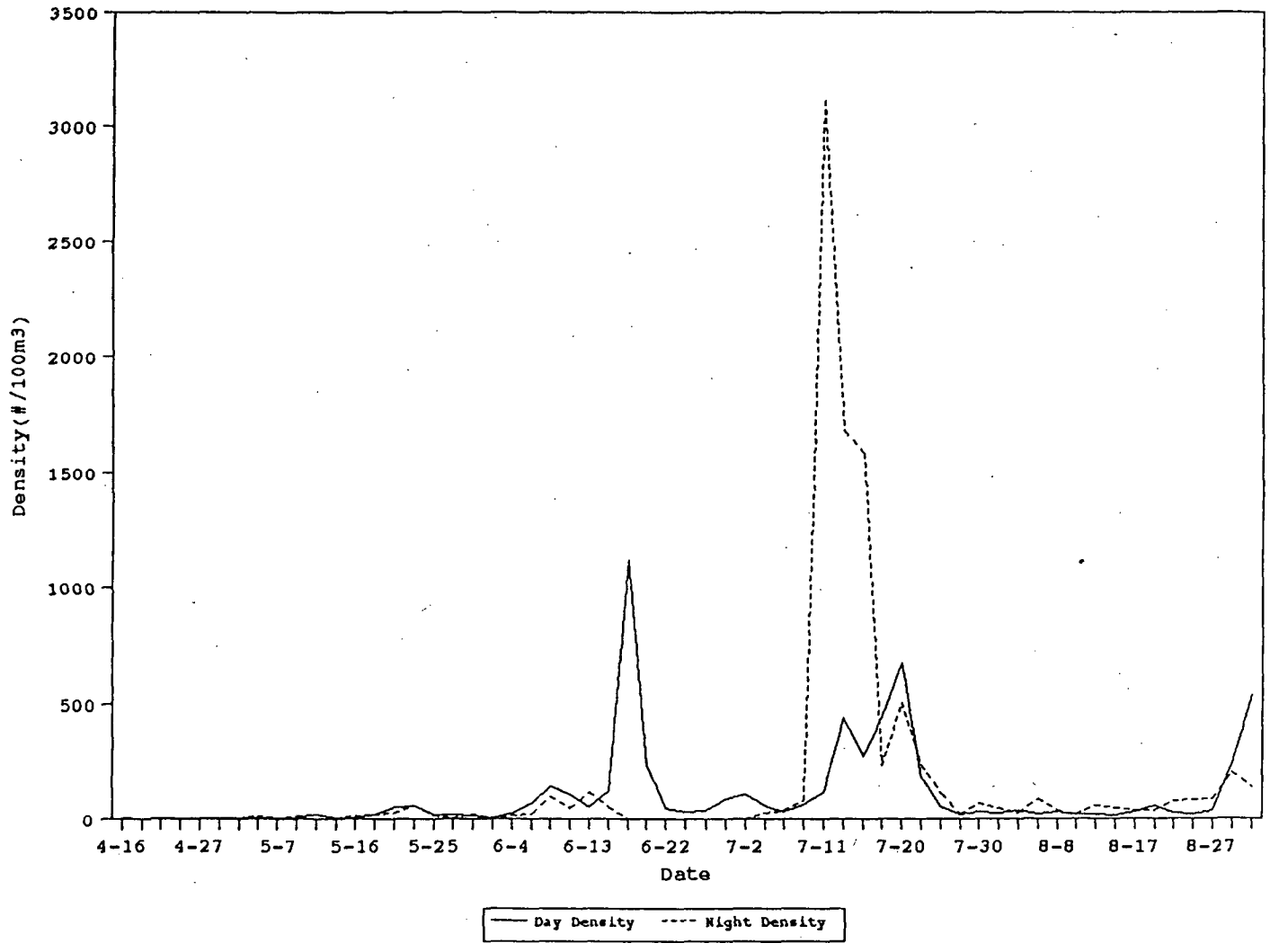


Figure A-1
1984 DAY AND NIGHT LARVAL IMPINGEMENT DENSITIES

Environmental Science & Engineering, Inc.
A GILCORP Company

815965113NORTH.STA.PWR

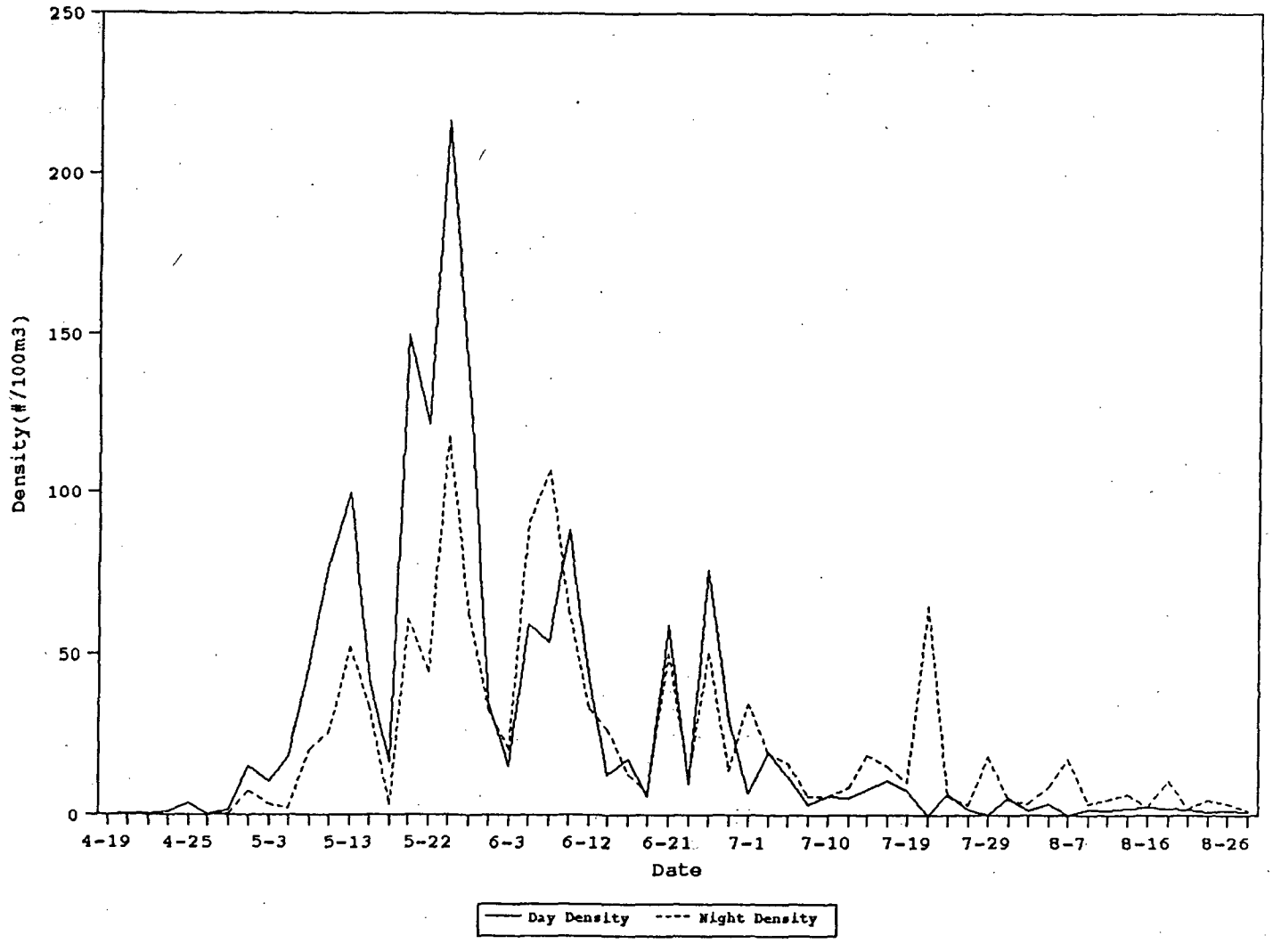
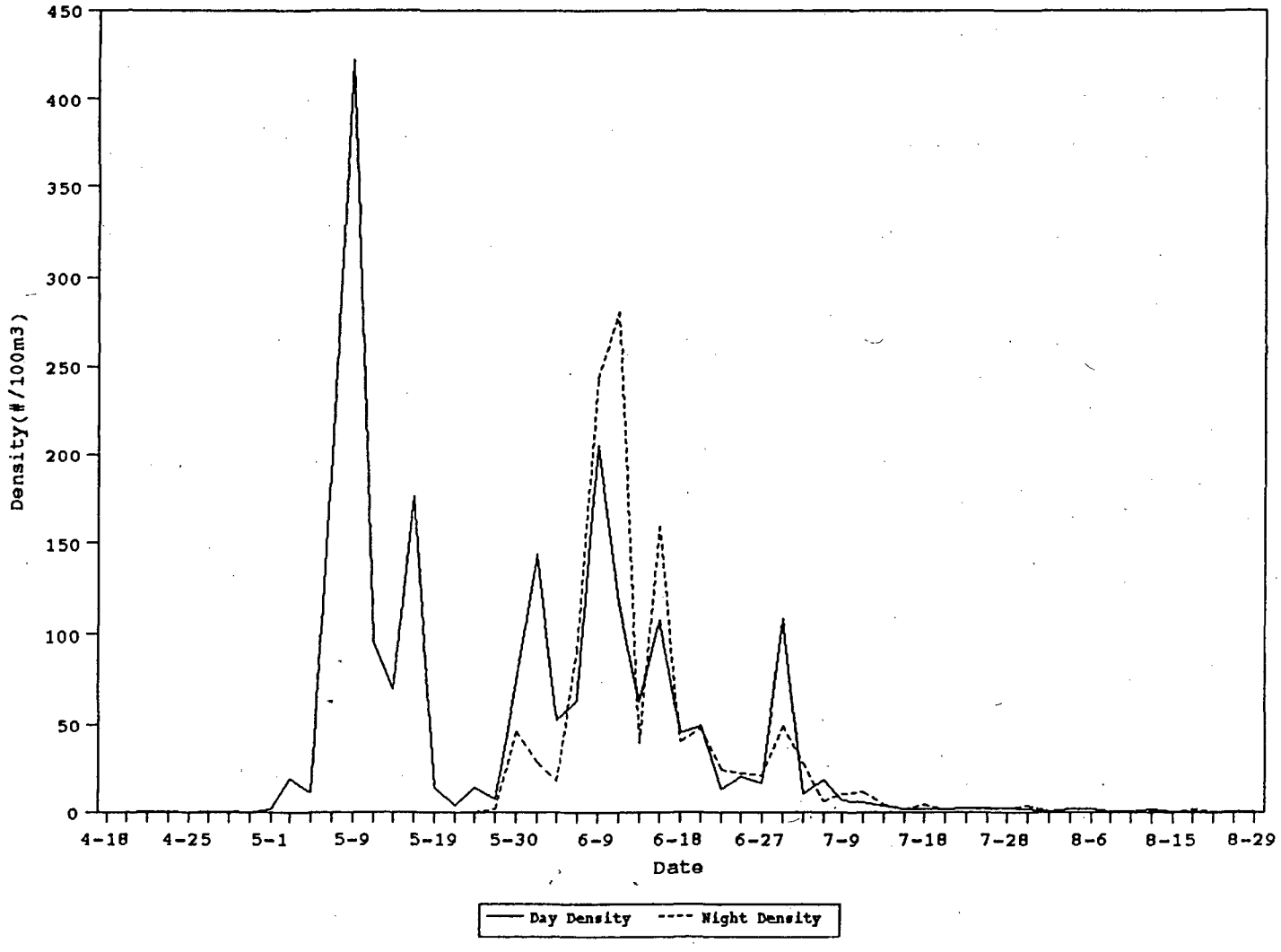


Figure A-2
1985 DAY AND NIGHT LARVAL IMPINGEMENT DENSITIES

Environmental Science & Engineering, Inc.
A CBI CORP Company

815965113NORTH.STA.PWR



8159651 13NORTH.STA.PWR

Figure A-3
1986 DAY AND NIGHT LARVAL IMPINGEMENT DENSITIES

ESE Environmental Science & Engineering, Inc.
A CILCORP Company

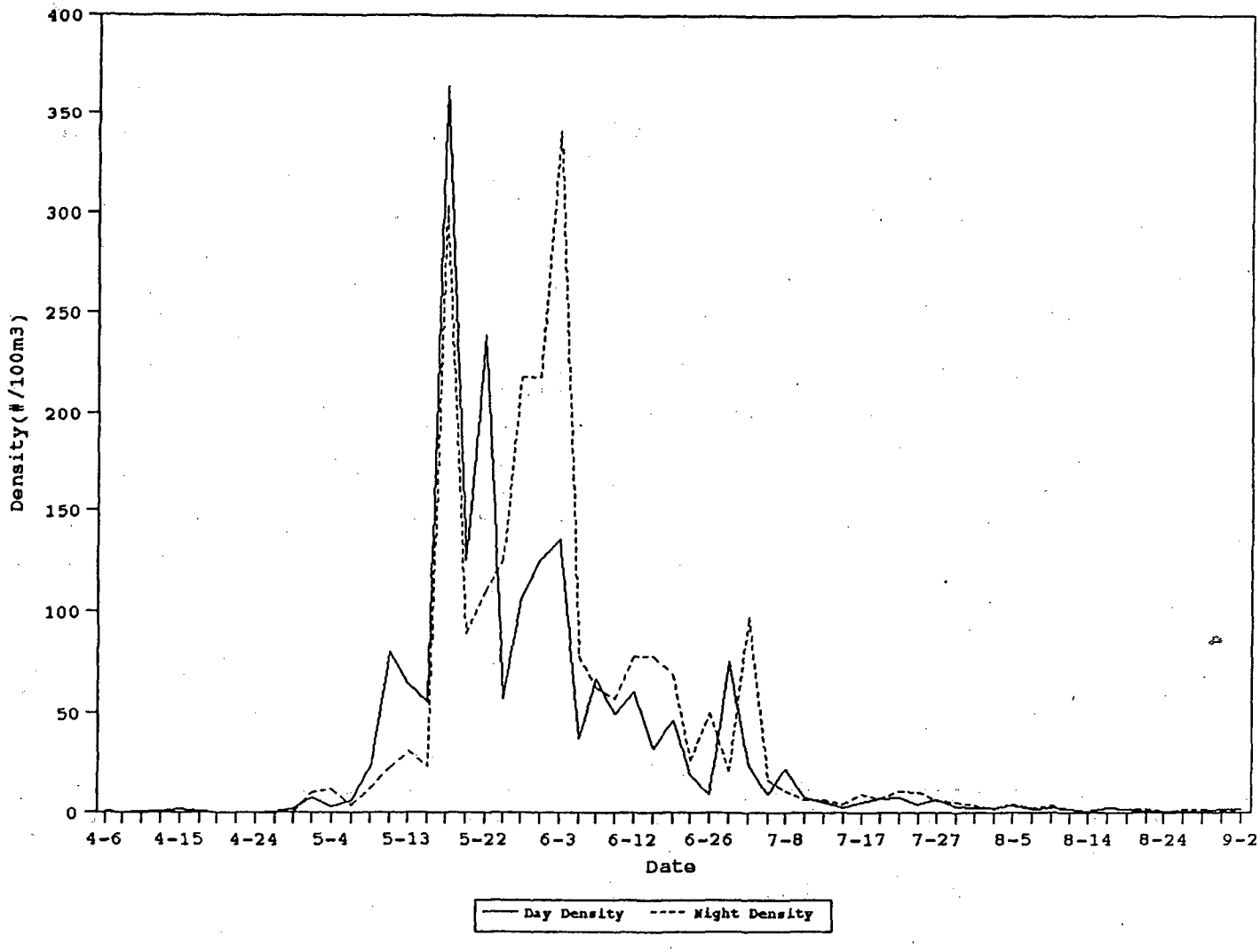
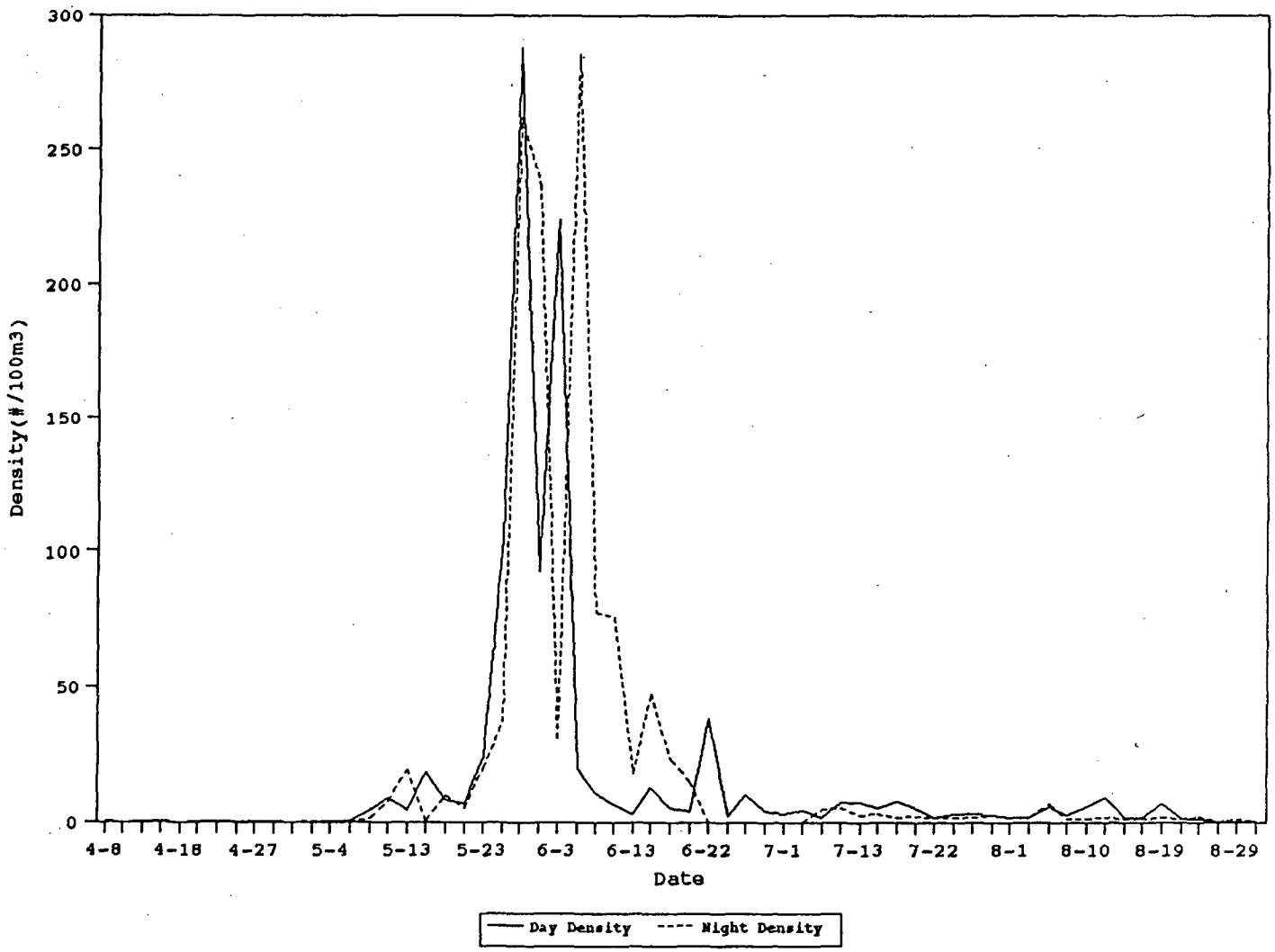


Figure A-4
1987 DAY AND NIGHT LARVAL IMPINGEMENT DENSITIES

Environmental Science & Engineering, Inc.
A CILCORP Company

815966113NORTH.STA.PWR



8169651 13NORTH.STA.PWR

Figure A-5
1988 DAY AND NIGHT LARVAL IMPINGEMENT DENSITIES

ESE
A GILCORP Company
Environmental Science & Engineering, Inc.

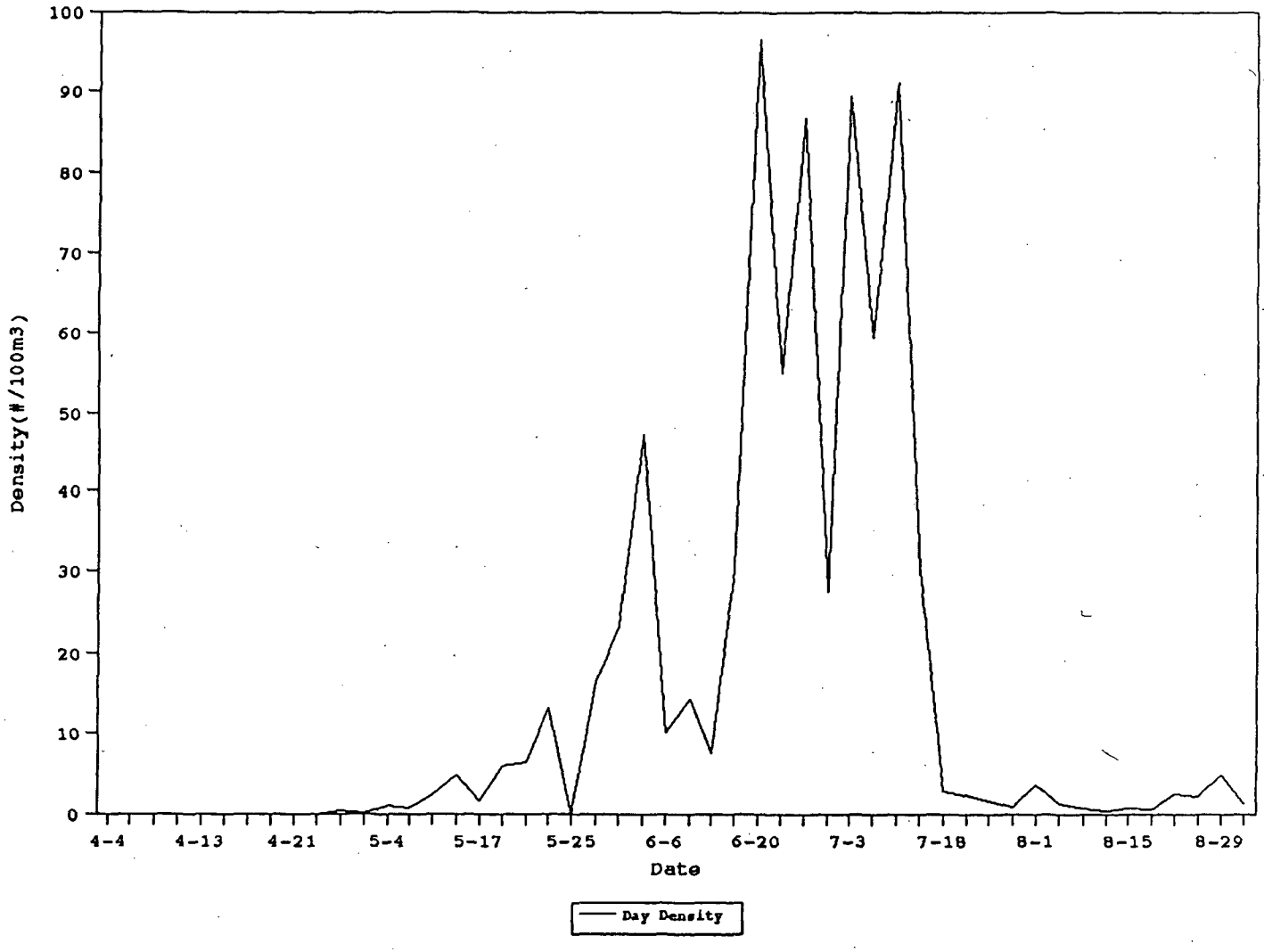


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Figure A-6
1989 DAY AND NIGHT LARVAL IMPINGEMENT DENSITIES

ESE
A CILCORP Company
Environmental Science & Engineering, Inc.

C-LINE® PRODUCTS, INC.

Prairie Island I

Environmental
Science &
Engineering, Inc.

A CILCORP Company

3.0 Results

3.1 Impingement Summarization

Sampling dates and day/night impingement densities from 1984 to 1989 are presented in Tables-3-1 and 3-2. Annual density figures for night and day samples are presented in Appendix A Figures A-1 through A-6. Night samples were not collected in 1989. Inflection point dates determined for day densities occurred from May 2 to May 20 with inflection point densities ranging from 0.78 to 11.18/100m^3, resulting in a mean inflection point density of 5.33/100m^3. Annual peak day impingement densities ranged from 96.53 to 1,118.76/100m^3. Inflection point dates determined for night densities occurred from May 6 to May 20 with inflection point densities ranging from 2.00 to 5.08/100m^3, resulting in a mean inflection point density of 3.47/100m^3. An inflection point was not determined for the night density data in 1986 due to the late initial night sampling date (May 27) and based on the 1986 day density data the annual peak impingement occurred on May 9. Peak annual night densities ranged from 117.56 to 3,112.58/100m^3.

Table 3-3 presents the species composition and relative abundance of larvae and eggs collected in day impingement samples on the inflection point and annual peak dates. Carp, catostomids, and eggs (primarily freshwater drum eggs) were typically the dominant taxa that represented the inflection point. In contrast, freshwater drum and egg density typically corresponded to the annual peak. Species composition and relative abundance of the inflection point dates in night impingement samples were similar to day samples and were most often represented by carp, catostomids, and eggs (Table 3-4). Composition of annual peak dates were dissimilar and variable, and were represented by channel catfish, eggs, and cyprinids.

3.2 Identification of Environmental Relationships

Correlations were conducted among environmental and operational parameters to identify significant relationships between these independent variables. Correlations were conducted over periods from the initiation of sampling to the inflection point and to the annual peak (Table 3-5). In both cases temperature was significantly correlated with blowdown and percent river flow. This reflects NSP's operating procedures of a stepwise increase in allowable blowdown from April to July as water temperatures gradually increase from spring to summer. As expected, river flow is highly significant with river stage. The significance of percent river flow with all other parameters reflects its direct relationship to blowdown and river flow.

3.2.1 Total Day Density

Regression analyses of day density and environmental/operational parameters from the initiation of sampling to the inflection point for data from 1984 to 1989 are presented in Figure 3-1. Temperature ($F=22.61$, $p<0.001$), blowdown ($F=56.35$, $p<0.001$), and percent river flow ($F=8.85$, $p<0.01$) were significantly correlated with density. Regression analysis of day density and environmental/operational parameters from the initiation of sampling to the annual peak revealed similar significant relationships with density correlated with temperature, blowdown, and percent river flow (Figure 3-2).

Multiple regression analysis was conducted for environmental/operational intervals and the day density inflection point interval. The highest R^2 value was determined for interval D ($R^2=0.556$) (Table 3-6). Temperature ($F=17.32$, $p<0.001$) and river flow ($F=12.41$, $p<0.001$) were both significant within interval D (20 days before the inflection point).

To further analyze the significance of temperature and river flow, a linear regression analysis was conducted for inflection point density and interval D temperature and inflection point density and interval D river flow. Regression analysis of inflection point density and interval D temperature indicated a significant relationship between the variables ($F=12.74$, $p<0.01$) (Figure 3-3). The resultant regression equation was then used to predict the temperature which was significantly related to the inflection point. A mean inflection point density (log $Y+1$) was substituted into the regression equation resulting in a predicted temperature of 47°F. The regression suggests that a temperature of 47°F is related to (or is a cue for) the subsequent increase in larval densities (inflection point) and that the inflection point will occur in approximately 20 days. Confidence limits (95 percent) were calculated based on the method provided by Sokal and Rohlf (1969) in Box 14.7, resulting in a upper limit of 49.5°F and lower limit of 40.6°F.

The linear regression of inflection point density and interval D river flow was not significant (Figure 3-4). Significance of river flow with density in the multiple regression and non-significance within the linear regression suggests that either a non-linear relationship exists between density and river flow, or that there is an interactive effect between river flow and the other environmental and operational parameters.

3.2.2 Total Night Density

Results of the regression analysis of night density and environmental/operational parameters from the initiation of night sampling to the annual peak for data from 1984 to 1988 are presented in Figure 3-5. Regression analysis of night density from the initiation of sampling to the inflection

point was not conducted due to the reduced and incomplete data set. Temperature ($F=60.29$, $p<0.001$), blowdown ($F=8.82$, $p<0.01$), and percent river flow ($F=7.73$, $p<0.01$) were significantly correlated with density.

Multiple regression analysis was conducted for environmental/operational intervals and the night density inflection point interval. The highest R^2 value was determined for interval E (Table 3-7). Temperature ($F=18.38$, $p<0.001$) was the most significant parameter within interval E (25 days before the inflection point).

To further analyze the significance of temperature, a linear regression analysis was conducted for inflection point density and interval E temperature. Regression analysis of inflection point density and interval E temperature resulted in a significant relationship ($F=7.97$, $p<0.05$) (Figure 3-6). The resultant regression equation was then used to predict the temperature which was significantly related to the inflection point. A mean inflection point density (log $Y+1$) was substituted into the regression equation resulting in a predicted temperature of 43.7°F. The regression suggested that a temperature of 43.7°F is related to (or a cue for) the subsequent increase in larval densities (inflection point) and that the inflection point will occur in approximately 25 days. Confidence limits (95 percent) were calculated based on the method provided by Sokal and Rohlf (1969) resulting in a upper limit of 44.9°F and calculated lower limit of 30.5°F.

3.2.3 Specific Flow Analysis

Initially, flow was considered to be a potential factor which influenced the timing of the inflection point of impinged larvae. Flow was entered in interval subsets along with other environmental/operational parameters into a multiple regression analysis with impingement density data for all species combined. The results of the day density multiple regression indicated that the regression association of day density with the four abiotic variables was significant ($R^2=0.556$; $F=7.51$, $p<0.001$), when the abiotic variables considered were from interval D (see Table 3-6). Additionally, 2 of the 4 abiotic variables were significantly associated with impingement density within the multiple regression equation (temperature and river flow).

As described in Section 3.2.1, linear regression analysis was conducted to examine the significant associations between inflection point day density and interval D temperature and flow. Temperature was significant and positively associated with impingement density. In contrast, results of linear regression using river flow were not significant. Thus, two hypotheses were disproved. First, patterns of flow did not appear to be associated with the timing of larval density

of 50° to 55°F. Sauger spawn when water temperatures are between 43° and 53°F, with an incubation period for eggs of 21 days at an average water temperature of 47°F (Becker, 1983). Auer (1982) reported that walleye begin spawning at temperatures of between 40° and 42°F and are most active between 46° and 50°F. Incubation periods range from 30 to 49 days at 43°F and 12 to 18 days at 50° to 54°F. Auer (1982) reported a similar spawning temperature range (39° to 53°F) as Becker with incubation periods ranging from 37 to 58 days at 43°F and 9 to 14 days at 50° to 54°F.

3.2.4 Burbot Impingement

Regression analyses of burbot day density (log density) and environmental/operational parameters for the month of April from 1984 to 1989 and 1992 to 1996 are presented in Figure 3-10. River flow ($F=13.40$, $p<0.001$) and blowdown ($F=4.46$, $p<0.05$) were significantly correlated with density. Burbot densities were highest when April river flows and blowdown were reduced. Multiple regression analysis was conducted for environmental/operational intervals and the burbot inflection point interval. The highest R^2 value was determined for interval A ($R^2=0.466$) (Table 3-9). River flow was the most highly significant parameter within interval A (5 days before the inflection point).

To further analyze the significance of river flow a linear regression was conducted for the inflection point density and interval A river flow. Regression analysis of inflection point density and interval A flow indicated a significant relationship ($F=22.42$, $p<0.001$) (Figure 3-11). The resultant regression equation was then used to predict the flow which is significantly related to the burbot initial appearance (inflection point). A mean inflection point density (log $Y+1$) was substituted into the regression equation resulting in a predicted inflection point flow of 37,312 cfs. The results suggested that the burbot inflection point generally occurred when river flows were about 37,000 cfs. Confidence limits (95 percent) were calculated based on the method provided by Sokal and Rohlf (1969) resulting in a upper limit of 122,423 cfs and a calculated lower limit of -48,463 cfs.

To determine the period in which burbot larvae may be present in impingement samples relative to river temperatures, spawning temperatures and incubation periods were reviewed from relevant sources. Becker (1983) reported that burbot spawn in mid-winter, or in early spring before the ice has melted and that the incubation period of burbot eggs is from 4 to 5 weeks, at a water temperature of 39.2°F (4°C). Auer (1982) reported burbot spawning temperatures of 33° to 39°F with incubation periods ranging from 71 days at 32°F to 30 days at 43°F.

4.0 Discussion

Impingement Analysis

Discussion of the analysis of total density will focus on day density. The day density data set contained 6 complete years of larval impingement data, whereas the night density data set contained only 4 years of data--most of it incomplete due to delayed collection of night samples. Overall the total day density analysis is statistically stronger and more valid based solely upon the larger and more complete data set and more precise confidence interval.

The final analysis of the total day density determined that river temperature is a significant cue that can be used to predict a sustained increase in the larval density (inflection point). The interval most significantly associated with larval impingement density was interval D which is 20 days before the inflection point. Using the equation determined from the interval D density and temperature linear regression analysis, a predicted temperature significantly related to the inflection points was determined. The mean of the six inflection point densities (inflection points determined for sample years 1984 to 1989) was inserted into the regression equation and solved for temperature, resulting in a predicted temperature of 47°F (95 percent confidence interval of 40.6° to 49.5°F). These results suggest that inflection point for the total larval community occurs 20 days after the river temperatures reach sustained temperatures of 47°F. Sustained temperatures are defined as river temperatures that remain above 47°F for at least 3 consecutive days. This result may then be used to modify operational procedure by reducing blowdown 20 days after river intake temperatures above 47°F are sustained.

In order to test the effect of this proposed operational cue, historical temperature and density data (1984 to 1996) were examined to compare the results of the statistical analysis to the annual impingement data. Table 4-1 summarizes when sustained temperatures of 47°F occurred, larval density at or near the 47°F date (if data were collected), mean densities for 20 days after the 47°F date, and the determined inflection points. Inflection points could not be determined from 1990 to 1996 data since samples were collected during April only. In comparing the dates 20 days after the 47°F date to the determined inflection point dates for 1984 to 1989, the 20 day date was near or more conservative than the actual inflection points. For example, in 1986, the 20-day date was April 21, while the inflection point was determined to occur on May 5. This comparison suggests that a decreased blowdown 20 days after a sustained river temperature of 47°F is a conservative restrictive method to operate blowdown.

Although river flow conditions may be an important mechanism influencing impingement density, the analysis did not support a significant relationship between river flows and impingement

densities (i.e., high flows result in lower impingement densities or low flows result in higher impingement densities). Consequently, the results suggest that flows can not be used as a predictor of impingement density for all species and life stages combined.

Walleye/Sauger Analysis

Results of walleye/sauger analysis concluded that the inflection point (increased densities) occurred when river temperatures reached 55.1°F (95 percent confidence interval of 38.9° to 69.9°F). This temperature was not a cue to spawning activity leading to the inflection point a certain number of days thereafter. Rather, it reflected the temperature at which the increased densities occurred. However, as reported by Becker (1983) and Auer (1982), walleye and sauger spawn when water temperatures reach 42° to 53°F with incubation periods ranging from 30 to 58 days at 43°F and 9 to 18 days at 50° to 54°F. Sustained temperatures of 55°F were usually recorded during late April to early May at the Prairie Island intake (see Table 4-1). In 6 of the 11 study years, the walleye/sauger inflection point temperature (55°F) occurred before or on the same date as the date of the predicted inflection point determined by the total density analysis. During the remaining 5 sample years, the inflection point temperature (55°F) occurred within 6 or less days of the predicted inflection point. Based on the analysis of walleye/sauger density data, the total density analysis, and reported spawning temperatures and incubation periods, a blowdown restriction 20 days after a sustained temperature of 47°F is attained appears sufficient to minimize walleye/sauger impingement.

Burbot Analysis

Results of the burbot analysis determined that temperature was not a significant environmental factor related to impingement densities. However, river flows were significantly associated to burbot impingement density. This inverse relationship suggests that the burbot inflection point (initial appearance) generally occurred when river flows were about 37,000 cfs. However, an extremely broad 95 percent confidence interval (-48,463 to 122,423) implies that the density data concerning the predicted flow value is very imprecise and therefore not useful as a predictor of the inflection point. Burbot impingement densities were low and sporadic throughout the sampling years (1984 through 1996) making burbot density patterns difficult to identify and test statistically.

An overview of NSP electrofishing surveys conducted within the vicinity of the Prairie Island Plant is presented in Table 4-2. Walleye and sauger were common in adult collections with mean catch-per-unit-effort (CPE) ranging from 1.62 to 6.06 fish/hour for all sampling sectors. Collection of adult burbot in electrofishing surveys was uncommon and sporadic with mean CPE's ranging from 0.01 to 0.17 fish/hour for all sectors. Burbot were not encountered in electrofishing

surveys in 5 of the 11 survey years reviewed. Becker (1983) reported that burbot is uncommon in the Mississippi River. Eddy and Underhill (1974) report that burbot is a cold-water species common in northern Minnesota lakes and streams with occasional specimens collected as far south as Lake Pepin (Mississippi River south of the Prairie Island Plant).

Increased Water Appropriation

Larval impingement studies were conducted by NSP from 1992 through 1996 to assess impingement affects of increased water appropriation during April. In comparison to previous studies at Prairie Island, increased water appropriation in April does not appear to have increased the number of larval fish impinged on the traveling screens. Water appropriation (blowdown) during the first half of April in 1995 (715 cfs) was greater than twice the normal April blowdown (300 cfs) due to cooling tower repairs. Increased blowdown up to 715 cfs did not appear to have increased the number of larval fish impinged, when compared to normal blowdown impingement data.

Analyses of variance (ANOVAs) were performed using impingement data from 1984 to 1989 and 1992 to 1996 to statistically determine whether April impingement densities were significantly higher when blowdown rates were greater.

The first ANOVA tested for a significant difference between April impingement densities observed when blowdown rates were approximately 150 cfs *versus* those observed when blowdown rates were approximately 300 cfs or greater. Data collected from 1984 through 1996 were pooled for this analysis. The number of samples (n) for each treatment group ranged from 43 to 50. The results indicated that impingement density was significantly lower ($F=4.1$, $p<0.05$) under conditions of higher blowdown. This result was most likely a statistical artifact and primarily reflected the large number of zeros and very low density values in each of the two treatment groups. However, it offered no evidence that increased intake volume in April resulted in increased impingement.

A second ANOVA tested for significant differences in early to mid-April impingement densities between study years. This was done to reflect the varying blowdown rates which occurred among years (approximately 150 cfs in 1984 through 1989, generally 300 cfs in 1992 to 1994 and 1996, and approximately 700 cfs in 1995). For each treatment group, $n=6$ and represented densities from the first six larval fish collections taken in April of each year. The analysis indicated that densities were significantly lower ($F=3.77$, $p<0.05$) in 1989 (183 to 188 cfs blowdown) and 1995 (685 to 715 cfs blowdown) than in any of the other survey years. Although significant differences were not evident between the remaining study years, the analysis revealed that mean

impingement densities were higher in years in which lower blowdown rates occurred (1984 to 1988) than in years characterized by greater blowdown rates (1992 to 1994 and 1996). As with the first ANOVA, the results did not indicate that increased intake volumes caused greater impingement of larval fish in April.

The third ANOVA tested for significant differences in April impingement densities between the study years 1992 through 1996. The principal difference between this test and the one previously described was the inclusion of data collected at night. These data (night) were only available in April beginning in 1992. For four of the treatment groups (study years 1992, 1993, 1994, and 1996), blowdown rates were approximately 300 cfs. In 1995, the blowdown rates occurring during the survey period considered ranged from 685 to 715 cfs. For each treatment group, 10 data points were used ($n=10$) and represented the first 10 larval fish samples (night and day) collected in April of each year. Results revealed no significant difference in impingement density between any of the study years ($F=1.39$, $p>0.25$). Once again, the analysis suggested that April impingement densities were not higher as a result of higher blowdown rates.

5.0 Conclusions

Based on the review and statistical analysis of April impingement data from 1992 to 1996 and the statistical analysis of the 1984 to 1989 total impingement data, it appears that increased blowdown during the month of April will not substantially increase larval impingement densities. Larval drift is minimal during this period resulting in impingement rates that are relatively unaffected by blowdown rate. ANOVA's conducted on April density data for all sample years did not indicate that increased intake volumes caused greater impingement of larval fish.

The statistical analysis of the 1984 to 1989 data revealed that temperature was significantly correlated to an increased trend in impingement densities (inflection point) approximately 20 days after the intake temperatures reach a sustained temperature of 47°F. Review of historical temperature data revealed that this date generally occurs in early May.

Increased blowdown during the month of April would not significantly increase walleye and sauger impingement since increased densities (inflection point) do not occur until intake temperatures reach 55°F (typically early May).

Based on reports that burbot are distributionally uncommon in the Mississippi River, the sporadic appearance of burbot in NSP adult fish surveys, and overall low presence of burbot larvae in past impingement samples, increased blowdown during April most likely would not increase the impingement of burbot larvae. Very low burbot densities and overall lack of burbot larvae in impingement samples preclude a conclusive analysis of burbot densities in relation to temperature.

Based on the analysis, river flow does not appear to be a significant factor which affects the timing of overall larval impingement densities or the timing of walleye and sauger impingement densities. River flow was inversely related to burbot impingement densities. However, based on the relatively broad confidence intervals for river flow, the use of river flow as a predictor of burbot densities would be very imprecise.

In conclusion, river temperature can be used to determine an implementation date for reducing plant blowdown. A reduced blowdown 20 days after the river reaches a sustained temperature of 47°F is a statistically supported approach that is protective in maintaining reduced larval impingement densities.

6.0 Literature Cited

Auer, N.A.(ed.) 1982. Identification of Larval Fishes of the Great Lakes Basin with Emphasis on the Lake Michigan Drainage. Great Lakes Fishery Commission. Special Publication 82-3.

Becker, G.C. 1983. Fishes of Wisconsin. The University of Wisconsin Press.

Devore, J. and R. Peck. 1986. Statistics: The Exploration and Analysis of Data. West Publishing Company.

Eddy, S. and J.C. Underhill. 1974. Northern Fishes: Third Edition. University of Minnesota Press, Minneapolis, Minnesota.

Northern States Power. 1995. Prairie Island Nuclear Generating Plant Environmental Monitoring and Ecological Studies Program 1995 Annual Report.

Sokal, R.R. and F.J. Rohlf. 1969. Biometry. W.H. Freeman and Company, San Francisco.

Table 3-1. Sampling Dates and Day Densities (#/100m3) for all Larvae and Eggs for 1984 to 1989

1984		1985		1986		1987		1988		1989	
Date	Density	Date	Density	Date	Density	Date	Density	Date	Density	Date	Density
4-16	0.08	4-19	0.00	4-18	0.00	4-6	0.20	4-8	0.17	4-4	0.00
4-18	0.00	4-22	0.30	4-21	0.00	4-8	0.00	4-11	0.00	4-6	0.00
4-23	0.84	4-23	0.12	4-23	0.06	4-10	0.52	4-13	0.08	4-7	0.00
4-25	0.84	4-24	0.83	4-24	0.38	4-13	0.53	4-15	0.17	4-11	0.00
4-27	0.45	4-25	3.34	4-25	0.00	4-15	0.75	4-18	0.00	4-13	0.00
4-30	1.38	4-26	0.34	4-28	0.09	4-16	0.12	4-20	0.16	4-14	0.00
5-2	0.78	4-29	0.94	4-29	0.31	4-20	0.00	4-22	0.42	4-18	0.00
5-4	3.86	5-1	15.18	4-30	0.00	4-22	0.00	4-25	0.25	4-20	0.00
5-7	4.46	5-3	10.16	5-1	1.42	4-24	0.00	4-27	0.25	4-21	0.00
5-9	5.48	5-6	17.84	5-2	19.73	4-27	0.25	4-28	0.08	4-25	0.00
5-11	12.12	5-8	47.54	5-5	11.18	4-29	0.75	4-29	0.00	4-27	0.23
5-14	2.42	5-10	77.78	5-7	198.46	5-1	6.96	5-2	0.00	5-2	0.15
5-16	5.90	5-13	99.64	5-9	422.06	5-4	2.23	5-4	0.32	5-4	0.95
5-18	13.56	5-15	42.28	5-12	96.29	5-6	5.02	5-6	0.37	5-9	0.60
5-21	42.22	5-17	15.74	5-14	68.98	5-8	21.87	5-9	3.99	5-11	2.19
5-23	52.42	5-20	149.32	5-16	175.92	5-11	79.89	5-11	8.29	5-16	4.74
5-25	12.26	5-22	121.40	5-19	14.12	5-13	64.28	5-13	3.61	5-17	1.41
5-28	13.52	5-24	216.40	5-21	3.47	5-15	55.51	5-16	18.36	5-18	5.95
5-30	6.34	5-29	133.02	5-23	14.30	5-18	364.15	5-18	8.09	5-19	6.27
6-1	5.64	5-31	35.24	5-27	7.16	5-20	124.81	5-20	6.24	5-23	13.05
6-4	19.18	6-3	15.16	5-30	73.06	5-22	238.59	5-23	23.52	5-25	26.50
6-6	63.86	6-5	59.34	6-2	143.64	5-27	57.32	5-25	104.51	5-30	16.30
6-8	134.22	6-7	53.20	6-4	52.76	5-29	105.71	5-27	287.78	6-1	23.26
6-11	99.32	6-10	88.14	6-6	63.06	6-1	124.50	6-1	91.95	6-2	47.32
6-13	46.00	6-12	41.76	6-9	205.42	6-3	135.74	6-3	223.85	6-6	9.89
6-15	117.30	6-14	12.04	6-11	116.92	6-5	37.25	6-6	19.32	6-8	14.19
6-18	1118.76	6-17	17.42	6-13	62.46	6-8	67.19	6-8	10.62	6-13	7.42
6-20	231.62	6-19	5.16	6-16	107.80	6-10	49.48	6-10	5.74	6-15	30.42
6-22	36.76	6-21	58.76	6-18	45.88	6-12	60.94	6-13	2.95	6-20	96.53
6-25	25.56	6-24	9.26	6-20	48.98	6-17	31.73	6-15	12.45	6-22	54.95
6-27	34.56	6-26	75.80	6-23	12.26	6-19	46.59	6-17	4.94	6-27	86.74
6-29	79.92	6-28	29.16	6-25	20.46	6-24	18.93	6-20	3.37	6-29	27.46
7-2	97.14	7-1	6.74	6-27	16.20	6-26	8.58	6-22	37.76	7-3	89.50
7-4	50.34	7-3	19.48	6-30	108.16	6-29	75.23	6-24	1.78	7-6	59.25
7-6	24.48	7-5	11.50	7-2	10.10	7-1	23.47	6-27	9.89	7-11	91.27
7-9	54.92	7-8	2.58	7-7	18.98	7-6	8.46	6-29	3.15	7-14	30.19
7-11	112.24	7-10	5.36	7-9	6.34	7-8	21.31	7-1	3.02	7-18	2.57
7-13	437.78	7-12	4.76	7-11	4.96	7-10	7.30	7-6	3.69	7-20	2.10
7-16	267.84	7-15	7.44	7-14	3.26	7-13	4.13	7-8	1.53	7-25	1.47
7-18	440.50	7-17	10.26	7-16	1.24	7-15	1.95	7-11	6.92	7-27	0.77
7-20	671.40	7-19	6.98	7-18	1.18	7-17	4.18	7-13	6.87	8-1	3.48
7-23	173.12	7-22	0.00	7-21	1.18	7-20	6.23	7-15	4.72	8-3	1.08
7-25	44.58	7-24	5.98	7-23	1.78	7-22	6.84	7-18	7.21	8-8	0.63
7-27	11.94	7-26	1.42	7-25	1.82	7-24	3.93	7-20	4.99	8-10	0.28
7-30	24.28	7-29	0.00	7-28	2.08	7-27	5.96	7-22	1.12	8-15	0.62
8-1	19.90	7-31	5.00	7-30	1.18	7-29	2.15	7-25	2.77	8-17	0.48
8-3	32.64	8-2	1.22	8-1	0.24	7-31	1.92	7-27	2.96	8-22	2.26
8-6	16.72	8-5	3.16	8-4	0.94	8-3	1.70	7-29	2.46	8-24	1.93
8-8	25.86	8-7	0.00	8-6	1.00	8-5	3.33	8-1	1.07	8-29	4.76
8-10	12.14	8-9	1.68	8-8	0.66	8-7	1.11	8-3	1.10	8-31	1.17
8-13	12.84	8-12	1.14	8-11	0.40	8-10	1.98	8-5	5.14		
8-15	9.84	8-14	1.72	8-13	1.00	8-12	1.18	8-8	2.27		
8-17	24.48	8-16	2.28	8-15	0.48	8-14	0.66	8-10	5.46		
8-20	50.74	8-19	1.76	8-18	0.76	8-17	1.53	8-12	8.56		
8-22	19.70	8-21	1.40	8-20	0.60	8-19	1.14	8-15	1.35		
8-24	12.54	8-23	0.78	8-22	0.60	8-21	0.45	8-17	1.12		
8-27	32.22	8-26	0.90	8-29	0.52	8-24	0.28	8-19	6.30		
8-29	237.58	8-28	0.84			8-26	0.64	8-22	0.55		
8-31	532.48					8-28	0.36	8-24	0.70		
						8-31	0.94	8-26	0.31		
						9-2	0.69	8-29	0.48		
								8-31	0.07		

Outlined Dates and Densities Represent the Inflection Point.

Table 3-2. Sampling Dates and Night Densities (#/100m3) for all Larvae and Eggs for 1984 to 1988

1984		1985		1986		1987		1988	
Date	Density	Date	Density	Date	Density	Date	Density	Date	Density
4-16	-	4-19	-	4-18	-	4-6	-	4-8	-
4-18	-	4-22	-	4-21	-	4-8	-	4-11	-
4-23	-	4-23	-	4-23	-	4-10	-	4-13	-
4-25	-	4-24	-	4-24	-	4-13	-	4-15	-
4-27	-	4-25	-	4-25	-	4-15	-	4-18	-
4-30	-	4-26	-	4-28	-	4-16	-	4-20	-
5-2	0.51	4-29	0.16	4-29	-	4-20	-	4-22	-
5-4	6.69	5-1	6.92	4-30	-	4-22	-	4-25	-
5-7	4.00	5-3	2.80	5-1	-	4-24	-	4-27	-
5-9	8.08	5-6	2.00	5-2	-	4-27	-	4-28	-
5-11	13.04	5-8	19.86	5-5	-	4-29	-	4-29	-
5-14	2.08	5-10	25.14	5-7	-	5-1	9.83	5-2	0.22
5-16	9.28	5-13	52.00	5-9	-	5-4	11.49	5-4	0.27
5-18	17.82	5-15	33.62	5-12	-	5-6	2.79	5-6	0.26
5-21	23.64	5-17	2.86	5-14	-	5-8	11.42	5-9	0.73
5-23	50.42	5-20	60.58	5-16	-	5-11	22.14	5-11	7.61
5-25	11.56	5-22	44.36	5-19	-	5-13	31.13	5-13	18.38
5-28	4.10	5-24	117.56	5-21	-	5-15	22.57	5-16	0.03
5-30	12.46	5-29	62.12	5-23	-	5-18	302.82	5-18	9.45
6-1	5.54	5-31	33.00	5-27	1.52	5-20	88.83	5-20	5.08
6-4	7.26	6-3	19.80	5-30	46.46	5-22	108.95	5-23	19.64
6-6	16.32	6-5	90.84	6-2	28.74	5-27	125.00	5-25	36.44
6-8	93.70	6-7	106.96	6-4	17.92	5-29	217.51	5-27	261.62
6-11	40.64	6-10	63.74	6-6	91.26	6-1	217.38	6-1	236.72
6-13	111.80	6-12	32.86	6-9	243.76	6-3	340.75	6-3	30.87
6-15	47.58	6-14	26.14	6-11	280.20	6-5	77.90	6-6	285.61
6-18	0.00	6-17	12.52	6-13	39.60	6-8	62.20	6-8	76.82
6-20	0.00	6-19	6.80	6-16	158.90	6-10	57.16	6-10	75.24
6-22	0.00	6-21	50.56	6-18	40.26	6-12	77.59	6-13	17.80
6-25	0.00	6-24	11.42	6-20	47.66	6-17	77.96	6-15	47.26
6-27	0.00	6-26	50.18	6-23	23.78	6-19	68.21	6-17	22.92
6-29	0.00	6-28	13.28	6-25	22.48	6-24	26.35	6-20	14.78
7-2	0.00	7-1	34.72	6-27	21.36	6-26	49.71	6-22	-
7-4	18.70	7-3	18.38	6-30	49.62	6-29	20.71	6-24	-
7-6	34.42	7-5	15.78	7-2	27.92	7-1	97.20	6-27	-
7-9	73.62	7-8	5.28	7-7	5.82	7-6	15.71	6-29	-
7-11	3112.58	7-10	5.32	7-9	10.50	7-8	10.59	7-1	-
7-13	1682.14	7-12	8.32	7-11	11.86	7-10	6.02	7-6	-
7-16	1580.78	7-15	18.00	7-14	4.00	7-13	5.98	7-8	4.14
7-18	223.66	7-17	14.90	7-16	0.86	7-15	3.91	7-11	4.63
7-20	502.64	7-19	9.36	7-18	4.50	7-17	8.43	7-13	2.26
7-23	228.38	7-22	64.60	7-21	0.80	7-20	6.73	7-15	2.99
7-25	104.30	7-24	5.28	7-23	1.58	7-22	10.38	7-18	1.47
7-27	12.10	7-26	2.94	7-25	1.32	7-24	9.74	7-20	1.68
7-30	63.32	7-29	17.84	7-28	2.14	7-27	5.19	7-22	1.45
8-1	37.02	7-31	4.64	7-30	3.10	7-29	4.44	7-25	1.26
8-3	19.70	8-2	3.24	8-1	0.72	7-31	2.75	7-27	1.41
8-6	82.02	8-5	8.56	8-4	1.04	8-3	0.76	7-29	2.30
8-8	31.68	8-7	17.36	8-6	1.12	8-5	3.61	8-1	1.28
8-10	14.74	8-9	3.32	8-8	0.60	8-7	1.98	8-3	1.14
8-13	50.88	8-12	4.58	8-11	0.40	8-10	2.81	8-5	6.21
8-15	39.30	8-14	6.30	8-13	0.44	8-12	1.11	8-8	0.74
8-17	30.52	8-16	2.28	8-15	0.44	8-14	0.10	8-10	0.99
8-20	34.76	8-19	10.60	8-18	0.88	8-17	1.73	8-12	1.33
8-22	71.20	8-21	1.96	8-20	0.48	8-19	0.80	8-15	0.81
8-24	76.64	8-23	4.46	8-22	0.60	8-21	1.18	8-17	0.54
8-27	81.98	8-26	3.20	8-29	0.40	8-24	0.47	8-19	1.26
8-29	195.30	8-28	1.22			8-26	0.89	8-22	0.67
8-31	130.44					8-28	1.12	8-24	1.92
						8-31	0.47	8-26	0.05
						9-2	1.12	8-29	0.52
								8-31	0.14

Outlined Dates and Densities Represent the Inflection Point

Table 3-3. Species Composition and Relative Abundance of Larvae and Eggs Collected in Day Impingement Samples on the Inflection Point and Annual Peak Dates from 1984 - 1989

	1984		1985		1986		1987		1988		1989	
	Inflection Point	Annual Peak	Inflection Point	Annual Peak	Inflection Point	Annual Peak	Inflection Point	Annual Peak	Inflection Point	Annual Peak	Inflection Point	Annual Peak
Taxa	May 2	June 18	May 3	May 24	May 5	May 9	May 4	May 18	May 20	May 27	May 17	June 20
Gizzard shad	-	-	-	0.1	-	0.0	9.4	0.1	4.0	3.4	-	15.3
Mooneye	-	-	-	-	0.6	-	-	-	-	-	-	-
Cyprinidae	-	0.1	1.2	0.0	-	-	-	1.7	-	0.6	-	1.5
Carp	-	97.8	45.4	-	44.7	53.1	-	5.8	0.4	0.4	-	6.9
Catostomidae	-	0.8	49.1	0.2	15.5	46.0	59.4	0.1	0.8	0.1	20.0	-
Burbot	11.8	-	-	-	-	-	-	-	-	-	-	-
White bass	-	-	-	0.5	-	-	12.5	0.3	4.0	1.0	20.0	1.5
Pomoxis sp.	-	0.2	-	0.0	-	-	-	0.0	-	0.0	-	0.5
Percidae	35.3	-	3.1	0.1	13.0	0.2	12.5	0.2	0.8	0.2	-	-
Sauger	-	-	0.6	-	1.2	0.0	6.3	-	0.4	-	10.0	-
Walleye	23.5	-	0.6	-	1.2	0.0	-	-	-	-	-	-
Freshwater drum	-	0.7	-	5.5	-	-	-	15.9	14.2	87.2	-	55.8
Unidentified larvae	-	-	-	-	1.2	0.5	-	0.2	7.1	5.1	-	8.5
Eggs	29.4	0.3	-	93.4	22.4	-	-	75.8	68.4	2.0	50.0	10.1

Table 3-4. Species Composition and Relative Abundance of Larvae and Eggs Collected in Night Impingement Samples on the Inflection Point and Annual Peak Dates in 1984, 1985, 1987, and 1988

	1984		1985		1987		1988	
	Inflection Point	Annual Peak	Inflection Point	Annual Peak	Inflection Point	Annual Peak	Inflection Point	Annual Peak
Taxa	May 7	July 11	May 6	May 24	May 6	June 3	May 20	June 6
Gizzard shad	-	0.4	-	0.4	3.6	2.6	2.4	2.4
Mooneye	-	-	-	0.1	-	0.0	-	-
Cyprinidae	-	2.3	-	0.1	-	41.7	-	62.5
Carp	-	1.5	37.0	-	-	1.5	-	1.4
Catostomidae	-	0.4	48.1	0.2	40.6	0.4	2.0	-
Channel catfish	-	91.6	-	-	-	-	0.5	-
Tadpole madtom	-	0.8	-	-	-	-	-	-
White bass	-	-	-	0.7	5.5	0.1	5.4	0.2
Lepomis sp.	-	0.4	-	-	-	-	-	0.0
Pomoxis sp.	-	0.4	3.7	0.0	-	0.1	-	0.2
Percidae	3.5	0.4	11.1	0.5	46.7	0.1	1.0	-
Sauger	-	-	-	-	2.4	-	-	-
Walleye	67.4	-	-	-	1.2	-	-	-
Stizostedion sp.	5.8	-	-	-	-	-	-	-
Freshwater drum	-	1.9	-	19.8	-	51.6	3.9	20.1
Unidentified larvae	4.7	-	-	0.1	-	0.6	5.9	0.1
Eggs	18.6	-	-	78.1	-	1.5	79.0	13.1

Table 3-5. Pearson Correlations (r) Determined for Environmental and Operational Parameters Measured from the Initiation of Sampling to the Inflection Point (IP) and to the Annual Peak (AP) for 1984 to 1989 Impingement Sampling Dates

	IP Temp	IP Flow	IP Stage	IP Blowdown	IP % Flow
IP Temp	–	0.011	0.148	0.467***	0.348**
IP Flow	–	–	0.958***	(0.055)	(0.710)***
IP Stage	–	–	–	0.024	(0.556)***
IP Blowdown	–	–	–	–	0.604***

	AP Temp	AP Flow	AP Stage	AP Blowdown	AP % Flow
AP Temp	–	(0.141)	(0.027)	0.679***	0.495***
AP Flow	–	–	0.933***	(0.048)	(0.628)***
AP Stage	–	–	–	0.051	(0.388)***
AP Blowdown	–	–	–	–	0.567***

( ) = negative value
* $p<0.05$
** $p<0.01$
*** $p<0.001$

Table 3-6. Multiple Regression Results for Day Density Intervals Relative to Environmental Parameters

	R^2	F-value Temp	F-value Flow	F-value Blowdown	F-value % Flow
Interval A	0.546	8.26**	10.67**	0.08	11.09**
Interval B	0.479	9.23**	6.45*	0.21	7.13*
Interval C	0.289	6.27*	2.36	0.94	0.58
Interval D	0.556	17.32***	12.41**	0.20	0.10
Interval E	0.429	3.98	4.40*	0.02	9.64**
Interval F	0.354	4.62*	0.24	7.04*	1.24

* $P<0.05$
** $P<0.01$
*** $P<0.001$

Table 3-7. Multiple Regression Results for Night Density Intervals Relative to Environmental Parameters

	R^2	F-value Temp	F-value Flow	F-value Blowdown	F-value % Flow
Interval A	0.573	18.54***	0.02	0.63	0.93
Interval B	0.419	4.90*	0.20	4.94*	0.76
Interval C	0.153	2.14	0.07	0.01	0.49
Interval D	0.586	17.27***	0.28	0.01	3.67
Interval E	0.757	18.38***	2.60	13.20**	9.42**
Interval F	0.477	4.27	4.65*	2.39	1.44

* $P<0.05$
** $P<0.01$
*** $P<0.001$

Table 3-8. Multiple Regression Results for Walleye/Sauger Day Density Intervals Relative to Environmental Parameters.

	R^2	F-value Temp	F-value Flow	F-value Blowdown	F-value % Flow
Interval A	0.319	8.31**	2.18	0.92	0.30
Interval B	0..283	4.65*	3.39	0.68	1.13
Interval C	0.207	0.11	3.28	0.33	2.31
Interval D	0.186	1.23	1.26	0.93	1.84
Interval E	0.159	0.16	2.54	0.09	1.72
Interval F	0.173	0.28	3.82	0.63	0.07

* $P<0.05$
** $P<0.01$
*** $P<0.001$

Table 3-9. Multiple Regression Results for Burbot Day Density Intervals Relative to Environmental Parameters.

	R^2	F-value Temp	F-value Flow	F-value Blowdown	F-value % Flow
Interval A	0.466	3.99	27.86***	1.46	6.01*
Interval B	0.255	0.69	12.93***	0.68	0.75
Interval C	0.244	0.66	5.39*	5.97*	2.19
Interval D	0.339	2.89	10.07**	9.23**	0.93
Interval E	0.353	1.69	9.63**	12.91***	0.29
Interval F	0.418	4.47*	4.34*	19.98***	3.54

* $P<0.05$
** $P<0.01$
*** $P<0.001$

Table 4-1. Comparison of Annual Dates and Temperatures when Sustained Temperatures of 47F Were Measured at the Intake, 20 Days Thereafter, Selected Inflection Points, and The Date Sustained Temperatures of 55F Were Measured.

	47F Date	Density	20 Day Date and Temperature	Mean Density 20 Days	Inflection Point and Temperature	55F Date
1984	4-15	0.08	5-5(54.0)	1.03	5-2(50.0)	5-11
1985	4-11	-	5-1(60.2)	2.63	5-3(62.3)	4-18
1986	4-1	-	4-21(53.8)	0.00	5-5(63.9)	4-23
1987	3-24	-	4-13(57.0)	0.31	5-4(62.3)	4-13
1988	4-7	0.17	4-27(47.9)	0.17	5-20(64.6)	4-30
1989	4-15	0.00	5-5(51.3)	0.27	5-17(67.9)	5-9
1990	4-14	-	5-4(59.5)	-	-	4-22
1992	4-29	0.00	5-19(64.1)	-	-	5-1
1993	4-21	0.00	5-11(63.9)	-	-	4-29
1994	4-14	0.00	5-4 (53.5)	-	-	5-9
1995	4-25	0.16	5-15(58.3)	-	-	5-6
1996	4-21	0.00	5-11	-	-	-

Sources: ESE, 1996.
NSP, 1984-1990, 1992-1996.

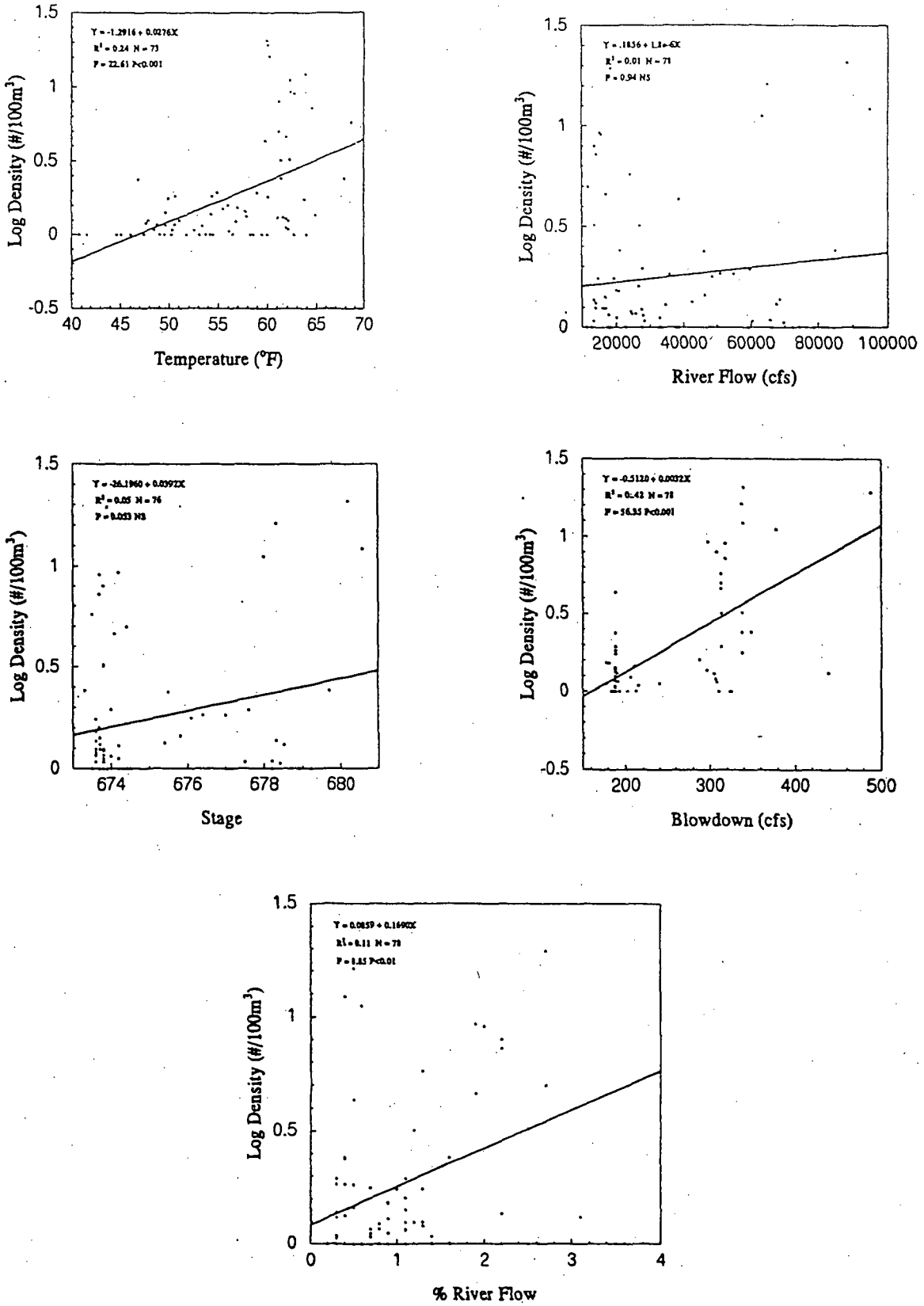
45,000 cfs 2 scans 10 min sample

1,274.4
12.74 fish/sample = .75 fish/100 m^3

Table 4-2. Catch Per Unit Effort (CPE, #fish/hour) of Walleye, Sauger, and Burbot Collected During NSP Electrofishing Surveys Within the Vicinity of the Prairie-Island Nuclear Generating Plant 1984-1990, 1992-1995.

	SECTOR			
	1	2	3	4
1995	CPE	CPE	CPE	CPE
Walleye	2.81	1.09	4.96	1.67
Sauger	2.60	1.86	12.00	6.73
Burbot	0.07	0.31	1.04	0.07
1994				
Walleye	1.50	1.53	3.14	2.26
Sauger	3.47	2.84	6.42	3.90
Burbot	0.09	0.00	0.14	0.00
1993				
Walleye	1.39	1.46	2.59	2.64
Sauger	5.36	2.92	9.31	5.29
Burbot	0.00	0.00	0.52	0.00
1992				
Walleye	1.82	2.10	2.84	2.55
Sauger	4.71	3.85	6.42	6.00
Burbot	0.00	0.18	0.00	0.00
1990				
Walleye	1.74	0.68	3.98	3.04
Sauger	1.06	0.34	4.27	3.50
Burbot	0.00	0.00	0.00	0.00
1989				
Walleye	3.38	1.31	5.80	6.29
Sauger	1.43	0.33	5.51	3.54
Burbot	0.00	0.00	0.00	0.00
1988				
Walleye	3.69	0.98	11.03	7.50
Sauger	0.74	0.00	5.37	2.32
Burbot	0.00	0.00	0.00	0.00
1987				
Walleye	2.30	2.32	4.01	3.41
Sauger	1.23	1.60	3.15	3.48
Burbot	0.15	0.00	0.00	0.00
1986				
Walleye	1.68	2.75	2.95	0.57
Sauger	3.67	4.46	4.04	0.98
Burbot	0.00	0.00	0.00	0.00
1985				
Walleye	2.18	2.65	3.10	2.61
Sauger	4.68	5.30	5.46	2.84
Burbot	0.00	0.00	0.00	0.00
1984				
Walleye	1.44	0.92	3.37	2.41
Sauger	3.45	3.68	4.74	4.42
Burbot	0.16	-	0.15	-
MEAN				
Walleye	2.18	1.62	4.34	3.18
Sauger	2.95	2.47	6.06	3.91
Burbot	0.04	0.05	0.17	0.01

Source: NSP, 1984-1990, 1992-1995.



B15886113NORTH.STA.PWR

Figure 3-1
LINEAR REGRESSIONS OF LARVAL DAY DENSITY (INFLECTION POINT) VS. TEMPERATURE, RIVER FLOW, STAGE, BLOWDOWN, AND PERCENT RIVER FLOW.

ESE Environmental Science & Engineering, Inc.
A CH2M HILL Company

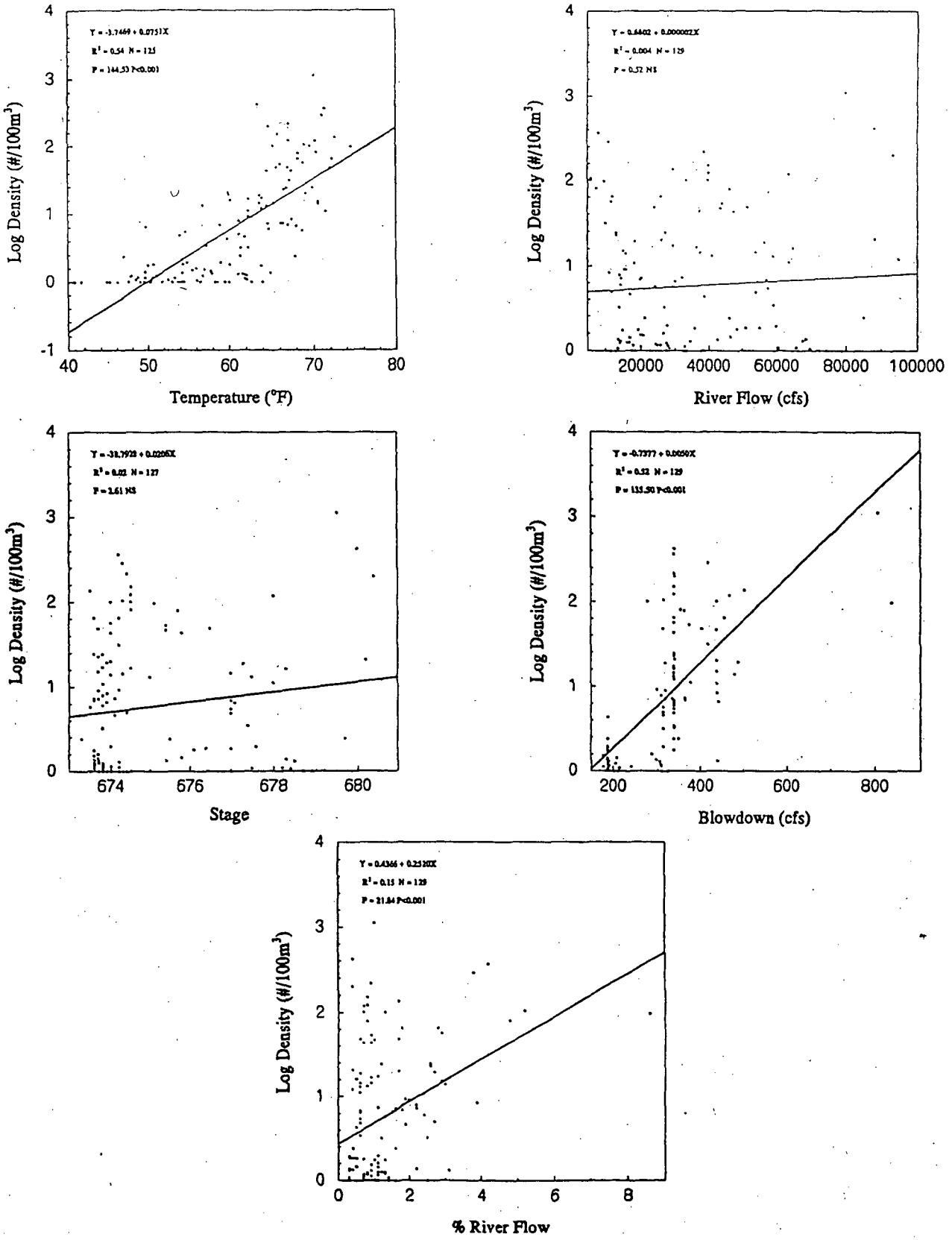


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Figure 3-2
LINEAR REGRESSIONS OF LARVAL DAY DENSITY (ANNUAL PEAK) VS. TEMPERATURE, RIVER FLOW, STAGE, BLOWDOWN, AND PERCENT RIVER FLOW.

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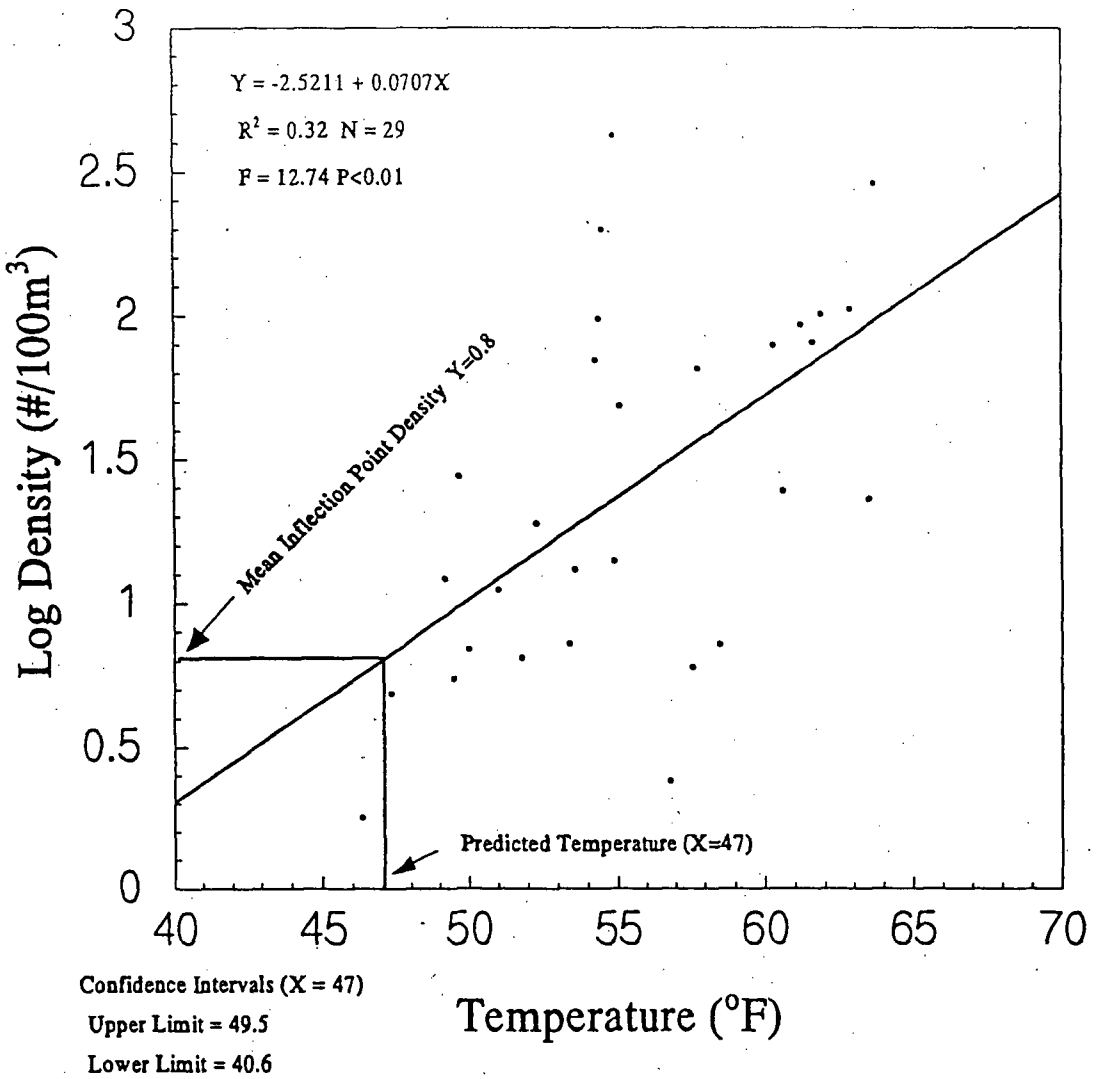

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Figure 3-3
LINEAR REGRESSIONS OF INTERVAL "D" TEMPERATURE AND LARVAL DAY DENSITY

ESE Environmental Science & Engineering, Inc.
A CH2M HILL Company

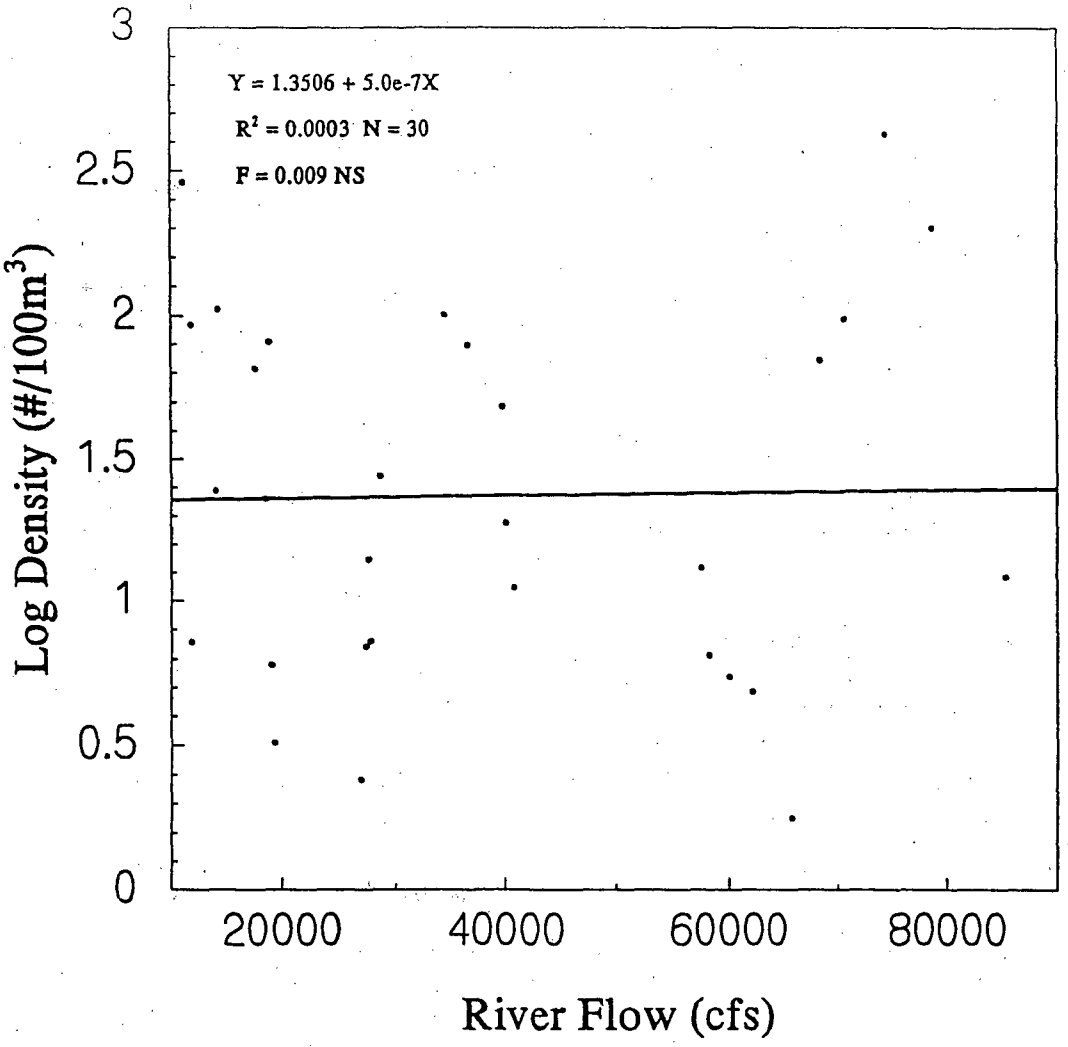

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Figure 3-4
LINEAR REGRESSIONS OF INTERVAL "D" FLOW AND LARVAL DAY DENSITY

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A CILCORP Company
Environmental Science & Engineering, Inc.

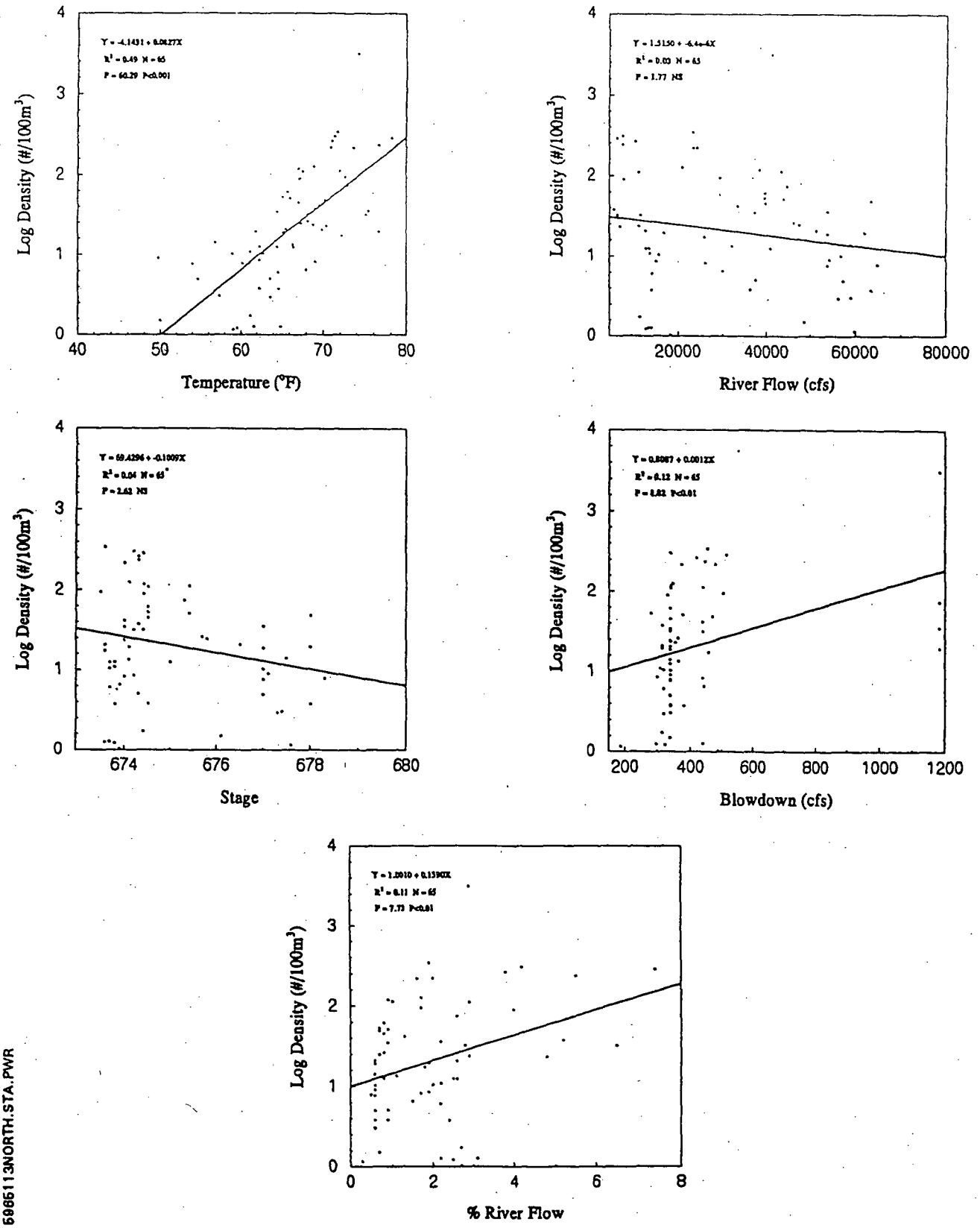

Figure 3-5
LINEAR REGRESSIONS OF LARVAL NIGHT DENSITY (ANNUAL PEAK) VS. TEMPERATURE, RIVER FLOW, STAGE, BLOWDOWN, AND PERCENT RIVER FLOW.

Environmental Science & Engineering, Inc.

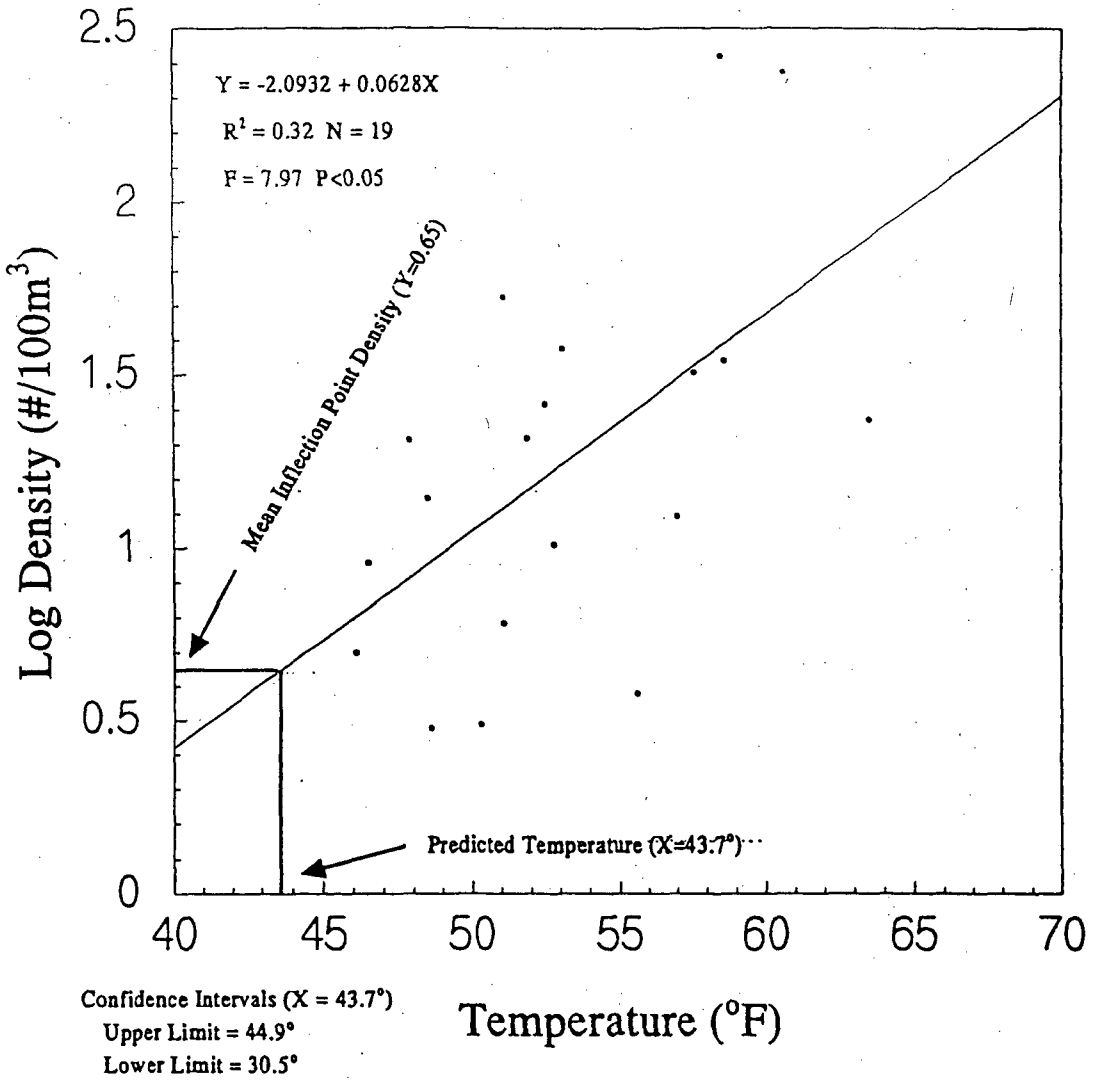

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Figure 3-6
LINEAR REGRESSIONS OF INTERVAL "E" TEMPERATURE AND LARVAL NIGHT DENSITY

ESE Environmental Science & Engineering, Inc.
A CH2M HILL Company

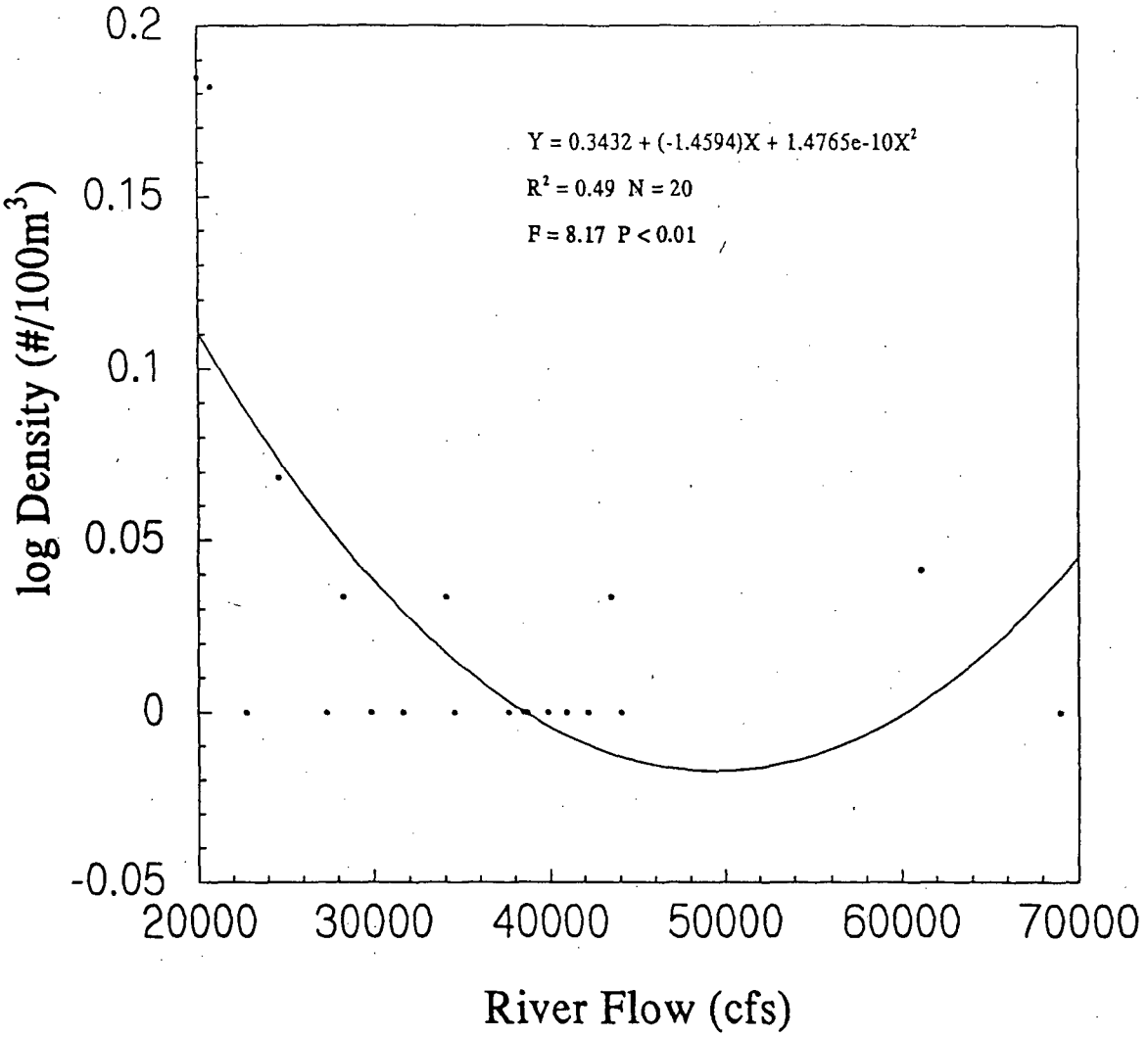

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Figure 3-7
QUADRATIC REGRESSION OF APRIL 8-14 INTERVAL FOR TOTAL LOG DENSITY VS. RIVER FLOW.

ESE Environmental Science & Engineering, Inc.
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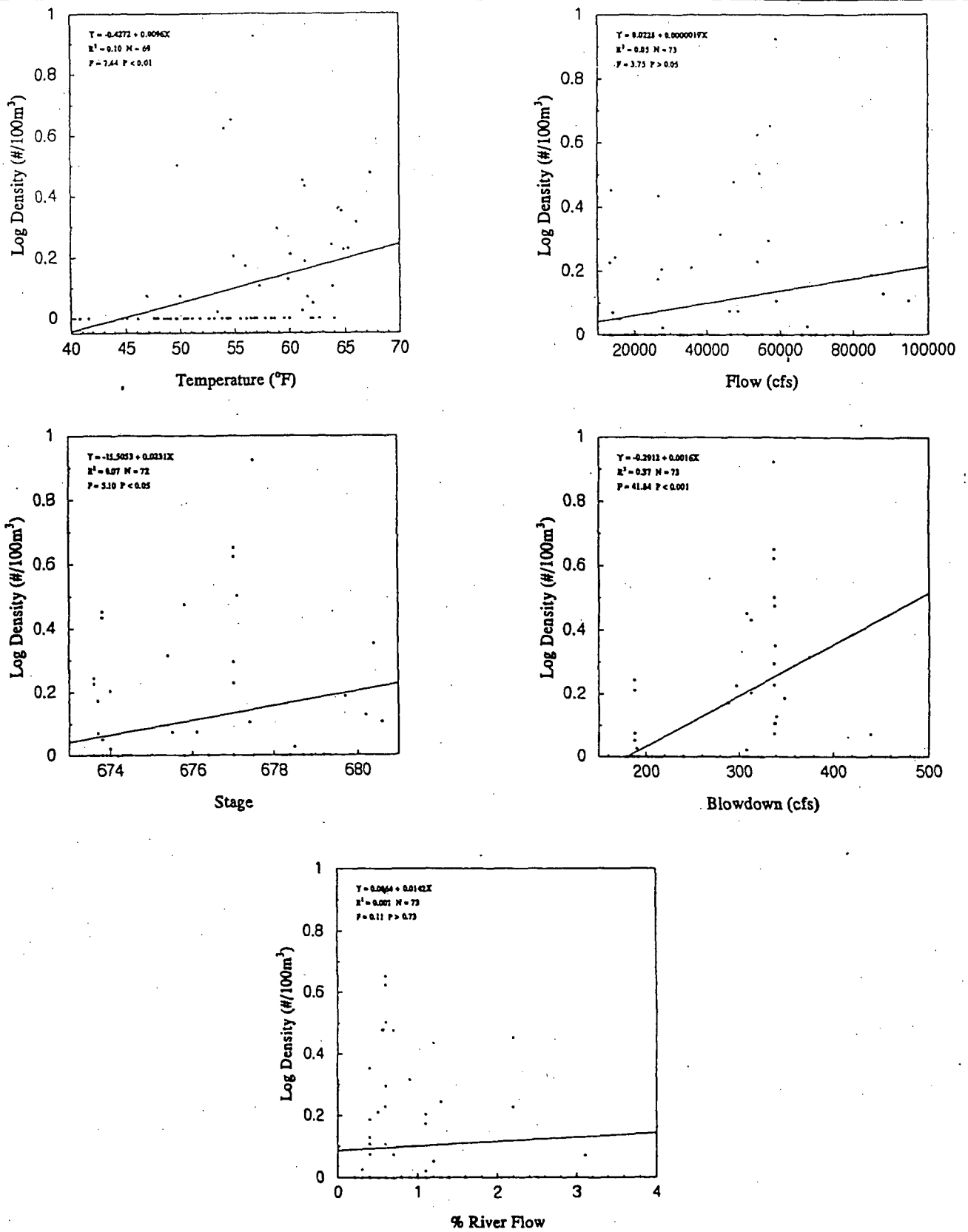

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Figure 3-8
LINEAR REGRESSIONS OF WALLEYE/SAUGER DENSITY VS. TEMPERATURE, RIVER FLOW, STAGE, BLOWDOWN AND PERCENT RIVER FLOW.

ESE Environmental Science & Engineering, Inc.
A CH2M HILL Company

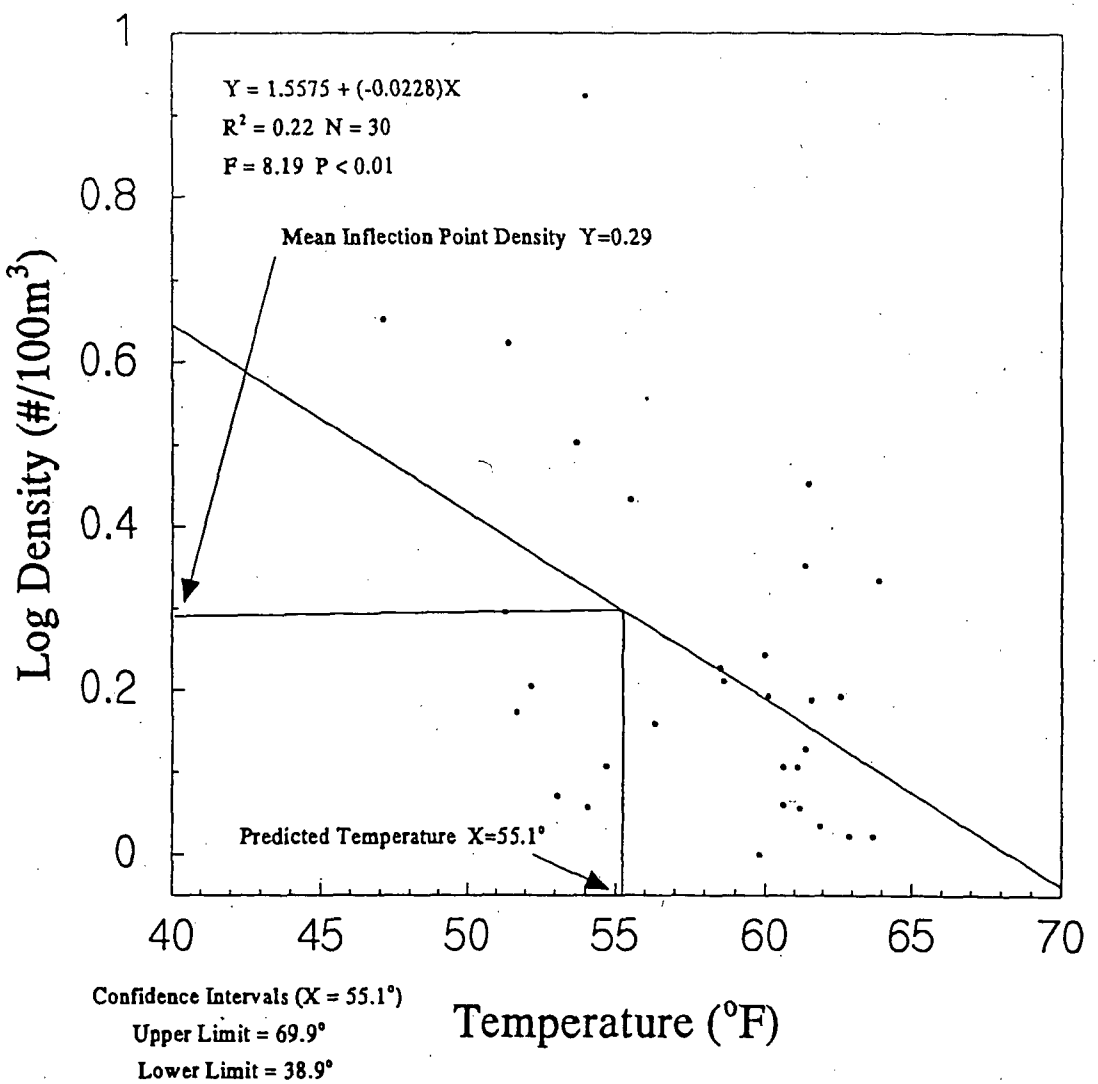

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Figure 3-9
LINEAR REGRESSIONS OF INTERVAL "A" TEMPERATURE AND WALLEYE DENSITY.

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A CLCORP Company

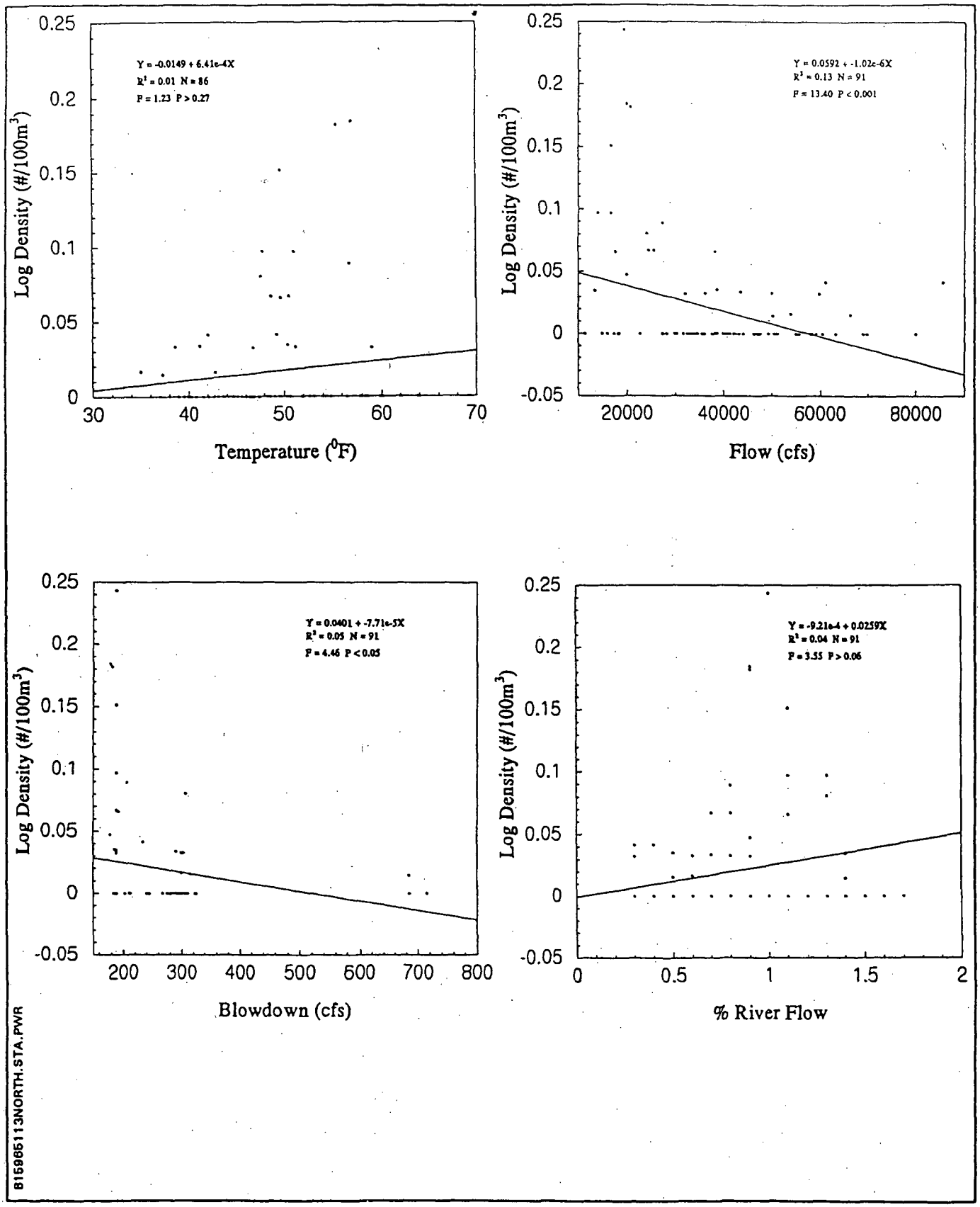

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Figure 3-10
LINEAR REGRESSIONS OF BURBOT DENSITY VS. TEMPERATURE, RIVER FLOW, BLOWDOWN, AND PERCENT RIVER FLOW.

ESE Environmental Science & Engineering, Inc.
A CLCORP Company

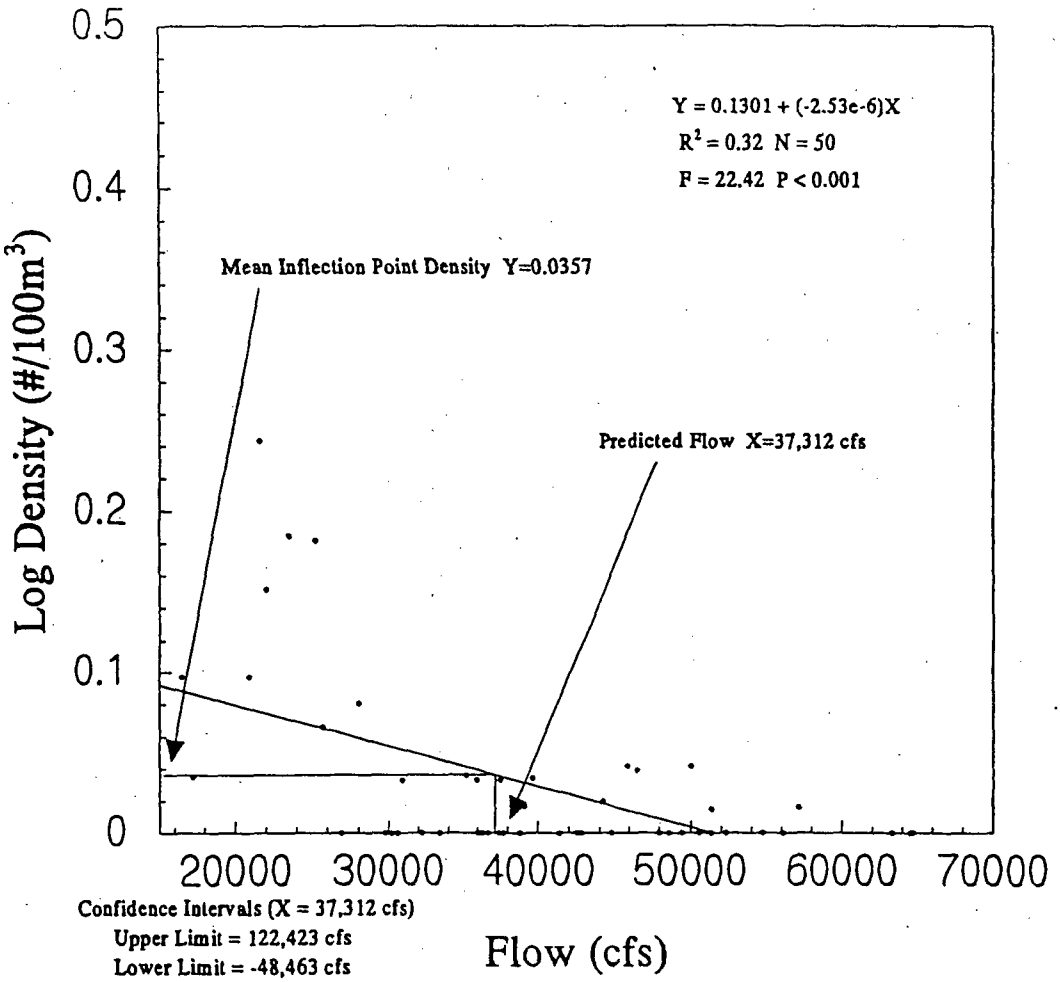

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Figure 3-11
LINEAR REGRESSIONS OF INTERVAL "A" FLOW AND BURBOT DENSITY

ESE Environmental Science & Engineering, Inc.
A CLCORP Company

Appendix A

Density, Environmental and Operational Data

Table A-1. 1984 Sampling Dates, Total Impingement Densities, Environmental, and Operational Data.

Date	Day Density	Night Density	River Temp.	River Flow	River Stage	Blowdown	% River Flow
4-16	0.08	-	48.5	60,500	677.5	188	0.3
4-18	0.00	-	50.3	59,200	677.0	188	0.3
4-23	0.84	-	50.7	55,000	677.0	188	0.3
4-25	0.84	-	54.4	51,000	676.4	188	0.4
4-27	0.45	-	57.8	46,500	675.8	210	0.5
4-30	1.38	-	46.9	46,200	675.5	188	0.4
5-2	0.78	0.51	50.0	48,500	676.1	338	0.7
5-4	3.86	6.69	54.0	54,000	677.0	338	0.6
5-7	4.46	4.00	54.7	57,500	677.0	338	0.6
5-9	5.48	8.08	49.8	54,500	677.1	338	0.6
5-11	12.12	13.04	56.8	59,000	677.5	338	0.6
5-14	2.42	2.08	57.3	59,000	677.4	338	0.6
5-16	5.90	9.28	58.9	57,000	677.0	338	0.6
5-18	13.56	17.82	65.3	54,000	677.0	338	0.6
5-21	42.22	23.64	67.4	47,500	675.8	338	0.7
5-23	52.42	50.42	66.1	44,000	675.4	375	0.9
5-25	12.26	11.56	64.5	41,000	675.0	338	0.8
5-28	13.52	4.10	63.6	37,500	674.3	338	0.9
5-30	6.34	12.46	66.4	32,106	674.1	363	1.1
6-1	5.64	5.54	68.0	30,040	673.9	442	1.5
6-4	19.18	7.26	69.1	26,010	674.0	438	1.7
6-6	63.86	16.32	72.2	25,830	673.6	456	1.8
6-8	134.22	93.70	72.6	29,342	673.5	503	1.7
6-11	99.32	40.64	69.6	33,385	674.0	438	1.3
6-13	46.00	111.80	72.0	43,500	675.4	438	1.0
6-15	117.30	47.58	70.3	63,500	678.0	468	0.7
6-18	1118.76	0.00	70.1	79,900	679.5	808	1.0
6-20	231.62	0.00	71.6	79,900	679.4	808	1.0
6-22	36.76	0.00	73.0	79,000	679.4	836	1.1
6-25	25.56	0.00	73.5	78,200	679.3	838	1.1
6-27	34.56	0.00	73.9	75,500	679.0	838	1.1
6-29	79.92	0.00	75.4	73,500	678.6	838	1.1
7-2	97.14	0.00	76.4	65,800	678.5	1187	1.8
7-4	50.34	18.70	76.7	62,000	678.0	1183	1.9
7-6	24.48	34.42	75.4	54,000	677.0	1183	2.2
7-9	54.92	73.62	72.9	44,700	675.3	1183	2.6
7-11	112.24	3112.58	74.2	41,400	674.9	1183	2.9
7-13	437.78	1682.14	77.5	37,800	674.9	1183	3.1
7-16	267.84	1580.78	76.0	33,480	674.0	1183	3.5
7-18	440.50	223.66	74.2	32,448	673.4	1183	3.6
7-20	671.40	502.64	77.0	31,046	673.4	1183	3.8
7-23	173.12	228.38	78.8	26,809	673.8	1183	4.4
7-25	44.58	104.30	78.7	23,348	673.8	1183	5.1
7-27	11.94	12.10	78.3	21,822	673.3	1183	5.4
7-30	24.28	63.32	77.5	16,492	673.3	1183	7.2
8-1	19.90	37.02	76.9	15,300	673.3	1183	7.7
8-3	32.64	19.70	78.4	16,025	674.0	1183	7.4
8-6	16.72	82.02	80.3	13,760	673.5	1183	8.6
8-8	25.86	31.68	79.4	21,293	673.5	1183	5.6
8-10	12.14	14.74	78.7	22,134	673.5	1183	5.3
8-13	12.84	50.88	77.5	16,354	673.7	1183	7.2
8-15	9.84	39.30	79.4	14,344	673.7	1183	8.2
8-17	24.48	30.52	80.1	13,200	673.8	1183	9.0
8-20	50.74	34.76	78.5	11,024	673.8	1183	10.7
8-22	19.70	71.20	75.0	7,460	674.0	1183	15.6
8-24	12.54	76.64	73.7	8,994	674.5	1183	13.2
8-27	32.22	81.98	75.1	9,607	674.5	1183	12.3
8-29	237.58	195.30	77.5	11,480	674.5	1183	10.3
8-31	532.48	130.44	73.1	8,556	674.5	1183	13.8

Table A-2. 1985 Sampling Dates, Total Impingement Densities, Environmental, and Operational Data.

Date	Day Density	Night Density	River Temp.	River Flow	River Stage	Blowdown	% River Flow
4-19	0.00	-	58.6	38,400	674.5	325	0.8
4-22	0.30	-	61.9	34,500	674.2	305	0.9
4-23	0.12	-	61.9	32,800	674.2	240	0.7
4-24	0.83	-	60.1	35900	-	188	0.5
4-25	3.34	-	59.8	38,700	-	188	0.5
4-26	0.34	-	57.9	42,500	675.4	188	0.4
4-29	0.94	0.16	59.0	59,800	677.6	188	0.3
5-1	15.18	6.92	60.2	64,800	678.3	338	0.5
5-3	10.16	2.80	62.3	63,500	678.0	378	0.6
5-6	17.84	2.00	63.6	56,400	677.3	318	0.6
5-8	47.54	19.86	65.6	51,500	676.5	313	0.6
5-10	77.78	25.14	68.2	46,200	675.7	362	0.8
5-13	99.64	52.00	65.2	39,700	674.5	278	0.7
5-15	42.28	33.62	64.5	37,300	674.0	338	0.9
5-17	15.74	2.86	62.3	36,400	674.5	338	0.9
5-20	149.32	60.58	65.8	39,800	674.5	338	0.8
5-22	121.40	44.36	67.1	39,900	674.5	338	0.8
5-24	216.40	117.56	67.1	38,500	674.4	338	0.9
5-29	133.02	62.12	67.0	31,700	674.0	338	1.1
5-31	35.24	33.00	67.4	29,950	674.0	338	1.1
6-3	15.16	19.80	64.9	33,500	673.6	466	1.4
6-5	59.34	90.84	65.7	35,100	674.0	438	1.2
6-7	53.20	106.96	67.9	33,600	-	438	1.3
6-10	88.14	63.74	68.8	32,600	-	438	1.3
6-12	41.76	32.86	66.9	30,100	673.8	434	1.4
6-14	12.04	26.14	68.0	29,124	673.5	434	1.5
6-17	17.42	12.52	67.9	29,106	673.8	838	2.9
6-19	5.16	6.80	67.9	29,580	673.8	838	2.8
6-21	58.76	50.56	69.5	28,200	673.7	838	3
6-24	9.26	11.42	71.8	26,700	673.8	838	3.1
6-26	75.80	50.18	74.8	22,800	673.9	838	3.7
6-28	29.16	13.28	73.4	28,300	674.0	838	3
7-1	6.74	34.72	74.6	35,500	674.0	1128	3.2
7-3	19.48	18.38	75.3	34,400	673.8	1188	3.5
7-5	11.50	15.78	74.8	34,800	673.8	1188	3.4
7-8	2.58	5.28	77.8	33,295	674.0	1188	3.6
7-10	5.36	5.32	78.1	31,500	673.6	1188	3.8
7-12	4.76	8.32	77.8	27,591	673.3	1188	4.3
7-15	7.44	18.00	77.2	22,100	673.4	1188	5.4
7-17	10.26	14.90	77.0	20,100	-	1188	5.9
7-19	6.98	9.36	77.3	18,300	673.8	1118	6.5
7-22	0.00	64.60	77.1	18,800	673.8	1188	6.3
7-24	5.98	5.28	74.5	18,600	673.8	1188	6.4
7-26	1.42	2.94	76.3	23,606	673.6	1188	5
7-29	0.00	17.84	76.4	21,300	673.5	1188	5.6
7-31	5.00	4.64	73.7	21,700	674.0	1188	5.5
8-2	1.22	3.24	75.9	20,300	673.7	1150	5.7
8-5	3.16	8.56	73.6	18,250	673.4	1150	6.3
8-7	0.00	17.36	76.1	16,900	673.6	1150	6.8
8-9	1.68	3.32	74.8	14,400	673.4	1150	8
8-12	1.14	4.58	71.6	14,100	673.4	1150	8.2
8-14	1.72	6.30	72.5	20,800	673.8	1150	5.5
8-16	2.28	2.28	72.9	20,100	673.6	1150	5.7
8-19	1.76	10.60	68.9	21,300	673.8	1150	5.4
8-21	1.40	1.96	68.5	19,400	673.6	1150	5.9
8-23	0.78	4.46	68.0	18,000	673.5	1150	6.4
8-26	0.90	3.20	69.4	17,000	673.6	1150	6.8
8-28	0.84	1.22	70.2	15,700	674.5	1150	7.3

Table A-3. 1986 Sampling Dates, Total Impingement Densities, Environmental, and Operational Data.

Date	Day Density	Night Density	River Temp.	River Flow	River Stage	Blowdown	% River Flow
4-18	0.00	-	54.5	78700	679.2	188	0.2
4-21	0.00	-	53.8	72300	678.7	188	0.3
4-23	0.06	-	56.1	69600	678.4	188	0.3
4-24	0.38	-	54.3	68400	678.3	188	0.3
4-25	0.00	-	58.3	66100	678.2	188	0.3
4-28	0.09	-	62.1	65700	678.2	215	0.3
4-29	0.31	-	61.1	67500	678.5	190	0.3
4-30	0.00	-	62.7	74400	678.9	193	0.3
5-1	1.42	-	61.4	85000	679.7	349	0.4
5-2	19.73	-	59.9	88200	680.2	340	0.4
5-5	11.18	-	63.9	94800	680.6	339	0.4
5-7	198.46	-	64.7	93300	680.4	339	0.4
5-9	422.06	-	63.4	88100	680.0	339	0.4
5-12	96.29	-	63.6	84200	679.7	339	0.4
5-14	68.98	-	65.2	89600	681.2	339	0.4
5-16	175.92	-	66.5	97600	680.9	339	0.3
5-19	14.12	-	66.5	95500	680.6	339	0.4
5-21	3.47	-	67.1	85900	679.7	339	0.4
5-23	14.30	-	68.1	74500	678.7	339	0.5
5-27	7.16	1.52	70.3	56900	677.2	339	0.6
5-30	73.06	46.46	75.8	49600	676.2	379	0.8
6-2	143.64	28.74	74.5	42800	675.0	413	1.0
6-4	52.76	17.92	74.5	39700	674.4	431	1.1
6-6	63.06	91.26	73.9	36700	673.9	438	1.2
6-9	205.42	243.76	75.2	33050	673.8	445	1.3
6-11	116.92	280.20	73.3	32300	673.8	453	1.4
6-13	62.46	39.60	73.1	33300	673.8	438	1.3
6-16	107.80	158.90	75.5	35700	674.3	761	2.1
6-18	45.88	40.26	76.9	33800	673.7	838	2.5
6-20	48.98	47.66	81.1	33700	673.9	838	2.5
6-23	12.26	23.78	79.3	35700	674.2	838	2.3
6-25	20.46	22.48	77.5	40000	674.9	838	2.1
6-27	16.20	21.36	79.7	43200	675.3	838	1.9
6-30	108.16	49.62	76.9	45000	675.4	838	1.9
7-2	10.10	27.92	76.0	44000	675.4	1158	2.6
7-7	18.98	5.82	82.4	36200	673.8	1158	3.2
7-9	6.34	10.50	81.6	32500	673.6	1158	3.6
7-11	4.96	11.86	79.3	29700	673.6	1158	3.9
7-14	3.26	4.00	78.0	30400	673.8	1158	3.8
7-16	1.24	0.86	79.4	31500	674.0	1363	4.3
7-18	1.18	4.50	84.3	33400	673.9	1188	3.6
7-21	1.18	0.80	82.9	35300	674.5	1188	3.3
7-23	1.78	1.58	83.7	35000	674.7	1188	3.4
7-25	1.82	1.32	83.5	35100	674.4	1188	3.4
7-28	2.08	2.14	79.6	33500	674.2	1188	3.5
7-30	1.18	3.10	83.1	32700	674.2	1188	3.6
8-1	0.24	0.72	82.2	34800	674.2	1188	3.4
8-4	0.94	1.04	79.8	32400	674.0	1188	3.7
8-6	1.00	1.12	80.2	30800	673.9	1188	3.9
8-8	0.66	0.60	79.7	29900	674.0	1188	4.0
8-11	0.40	0.40	77.4	32000	674.0	1188	3.7
8-13	1.00	0.44	75.4	31400	674.0	1188	3.8
8-15	0.48	0.44	77.4	31900	673.7	1188	3.7
8-18	0.76	0.88	79.1	30000	674.1	1188	4.0
8-20	0.60	0.48	77.5	29200	674.0	1188	4.1
8-22	0.60	0.60	74.3	27900	673.6	1188	4.3
8-29	0.52	0.40	61.3	30210	673.8	1158	3.8

Table A-4. 1987 Sampling Dates, Total Impingement Densities, Environmental, and Operational Data.

Date	Day Density	Night Density	River Temp.	River Flow	River Stage	Blowdown	% River Flow
4-6	0.20	-	47.7	24,200	673.6	307	1.3
4-8	0.00	-	51.8	22,800	673.5	212	0.9
4-10	0.52	-	55.5	20,800	673.6	181	0.9
4-13	0.53	-	57.0	20,000	673.6	178	0.9
4-15	0.75	-	-	19,300	673.6	188	1.0
4-16	0.12	-	-	20,000	673.8	178	0.9
4-20	0.00	-	64.0	18,400	673.8	188	1.0
4-22	0.00	-	58.3	18,200	673.7	188	1.0
4-24	0.00	-	60.0	17,400	673.7	188	1.1
4-27	0.25	-	62.1	16,000	673.8	188	1.2
4-29	0.75	-	63.8	14,900	673.6	188	1.3
5-1	6.96	9.83	61.2	13,900	673.8	308	2.2
5-4	2.23	11.49	62.3	13,700	673.8	338	2.5
5-6	5.02	2.79	64.7	14,300	673.8	338	2.4
5-8	21.87	11.42	66.5	13,000	673.7	338	2.6
5-11	79.89	22.14	70.4	7,400	674.5	353	4.8
5-13	64.28	31.13	68.2	11,900	674.2	338	2.8
5-15	55.51	22.57	68.8	11,600	674.0	338	2.9
5-18	364.15	302.82	71.4	8,100	674.2	338	4.2
5-20	124.81	88.83	67.2	8,200	674.4	329	4.0
5-22	238.59	108.95	67.6	11,500	674.5	338	2.9
5-27	57.32	125.00	68.9	20,900	674.1	345	1.7
5-29	105.71	217.51	70.9	23,300	674.0	371	1.6
6-1	124.50	217.38	73.6	24,200	674.0	478	2.0
6-3	135.74	340.75	71.7	23,300	673.6	453	1.9
6-5	37.25	77.90	72.9	22,200	673.8	459	2.1
6-8	67.19	62.20	76.6	20,500	673.3	759	3.7
6-10	49.48	57.16	72.8	17,600	673.6	671	3.8
6-12	60.94	77.59	74.5	15,300	673.7	703	4.6
6-17	31.73	77.96	-	9,800	674.0	1023	10.4
6-19	46.59	68.21	-	8,900	674.4	1008	11.3
6-24	18.93	26.35	80.9	7,400	674.3	1034	14.0
6-26	8.58	49.71	76.9	11,100	674.5	982	8.8
6-29	75.23	20.71	76.5	8,800	674.4	1093	12.4
7-1	23.47	97.20	78.0	10,600	674.1	1213	11.4
7-6	8.46	15.71	76.5	9,900	674.8	1183	11.9
7-8	21.31	10.59	79.0	8,900	674.6	1183	13.3
7-10	7.30	6.02	81.1	8,100	674.4	1163	14.4
7-13	4.13	5.98	77.1	7,700	674.5	1088	14.1
7-15	1.95	3.91	77.4	7,700	674.4	1118	14.5
7-17	4.18	8.43	78.3	8,400	674.5	1163	13.8
7-20	6.23	6.73	82.2	11,900	674.4	1163	9.8
7-22	6.84	10.38	83.0	12,600	674.7	1163	9.2
7-24	3.93	9.74	81.3	22,700	674.7	1163	5.1
7-27	5.96	5.19	82.0	20,400	674.0	1168	5.7
7-29	2.15	4.44	82.0	19,400	673.8	1438	7.4
7-31	1.92	2.75	84.9	14,500	673.6	1288	8.9
8-3	1.70	0.76	85.9	15,200	673.5	1191	7.8
8-5	3.33	3.61	80.1	12,000	673.8	1188	9.9
8-7	1.11	1.98	79.4	10,200	674.3	1188	11.6
8-10	1.98	2.81	79.1	14,500	674.3	1188	8.2
8-12	1.18	1.11	79.0	8,500	674.0	1188	14.0
8-14	0.66	0.10	76.4	8,300	674.6	1188	14.3
8-17	1.53	1.73	78.0	13,100	674.6	1188	9.1
8-19	1.14	0.80	-	11,400	674.6	1188	10.4
8-21	0.45	1.18	-	8,200	674.4	1188	14.5
8-24	0.28	0.47	-	7,800	674.8	1149	14.7
8-26	0.64	0.89	-	9,700	674.4	1163	12.0
8-28	0.36	1.12	70.8	7,500	674.5	1138	15.2
8-31	0.94	0.47	70.4	10,500	674.5	1138	10.8
9-2	0.69	1.12	71.2	5,500	674.5	1138	20.7

Table A-5. 1988 Sampling Dates, Total Impingement Densities, Environmental, and Operational Data.

Date	Day Density	Night Density	River Temp.	River Flow	River Stage	Blowdown	% River Flow
4-8	0.17	-	50.6	24,600	673.8	188	0.8
4-11	0.00	-	49.6	27,400	673.8	188	0.7
4-13	0.08	-	52.6	28,300	673.8	188	0.7
4-15	0.17	-	48.8	25,700	673.8	188	0.7
4-18	0.00	-	47.5	22,800	673.7	310	1.4
4-20	0.16	-	49.7	17,700	673.6	191	1.1
4-22	0.42	-	49.7	16,800	673.7	188	1.1
4-25	0.25	-	51.1	16,700	673.6	188	1.1
4-27	0.25	-	47.9	14,000	673.7	188	1.3
4-28	0.08	-	50.4	13,500	673.6	188	1.4
4-29	0.00	-	53.1	11,500	673.7	188	1.6
5-2	0.00	0.22	59.5	12,900	673.8	323	2.5
5-4	0.32	0.27	61.6	14,100	673.7	439	3.1
5-6	0.37	0.26	64.9	13,500	673.6	297	2.2
5-9	3.99	0.73	61.2	11,800	674.4	313	2.7
5-11	8.29	7.61	62.3	15,300	674.2	298	1.9
5-13	3.61	18.38	61.9	16,900	674.1	313	1.9
5-16	18.36	0.03	60.0	18,300	673.9	488	2.7
5-18	8.09	9.45	62.7	15,800	673.7	318	2.0
5-20	6.24	5.08	64.6	14,400	673.7	318	2.2
5-23	23.52	19.64	69.9	13,000	673.6	338	2.6
5-25	104.51	36.44	69.0	6,000	674.3	314	5.2
5-27	287.78	261.62	71.1	10,900	674.3	418	3.8
6-1	91.95	236.72	76.7	8,100	674.3	445	5.5
6-3	223.85	30.87	75.1	6,800	674.4	439	6.5
6-6	19.32	285.61	78.2	6,900	674.4	513	7.4
6-8	10.62	76.82	79.5	5,400	674.5	531	9.8
6-10	5.74	75.24	75.5	4,600	674.5	418	9.1
6-13	2.95	17.80	76.0	3,900	674.5	447	11.5
6-15	12.45	47.26	76.9	3,200	674.7	518	16.2
6-17	4.94	22.92	76.5	4,400	674.6	838	19.0
6-20	3.37	14.78	79.8	4,300	674.6	838	19.5
6-22	37.76	-	79.6	3,600	674.7	838	23.3
6-24	1.78	-	78.3	3,000	674.4	848	28.3
6-27	9.89	-	78.8	3,400	675.1	838	24.6
6-29	3.15	-	76.6	3,400	674.8	838	24.6
7-1	3.02	-	74.9	3,700	674.7	1120	30.3
7-6	3.69	-	79.1	2,800	674.5	1098	39.2
7-8	1.53	4.14	82.0	2,800	674.8	1138	40.6
7-11	6.92	4.63	79.6	2,800	674.9	1038	37.1
7-13	6.87	2.26	79.1	2,800	674.8	1113	39.8
7-15	4.72	2.99	80.8	3,100	674.9	1088	35.1
7-18	7.21	1.47	80.8	3,800	674.7	1088	28.6
7-20	4.99	1.68	77.0	2,800	674.7	1108	39.6
7-22	1.12	1.45	78.8	2,500	674.9	1118	44.7
7-25	2.77	1.26	76.5	2,900	675.0	1088	37.5
7-27	2.96	1.41	79.5	2,900	674.9	1088	37.5
7-29	2.46	2.30	80.8	2,800	674.7	1118	39.9
8-1	1.07	1.28	83.8	2,500	674.8	1118	44.7
8-3	1.10	1.14	83.3	1,600	674.7	1118	69.9
8-5	5.14	6.21	80.6	4,800	675.2	1118	23.3
8-8	2.27	0.74	80.5	3,900	675.0	1088	27.9
8-10	5.46	0.99	80.6	5,300	674.8	1138	21.5
8-12	8.56	1.33	81.2	3,800	674.8	1188	29.4
8-15	1.35	0.81	83.0	4,700	674.9	1138	24.2
8-17	1.12	0.54	85.0	6,300	675.0	1138	18.1
8-19	6.30	1.26	79.4	5,300	674.7	1088	20.5
8-22	0.55	0.67	76.8	4,700	674.8	1163	24.7
8-24	0.70	1.92	74.0	10,500	674.8	943	9.0
8-26	0.31	0.05	73.7	7,600	674.6	978	12.9
8-29	0.48	0.52	73.0	6,100	674.5	638	10.5
8-31	0.07	0.14	72.5	5,700	674.6	653	11.5

Table A-6. 1989 Sampling Dates, Total Impingement Densities, Environmental, and Operational Data.

Date	Day Density	Night Density	River Temp.	River Flow	River Stage	Blowdown	% River Flow
4-4	0.00		41.6	33,200	673.7	188	0.6
4-6	0.00		45.1	33,227	673.8	183	0.6
4-7	0.00		44.7	33,500	673.7	186	0.6
4-11	0.00		40.8	38,500	674.4	188	0.5
4-13	0.00		-	38,700	674.3	185	0.5
4-14	0.00		46.1	37,700	674.2	188	0.5
4-18	0.00		49.1	33,000	673.9	188	0.6
4-20	0.00		-	33,200	674.0	202	0.6
4-21	0.00		54.2	32,500	674.0	188	0.6
4-25	0.00		56.5	27,600	673.8	188	0.7
4-27	0.23		56.8	27,400	673.8	206	0.8
5-2	0.15		53.4	27,800	674.0	308	1.1
5-4	0.95		54.9	27,700	674.0	313	1.1
5-9	0.60		56.0	26,600	673.7	288	1.1
5-11	2.19		61.4	26,800	673.8	313	1.2
5-16	4.74		68.7	24,100	673.5	313	1.3
5-17	1.41		67.9	21,200	673.3	338	1.6
5-18	5.95		67.0	19,900	673.6	364	1.8
5-19	6.27		66.1	20,300	673.6	334	1.6
5-23	13.05		70.6	15,800	674.0	480	3.0
5-25	26.50		68.8	19,900	673.6	438	2.2
5-30	16.30		63.9	29,400	673.8	338	1.1
6-1	23.26		66.8	27,100	673.8	338	1.2
6-2	47.32		67.0	23,900	673.7	404	1.7
6-6	9.89		71.5	18,100	673.8	438	2.4
6-8	14.19		70.6	15,100	673.7	438	2.9
6-13	7.42		67.5	11,100	673.9	438	3.9
6-15	30.42		67.2	9,900	674.2	418	4.2
6-20	96.53		74.5	9,700	675.1	838	8.6
6-22	54.95		72.6	9,500	674.3	838	8.8
6-27	86.74		76.5	11,500	674.4	798	6.9
6-29	27.46		77.0	12,300	674.1	806	6.6
7-3	89.50		81.1	12,500	674.1	1188	9.5
7-6	59.25		83.9	8,200	674.7	1138	13.9
7-11	91.27		83.7	8,100	674.2	1168	14.4
7-14	30.19		83.8	6,800	674.2	1148	16.9
7-18	2.57		80.6	6,100	674.4	1138	18.7
7-20	2.10		80.7	8,900	674.5	1168	13.1
7-25	1.47		82.2	4,600	674.6	1218	26.5
7-27	0.77		83.5	4,300	673.9	1218	28.3
8-1	3.48		80.7	6,800	674.7	1218	17.9
8-3	1.08		82.8	5,300	674.5	1218	23.0
8-8	0.63		77.2	3,900	674.4	1188	30.5
8-10	0.28		78.7	2,400	674.6	1188	49.5
8-15	0.62		75.9	5,900	674.8	1218	20.6
8-17	0.48		77.9	4,300	674.7	1188	27.6
8-22	2.26		74.6	4,700	674.7	1188	25.3
8-24	1.93		73.6	6,200	674.7	1218	19.6
8-29	4.76		72.0	5,400	674.7	1218	22.6
8-31	1.17		69.0	5,300	674.5	1163	21.9

Northern States Power Company

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May 21, 1998

Mr. Marvin Hora
Section Manger
Point Source Compliance Section
Division of Water Quality
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, MN 55155

Attention: Mary Hayes

PRAIRIE ISLAND NUCLEAR GENERATING PLANT
NPDES Permit No. MN0004006
Monthly Discharge Monitoring Reports

In accordance with Part I.D.2. of the subject NPDES permit, we are submitting our Discharge Monitoring Reports for discharges 701M, 010, 011, 012, 013, 014, 015, 016, 017, 018, 021, 022, 023 and 030 at the Prairie Island Nuclear Generating Plant. These reports cover the period April 1, 1998 through April 30, 1998. We are also submitting the Bromine/Chlorine Monthly Supplemental Report (in the new plant format) and the Circulating Water Total Phosphorous Report for the month of April.

In accordance with Part I.C.5.e. of the subject NPDES permit, we are also submitting the records of the daily maximum, minimum, and average temperatures for the monitoring locations of the expanded temperature monitoring system. Per past agreement, the Sturgeon Lake monitors were removed mid-November for protection from winter ice conditions. River conditions allowed reinstallation of the Sturgeon Lake monitors in April. Readings from Sturgeon Lake #1 monitoring were available starting April 3, and readings from #2 monitoring were available April 14. The Lock and Dam monitoring was out of service or operating incorrectly from April 13 through April 30 for Pier 1, and on April 1 for the Pier 2. Minimum temperature monitoring was out of service or operating incorrectly on April 14 for both Sturgeon Lake (1 and 2) monitors and on April 24 for both Sturgeon Lake (1 and 2) monitors and for all three Lock and Dam Piers (1, 2, and 3). The Diamond Bluff monitor had been out of service or operating incorrectly since August 6, but the monitor has since been repaired and was returned to service on April 21. Backup monitoring and reporting is utilized when a particular monitor is out of service.

FILE COPY
PI-LAB

Enclosed is a violation report for the missed outfall 021 (heating system blowdown) total suspended solids sample in April. A sample was not available because the heating boiler water had leaked out. Response actions are detailed in the report. The situation was previously verbally reported to the state.

A plant status report of the continuous bromination/chlorination treatment program is included and provides a summary of April operation including the monthly demand result and the reduced minutes in the day for April 5 due to the change to daylight savings time.

Enclosed is documentation of the fish rescue on April 7 from intake bay #125 when it was isolated and dewatered for maintenance. The plant rescued 217 fish and returned them to the river. The documentation notes 11 fish found dead.

Also attached for your records is the March 22 data sheet for the temperature monitoring system. The data was not available at the time of submittal of the March discharge monitoring reports, and the External Circ Water Log covering that day had been utilized and filed as the backup.

If you have any questions, please call me at 330-6625.

Sincerely,

Jim Bodensteiner / CVJ

Jim Bodensteiner
Senior Environmental Analyst

Enclosures

c: Marilyn Danks (DNR)
Mark Gruber
Gary Kolle
Gerald Joachim
Tom Verbout
Ken Mueller
ERAD Record Center

w:jjb/rpts/mpraire

TO: Tom Verbout

See note in cover letter.

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

MAR 23,98
00:03:26

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 03/23/98 TIME: 00:03:22

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	N C A L	N C A L	N C A L	out for winter
1T2571A	STURGEON LAKE TEMP 2	N C A L	N C A L	N C A L	and TIC
1T2572A	DIAMOND BLUFF TEMP	41.8	39.6	40.8	
1T2573A	LOCK & DAM PIER 1 TEMP	38.8	36.6	37.6	Good
1T2574A	LOCK & DAM PIER 2 TEMP	41.1	38.1	39.1	
1T2575A	LOCK & DAM PIER 3 TEMP	43.0	38.7	40.8	
1T2527A	SCREENHOUSE INLT TEMP	39.7	37.3	38.5	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	85.2	81.3	83.6	

E-O-J

125 TRAVELING SCREEN 4-7-98

(217 LIVE FISH)

(11 DEAD FISH)

CARP) 22 1/2, 24 1/2, 21, 25 1/2, 23, 24 1/2, 29, 22, 25, 23 1/2, 28 1/4,
23, 20, 20 3/4, 21, 22, 22 1/4, 22 1/4, 20, 23 1/2, 22 1/4,
(48) 26, 20 1/2, 19 3/4, 24 1/2, 21, 17 1/4, 22 1/2, 27, 23 1/2, 25
11, 21 1/4, 11 1/2, 19, 10 1/2, 20 1/2, 21, 21 1/2, 23 3/4, 19 3/4
20 1/2, 10 3/4, 22 1/4, 14 3/4, 11 1/2, 10 3/4, 20 1/4,

CHANNEL CATFISH) 14 1/2, 13, 13, 9 1/2, 15, 15, 14, 19, 13 1/2, 14 1/4, 17 1/4, 15 1/2,
12, 11, 13 1/2, 14 1/2, 5, 14 1/2, 16 3/4, 14 1/2, 15 1/2, 13 1/4,
13, 15 1/4, 15, 16, 9 3/4, 12, 15 1/2, 16, 14 1/2, 18, 14 3/4,
BACKHALF MISSING (11) 15 3/4, 9 1/2, 25 3/4, 12 1/4, 13 3/4, 14, 14, 12 1/2, 16 1/4
24, 14 1/2, 13 1/2, 16, 14, 14 1/2, 15, 16, 13 3/4, 15, 13 1/4, 17 1/2, 13
21 1/2, 14, 15 1/4, 15 3/4, 16 1/2, 14 3/4, 15 1/2, 13 3/4, 16, 19 1/4,
(1[illegible]) 18 3/4, 13 1/4, 14, 15, 16, 14, 10, 17, 16, 15 1/2, 14, 22, 26 3/4
13 1/2, 15 1/2, 15 1/2, 12, 14 3/4, 15 1/2, 15 1/2, 12 1/4, 14 1/4, 16, 13 3/4,
14 3/4, 8, 14, 14 1/4, 19, 13 1/2, 15, 12, 16 1/2, 15, 15 1/2, 15 1/2,
13, 13 1/2, 14 1/4, 21 1/4, 14, 14 1/2, 12 1/4

FRESH WATER DRUM) 14, 12, 15, 12 1/2, 11, 15, 11 1/4, 14, 16 1/2,
11 1/2, 12 1/2, 10 3/4, 14 1/2, 12 1/2, 12 3/4, 11, 12 1/4, 10 3/4,
11 1/2, 12, 11 1/4, 5 3/4, 15 1/4, 12 1/4, 13, 12 3/4, 11 1/2, 10 1/2,
(53) 15 1/4, 12 1/2, 12 1/4, 12 1/4, 11 3/4, 12 1/4, 12, 11 3/4, 12 1/2, 11 1/2,
11, 12 3/4, 5 3/4, 11 1/4, 13, 14 1/2, 9 1/4, 12, 11 1/4, 6 1/2,
14, 12, 12, 11 3/4, 16 1/4,

CATHEAD CATFISH) 26 1/2 (1)

B[illegible]LL MOUTH BUFFALO) 23, 19 1/2 (2)

BIG MOUTH BUFFALO) 17 1/4, 22, 17 3/4 (3)

BLACK CRAPPIE) 5 3/4 (1)

(DEAD)

CHANNEL CATS) 20 1/2, 18, (1) 12 1/2, 16 1/2, 14 1/2, 14, 15 1/2

FRESH WATER DRUM) (2) 4 1/2, 5 1/4

BLACK CRAPPIE) 6", 5" (2)

NNNN SSSSSSPPPPPPPPPP Northern States Power Company
NN NN SSS PPP Prairie Island Nuclear Generating Plant
NN NN SSSS PPPPPPPP 1717 Wakonade Drive East
NN NN SSS PPP Welch, Minnesota 55089
NN NNSSSSSSS PPP (612)-388-1121

DATE MAY 04, 1998

NAME JIM BODENSTEINER
ADDRESS NSP ERAD

SUBJECT: MISSED APRIL SAMPLE OUTFALL#021(HEATING BOILER)

The heating boiler drum is normally sampled per the surveillance schedule sometime during the first full week of the month. This sample is completed even if there is no release from the heating boiler. This will prevent a sample from being missed due to a unreported draindown. However in this case the heating boiler drum drained empty before the scheduled sample date. The majority of the water could have leaked out during March when it was sampled previously. The boiler is maintained in a standby mode and run only for training purposes. The March sample results were 0.5 ppm suspended solids which is well below the limit of 30 ppm.

When the monthly NPDES sample on the heating boiler came due it was discovered that the heating boiler was empty and apparently had leaked through a drain valve. Approximately 250 gallons was leaked. The release point would have been Unit 1 turbine building sump(outfall#014) which is the normal release point for normal boiler draindowns. An investigation found no specific cause for the leakage. The repair was not completed in April so the boiler was not refilled. This coupled with the leakage prevented us from obtaining a sample for April. The only required sample is a total suspended solids sample. The sample on the Unit 1 turbine building sump was normal for April.

NSP ERAD was contacted when the permit violation was determined. It was determined that a call would be made to MPCA Water Quality because it was a missed sample. Call was completed on the afternoon of May 5th. This incident report is being filed to followup that phone call.

We are presently trying to delete this outfall in the new permit. The normal sample results are at or below the minimum detectable level. No enviromental effect is expected because we are permitted to drain this water as long as a monthly sample is obtained.

Since there was no personnel error indicated, no procedure changes are required. Repair work on the heating boiler is continuing.

Please contact me at Ext. 4440 if additional information is needed. Thank you.

Sincerely yours,

Gerald Joachim
Senior Radiation Protection Specialist

NNNN SSSSSSPPPPPPPPPP Northern States Power Company
NN NN SSS PPP Prairie Island Nuclear Generating Plant
NN NN SSSS PPPPPPPP 1717 Wakonade Drive East
NN NN SSS PPP Welch, Minnesota 55089
NN NNSSSSSSS PPP (612)-388-1121

DATE MAY 01, 1998

NAME JIM BODENSTEINER
ADDRESS NSP ERAD

SUBJECT: CONTINUOUS CHLORINATION/BROMINATION

We operated in the continuous bromination mode the entire month of April with minimal problems. Had some minor manipulations because of low tank level and pump problems. The reported 1380 minutes on April 5th is because of the daylights savings time one hour time advance.

The bromine river demand completed on April 20th had results of 0.62ppm which is a slight decrease from the March value. It should start to increase slowly now with rising river temperature.

Please contact me at Ext. 4440 if additional information is needed. Thank you.

Sincerely yours,

Gerald Joachim
Senior Radiation Protection Specialist

PRAIRIE ISLAND CIRC WATER TOTAL PHOSPHOROUS CONCENTRATION (PPB)

	INLET	OUTLET
APRIL 06	185	179
		185
APRIL 13	223	251
		274
APRIL 20	193	179
		174
APRIL 27	217	177
		181

The UNIT 2 descaler pump was running all the month of April at 14.0 gallons per day.

APRIL 1998

	Bromine Kgrs / day	Chlorine Kgrs / day	Time mins. / day	U-1 Residual	U-2 Residual	Outfall Residual
1	11.2	36.9	1440	.09	.09	<.001
2	11.2	37.9	1440	.06	.08	<.001
3	16.8	39.9	1440	.06	.07	<.001
4	11.2	43.5	1440	.07	.07	<.001
5	16.8	50.9	1380	.06	.06	<.001
6	11.2	38.9	1440	.07	.06	<.001
7	22.4	43.5	1440	<.01	<.01	<.001
8	22.4	49.6	1440	.02	.04	<.001
9	16.8	39.9	1440	.07	.07	<.001
10	22.4	44.7	1440	.08	.07	<.001
11	16.8	50.3	1440	.05	.07	<.001
12	11.2	43.7	1440	.07	.08	<.001
13	11.2	42.8	1440	.03	<.01	<.001
14	16.8	25.3	1440	.03	<.01	<.001
15	11.2	32.1	1440	.02	<.01	<.001
16	22.4	72.2	1440	.08	.09	<.001
17	28.0	71.1	1440	.09	.11	<.001
18	22.4	66.8	1440	.10	.11	<.001
19	22.4	64.2	1440	.11	.12	<.001
20	22.4	71.4	1440	.11	.13	<.001
21	22.4	66.1	1440	.09	.11	<.001
22	22.4	46	1440	.14	.15	<.001
23	11.2	46	1440	.04/.08	<.01/.12	<.001
24	39.1	51	1440	.07/.09	.07/.05	<.001
25	33.6	47.7	1440	.06	.07	<.001
26	33.6	50.6	1440	.06	.07	<.001
27	39.1	55.4	1440	.13	.09	<.001
28	39.1	50.6	1440	.11	.08	<.001
29	33.6	60.3	1440	.12	.09	<.001
30	33.5	56.4	1440	.12	.09	<.001
31						

PERMITTEE NAME/ADDRESS:

NSP-PRAIRIE ISLAND PLANT
414 NICOLLET MALL
MINNEAPOLIS MN 55401

NSP-PRAIRIE ISLAND PLANT
WELCH MN 55089
ATTN: MR. MICHAEL HESTICK

WASTEWATER TREATMENT DISCHARGE MONITORING REPORT

PERMIT #	OUTFALL #
MN0004006	010 M

MONITORING PERIOD	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	98	04	01	TO	98	04	30

Combined Effl frm 011 to 02
(SUBR 05) 12345
F - FINAL
MAJOR

*** NO DISCHARGE !__! ***

PARAMETER		QUANTITY AVERAGE	QUANTITY MAXIMUM	QUANTITY UNITS	CONCENTRATION MINIMUM	CONCENTRATION AVERAGE	CONCENTRATION MAXIMUM	CONCENTRATION UNITS	FREQUENCY OF ANALYSIS	SAMPLE TYPE
PLANT CAPACITY FACT, PERCENT OF CAPACITY	SAMPLE MEASUREMENT	******	******		******	98.3	******	(23)	Cont	MEAS
00180 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	******	**** ****	******	REPORT MO AVG	******	PER-CENT	CONTINUOUS	MEASRD
PH	SAMPLE MEASUREMENT	******	******		8.5	******	8.6	(12)	1/7	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	******	**** ****	6.0 MO MIN	******	9.0 MO MAX	SU	WEEKLY	GRAB
OXIDANTS, TOTAL RESIDUAL	SAMPLE MEASUREMENT	******	******		******			(19)		
34044 A 0 0 DISINFECT,PRCS CMPLT	PERMIT REQUIREMENT	******	******	**** ****	******	OPTIONAL MO AVG	.05 DAILY MX	MG/L	ONCE/ DISCHG	GRAB
OXIDANTS, TOTAL RESIDUAL	SAMPLE MEASUREMENT	******	******		******			(19)		
34044 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	******	**** ****	******	REPORT MO AVG	.04 MX DA AV	MG/L	CONTINUOUS	CONTIN
OXIDANTS RELEASED, TOTAL RESIDUAL	SAMPLE MEASUREMENT	******	******		******			(19)		
34046 A 0 0 DISINFECT,PRCS CMPLT	PERMIT REQUIREMENT	******	******	**** ****	******	OPTIONAL MO AVG	.2 DAILY MX	MG/L	ONCE/ DISCHG	GRAB
OXIDANTS RELEASED, TOTAL RESIDUAL	SAMPLE MEASUREMENT	******	******		******	<0.001	<0.001	(19)	30/30	CALC
34046 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	******	**** ****	******	REPORT MO AVG	.001 MX DA AV	MG/L	CONTINUOUS	CONT
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	******	******		5457	181.9		(03)	Cont	EST
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	******	**** ****	REPORT MO TOTAL	REPORT AVERAGE	OPTIONAL DAILY MX	MGD		

Send white copy with supplemental DMR form by 21st day of month following reporting period to:
MINNESOTA POLLUTION CONTROL AGENCY
520 LAFAYETTE ROAD
ST. PAUL, MINNESOTA 55155
ATTN: W.Q. POINT SOURCE COMPLIANCE

I certify that I am familiar with the information contained in this report and that to the best of my knowledge and belief the information is true, complete, and accurate.

D. A. Schulke — SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT — DATE 5-11-98

SIGNATURE OF CHIEF OPERATOR — DATE — CERTIFICATION # — ☐ √ IF NEW

COMMENTS:

1)EFL:no floatg solids,foam or film 2)See Part I.C.6 for flow restrictions 3)See Part I.C.5 for thermal limitations 4)Amount and Time of Chlorine and/or Bromine continuous and/or intermittent application shall be recorded daily and submitted with the monthly DMRs in addition to the values reported on this DMR.

PERMITTEE NAME/ADDRESS:

NSP-PRAIRIE ISLAND PLANT
414 NICOLLET MALL
MINNEAPOLIS MN 55401

NSP-PRAIRIE ISLAND PLANT
WELCH MN 55089
ATTN: MR. MICHAEL HESTICK

WASTEWATER TREATMENT DISCHARGE MONITORING REPORT

PERMIT #	OUTFALL #
MN0004006	701 M

MONITORING PERIOD	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	98	04	01	TO	98	04	30

Miss R Imdtly Blw Lock & Dam#1
(SUBR 05) 12345
F - FINAL
MAJOR

*** NO DISCHARGE !--! ***

PARAMETER		QUANTITY AVERAGE	QUANTITY MAXIMUM	QUANTITY UNITS	CONCENTRATION MINIMUM	CONCENTRATION AVERAGE	CONCENTRATION MAXIMUM	CONCENTRATION UNITS	FREQUENCY OF ANALYSIS	SAMPLE TYPE
TEMPERATURE, WATER DEG. FAHRENHEIT 00011 6 N 0 DOWNSTREAM MONITOR	SAMPLE MEASUREMENT	******	******		43.0	53.2	64.1	(15)	Cont	MEAS
	PERMIT REQUIREMENT	******	******	**** ****	REPORT MO MIN	86.0 MX DA AV	REPORT MO MAX	DEG.F	CONTIN UOUS	INSITU
TEMPERATURE, WATER DEG. FAHRENHEIT 00011 7 N 0 INTAKE FROM STREAM	SAMPLE MEASUREMENT	******	******		44.4	52.7	58.7	(15)	cont	meas
	PERMIT REQUIREMENT	******	******	**** ****	REPORT	REPORT	REPORT	DEG.F	CONTIN UOUS	CONTIN
TEMP. DIFF. BETWEEN SAMP. & UPSTRM DEG.F 00018 6 N 0 DOWNSTREAM MONITOR	SAMPLE MEASUREMENT	******	******			0.5		(15)		
	PERMIT REQUIREMENT	******	******	**** ****	OPTIONAL MO MIN	5.0 MO AVG	OPTIONAL MO MAX	DEG.F	CONTIN UOUS	INSITU
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									

Send white copy with supplemental DMR form by 21st day of month following reporting period to:
MINNESOTA POLLUTION CONTROL AGENCY
520 LAFAYETTE ROAD
ST. PAUL, MINNESOTA 55155
ATTN: W.Q. POINT SOURCE COMPLIANCE

I certify that I am familiar with the information contained in this report and that to the best of my knowledge and belief the information is true, complete, and accurate.

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT — DATE: 5-11-98

SIGNATURE OF CHIEF OPERATOR — DATE — CERTIFICATION # — ☐ √ IF NEW

COMMENTS:

1)See Permit Part I.C.5. for Thermal Restrictions. 2)Notify MPCA & MDNR when winter temp GE 43F.
3)Use 701N to summarize NOV-MAR days when river temp is GT 43F. 4)Parameter 00018 is Delta T=Trive-Tintk
5)MIN=LOW DLY MAX IN MONTH 6)AVG=Monthly avgerage of daily maximum 7)MAX=HIGH DLY MAX IN MONTH

PERMITTEE NAME/ADDRESS:

NSP PRAIRIE ISLAND PLANT
414 NICOLLET MALL
MINNEAPOLIS MN 55401

NSP-PRAIRIE ISLAND PLANT
WELCH MN 55089
ATTN: MR. MICHAEL HESTICK

WASTEWATER TREATMENT DISCHARGE MONITORING REPORT

PERMIT #	OUTFALL #
MN0004006	011 M

MONITORING PERIOD	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	98	04	01	TO	98	04	30

Steam Generator Blowdow sch
(SUBR 05) 1234
F - FINAL
MAJOR

*** NO DISCHARGE !_! ***

PARAMETER		QUANTITY AVERAGE	QUANTITY MAXIMUM	UNITS	CONCENTRATION MINIMUM	CONCENTRATION AVERAGE	CONCENTRATION MAXIMUM	UNITS	FREQUENCY OF ANALYSIS	SAMPLE TYPE
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	<0.1	<0.1	(01)	0.4	0.4	0.4	(19)	1/30	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	65.3 MO AVG	217.0 MO MAX	KG/ DAY	45.0 MX WK AV	30.0 MO AVG	100.0 MO MAX	MG/L	ONCE/ MONTH	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	******	******		0.240	0.008		(03)	1/30	Est.
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	******	**** ****	REPORT MO TOTAL	REPORT AVERAGE	OPTIONAL DAILY MX	MGD	ONCE/ MONTH	ESTIM
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									

Send white copy with supplemental DMR form by 21st day of month following reporting period to:
MINNESOTA POLLUTION CONTROL AGENCY
520 LAFAYETTE ROAD
ST. PAUL, MINNESOTA 55155
ATTN: W.Q. POINT SOURCE COMPLIANCE

I certify that I am familiar with the information contained in this report and that to the best of my knowledge and belief the information is true, complete, and accurate.

D.A. Schulke — 5-11-98
SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT — DATE

SIGNATURE OF CHIEF OPERATOR — DATE — CERTIFICATION # — ☐ √ IF NEW

COMMENTS:

1) EFL: no floatg solids, foam or film

PERMITTEE NAME/ADDRESS:

NSP-PRAIRIE ISLAND PLANT
414 NICOLLET MALL
MINNEAPOLIS MN 55401

NSP-PRAIRIE ISLAND PLANT
WELCH MN 55089
ATTN: MR. MICHAEL HESTICK

WASTEWATER TREATMENT DISCHARGE MONITORING REPORT

PERMIT #	OUTFALL #
MN0004006	012 M

Radwaste Treatment Effluent
(SUBR 05) 17345
F - FINAL
MAJOR

MONITORING PERIOD	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	98	04	01	TO	98	04	30

*** NO DISCHARGE !--! ***

PARAMETER		QUANTITY AVERAGE	QUANTITY MAXIMUM	UNITS	CONCENTRATION MINIMUM	CONCENTRATION AVERAGE	CONCENTRATION MAXIMUM	UNITS	FREQUENCY OF ANALYSIS	SAMPLE TYPE
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	<0.1	<0.1	(01)	0.2	0.2	0.2	(19)	1/30	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	26.0 MO AVG	86.9 KG/ MO MAX	DAY	45.0 MX WK AV	30.0 MO AVG	100.0 MO MAX	MG/L	ONCE/ MONTH	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	******	******		0.030	0.001		(03)	1/30	Est
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	******	**** ****	REPORT MO TOTAL	REPORT AVERAGE	OPTIONAL DAILY MX	MGD	ONCE/ MONTH	ESTIMA
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									

Send white copy with supplemental DMR form by 21st day of month following reporting period to:
MINNESOTA POLLUTION CONTROL AGENCY
520 LAFAYETTE ROAD
ST. PAUL, MINNESOTA 55155
ATTN: W.Q. POINT SOURCE COMPLIANCE

I certify that I am familiar with the information contained in this report and that to the best of my knowledge and belief the information is true, complete, and accurate.

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT — DATE: 5-11-98

SIGNATURE OF CHIEF OPERATOR — DATE — CERTIFICATION #

☐ √ IF NEW

COMMENTS:

1) EFL: no floatg solids, foam or film

PERMITTEE NAME/ADDRESS:

NSP PRAIRIE ISLAND PLANT
414 NICOLLET MALL
MINNEAPOLIS MN 55401

NSP-PRAIRIE ISLAND PLANT
WELCH MN 55089
ATTN: MR. MICHAEL HESTICK

WASTEWATER TREATMENT DISCHARGE MONITORING REPORT

PERMIT #: MN0004006
OUTFALL #: 013 M

MONITORING PERIOD FROM YEAR 98 MO. 04 DAY 01 TO YEAR 98 MO. 04 DAY 30

Neutrlizer + Resin Rins Schs
(SUBR 05) 1234
F - FINAL
MAJOR

*** NO DISCHARGE !--! ***

PARAMETER		QUANTITY AVERAGE	QUANTITY MAXIMUM	QUANTITY UNITS	CONCENTRATION MINIMUM	CONCENTRATION AVERAGE	CONCENTRATION MAXIMUM	CONCENTRATION UNITS	FREQUENCY OF ANALYSIS	SAMPLE TYPE
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	0.6	5.5	(01)	18.9	14.0	27.0	(19)	9/30	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	97.9 MO AVG	326.0 MO MAX	KG/ DAY	45.0 MX WK AV	30.0 MO AVG	100.0 MO MAX	MG/L	ONCE/ MONTH	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	******	******		0.300	0.010		(03)	9/30	Est
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	******	**** ****	REPORT MO TOTAL	REPORT AVERAGE	OPTIONAL DAILY MX	MGD	ONCE/ MONTH	ESTIM
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									

Send white copy with supplemental DMR form by 21st day of month following reporting period to:
MINNESOTA POLLUTION CONTROL AGENCY
520 LAFAYETTE ROAD
ST. PAUL, MINNESOTA 55155
ATTN: W.Q. POINT SOURCE COMPLIANCE

I certify that I am familiar with the information contained in this report and that to the best of my knowledge and belief the information is true, complete, and accurate.

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT — DATE: 5-11-98

SIGNATURE OF CHIEF OPERATOR — DATE — CERTIFICATION # — ☐ √ IF NEW

COMMENTS:

1)EFL:no floatg solids,foam or film

PERMITTEE NAME/ADDRESS:

NSP-PRAIRIE ISLAND PLANT
414 NICOLLET MALL
MINNEAPOLIS MN 55401

NSP-PRAIRIE ISLAND PLANT
WELCH MN 55089
ATTN: MR. MICHAEL HESTICK

WASTEWATER TREATMENT DISCHARGE MONITORING REPORT

PERMIT #	OUTFALL #
MN0004006	014 M

MONITORING PERIOD	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	98	04	01	TO	98	04	30

Unit 1 Turbine Bldg Sump Dschg
(SUBR 05) 12345
F - FINAL
MAJOR

*** NO DISCHARGE !--! ***

PARAMETER		QUANTITY AVERAGE	QUANTITY MAXIMUM	QUANTITY UNITS	CONCENTRATION MINIMUM	CONCENTRATION AVERAGE	CONCENTRATION MAXIMUM	CONCENTRATION UNITS	FREQUENCY OF ANALYSIS	SAMPLE TYPE
SOLIDS, TOTAL SUSPENDED 00530 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	******	******		3.8	3.8	3.8	(19)	1/30	GRAB
	PERMIT REQUIREMENT	******	******	**** ****	45.0 MX WK AV	30.0 MO AVG	100.0 MO MAX	MG/L	ONCE/ MONTH	GRAB
OIL AND GREASE FREON EXTR-GRAV METH 00556 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	******	******		******	1.0	1.0	(19)	1/30	GRAB
	PERMIT REQUIREMENT	******	******	**** ****	******	10.0 MO AVG	15.0 MO MAX	MG/L	ONCE/ MONTH	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT 50050 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	******	******		2.460	0.082		(03)	1/7	Est.
	PERMIT REQUIREMENT	******	******	**** ****	REPORT MO TOTAL	REPORT AVERAGE	OPTIONAL DAILY MX	MGD	WEEKLY	ESTIMA
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									

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MINNESOTA POLLUTION CONTROL AGENCY
520 LAFAYETTE ROAD
ST. PAUL, MINNESOTA 55155
ATTN: W.Q. POINT SOURCE COMPLIANCE

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SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT — DATE: 5-11-98

SIGNATURE OF CHIEF OPERATOR — DATE — CERTIFICATION # — ☐ √ IF NEW

COMMENTS:

1)EFL:no floatg solids,foam or film

PERMITTEE NAME/ADDRESS:

NS[redacted]RAIRIE ISLAND PLANT
414 NICOLLET MALL
MINNEAPOLIS MN 55401

NSP-PRAIRIE ISLAND PLANT
WELCH MN 55089
ATTN: MR. MICHAEL HESTICK

WASTEWATER TREATMENT DISCHAR[redacted]MONITORING REPORT

PERMIT #	OUTFALL #
MN0004006	015 M

MONITORING PERIOD	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	98	04	01	TO	98	04	30

Unit 2 Turbine Bldg Sum[redacted]sch
(SUBR 05) 1234
F - FINAL
MAJOR

*** NO DISCHARGE !--! ***

PARAMETER		QUANTITY AVERAGE	QUANTITY MAXIMUM	QUANTITY UNITS	CONCENTRATION MINIMUM	CONCENTRATION AVERAGE	CONCENTRATION MAXIMUM	CONCENTRATION UNITS	FREQUENCY OF ANALYSIS	SAMPLE TYPE
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	******	******		0.9	0.9	0.9	(19)	1/30	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	******	**** ****	45.0 MX WK AV	30.0 MO AVG	100.0 MO MAX	MG/L	ONCE/ MONTH	GRAB
OIL AND GREASE FREON EXTR-GRAV METH	SAMPLE MEASUREMENT	******	******		******	2.0	2.0	(19)	1/30	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	******	**** ****	******	10.0 MO AVG	15.0 MO MAX	MG/L	ONCE/ MONTH	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	******	******		0.270	0.009		(03)	1/30	Est
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	******	**** ****	REPORT MO TOTAL	REPORT AVERAGE	OPTIONAL DAILY MX	MGD	WEEKLY	ESTIMA
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									

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MINNESOTA POLLUTION CONTROL AGENCY
520 LAFAYETTE ROAD
ST. PAUL, MINNESOTA 55155
ATTN: W.Q. POINT SOURCE COMPLIANCE

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SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT — DATE: 5-11-98

SIGNATURE OF CHIEF OPERATOR — DATE — CERTIFICATION # — ☐ √ IF NEW

COMMENTS:

1)EFL:no floatg solids,foam or film

PERMITTEE NAME/ADDRESS:

NSP-PRAIRIE ISLAND PLANT
414 NICOLLET MALL
MINNEAPOLIS MN 55401

NSP-PRAIRIE ISLAND PLANT
WELCH MN 55089
ATTN: MR. MICHAEL HESTICK

WASTEWATER TREATMENT DISCHARGE MONITORING REPORT

PERMIT #	OUTFALL #
MN0004006	016 M

MONITORING PERIOD	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	98	04	01	TO	98	04	30

Metal Cleaning Effluent Dchg
(SUBR 05) 1234
F - FINAL
MAJOR

*** NO DISCHARGE !X! ***

PARAMETER		QUANTITY AVERAGE	QUANTITY MAXIMUM	QUANTITY UNITS	CONCENTRATION MINIMUM	CONCENTRATION AVERAGE	CONCENTRATION MAXIMUM	CONCENTRATION UNITS	FREQUENCY OF ANALYSIS	SAMPLE TYPE
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT			(01)				(19)		
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	.6 MO AVG	1.9 MO MAX	KG/ DAY	45.0 MX WK AV	30.0 MO AVG	100.0 MO MAX	MG/L	ONCE/ BATCH	GRAB
OIL AND GREASE FREON EXTR-GRAV METH	SAMPLE MEASUREMENT			(01)	******			(19)		
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	.2 MO AVG	.3 MO MAX	KG/ DAY	******	10.0 MO AVG	15.0 MO MAX	MG/L	ONCE/ BATCH	GRAB
COPPER, TOTAL (AS CU)	SAMPLE MEASUREMENT			(01)	******			(19)		
01042 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	.02 MO AVG	.02 MO MAX	KG/ DAY	******	1.0 MO AVG	1.0 MO MAX	MG/L	ONCE/ BATCH	GRAB
IRON, TOTAL (AS FE)	SAMPLE MEASUREMENT			(01)	******			(19)		
01045 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	.02 MO AVG	.02 MO MAX	KG/ DAY	******	1.0 MO AVG	1.0 MO MAX	MG/L	ONCE/ BATCH	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	******	******					(03)		
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	******	**** ****	REPORT MO TOTAL	REPORT AVERAGE	OPTIONAL DAILY MX	MGD	ONCE/ BATCH	ESTIMA
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									

Send white copy with supplemental DMR form by 21st day of month following reporting period to:
MINNESOTA POLLUTION CONTROL AGENCY
520 LAFAYETTE ROAD
ST. PAUL, MINNESOTA 55155
ATTN: W.Q. POINT SOURCE COMPLIANCE

I certify that I am familiar with the information contained in this report and that to the best of my knowledge and belief the information is true, complete, and accurate.

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT — DATE 5/1/98

SIGNATURE OF CHIEF OPERATOR — DATE — CERTIFICATION # — ☐ √ IF NEW

COMMENTS:

1)EFL:no floatg solids,foam or film

PERMITTEE NAME/ADDRESS:

NSP PRAIRIE ISLAND PLANT
414 NICOLLET MALL
MINNEAPOLIS MN 55401

NSP-PRAIRIE ISLAND PLANT
WELCH MN 55089
ATTN: MR. MICHAEL HESTICK

WASTEWATER TREATMENT DISCHARGE MONITORING REPORT

PERMIT #	OUTFALL #
MN0004006	017 M

MONITORING PERIOD	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	98	04	01	TO	98	04	30

Unit 1 Condensate Blowd
(SUBR 05) 12345
F - FINAL
MAJOR

*** NO DISCHARGE !__! ***

PARAMETER		QUANTITY AVERAGE	QUANTITY MAXIMUM	QUANTITY UNITS	CONCENTRATION MINIMUM	CONCENTRATION AVERAGE	CONCENTRATION MAXIMUM	CONCENTRATION UNITS	FREQUENCY OF ANALYSIS	SAMPLE TYPE
SOLIDS, TOTAL SUSPENDED 00530 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	0.1	0.1	(01)	0.7	0.7	0.7	(19)	1/30	GRAB
	PERMIT REQUIREMENT	28.4 MO AVG	94.6 MO MAX	KG/ DAY	45.0 MX WK AV	30.0 MO AVG	100.0 MO MAX	MG/L	ONCE/ MONTH	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT 50050 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	******	******		0.150	0.005		(03)	1/30	Est
	PERMIT REQUIREMENT	******	******	**** ****	REPORT MO TOTAL	REPORT AVERAGE	OPTIONAL DAILY MX	MGD	ONCE/ MONTH	ESTI
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									

Send white copy with supplemental DMR form by 21st day of month following reporting period to:
MINNESOTA POLLUTION CONTROL AGENCY
520 LAFAYETTE ROAD
ST. PAUL, MINNESOTA 55155
ATTN: W.Q. POINT SOURCE COMPLIANCE

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SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT — DATE: 5-11-98

SIGNATURE OF CHIEF OPERATOR — DATE — CERTIFICATION # — ☐ √ IF NEW

COMMENTS:

1) EFL: no floatg solids, foam or film
2) TSS kg/day values equal the sum for 017 and 018.

PQ00592-03 MPCA DMR 04/25/95

00172/980408-0905

PERMITTEE NAME/ADDRESS:

NSP-PRAIRIE ISLAND PLANT
414 NICOLLET MALL
MINNEAPOLIS MN 55401

NSP-PRAIRIE ISLAND PLANT
WELCH MN 55089
ATTN: MR. MICHAEL HESTICK

WASTEWATER TREATMENT DISCHARGE MONITORING REPORT

PERMIT #	OUTFALL #
MN0004006	018 M

Unit 2 Condensate Blowdown
(SUBR 05) 12345
F - FINAL
MAJOR

MONITORING PERIOD	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	98	04	01	TO	98	04	30

*** NO DISCHARGE !_!_! ***

PARAMETER		QUANTITY AVERAGE	QUANTITY MAXIMUM	QUANTITY UNITS	CONCENTRATION MINIMUM	CONCENTRATION AVERAGE	CONCENTRATION MAXIMUM	CONCENTRATION UNITS	FREQUENCY OF ANALYSIS	SAMPLE TYPE
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	0.1	0.1	(01)	1.0	1.0	1.0	(19)	1/30	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	28.4 MO AVG	94.6 KG/ MO MAX	DAY	45.0 MX WK AV	30.0 MO AVG	100.0 MO MAX	MG/L	ONCE/ MONTH	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	******	******		0.480	0.016		(03)	1/30	Est
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	******	**********	REPORT MO TOTAL	REPORT AVERAGE	OPTIONAL DAILY MX	MGD	ONCE/ MONTH	ESTIMA
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									

Send white copy with supplemental DMR form by 21st day of month following reporting period to:
MINNESOTA POLLUTION CONTROL AGENCY
520 LAFAYETTE ROAD
ST. PAUL, MINNESOTA 55155
ATTN: W.Q. POINT SOURCE COMPLIANCE

I certify that I am familiar with the information contained in this report and that to the best of my knowledge and belief the information is true, complete, and accurate.

DAS Schulke — SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT — DATE 5-11-98

SIGNATURE OF CHIEF OPERATOR — DATE — CERTIFICATION # — ☐ √ IF NEW

COMMENTS:

1)EFL:no floatg solids,foam or film
2)TSS kg/day values equal the sum for 017 and 018.

PERMITTEE NAME/ADDRESS:

NSP PRAIRIE ISLAND PLANT
414 NICOLLET MALL
MINNEAPOLIS MN 55401

NSP-PRAIRIE ISLAND PLANT
WELCH MN 55089
ATTN: MR. MICHAEL HESTICK

WASTEWATER TREATMENT DISCHARGE MONITORING REPORT

PERMIT #	OUTFALL #
MN0004006	021 M

MONITORING PERIOD	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	98	04	01	TO	98	04	30

Heating System Blowdown Dischg
(SUBR 05) 12345
F - FINAL
MAJOR

*** NO DISCHARGE !__! ***

PARAMETER		QUANTITY AVERAGE	QUANTITY MAXIMUM	QUANTITY UNITS	CONCENTRATION MINIMUM	CONCENTRATION AVERAGE	CONCENTRATION MAXIMUM	CONCENTRATION UNITS	FREQUENCY OF ANALYSIS	SAMPLE TYPE
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	*	*	(01)	*	*	*	(19)	*	*
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	9.1 MO AVG	30.3 KG/ MO MAX	DAY	45.0 MX WK AV	30.0 MO AVG	100.0 MO MAX	MG/L	ONCE/ MONTH	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	******	******		<0.001	<0.001		(03)	1/30	Est
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	****** ****	****	REPORT MO TOTAL	REPORT AVERAGE	OPTIONAL MO MAX	MGD	ONCE/ MONTH	ESTIM
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									

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MINNESOTA POLLUTION CONTROL AGENCY
520 LAFAYETTE ROAD
ST. PAUL, MINNESOTA 55155
ATTN: W.Q. POINT SOURCE COMPLIANCE

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SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT — DATE: 5-11-98

SIGNATURE OF CHIEF OPERATOR — DATE — CERTIFICATION # — ☐ √ IF NEW

COMMENTS:
* MISSED SAMPLE DUE TO SYSTEM LEAK. ** SEE ATTACHED REPORT
which drained boiler empty

PERMITTEE NAME/ADDRESS:

NSP-PRAIRIE ISLAND PLANT
414 NICOLLET MALL
MINNEAPOLIS MN 55401

NSP-PRAIRIE ISLAND PLANT
WELCH MN 55089
ATTN: MR. MICHAEL HESTICK

WASTEWATER TREATMENT DISCHARGE MONITORING REPORT

PERMIT #	OUTFALL #
MN0004006	022 M

MONITORING PERIOD	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	98	04	01	TO	98	04	30

Unit 1 Plant Cooling Wtr Dschg
(SUBR 05) 12345
F - FINAL
MAJOR

*** NO DISCHARGE !__! ***

PARAMETER		QUANTITY AVERAGE	QUANTITY MAXIMUM	QUANTITY UNITS	CONCENTRATION MINIMUM	CONCENTRATION AVERAGE	CONCENTRATION MAXIMUM	CONCENTRATION UNITS	FREQUENCY OF ANALYSIS	SAMPLE TYPE
OXIDANTS, TOTAL RESIDUAL	SAMPLE MEASUREMENT	******	******		******		0.14	(19)	30/30	GRAB
34044 A 0 0 DISINFECT,PRCS CMPLT	PERMIT REQUIREMENT	******	******	**** ****	******	OPTIONAL MO AVG	2.0 DAILY MX	MG/L	ONCE/ DISCHG	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	******	******		897	29.9		(03)	30/30	Est
50050 8 0 0 OTHER TRT,PRCS CMPLT	PERMIT REQUIREMENT	******	******	**** ****	REPORT MO TOTAL	REPORT AVERAGE	OPTIONAL MO MAX	MGD	CONTINUOUS	ESTIMA
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									

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MINNESOTA POLLUTION CONTROL AGENCY
520 LAFAYETTE ROAD
ST. PAUL, MINNESOTA 55155
ATTN: W.Q. POINT SOURCE COMPLIANCE

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SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT — DATE: 5-11-98

SIGNATURE OF CHIEF OPERATOR — DATE — CERTIFICATION # — ☐ √ IF NEW

COMMENTS:
NOTE: FLOW IS A TOTAL OF OUTFALLS 022 & 023

PERMITTEE NAME/ADDRESS:

NS[illegible] PRAIRIE ISLAND PLANT
414 NICOLLET MALL
MINNEAPOLIS MN 55401

NSP-PRAIRIE ISLAND PLANT
WELCH MN 55089
ATTN: MR. MICHAEL HESTICK

WASTEWATER TREATMENT DISCHAR[illegible] MONITORING REPORT

PERMIT #	OUTFALL #
MN0004006	023 M

MONITORING PERIOD	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	98	04	01	TO	98	04	30

Unit 2 Plant Cooling Wt[illegible]sch[illegible]
(SUBR 05) 12345
F - FINAL
MAJOR

*** NO DISCHARGE !__! ***

PARAMETER		QUANTITY AVERAGE	QUANTITY MAXIMUM	QUANTITY UNITS	CONCENTRATION MINIMUM	CONCENTRATION AVERAGE	CONCENTRATION MAXIMUM	CONCENTRATION UNITS	FREQUENCY OF ANALYSIS	SAMPLE TYPE
OXIDANTS, TOTAL RESIDUAL	SAMPLE MEASUREMENT	******	******		******		0.15	(19)	30/30	GRAB
34044 A 0 0 DISINFECT,PRCS CMPLT	PERMIT REQUIREMENT	******	******	**** ****	******	OPTIONAL MO AVG	2.0 DAILY MX	MG/L	ONCE/ DISCHG	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	******	******		897	29.9		(03)	30/30	Est.
50050 8 0 0 OTHER TRT,PRCS CMPLT	PERMIT REQUIREMENT	******	******	**** ****	REPORT MO TOTAL	REPORT AVERAGE	OPTIONAL MO MAX	MGD	CONTINUOUS	EST[illegible]
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									

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520 LAFAYETTE ROAD
ST. PAUL, MINNESOTA 55155
ATTN: W.Q. POINT SOURCE COMPLIANCE

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D.H. Schuelke — SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT — DATE: 5-11-98

SIGNATURE OF CHIEF OPERATOR — DATE — CERTIFICATION # — ☐ √ IF NEW

COMMENTS:
NOTE: FLOW IS A TOTAL OF OUTFALLS 022 & 023

PERMITTEE NAME/ADDRESS:

NSP-PRAIRIE ISLAND PLANT
414 NICOLLET MALL
MINNEAPOLIS MN 55401

NSP-PRAIRIE ISLAND PLANT
WELCH MN 55089
ATTN: MR. MICHAEL HESTICK

WASTEWATER TREATMENT DISCHARGE MONITORING REPORT

PERMIT #	OUTFALL #
MN0004006	030 M

MONITORING PERIOD	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	98	04	01	TO	98	04	30

Intake Screen Bkwsh+Fish Retn
(SUBR 05) 12345
F - FINAL
MAJOR

*** NO DISCHARGE !--! ***

PARAMETER		QUANTITY AVERAGE	QUANTITY MAXIMUM	QUANTITY UNITS	CONCENTRATION MINIMUM	CONCENTRATION AVERAGE	CONCENTRATION MAXIMUM	CONCENTRATION UNITS	FREQUENCY OF ANALYSIS	SAMPLE TYPE
FLOW, IN CONDUIT OR THRU TREATMENT PLANT 50050 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	******	******		60	2		(03)	1/30	Est
	PERMIT REQUIREMENT	******	******	**** ****	REPORT MO TOTAL	REPORT AVERAGE	OPTIONAL DAILY MX	MGD	ONCE/ MONTH	ESTIMA
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									

Send white copy with supplemental DMR form by 21st day of month following reporting period to:
MINNESOTA POLLUTION CONTROL AGENCY
520 LAFAYETTE ROAD
ST. PAUL, MINNESOTA 55155
ATTN: W.Q. POINT SOURCE COMPLIANCE

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SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT — DATE: 5-11-98

SIGNATURE OF CHIEF OPERATOR — DATE — CERTIFICATION #

☐ √ IF NEW

COMMENTS:

1)EFL:no floatg solids,foam or film
2)Large debris shall not be discharged.

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

APR 02,98
00:00:53

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 04/02/98 TIME: 00:00:32

POINT ID	DESCRIPTION	MAX	MIN	AVE
1T2570A	STURGEON LAKE TEMP 1	N C A L	N C A L	N C A L
1T2571A	STURGEON LAKE TEMP 2	67.6	62.7	66.7
1T2572A	DIAMOND BLUFF TEMP	N C A L	N C A L	N C A L
1T2573A	LOCK & DAM PIER 1 TEMP	43.3	43.3	43.3
1T2574A	LOCK & DAM PIER 2 TEMP	N C A L	N C A L	N C A L
1T2575A	LOCK & DAM PIER 3 TEMP	N C A L	N C A L	N C A L
1T2527A	SCREENHOUSE INLT TEMP	45.6	44.8	45.3
1T2530A	DISCHARGE CANAL AVERAGE TEMP	82.0	77.9	79.4

Working on system to repair damage from last season.

E-O-J

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

APR 03,98
00:00:59

TO: TOM VERBOUT

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 04/03/98 TIME: 00:00:52

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	N C A L	N C A L	N C A L	
1T2571A	STURGEON LAKE TEMP 2	67.5	43.4	52.8	Returning system
1T2572A	DIAMOND BLUFF TEMP	N C A L	N C A L	N C A L	
1T2573A	LOCK & DAM PIER 1 TEMP	42.1	41.6	41.9	
1T2574A	LOCK & DAM PIER 2 TEMP	44.9	43.5	44.0	
1T2575A	LOCK & DAM PIER 3 TEMP	43.8	43.7	43.7	good
1T2527A	SCREENHOUSE INLT TEMP	44.9	43.7	44.3	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	79.4	75.7	77.7	

E-O-J

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

APR 04,98
00:01:15

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 04/04/98 TIME: 00:01:08

TO: TOM VERBOUT

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	43.9	42.0	43.4	Good
1T2571A	STURGEON LAKE TEMP 2	44.9	42.9	43.8	At Intake, NOT STURGEON LAKE
1T2572A	DIAMOND BLUFF TEMP	42.2	41.9	42.1	Good — Bad reading
1T2573A	LOCK & DAM PIER 1 TEMP	42.0	40.6	41.3	
1T2574A	LOCK & DAM PIER 2 TEMP	43.4	42.0	42.9	
1T2575A	LOCK & DAM PIER 3 TEMP	43.5	41.9	43.0	
1T2527A	SCREENHOUSE INLT TEMP	44.4	42.9	43.6	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	82.0	76.1	78.9	

E-O-J

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

APR 05,98
00:01:25

TO: TOM VERBOUT

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 04/05/98 TIME: 00:01:17

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	45.8	42.4	43.9	Good
1T2571A	STURGEON LAKE TEMP 2	46.5	43.1	44.7	at Intake (NOT STURGEON LAKE)
1T2572A	DIAMOND BLUFF TEMP	N C A L	N C A L	N C A L	Bad T/C connection
1T2573A	LOCK & DAM PIER 1 TEMP	43.3	41.1	42.1	Good
1T2574A	LOCK & DAM PIER 2 TEMP	44.8	42.6	43.7	
1T2575A	LOCK & DAM PIER 3 TEMP	44.9	42.5	43.7	
1T2527A	SCREENHOUSE INLT TEMP	46.2	43.1	44.6	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	82.0	74.4	78.7	

E-O-J

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

APR 06,98
00:01:37

N: TOM VERBOUT

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 04/06/98 TIME: 00:01:31

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	47.2	44.3	45.7	Good
1T2571A	STURGEON LAKE TEMP 2	48.1	45.0	46.4	-at Intake to plant (NOT STURGEON LAKE)
1T2572A	DIAMOND BLUFF TEMP	N C A L	N C A L	N C A L	Bad T/C connection
1T2573A	LOCK & DAM PIER 1 TEMP	44.9	43.3	43.9	Good
1T2574A	LOCK & DAM PIER 2 TEMP	46.3	44.5	45.4	
1T2575A	LOCK & DAM PIER 3 TEMP	46.4	44.4	45.4	
1T2527A	SCREENHOUSE INLT TEMP	47.6	45.1	46.3	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	82.7	74.6	79.0	

E-O-J

Tom VERBOUT

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

APR 07,98
00:01:43

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 04/07/98 TIME: 00:01:39

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	48.0	46.0	47.1	Good
1T2571A	STURGEON LAKE TEMP 2	49.0	46.9	47.9	at Intake (NOT STURGEON LAKE)
1T2572A	DIAMOND BLUFF TEMP	N C A L	N C A L	N C A L	Bad T/C connection
1T2573A	LOCK & DAM PIER 1 TEMP	46.2	44.6	45.3	Good
1T2574A	LOCK & DAM PIER 2 TEMP	47.6	46.1	46.8	
1T2575A	LOCK & DAM PIER 3 TEMP	47.6	46.0	46.7	
1T2527A	SCREENHOUSE INLT TEMP	48.5	46.8	47.7	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	83.8	76.6	80.6	

E-O-J

To: Tom Verbout

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

APR 08,98
00:01:51

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 04/08/98 TIME: 00:01:48

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	48.6	47.6	48.1	Good
1T2571A	STURGEON LAKE TEMP 2	49.0	48.4	48.7	at Intake (NOT STURGEON LAKE)
1T2572A	DIAMOND BLUFF TEMP	N C A L	N C A L	N C A L	Bad T/C connection
1T2573A	LOCK & DAM PIER 1 TEMP	46.8	46.1	46.5	Good
1T2574A	LOCK & DAM PIER 2 TEMP	48.3	47.5	48.0	
1T2575A	LOCK & DAM PIER 3 TEMP	48.2	47.4	47.9	
1T2527A	SCREENHOUSE INLT TEMP	48.9	48.2	48.6	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	85.0	80.6	83.3	

E-O-J

To: Tom Verbout

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

APR 09,98
00:01:56

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 04/09/98 TIME: 00:01:52

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	48.1	46.9	47.3	Good
1T2571A	STURGEON LAKE TEMP 2	48.7	47.6	48.0	at Intake (NOT STURGEON LAKE)
1T2572A	DIAMOND BLUFF TEMP	N C A L	N C A L	N C A L	Bad T/C connection
1T2573A	LOCK & DAM PIER 1 TEMP	47.2	46.5	46.8	
1T2574A	LOCK & DAM PIER 2 TEMP	48.4	47.8	48.1	Good
1T2575A	LOCK & DAM PIER 3 TEMP	48.1	47.4	47.8	
1T2527A	SCREENHOUSE INLT TEMP	48.6	47.4	48.0	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	84.2	80.1	82.0	

E-O-J

TO: Tom VERBOUT

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

APR 10,98
00:02:09

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 04/10/98 TIME: 00:02:05

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	48.3	46.2	47.1	Good
1T2571A	STURGEON LAKE TEMP 2	48.6	46.8	47.7	at Intake (NOT STURGEON LAKE)
1T2572A	DIAMOND BLUFF TEMP	N C A L	N C A L	N C A L	Bad T/C connection
1T2573A	LOCK & DAM PIER 1 TEMP	47.3	46.0	46.7	Good
1T2574A	LOCK & DAM PIER 2 TEMP	48.6	47.1	47.9	
1T2575A	LOCK & DAM PIER 3 TEMP	48.4	46.6	47.5	
1T2527A	SCREENHOUSE INLT TEMP	48.6	46.8	47.6	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	84.4	76.6	81.2	

E-O-J

To: Tom Verbout

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

APR 11,98
00:02:19

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 04/11/98 TIME: 00:02:16

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	50.0	47.3	48.4	Good
1T2571A	STURGEON LAKE TEMP 2	50.2	47.7	48.8	at Intake (NOT STURGEON LAKE)
1T2572A	DIAMOND BLUFF TEMP	N C A L	N C A L	N C A L	Bad TIC Connection
1T2573A	LOCK & DAM PIER 1 TEMP	48.2	46.4	47.3	
1T2574A	LOCK & DAM PIER 2 TEMP	49.5	47.7	48.7	Good
1T2575A	LOCK & DAM PIER 3 TEMP	49.5	47.4	48.5	
1T2527A	SCREENHOUSE INLT TEMP	50.2	47.9	48.8	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	82.9	75.5	79.8	

E-O-J

Tom VERBOUT

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

APR 12,98
00:02:29

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 04/12/98 TIME: 00:02:26

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	52.1	49.4	50.5	Good
1T2571A	STURGEON LAKE TEMP 2	52.3	50.0	51.0	at Intake (NOT STURGEON LAKE)
1T2572A	DIAMOND BLUFF TEMP	N C A L	N C A L	N C A L	Bad T/C connection
1T2573A	LOCK & DAM PIER 1 TEMP	49.8	47.8	48.7	Good
1T2574A	LOCK & DAM PIER 2 TEMP	51.3	49.3	50.2	
1T2575A	LOCK & DAM PIER 3 TEMP	51.4	49.2	50.2	
1T2527A	SCREENHOUSE INLT TEMP	52.3	49.9	50.8	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	87.6	79.7	83.6	

E-O-J

TOM VERBOUT

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

APR 13,98
00:02:38

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 04/13/98 TIME: 00:02:34

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	53.4	51.8	52.6	Good
1T2571A	STURGEON LAKE TEMP 2	53.7	52.2	53.1	at Intake (NOT STURGEON LAKE)
1T2572A	DIAMOND BLUFF TEMP	N C A L	N C A L	N C A L	Bad T/C connection
1T2573A	LOCK & DAM PIER 1 TEMP	51.5	49.8	50.6	
1T2574A	LOCK & DAM PIER 2 TEMP	53.0	51.2	52.2	Good
1T2575A	LOCK & DAM PIER 3 TEMP	53.1	51.1	52.3	
1T2527A	SCREENHOUSE INLT TEMP	53.6	52.1	53.0	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	88.0	82.4	85.6	

E-O-J

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

APR 14,98
00:02:45

TO: TOM VERBOUT

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 04/14/98 TIME: 00:02:41

POINT ID	DESCRIPTION	MAX	MIN	AVE
1T2570A	STURGEON LAKE TEMP 1	53.5	52.7	53.1
1T2571A	STURGEON LAKE TEMP 2	54.1	53.4	53.7
1T2572A	DIAMOND BLUFF TEMP	N C A L	N C A L	N C A L
1T2573A	LOCK & DAM PIER 1 TEMP	51.7	50.7	51.2
1T2574A	LOCK & DAM PIER 2 TEMP	53.6	52.5	52.9
1T2575A	LOCK & DAM PIER 3 TEMP	53.7	52.6	53.0
1T2527A	SCREENHOUSE INLT TEMP	53.9	53.3	53.5
1T2530A	DISCHARGE CANAL AVERAGE TEMP	89.0	81.7	86.0

good — Intake Temp (NOT STURGEON LAKE)

Bad T/C suspect cool

E-O-J

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

APR 15,98
00:02:59

TO: TOM VERBOUT

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 04/15/98 TIME: 00:02:50

Bad reading by computer

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	54.4	0.0	53.0	good
1T2571A	STURGEON LAKE TEMP 2	54.9	0.0	53.6	
1T2572A	DIAMOND BLUFF TEMP	N C A L	N C A L	N C A L	— Bad T/C
1T2573A	LOCK & DAM PIER 1 TEMP	52.6	50.8	51.7	- suspect
1T2574A	LOCK & DAM PIER 2 TEMP	54.2	52.6	53.5	good
1T2575A	LOCK & DAM PIER 3 TEMP	54.3	52.4	53.4	
1T2527A	SCREENHOUSE INLT TEMP	54.7	53.0	53.8	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	86.1	80.4	83.9	

E-O-J

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

APR 16,98
00:03:14

TO: TOM VERBOUT

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 04/16/98 TIME: 00:03:10

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	54.1	51.7	53.3	Good
1T2571A	STURGEON LAKE TEMP 2	54.5	52.7	53.9	Good
1T2572A	DIAMOND BLUFF TEMP	N C A L	N C A L	N C A L	Bad T/C connection
1T2573A	LOCK & DAM PIER 1 TEMP	52.8	50.9	51.8	Good
1T2574A	LOCK & DAM PIER 2 TEMP	54.3	52.4	53.5	
1T2575A	LOCK & DAM PIER 3 TEMP	54.1	52.1	53.4	
1T2527A	SCREENHOUSE INLT TEMP	54.3	52.5	53.8	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	84.3	81.7	83.1	

Suspect

E-O-J

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

APR 17,98
00:03:26

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 04/17/98 TIME: 00:03:22

TO: TOM VERBOUT

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	52.4	50.3	51.4	Good
1T2571A	STURGEON LAKE TEMP 2	52.7	51.1	51.9	
1T2572A	DIAMOND BLUFF TEMP	N C A L	N C A L	N C A L	Bad TLC
1T2573A	LOCK & DAM PIER 1 TEMP - suspect	51.7	50.5	51.1	Good
1T2574A	LOCK & DAM PIER 2 TEMP	53.4	51.8	52.5	
1T2575A	LOCK & DAM PIER 3 TEMP	53.0	51.4	52.2	
1T2527A	SCREENHOUSE INLT TEMP	52.7	51.0	51.9	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	83.4	77.6	80.9	

E-O-J

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

APR 18,98
00:03:46

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 04/18/98 TIME: 00:03:37

TO: TOM Verbout

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	52.8	50.7	51.7	Good
1T2571A	STURGEON LAKE TEMP 2	52.6	51.8	52.1	and TIC
1T2572A	DIAMOND BLUFF TEMP	N C A L	N C A L	N C A L	
1T2573A	LOCK & DAM PIER 1 TEMP	51.5	50.5	51.1	- Suspect
1T2574A	LOCK & DAM PIER 2 TEMP	53.1	51.9	52.5	Good
1T2575A	LOCK & DAM PIER 3 TEMP	53.0	51.5	52.2	
1T2527A	SCREENHOUSE INLT TEMP	53.3	51.0	52.1	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	83.4	75.7	80.0	

E-O-J

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

APR 19,98
00:04:18

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 04/19/98 TIME: 00:04:10

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	53.5	52.2	53.0	Good
1T2571A	STURGEON LAKE TEMP 2	52.9	51.8	52.4	
1T2572A	DIAMOND BLUFF TEMP	N C A L	N C A L	N C A L	Bad TIC
1T2573A	LOCK & DAM PIER 1 TEMP	94.4	-6.8	68.3	Bad TIC
1T2574A	LOCK & DAM PIER 2 TEMP	53.3	52.2	52.8	Good
1T2575A	LOCK & DAM PIER 3 TEMP	53.2	52.1	52.8	
1T2527A	SCREENHOUSE INLT TEMP	53.9	52.5	53.4	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	86.1	80.8	84.5	

To: Tom Verbout.

E-O-J

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

APR 20,98
00:04:22

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 04/20/98 TIME: 00:04:19

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	53.9	51.8	52.7	Good
1T2571A	STURGEON LAKE TEMP 2	53.4	51.7	52.6	
1T2572A	DIAMOND BLUFF TEMP	N C A L	N C A L	N C A L	Bad T/C
1T2573A	LOCK & DAM PIER 1 TEMP	95.7	42.8	71.5	Bad T/C
1T2574A	LOCK & DAM PIER 2 TEMP	53.5	52.2	52.8	Good
1T2575A	LOCK & DAM PIER 3 TEMP	53.4	52.0	52.7	
1T2527A	SCREENHOUSE INLT TEMP	54.2	52.4	53.2	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	88.2	80.4	83.6	

E-O-J

To: Tom Verbout

TOM VERBOUT

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

APR 21,98
00:04:33

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 04/21/98 TIME: 00:04:31

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	53.6	52.2	52.9	} Good
1T2571A	STURGEON LAKE TEMP 2	53.4	52.3	52.9	Bad Redro (Data lost)
1T2572A	DIAMOND BLUFF TEMP	N C A L	N C A L	N C A L	
1T2573A	LOCK & DAM PIER 1 TEMP	96.4	-25.5	41.2	— Bad T/C
1T2574A	LOCK & DAM PIER 2 TEMP	53.6	52.7	53.1	Good
1T2575A	LOCK & DAM PIER 3 TEMP	53.6	52.5	53.0	
1T2527A	SCREENHOUSE INLT TEMP	53.9	52.6	53.3	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	85.6	80.5	83.9	

E-O-J

Tom Verbout

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

APR 22,98
00:04:44

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 04/22/98 TIME: 00:04:40

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	56.4	52.0	53.9	Good
1T2571A	STURGEON LAKE TEMP 2	55.0	52.6	53.7	
1T2572A	DIAMOND BLUFF TEMP	59.5	52.1	53.1	
1T2573A	LOCK & DAM PIER 1 TEMP	73.8	63.5	67.9	Bad T/C (Removed from Calculation)
1T2574A	LOCK & DAM PIER 2 TEMP	55.4	52.9	53.9	Good
1T2575A	LOCK & DAM PIER 3 TEMP	55.8	52.7	53.9	
1T2527A	SCREENHOUSE INLT TEMP	56.4	52.3	54.1	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	86.6	79.5	83.4	

E-O-J

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

APR 23,98
00:04:54

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 04/23/98 TIME: 00:04:50

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	58.5	54.0	56.1	good
1T2571A	STURGEON LAKE TEMP 2	57.1	54.3	55.6	good
1T2572A	DIAMOND BLUFF TEMP	54.5	52.2	53.5	
1T2573A	LOCK & DAM PIER 1 TEMP	78.5	70.4	73.7	Air temp Bad T/C
1T2574A	LOCK & DAM PIER 2 TEMP	57.0	54.7	55.8	Good
1T2575A	LOCK & DAM PIER 3 TEMP	57.6	54.7	56.0	
1T2527A	SCREENHOUSE INLT TEMP	58.7	54.4	56.3	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	89.0	78.8	84.3	

E-O-J

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

APR 24,98
00:05:07

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 04/24/98 TIME: 00:04:59

POINT ID	DESCRIPTION	MAX	MIN	AVE
1T2570A	STURGEON LAKE TEMP 1	59.9	55.7	57.6
1T2571A	STURGEON LAKE TEMP 2	58.6	55.5	57.0
1T2572A	DIAMOND BLUFF TEMP	55.7	53.4	54.4
1T2573A	LOCK & DAM PIER 1 TEMP	81.3	73.9	77.1
1T2574A	LOCK & DAM PIER 2 TEMP	58.7	56.0	57.2
1T2575A	LOCK & DAM PIER 3 TEMP	59.4	56.2	57.4
1T2527A	SCREENHOUSE INLT TEMP	60.1	56.1	57.9
1T2530A	DISCHARGE CANAL AVERAGE TEMP	89.2	79.5	85.5

Good

Air Temp Bad T/C (removed from calculation

Good

E-O-J

Temp high

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

APR 25,98
00:00:18

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 04/25/98 TIME: 00:00:14

computer down US 58.0

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	61.6	0.0	58.5	Good
1T2571A	STURGEON LAKE TEMP 2	59.9	0.0	57.9	
1T2572A	DIAMOND BLUFF TEMP	55.5	53.6	54.6	
1T2573A	LOCK & DAM PIER 1 TEMP	83.7	0.0	80.0	Air Temp Bad T/C (Removed from Calculation)
1T2574A	LOCK & DAM PIER 2 TEMP	59.5	0.0	58.3	Good
1T2575A	LOCK & DAM PIER 3 TEMP	60.6	0.0	58.7	
1T2527A	SCREENHOUSE INLT TEMP	61.9	57.7	59.5	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	91.9	82.2	87.3	

58.7

E-O-J

tom Verbout

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

APR 26,98
00:00:39

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 04/26/98 TIME: 00:00:31

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	60.6	57.9	59.2	Good
1T2571A	STURGEON LAKE TEMP 2	60.3	57.8	59.1	
1T2572A	DIAMOND BLUFF TEMP	56.0	54.8	55.3	
1T2573A	LOCK & DAM PIER 1 TEMP	83.8	73.0	78.3	- Bad T/C Air Temp (Removed from calculation
1T2574A	LOCK & DAM PIER 2 TEMP	60.2	58.5	59.2	Good
1T2575A	LOCK & DAM PIER 3 TEMP	60.3	58.5	59.2	
1T2527A	SCREENHOUSE INLT TEMP	60.7	58.4	59.6	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	89.9	83.1	86.7	

E-O-J

1 of 1

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

APR 27,98
00:00:53

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 04/27/98 TIME: 00:00:46

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	60.3	56.9	58.6	Good
1T2571A	STURGEON LAKE TEMP 2	60.8	57.8	59.0	
1T2572A	DIAMOND BLUFF TEMP	55.7	53.9	54.9	
1T2573A	LOCK & DAM PIER 1 TEMP	73.0	63.9	68.4	- Bad T/C Air Temp (Removed from calculation
1T2574A	LOCK & DAM PIER 2 TEMP	60.4	58.5	59.1	Good
1T2575A	LOCK & DAM PIER 3 TEMP	61.1	58.2	59.3	
1T2527A	SCREENHOUSE INLT TEMP	60.3	57.3	58.8	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	89.0	82.7	86.3	

E-O-J

Tom
Ken Davis

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

TO: Tom Verbout

APR 29,98
00:01:20

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 04/29/98 TIME: 00:01:14

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	62.3	56.6	59.7	Good
1T2571A	STURGEON LAKE TEMP 2	62.2	57.4	59.8	↓
1T2572A	DIAMOND BLUFF TEMP	56.2	54.0	55.1	
1T2573A	LOCK & DAM PIER 1 TEMP	75.2	67.0	70.4	Bad T/C Air temp (Removed from calculation)
1T2574A	LOCK & DAM PIER 2 TEMP	61.3	58.2	59.7	Good
1T2575A	LOCK & DAM PIER 3 TEMP	62.1	58.4	60.0	
1T2527A	SCREENHOUSE INLT TEMP	62.2	57.3	59.7	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	87.8	78.2	84.1	↓

E-O-J

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

TO: Tom Verbout

APR 29,98
00:01:20

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 04/29/98 TIME: 00:01:14

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	62.3	56.6	59.7	Good
1T2571A	STURGEON LAKE TEMP 2	62.2	57.4	59.8	↓
1T2572A	DIAMOND BLUFF TEMP	56.2	54.0	55.1	
1T2573A	LOCK & DAM PIER 1 TEMP	75.2	67.0	70.4	Bad T/C Air temp (Removed from calculation)
1T2574A	LOCK & DAM PIER 2 TEMP	61.3	58.2	59.7	Good
1T2575A	LOCK & DAM PIER 3 TEMP	62.1	58.4	60.0	
1T2527A	SCREENHOUSE INLT TEMP	62.2	57.3	59.7	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	87.8	78.2	84.1	↓

E-O-J

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

APR 30,98
00:01:29

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 04/30/98 TIME: 00:01:24

TO: Tom Verbout

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	63.6	58.3	61.0	Good
1T2571A	STURGEON LAKE TEMP 2	63.3	58.8	60.7	
1T2572A	DIAMOND BLUFF TEMP	56.5	54.1	55.3	
1T2573A	LOCK & DAM PIER 1 TEMP	78.5	70.3	74.0	Bad TIC Air temp (Removed from calculation
1T2574A	LOCK & DAM PIER 2 TEMP	62.1	59.6	60.6	Good
1T2575A	LOCK & DAM PIER 3 TEMP	63.1	59.6	61.0	
1T2527A	SCREENHOUSE INLT TEMP	63.4	59.0	61.1	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	90.1	79.2	85.8	

E-O-J

Tom Verbout

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

MAY 01,98
00:01:45

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 05/01/98 TIME: 00:01:37

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	65.4	59.1	62.2	Good
1T2571A	STURGEON LAKE TEMP 2	64.5	59.4	61.7	
1T2572A	DIAMOND BLUFF TEMP	56.8	54.9	55.8	
1T2573A	LOCK & DAM PIER 1 TEMP	82.4	74.5	77.9	Bad T/C (Removed from Calculation)
1T2574A	LOCK & DAM PIER 2 TEMP	63.8	60.1	61.6	Good
1T2575A	LOCK & DAM PIER 3 TEMP	64.4	60.0	62.0	
1T2527A	SCREENHOUSE INLT TEMP	65.2	59.9	62.4	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	92.4	82.0	87.5	

E-O-J

Northern States Power Company

414 Nicollet Mall
Minneapolis, Minnesota 55401-1927
Telephone (612) 330-5500

June 19, 1998

Mr. Marvin Hora
Section Manager
Point Source Compliance Section
Division of Water Quality
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, MN 55155

Attention: Mary Hayes

PRAIRIE ISLAND NUCLEAR GENERATING PLANT
NPDES Permit No. MN0004006
Monthly Discharge Monitoring Reports

In accordance with Part I.D.2. of the subject NPDES permit, we are submitting our Discharge Monitoring Reports for discharges 701M, 010, 011, 012, 013, 014, 015, 016, 017, 018, 021, 022, 023 and 030 at the Prairie Island Nuclear Generating Plant. These reports cover the period May 1, 1998 through May 31, 1998. We are also submitting the Bromine/Chlorine Monthly Supplemental Report (in the new plant format) and the Circulating Water Total Phosphorous Report for the month of May.

In accordance with Part I.C.5.e. of the subject NPDES permit, we are also submitting the records of the daily maximum, minimum, and average temperatures for the monitoring locations of the expanded temperature monitoring system. The Sturgeon Lake #1 monitoring was out of service or operating incorrectly from May 25 through May 31. The Lock and Dam Pier 1 monitoring was out of service or operating incorrectly from May 1 through May 14. Minimum temperature monitoring was out of service or operating incorrectly on May 6, 26, and 28 for both Sturgeon Lake (1 and 2) monitors, for the Diamond Bluff monitor and for all three Lock and Dam Piers (1, 2, and 3). Backup monitoring and reporting is utilized when a particular monitor is out of service.

A plant status report of the continuous bromination/chlorination treatment program is included and provides a summary of April operation including the monthly demand result which increased significantly triggering an increase in treatment levels.

FILE COPY
PI-LAB

Enclosed is the plant's synopsis of the blowdown situation in May and early June. The plant increased and maintained blowdown above normal springtime thresholds so as to maintain condenser inlet temperatures at or below 85°F per Permit Part I.C.6.b. The initial increase to higher than normal blowdown levels was primarily due to weather conditions. Subsequently, cooling tower failures were a primary factor in the situation. The enclosed synopsis does not summarize cooling tower repair work or the additional larval fish impingement monitoring implemented during the situation. Summaries of that work will be forwarded as separate reports after all work and analyses are completed. The enclosed synopsis has the following attachments:

- a summary of data from the plant's external circulating water logs from May 1 through June 9 including blowdown readings and the high temperature readings from the condenser inlet, ambient river, and lock and dam,
- the actual plant external circulating water logs covering this time period (May 1 through June 9),
- additional blowdown and temperature data collected during the situation from May 20 through June 7,
- a summary of May air temperatures for the Minneapolis area from the *Star Tribune*.

Also enclosed with the blowdown synopsis is a report of the fish loss within the plant's recycle and discharge canal systems, likely due to the rise in temperatures within the canal systems following the initial cooling tower failure on May 15. Inspections found no evidence of a loss until May 18. The loss was previously reported to the MPCA and the DNR. Please note the discussion in the report that an option to increase blowdown further to lower canal system temperatures was considered but decided against to protect against effects external to plant systems, as well as to adhere to permit language.

If you have any questions, please call me at 330-6625.

Sincerely,

Jim Bodensteiner
Senior Environmental Analyst

Enclosures

c: Marilyn Danks (DNR)
Mark Gruber
Gary Kolle
Gerald Joachim
Tom Verbout
Ken Mueller
ERAD Record Center

w:jjb/rpts/mpraire

NNNN SSSSSSPPPPPPPPPP Northern States Power Company
NN NN SSS PPP Prairie Island Nuclear Generating Plant
NN NN SSSS PPPPPPPP 1717 Wakonade Drive East
NN NN SSS PPP Welch, Minnesota 55089
NN NNSSSSSSS PPP (612)-388-1121

DATE JUNE 06,1998

NAME JIM BODENSTEINER
ADDRESS NSP ERAD

SUBJECT: FISHKILL IN RECYCLE CANAL AND DISCHARGE CANAL

At 0352 on May 15th 124 cooling tower was turned off due to structural damage to one cell. Cooling tower blowdown was increased to 700 cfs to maintain condenser inlet temp below 85 degrees. The discharge canal temp rose into the mid 90's from the low 90's. Inspection of the discharge canal at 0830 on the 15th showed no dead fish. The air temp on the 14th was a near record high 92 degrees which probably aided the discharge canal temp increase. The canal remained in the mid to upper 90's on the 16th and the 17th.

Around 1000 on the 18th a fishkill was identified on the old intake screenhouse trash racks. Approximately 60-70 carp and catfish were on the trash racks. Probable cause was long term temperature stress. Inspection of the discharge canal showed no dead fish. Recycle canal temp could be in the 100-105 range and the discharge canal was near 100 degrees. NSP ERAD was notified and a notification was made to MPCA Water Quality, Minn DNR, and the state duty officer. An internal NSP notification was completed. NSP had an internal discussion on the effects of raising the blowdown higher from the current 700 to reduce the circ water temperatures. It was decided that the possible detrimental effect on the larval fish at the intake screenhouse from even higher intake flows outweighed the possible positive effect from reducing circ water temperatures on the fish population within the plant's circ water system.

An additional 10 mostly catfish were found the morning of the 19th on the old screenhouse trash racks. Discharge canal showed no dead fish. About 1300 a shutdown of 121 tower was started because of possible structural damage. This caused the discharge canal temp to slowly rise to 101 degrees Around 1500 a number of dead fish appeared in the discharge canal. Between 1800 and 2100 approximately 700 fish(mostly sunfish) were removed from the discharge canal. 121 tower was completely shutdown around 1800.

Around 0800 on the 20th an inspection of the discharge canal yielded no additional dead fish. The old screenhouse trash bucket that was in service since Monday showed 1 catfish and 50 or so sunfish. On the 21st the discharge canal was clean and the old screenhouse trash bucket had an additional 1 catfish and around 100 sunfish since they were emptied yesterday. We continued to see a small number(<5) of fish on the racks and 10-20 small fish in the trash bucket daily through the end of May. The discharge canal remained clean. On the 22nd 121 tower was returned to service. The discharge canal temps remained in the low to upper 90's the rest of May.

In summary the discharge canal yielded the following:

681 Green sunfish(1.5"-6")
3 Spotfin shiners(adult)
13 Channel catfish(1@14.5", 1 @17", 1@17.5", 3@18", 2@19", 2@20", 2@21", 1@21", 1@22".

the old screenhouse trash racks and buckets the following:

55 Catfish (2-5#)
20 Carp (3-7#)
5 Sheephead
150 Sunfish(two buckets)

Additionally daily we saw a couple catfish or carp on the racks and 10-20 sunfish in the trash buckets through the end of May. June has shown only normal amounts so far. On the 5th of June one large carp was seen in the discharge canal. Numerous cooling tower manipulations occurred in early June.

Please contact me at Ext. 4440 if additional information is needed. Thank you.

Sincerely yours,

Gerald Joachim
Senior Radiation Protection Specialist

NNNN SSSSSSPPPPPPPPPP Northern States Power Company
NN NN SSS PPP Prairie Island Nuclear Generating Plant
NN NN SSSS PPPPPPPP 1717 Wakonade Drive East
NN NN SSS PPP Welch, Minnesota 55089
NN NNSSSSSSS PPP (612)-388-1121

DATE JUNE 07,1998

NAME JIM BODENSTEINER
ADDRESS NSP ERAD

SUBJECT: COOLING TOWER BLOWDOWN INCREASES AND COOLING TOWER FAILURES

This report is strictly a synopsis of blowdown conditions in May and early June as a result of cooling tower operations and failures, river conditions, and the weather. This report does not summarize engineering evaluations of the cooling tower failures, previous cooling tower inspection results, the repair work completed on the cooling towers, the results of the additional larval fish inpingement monitoring during the increased blowdown periods nor the plant decision making process during this time period. These items will be contained in a separate report. Some additional trend plots of various temperatures may also be available in the future.

A summary of the cooling tower status on May 1st is:

#121 tower running with 7 fans NOTE: all towers have
#122 tower running with 12 fans 12 fans installed
#123 tower running with 9 fans
#124 tower running with 9 fans

The majority of fans were out of service due to cabling problems

During April the plant was able to meet the 300 cfs blowdown limit without problems. The 300 cfs blowdown limit continues through the month of May.

On May 4th the condenser inlets were allowed to rise to around 87 degrees to keep blowdown below 300 cfs. On May 5th after a review of plant guidelines it was determined that operations above 85 degrees inlet would not continue. Our NPDES permit allows us to increase blowdown above the permit limit to maintain condenser inlet within $\leq$ 85 degrees as long as we are running cooling towers to the maximum practical extent and minimize the excess amount. Blowdown was increased to 325 from 291 late in the afternoon. A courtesy notification was made to MPCA Water Quality.

We stayed around 325 on the 6th and 7th. Cooler air temps allowed us to reduce blowdown below 300 on the 8th and 9th. On the 10th warmer air temps and increasing river temps required increasing blowdown to the upper 300's. On the 11th,12th and 13th we remained just below or at 400 cfs. A courtesy call was made to MPCA Water Quality.

On the 14th which was a NEAR RECORD high air temp the blowdown was increased to 526 cfs. The plant has set a goal of maintaining condenser inlet temperatures between 82 and 85 degrees because of the difficulty in maintaining a tighter band. Maintaining a tighter band would require too many gate adjustments because of changing air temps and river temps. NSP feels this band meets the intent of the wording of the NPDES permit. In the afternoon of the 14th a courtesy call was made by ERAD to MPCA Water Quality about increasing blowdown to around 500 cfs.

After slowly ramping up in blowdown the evening and early morning of the 15th, at 0352 #124 cooling tower was shutdown because of major structural failure on one cell. Blowdown was increased to 708 cfs shortly after the tower shutdown. A courtesy call was made by ERAD to MPCA water Quality informing them of the increase in blowdown and the failure of #124 tower. Except for a decrease on the 16th we held blowdown around 700 cfs until the afternoon of the 19th. A fishkill at the old screenhouse was found on the morning of the 18th with no evidence of fishkill in the discharge canal.

Early afternoon on the 19th a shutdown was commenced on #121 tower because of possible structural damage. Blowdown increased to 940 cfs by midnight. A courtesy call by ERAD was made to MPCA Water Quality informing them of the tower shutdown and increased blowdown. At this same time a significant fishkill(likely induced by rise in temperature and extended high temperatures in the system) was found in the discharge canal in the late afternoon. See Fishkill Report for more detail. We held at about 900 cfs until 2200 on the 22nd when #121 tower was placed back in service. Blowdown decreased rapidly on the 23rd to around 475. We held this flow until the morning of the 25th when we were able to decrease to around 380 cfs. We slowly ramped up to 600 late on the 27th. By afternoon of the 28th we increased to 720 cfs.

We slowly ramped down to 600 cfs on the morning of the 31st. Unusually cold weather on June 1st allowed blowdown to decrease to 488 in the morning. At 1511 #123 tower was shutdown due to major structural damage to one cell. Blowdown increased to 745 cfs by midnight. It held around 700 on the 2nd until the morning of the 3rd when it decreased to 402 cfs. Unit 1 had been reduced in power to around 42% for a condenser inspection and #122 tower had been shutdown for an inspection. With the power reduction the loss of #122 tower still allowed a siginificant reduction in blowdown. There was also an unusually cold weather spell. Air temps were much below normal. The power reduction and associated tower shutdown for inspection were discussed with MPCA Water Quality during a telephone conference on the afternoon of June 2nd prior to the shutdown on the 3rd.

#122 tower was returned to service late on the 3rd. Shortly afterward a breaker failure caused all fans to be inoperable. Unit 1 was ramped up in power through the night to 70% where it held for more power demand. In the late morning Unit 1 returned to full power. Blowdown slowly increased to around 600 cfs on the 5th. The cold weather continued. To determine the problem on 122 tower the fans on #121 also had to be turned off. The problem was a breaker failure. #121 fans were restarted. A courtesy call was made to MPCA Water Quality informing them of the results of the power reduction and repair

On the 5th repair of the breaker required #121 fans to be off also. Scheduled a Unit 2 power reduction to 50% for the morning of the 6th. #122 tower would be completely fixed and then #121 tower would be completely shutdown for inspection. Unit 2 would remain at 50% until 2000 on Sunday June 7th. Both #121 tower and #122 tower should be fixed by then. A courtesy call was made to MPCA WAter Quality informing them of the plans for the weekend with an update scheduled for Monday June 8th.

At 1900 on the 5th Unit 1 reactor tripped on a dropped rod. Unit 2 will remain at 100%. #122 tower was returned to service with 10 fans late evening on the 5th. At 0300 #121 tower was shutdown for inspection. Blowdown ramped down to 392 cfs by 0840 on the 6th which is less than the allowable 400 cfs for June 1-14. We are currently meeting all NPDES limits

Late June 6th #121 tower was retuned to service with 6 fans. Early June 7th blowdown was 381 cfs and condenser inlets had dropped to 78 degrees. Unit 1 is scheduled to be down for a minimum of 14 days. That will put us into the 800 cfs limit after June 15th which we would not expect to exceed. #124 tower is currently scheduled to be online around June 15th. Repair on #123 tower is not known at this time. Full open cycle ocurrs on July 1st.

During the entire month of May the five degree delta temperature limit was never even approached. The average for May was 0.2 degrees and June is less than one degree as of today.

On June 7th, in summary we currently have #121 tower and #122 tower running and Unit 1 shutdown and cooling tower blowdown is within the limit.

Attached are the External Circ Water Logs and water temperature summary for May and early June, air temp summary for May and a summary of some additional data taken during this time period.

Please contact me at Ext. 4440 if additional information is needed. Thank you.

Sincerely yours,

Gerald Joachim
Senior Radiation Protection Specialist

SUMMARY OF DATA FROM EXTERNAL CIRC WATER LOGS

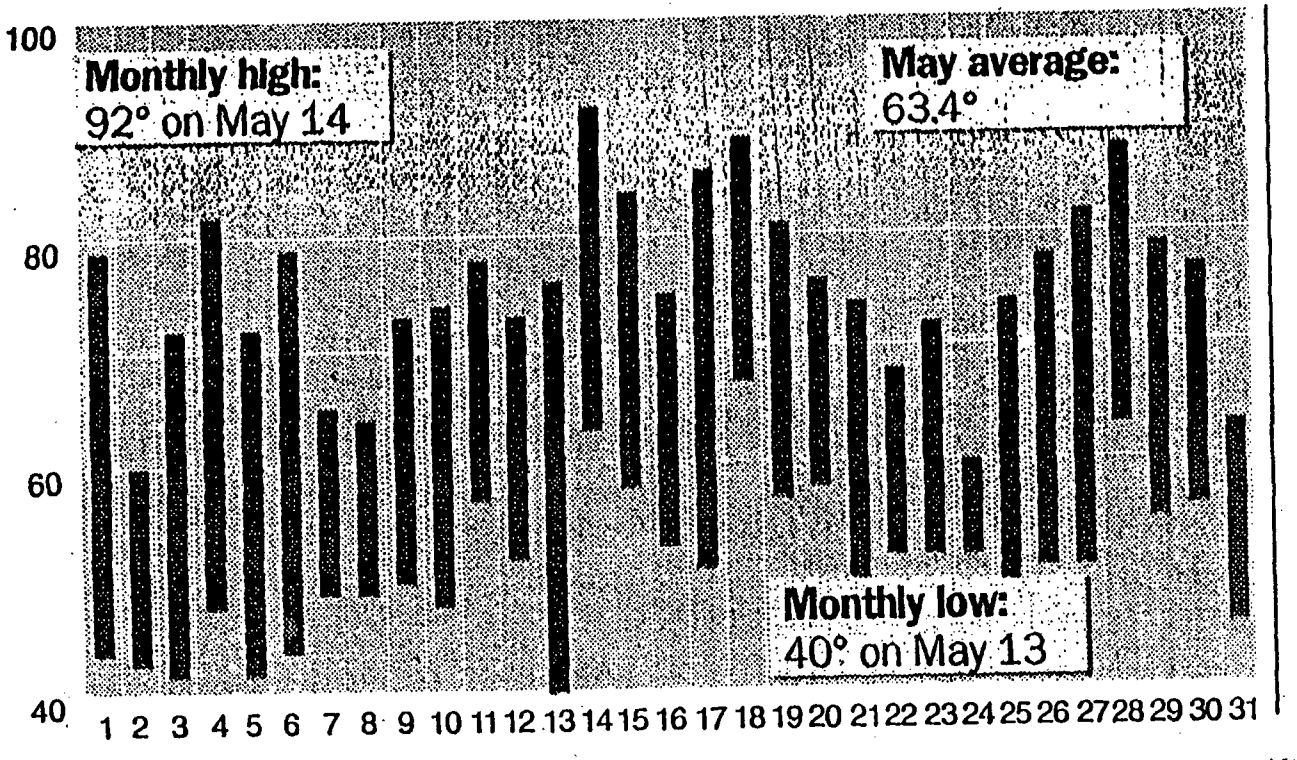
	DATE/TIME	HI COND INLET	AMBIENT RIVER	DAM	BLOWDOWN
	5/1 1130	82.7	56.6	61.6	299
	5/2 1015	83.3	62.6	63.2	299
	5/3 0940	80.9	60.9	61.2	299
	5/4 1150	85.7	64.4	64.6	291
	5/5 1100	85.8	64.0	64.2	291
	5/5 2220	85.0	65.8	66.9	325
	5/6 1110	84.2	64.6	64.6	315
	5/7 0825	83.9	64.9	65.7	323
	5/8 1130	84.7	63.3	64.4	299
	5/9 1130	82.4	64.6	64.5	299
	5/10 0730	81.9	65.7	65.9	355
	5/10 1050	82.5	65.8	66.2	384
	5/10 1325	84.5	66.6	67.3	372
	5/11 1122	82.7	66.3	67.0	396
	5/12 0919	81.5	65.6	66.5	384
	5/12 1556	85.0	67.3	67.3	396
	5/13 1055	81.7	64.4	64.9	396
	5/14 1100	81.8	65.3	65.9	396
	5/14 1400	83.6	68.0	67.9	526
124 TOW DOWN	5/15 0410	84.2	68.5	69.5	559
	5/15 0530	82.3	68.2	69.8	708
	5/15 0944	82.0	68.0	69.3	708
	5/15 2345	82.7	69.3	70.9	708
	5/16 1020	83.3	67.4	68.1	576
	5/17 1130	83.9	67.2	68.4	672
	5/18 1140	84.9	69.9	70.6	695
	5/18 1700	84.9	73.4	73.5	720
	5/19 0830	81.8	71.0	71.6	750
121 TOW STOP	5/19 1430	83.4	73.9	73.8	660
	5/20 0000	80.0	73.3	74.3	940
	5/20 0515	83.2	72.8	73.0	895
	5/20 0920	84.4	72.2	72.8	880
	5/20 1630	84.8	74.9	74.5	895
	5/21 1015	83.1	71.9	72.6	888
	5/22 1015	81.7	71.7	72.1	888
	5/22 1453	83.8	72.7	72.7	865
121 TOW START	5/22 2240	84.2	71.8	72.3	865
	5/23 0335	83.2	70.6	71.2	593
	5/23 1035	84.1	69.4	69.3	475
	5/24 1020	82.9	68.5	68.4	475
	5/24 1317	83.5	68.4	68.3	463
	5/24 1815	83.8	68.7	68.3	475
	5/25 0030	84.5	68.1	67.8	463
	5/25 0200	84.8	67.9	67.6	463
	5/25 0506	84.9	67.6	67.3	381
	5/25 1005	84.3	67.1	67.0	392
	5/26 0617	85.0	68.8	68.8	465
	5/26 0945	83.2	68.7	69.1	516
	5/27 0115	84.5	70.3	71.6	549
	5/27 0600	84.7	69.5	70.5	527
	5/27 1030	84.6	69.9	70.2	527
	5/27 1700	83.8	72.7	72.8	560
	5/27 2000	84.1	72.4	73.3	600
	5/28 1017	84.1	71.1	71.5	610
	5/28 1420	84.3	73.0	72.6	625
	5/28 1510	84.5	73.3	73.7	720
	5/29 0630	82.1	72.7	73.3	685

	5/29	1050	84.1	73.2	3.4	650
	5/29	1520	84.3	75.2	75.1	675
	5/29	2209	84.3	75.5	76.0	696
	5/30	0439	84.2	73.6	74.4	648
	5/30	1025	82.9	73.2	73.2	630
	5/30	1700	84.4	74.3	73.2	630
	5/30	2045	84.4	74.4	74.0	648
	5/31	0513	84.9	71.9	72.3	624
	5/31	1000	84.9	70.9	71.1	600
	5/31	2230	84.0	72.3	72.6	600
	6/1	0126	84.5	72.3	72.6	500
	6/1	0511	84.2	72.3	72.6	488
	6/1	1121	84.9	70.6	70.2	488
	6/1	1325	83.5	71.9	70.7	525
123 TOW	6/1	1535	82.4	71.8	71.0	550
DOWN	6/1	2128	83.9	71.2	71.4	725
	6/1	2344	84.1	70.4	71.2	745
	6/2	0452	83.5	69.0	69.6	722
	6/2	1120	82.9	67.9	68.1	707
	6/3	0025	82.5	67.7	67.9	707
U2 42%	6/3	0812	82.3	65.9	65.4	434
	6/4	0042	83.6	66.6	67.0	538
	6/4	1130	84.8	66.6	66.3	570
	6/4	1430	83.5	66.2	66.9	600
	6/5	1100	85.4	65.8	65.8	600
U1 TRIP	6/5	2200	77.4	66.4	66.4	560
121 TOW	6/6	0505	83.4	65.3	65.2	445
STOP	6/6	0840	84.5	64.8	65.0	392
121 TOW	6/6	2135	84.2	65.7	65.4	380
START	6/7	0730	77.4	63.6	63.6	392
	6/8	1325	79.1	66.9	65.7	392
	6/9	1115	77.9	64.5	64.4	392

ADDITIONAL DATA NOT ON ANY OTHER SHEET

DATE/TIME	RIVER/INTAKE	HI COND INLET	BLOWDOWN(CFS)	DISCH CANAL
5/20 0630		82	900	98
5/21 0600		83.1	895	98
5/26 0600		85.0	392	94
5/26 1000		83	464	
5/27 0600	69.9	84.5	548	95
5/28 0545	70.6	83.0	625	95
5/29 0645	72.7	82.6	685	95
6/01 0545	72.3	84.2	488	91
6/02 0545	68.2	83.6	722	99
6/03 0545	64.3	85.0	402	93
6/03 1600	68.3	83.8	434	98
6/04 0530	64.6	83.4	538	96
6/04 1010	64.3	83.9	570	98
6/04 1445	65.3	85.5	600	102
6/05 0645	64.7	84.2	600	100
6/06 0855	63.5	84.9	392	91
6/07 0545	62.8	77.7	381	84

Minneapolis Area Temperature Summary
(STAR TRIBUNE)



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DATES: 4-25-98 TO: 5-3-98

EXTERNAL CIRC WATER LOG

ATE / TIME	U1 CDSR INLETS 1T2513A / 1T2514A	U2 CDSR INLETS 2T2513A / 2T2514A	AMBIENT RIVER 1T2576A / 2T2576A	LOCK & DAM NO. 3 1T2528A / 2T2528A	RIVER ΔT 1T2578A / 2T2578A	CANAL TO RIVER ΔH	SLUICE GATES OPEN 5'	6'	7'	8'	PLANT DISCH FLOW	CTP/FANS IN SERVICE 121/12 / 123/12	122/12 / 124/12	U1 MWe 1Q0340A / U2 MWe 2Q0340A	OPCW UPDATED ✓	REMARKS	INIT.
1-25-98	79.1	74.5	56.2	59.0	2.8	2.4		✓			267	ON 7	ON 12	555	✓	38100 River flow update	
1115	79.0	76.2	56.2	59.0	2.8							ON 8	ON 9	544			
4-26-98	79.6	76.0	57.2	57.0	-.2	2.4		/			267	ON 7	ON 12	566		37,400 CFS UPDATE	
1130	79.5	76.1	57.2	57.0	-.2							ON 9	ON 9	521			
5/6-98	75.3	70.0	56.5	58.0	1.5	3.0		✓			315	ON 7	ON 12	560	✓	35,900 CFS ADJUST PREVIOUS UPDATE	
1100	75.0	72.0	56.5	58.0	1.5							ON 9	ON 10	546			
27-98	79.4	74.5	57.6	58.9	1.3	2.7		✓			292	ON 7	ON 12	556	✓	UPDATE	
1315	78.4	75.7	57.6	58.9	1.3							ON 9	ON 7	544			
28-98	77.7	72.4	55.6	58.7	3.0	2.7		✓			292	ON 7	ON 12	558		update	
0700	76.5	74.1	55.6	58.7	3.1							ON 8	ON 8	545			
29-98	78.9	74.6	55.9	59.9	4.0	2.7		✓			292	ON 7	ON 12	556		UPDATE	
0950	78.6	76.0	55.9	59.9	4.0							ON 7	ON 8	543			
30-98	~~78.3~~ 82.3	78.3	60.6	60.5	-.1	2.8		✓			299	ON 7	ON 12	551	✓	29,000 CFS River flow Update	
1145	82.4	79.1	60.6	60.5	-.1							ON 7	ON 8	539			
1-98	82.7	77.9	56.6	61.6	5.0	2.8		✓			299	ON 7	ON 12	549		update	
1130	82.7	79.1	56.6	61.6	5.0							ON 8	ON 8	539			
2-98	83.3	77.1	62.6	63.2	.6	2.8		✓			299	ON 7	ON 12	551		Update	
1015	81.8	75.2	62.6	63.2	.6							ON 8	ON 8	540			
3-98	80.9	76.1	60.8	61.2	.4	2.8		✓			299	ON 7	ON 12	553		Update	
0940	80.9	77.9	60.9	61.2	.3							ON 8	ON 8	542			

Complete log at the following times:

1. Daily between 0700 and 1200.
2. Immediately prior to adjusting discharge flow rate.
3. At equilibrium conditions following a discharge flow rate change.
4. Immediately following a change in the number of in-service cooling towers.

Jerry Joachim

DATES: 5-4-98 TO: 5-10-98

EXTERNAL CIRC WATER LOG

DATE / TIME	U1 CDSR INLETS 1T2512A / 1T2514A	U2 CDSR INLETS 2T2513A / 2T2514A	AMBIENT RIVER 1T2576A / 2T2576A	LOCK & DAM NO. 3 1T2526A / 2T2526A	RIVER ΔT 1T2578A / 2T2578A	CANAL TO RIVER ΔH	SLUICE GATES OPEN 5'	6'	7'	8'	PLANT DISCH FLOW	CTP/FANS IN SERVICE 121/12 / 123/12	122/12 / 124/12	U1 MWe 1Q0340A / U2 MWe 2Q0340A	OPCW UPDATED ✓	REMARKS	INIT.
5-4-98	85.7	81.2	64.4	64.6	.2	2.7		✓			291	ON 7	ON 12	547	✓	UPDATE	RAP
1150	85.7	82.7	64.4	64.6	.2							ON 8	ON 8	534			
5-5-98	85.3	79.2	64.0	64.2	.2	2.7		✓			291	ON 7	ON 12	548		Update	
1100	84.2	80.4	63.7	64.1	.4							ON 8	ON 8	537			
5-5-98	85.0	78.6	65.8	66.9	1.1	3.1		✓			325	ON 7	ON 12	549	✓	UPDATE	
2220	83.7	80.6	65.1	66.9	1.1							ON 8	ON 8	538			
5/6/98	84.2	79.2	64.6	64.6	0	3.0		✓			315	ON 8	ON 12	549	✓	update	
1110	83.7	80.2	64.6	64.6	0							ON 7	ON 8	538			
5-7-98	85.9	77.7	64.9	65.7	.8	3.1		✓			323	ON 7	ON 12	548	✓	update	
0825	83.4	79.8	64.9	65.7	.8							ON 8	ON 8	536			
5-8-98	84.7	79.7	63.3	64.4	1.1	2.8		✓			299	ON 7	ON 12	547	✓	ADJUSTED RECEIVE GATES UPDATE	
1130	84.4	80.5	63.3	64.4	1.1							ON 8	ON [illegible]	536			
5-9-98	82.2	78.0	64.6	~~64.5~~ 64.5	-0.1	2.8		✓			299	ON 7	ON [illegible]	551	✓	Update	
1130	82.4	78.7	64.6	64.5	-0.1							ON 8	ON [illegible]	538			
5-10-98	81.9	77.5	65.7	65.9	0.2	2.5		✓			355	ON 7	ON [illegible]	553	✓	UPDATE	
0730	81.8	78.6	63.7	65.9	0.2							ON 8	ON 8	539			
5-10-98	82.5	78.1	65.8	66.2	0.4	2.6			✓		384	ON 7	ON 12	553	✓	SWAPPED SLUICE GATES	
1030	82.3	79.1	65.8	66.2	0.4							ON 8	ON 8	539			
5-10-98	84.5	80.1	66.6	67.3	0.7	2.5			✓		372	ON 7	ON 12	549	✓	UPDATE	
1345	84.5	81.2	66.6	67.3	0.7							ON 8	ON 8	535			

Complete log at the following times:

1. Daily between 0700 and 1200.
2. Immediately prior to adjusting discharge flow rate.
3. At equilibrium conditions following a discharge flow rate change.

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DATES: 5-11-98 TO: 5-15-98

EXTERNAL CIRC WATER LOG

DATE / TIME	U1 CDSR INLETS 1T2513A / 1T2514A	U2 CDSR INLETS 2T2513A / 2T2514A	AMBIENT RIVER 1T2576A / 2T2576A	LOCK & DAM NO. 3 1T2526A / 2T2526A	RIVER ΔT 1T2576A / 2T2576A	CANAL TO RIVER ΔH	SLUICE GATES OPEN 5'	6'	7'	8'	PLANT DISCH FLOW	CTP/FANS IN SERVICE 121/12 / 123/12	122/12 / 124/12	U1 MWe 1Q0340A / U2 MWe 2Q0340A	OPCW UPDATED ✓	REMARKS	INIT.
5-11-98	82.4	78.7	66.3	67.0	.7	2.7			/		396	ON 7	ON 12	551	✓		
1122	82.7	80.0	66.3	67.0	.7							ON 7	ON 8	536		update	DEJ
5-12-98	81.5	77.4	65.6	66.5	.9	2.6			✓		384	ON 7	ON 12	552	✓		
0919	81.4	78.7	65.6	66.5	.9							ON 7	ON 8	540		UPDATE	JT
5-12-98	84.8	80.2	67.3	67.3	0	2.7		JT	✓		396	ON 7	ON 12	548	✓	SLUICED SLUICE GATES	
1556	85.0	82.4	67.3	67.3	0							ON 7	ON 8	535		OPENED RECYCLE GATES 5-6	JT → ANO Return Tower Series
5-13-98	81.7	76.7	64.4	64.9	.5	2.7			/		396	ON 7	ON 12	552			
1055	81.5	77.5	64.5	64.8	.3							ON 7	ON 8	540		update	DEJ
5-14-98	81.7	77.5	65.3	65.9	.6	2.7			✓		396	ON 7	ON 12	552			
1100	81.8	78.9	65.3	65.9	.6							ON 7	ON 8	539		Update	TA
5-14-98	83.6	80.2	68.0	67.9	-.1	2.8				✓	526	ON 7	ON 12	548	✓	Sluice Gates Closed & Gates open 8' & closed Recycle ≈ 114	
1400	83.5	81.6	68.0	67.9	-.1							ON 7	ON 8	535			TA
5-15-98	84.4	81.5	68.5	69.5	1.0	3.1				✓	559	ON 7	ON 12	548	✓	Shut Down Ice Control due to Damage	
0410	84.2	81.9	68.5	69.5	1.0							ON 7	OFF 0	534			[illegible]
5-15-98	82.2	80.5	68.2	69.8	1.6	2.9		✓	✓		708	ON 7	ON 12	550	✓	Swap Gates	
0530	82.3	82.2	68.2	69.8	1.6							ON 7	OFF 0	534		UPDATE	[illegible]
5-15-98	82.0	80.2	68.0	69.3	1.3	2.9		✓	✓		708	ON 7	ON 12	551			
0944	81.8	81.6	68.0	69.3	1.3							ON 7	OFF 0	535		UPDATE	A
5-15-98	82.6	80.8	69.3	70.9	1.6	2.9 ~~2.8~~		✓	✓		708	ON 7	ON 12	551		Adjusting Recycle Gates	
2345	82.7	81.3	69.3	70.9	1.6							ON 7	OFF 0	534			TD

Complete log at the following times:

1. Daily between 0700 and 1200.
2. Immediately prior to adjusting discharge flow rate.
3. At equilibrium conditions following a discharge flow rate change.
4. Immediately following a change in the number of in-service cooling towe

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DATES: 5-16-98 TO: 5-20-98

EXTERNAL CIRC WATER LOG

DATE / TIME	U1 CDSR INLETS 1T2513A / 1T2514A	U2 CDSR INLETS 2T2513A / 2T2514A	AMBIENT RIVER 1T2576A / 2T2576A	LOCK & DAM NO. 3 1T2526A / 2T2526A	RIVER ΔT 1T2576A / 2T2576A	CANAL TO RIVER ΔH	SLUICE GATES OPEN 5'	6'	7'	8'	PLANT DISCH FLOW	CTP/FANS IN SERVICE 121/12 / 123/12	122/12 / 124/12	U1 MWe 1Q0340A / U2 MWe 2Q0340A	OPCW UPDATED ✓	REMARKS	INIT.
5-16-98	83.3	79.5	67.4	68.1	.7	1.8		✓	✓		576	ON 7	ON 12	549	✓	Update	[illegible]
1020	82.8	80.3	67.4	68.1	.7						696	ON 7	OFF 0	535			
5-17-98	83.9	81.0	67.2	68.4	1.2	2.6		✓	✓		672	ON 7	ON 12	549	✓	UPDATE	A
1130	82.8	81.0	67.2	68.4	1.2							ON 7	OFF 0	535			
5-18-98	84.9	83.9	67.2	70.6	.7	USING ERCS 2.8		✓	✓		695	ON 7	ON 12	547	✓	UPDATE	GK
1140	84.8	82.9	69.9	70.6	.7						672	ON 7	OFF 0	532			
5-19-98	84.5	84.9	73.4	73.5	.1	USING ERCS 3.0		✓	✓		720	ON 7	ON 12	546	✓	LOWERED CONDENSER INLETS	GK
1700	84.2	83.6	73.4	73.5	.1							ON 7	OFF 0	529			
5/19/98	81.1	80.7	70.9	71.5	.6	3.3		✓	✓		750	ON 7	ON 12	551	✓	update	[illegible]
0830	81.8	80.3	71.0	71.6	.6							ON 7	OFF 0	535			
5/19/98	83.3	82.5	73.9	73.8	-.1	2.5*		✓	✓		660	ON 4	ON 12	548	✓	update prior to removing 121 CT	[illegible]
1430	83.4	82.3	73.9	73.8	-.1							ON 7	OFF 0	532			
5.20.98 0000	78.8	78.9	73.3	74.3	1.0	3.0	✓	✓	✓		940	OFF 0	ON 12	555	✓	STOPPED 121 CT pump opened 5' sluice	AM
	80.0	78.1	73.3	74.3	1.0							ON 7	OFF 0	538			
5.20.98 0515	79.7	83.2	72.8	73.0	.2	2.4	✓	✓	✓		895	OFF 0	ON 12	555	✓	raised inlets	AM
	81.4	81.7	72.8	73.0	.2							ON 7	OFF 0	533			
5.20.98	80.6	84.4	72.2	72.8	.6	USING ERCS 2.2	✓	✓	✓		880	OFF 0	ON 12	552	✓	RAISED INLET TRAYS	GK
0920	82.2	83.1	72.2	72.8	.6							ON 7	OFF 0	532			
5.20.98	81.1	84.8	74.9	74.5	.3	ERCS 2.4	✓	✓	✓		895	OFF 0	ON 12	551	✓	LOWERED INLETS	GK
1630	82.6	83.2	74.8	74.5	-.3							ON 7	OFF 0	531			

* New ΔH - change due to calibration [illegible]

Complete log at the following times:

1. Daily between 0700 and 1200.
2. Immediately prior to adjusting discharge flow rate.
3. At equilibrium conditions following a discharge flow rate change.
4. Immediately following a change in the number of in-service cooling towers.

DATES: 5-21-98 TO: 5-25-98

EXTERNAL CIRC WATER LOG

DATE / TIME	U1 CDSR INLETS 1T2513A / 1T2514A	U2 CDSR INLETS 2T2513A / 2T2514A	AMBIENT RIVER 1T2576A / 2T2576A	LOCK & DAM NO. 4 1T2528A / 2T2528A	RIVER ΔT 1T2578A / 2T2578A	CANAL TO RIVER ΔH	SLUICE GATES OPEN 5	6	7	8	PLANT DISCH FLOW	CTP/FANS IN SERVICE 121/12 / 123/12	122/12 / 124/12	U1 MWe 1Q0340A / U2 MWe 2Q0340A	OPCW UPDATED ✓	REMARKS	INIT.
5-21-98	79.4	83.1	71.9	72.6	.7	2.3	✓	✓	✓		888	off 0	on 12	554	✓	update	TH
1015	80.7	80.9	71.9	72.5	.6							on 7	off 0	534			
5-22-98	77.9	79.6	71.7	72.1	.4	2.3	/	/	/		888	off 0	on 12	556		update & prior to raising inlets	
1015	79.6	81.7	71.7	72.1	.4							on 7	off 0	535			DEJ
5-22-98	80.8	82.8	72.7	72.7	0	2.0	/	/	/		865	off 0	on 12	553	✓	After gate adjustments	
1453	82.5	83.8	72.7	72.7	0							on 7	off 0	531			DEJ
5-22-98	80.4	83.1	71.8	72.3	.4	2.0	✓	✓	✓		865	off 0	on 12	554		Prior to 121 this start & gate adjustment	
2240	82.0	84.2	71.8	72.3	.4							on 7	off 0	533			TH
5-23-98	82.7	79.6	70.6	71.2	.6	1.9		✓	✓		593	on 7	on 12	553		After gate adjustment	
0335	83.2	81.1	70.6	71.2	.6							on 7	off 0	536			TH
5-23-98	83.9	80.6	69.4	69.3	.1	2	✓		✓		475 ~~600~~	on 7	on 12	548	✓	After adjustment	
1035	84.1	82.0	69.4	69.3	.1							on 7	off 0	534			TH
5-24-98	82.5	79.2	68.5	68.4	-.1	2.0	/		/		475	on 7	on 12	552		update & prior to adjusting gates	
1020	82.9	80.5	68.5	68.4	-.1							on 7	off 0	537			DEJ
5-24-98	83.2	79.6	68.4	68.3	-.1	1.9	/		/		463	on 7	on 12	550	✓	After gate adjustment	
1317	83.5	80.9	68.4	68.3	-.1							on 7	off 0	535			DEJ
5-24-98	83.2	79.7	68.7	68.3	-.4	2.0	✓		✓		475	on 7	on 12	550	✓	Before gate Adjustment	
1815	83.8	81.0	68.7	68.3	-.4							on 7	off 0	535			TH
5-25-98	84.5	80.6	68.1	67.8	-.3	1.9				✓	463	on 7	on 12	549	✓	After Gate Adjustment	
0030	84.8	82.1	68.1	67.8	-.3							on 7	off 0	533			TH

Complete log at the following times:

1. Daily between 0700 and 1200.
2. Immediately prior to adjusting discharge flow rate.
3. At equilibrium conditions following a discharge flow rate change.
4. Immediately following a change in the number of in-service cooling towers.

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DATES: 5-25-98 TO: 5-27-98

EXTERNAL CIRC WATER LOG

DATE / TIME	U1 CDSR INLETS 1T2514A / 1T2514A	U2 CDSR INLETS 2T2513A / 2T2514A	AMBIENT RIVER 1T2576A / 2T2576A	LOCK & DAM NO. 3 1T2526A / 2T2526A	RIVER ΔT 1T2578A / 2T2578A	CANAL TO RIVER ΔH	SLUICE GATES OPEN 5	6	7	8	PLANT DISCH FLOW	CTP/FANS IN SERVICE 121/12 / 123/12	122/12 / 124/12	U1 MWe 1QG340A / U2 MWe 2QG340A	OPCW UPDATED ✓	REMARKS	INIT.
5-25-98	84.4	80.1	67.9	67.6	-.3							ON 7	ON 12	549		Before Gate	
0200	84.8	82.0	67.9	67.6	-.3	1.9				✓	463	ON 7	OFF 0	534		Adjustment	
5-25-98	84.5	80.3	67.6	67.3	-.3							ON 7	ON 12	551		After Gate	
0506 ~~0500~~	84.9	82.2	67.6	67.3	-.3	2.2	✓	✓			381	ON 7	OFF 0	535	✓	Adjustment	
5-25-98	84.1	80.6	67.1	67.0	.1							ON 7	ON 12	548			
1005	84.3	82.2	67.1	67.0	.1	2.3	✓	✓			392	ON 7	OFF 0	536	✓		
5-26-98	84.5	81.6	68.8	68.8	0							ON 7	ON 12	549		Update to	
0617	85.0	82.8	68.8	68.8	0	3.0	/	/			465	ON 7	OFF 0	534	✓	prior to Gate Adjustment	
5-26-98	83.2	80.3	68.7	69.1	.4							ON 7	ON 12	550		After Sluice	
0945	83.3	81.5	68.7	69.1	.4	2.7				✓	516	ON 7	OFF 0	535	✓	Gate Adjustment	
5-27-98	84.0	81.1	70.3	71.6	1.3							ON 7	ON 12	549			
0115	84.5	82.3	70.3	71.6	1.3	3.0				✓	548	ON 6	OFF 0	534	✓	UPDATE	
5-27-98	84.2	81.7	69.5	70.5	1.0							ON 7	ON 12	549			
0600	84.7	82.7	69.5	70.5	1.0	2.8				✓	527	ON 6	OFF 0	532	✓	UPDATE	
5-27-98	84.6	82.5	69.9	70.2	.3							ON 7	ON 12	547			
1030	84.5	82.9	69.8	70.2	.3	2.8				✓	527	ON 6	OFF 0	533		update	
5-27-98	84.3	83.1	72.7	72.8	.1							ON 7	ON 12	549		Before	
1700	84.0	83.8	72.7	72.8	.1	3.1				✓	560	ON 6	OFF 0	530	✓	Gate Adj	
5-27-98	84.1	83.6	72.4	~~72.2~~ 73.2	.8	3.0						ON 7	ON 12	549		After Gate	
2000	83.8	83.9	72.4	73.2	.8	~~3.1~~	✓		✓		600	ON 6	OFF 0	530	✓	Adjustment	

Complete log at the following times:

1. Daily between 0700 and 1200.
2. Immediately prior to adjusting discharge flow rate.
3. At equilibrium conditions following a discharge flow rate change.
4. Immediately following a change in the number of in-service cooling towers.

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cument Type: 4.100

DATES: 5-28-98 TO: 5/30/98

EXTERNAL CIRC WATER LOG

TE / TIME	U1 CDSR INLETS 1T2513A / 1T2514A	U2 CDSR INLETS 2T2513A / 2T2514A	AMBIENT RIVER 1T2576A / 2T2576A	LOCK & DAM NO. 3 1T2526A / 2T2526A	RIVER ΔT 1T2578A / 2T2578A	CANAL TO RIVER ΔH	SLUICE GATES OPEN 5'	6'	7'	8'	PLANT DISCH FLOW	CTP/FANS IN SERVICE 121/12 / 123/12	122/12 / 124/12	U1 MWe 1Q0340A / U2 MWe 2Q0340A	OPCW UPDATED ✓	REMARKS	INIT.
3/98	84.1	83.2	71.1	71.2	.7	3.1	✓		✓		610	ON 7	ON 12	548	✓	update	
1017	83.5	82.8	71.1	71.5	.5							ON 6	OFF 0	531			
98	84.3	83.8	73.0	72.6	-.4	3.2	✓		✓		625	ON 7	ON 12	547		Prior to gate adjustment	
1420	84.2	83.0	73.0	72.6	-.4							ON 6	OFF 0	531			
5-98	84.5	83.7	73.3	73.7	.4	3.0		✓	✓		720	ON 7	ON 12	546	✓	update	
510	84.2	84.1	73.5	73.5	0							ON 6	OFF 0	530			
-29-98	81.6	81.2	72.7	73.3	.6	2.8		✓	✓		685	ON 7	ON 12	533	✓	PRIOR TO GATE ADJUSTMENT	
0630	82.1	81.6	72.7	73.3	.6							ON 6	OFF 0	533			
29.98	84.1	83.0	73.2	73.4	.2	2.4		✓	✓		650	ON 7	ON 12	548	✓	UPDATE	
1050	83.8	83.1	73.2	73.4	.2							ON 6	OFF 0	531			
29.98	84.3	83.2	75.2	75.1	-.1	2.6		✓	✓		675	ON 7	ON 12	548	✓	UPDATE	
1520	84.2	83.0	75.2	75.1	-.1							ON 6	OFF 0	532			
-29-98	84.0	83.7	75.5	76.0	.5	2.8		/	/		696	ON 7	ON 12	549	✓	update	
209	84.3	84.1	75.5	76.0	.5							ON 6	OFF 0	531			
30-98	84.1	82.0	73.6	74.4	.8	2.4		/	/		648	ON 7	ON 12	549	✓	Gate Adjustment	
0439	84.2	82.9	73.6	74.4	.8							ON 6	OFF 0	533			
-30-98	84.1	82.4	73.2	73.2	0	2.2		✓	✓		630	ON 7	ON 12	550	✓	Gate Adjust. update	
1025	84.1	82.9	73.2	73.2	0							ON 6	OFF 0	533			
5-30-98	83.7	83.6	74.3	73.2	-.9	2.2		✓	✓		630	ON 7	ON 12	549		Gate Adjust update	
1700	83.7	84.4	74.3	73.2	-.9							ON 6	OFF 0	531			

Complete log at the following times:

1. Daily between 0700 and 1200.
2. Immediately prior to adjusting discharge flow rate.
3. At equilibrium conditions following a discharge flow rate change.
4. Immediately following a change in the number of in-service cooling towers.

Jerry Johnson

JUNE

PINGP 45, Rev. 20
Page 1 of 2 (Front)
Retention: 6 yrs.
Document Type: 4.100

DATES: 5-30-98 TO: 6-1-98

EXTERNAL CIRC WATER LOG

DATE / TIME	U1 CDSR INLETS 1T2513A / 1T2514A	U2 CDSR INLETS 2T2513A / 2T2514A	AMBIENT RIVER 1T2576A / 2T2576A	LOCK & DAM NO. 3 1T2528A / 2T2528A	RIVER ΔT 1T2578A / 2T2578A	CANAL TO RIVER ΔH	SLUICE GATES OPEN 5	6	7	8	PLANT DISCH FLOW	CTP/FANS IN SERVICE 121/12 / 123/12	122/12 / 124/12	U1 MWe 1Q0340A / U2 MWe 2Q0340A	OPCW UPDATED ✓	REMARKS	INIT.
5-30-98	84.0	84.4	74.4	74.0	-.4	2.4		✓	✓		648	on 7	on 12	549	✓	ADJUSTED RECYCLE GATES	JT
0045	84.1	83.8	74.4	74.1	-.3							on 6	off 0	531			
5-31-98	84.9	82.0	71.9	72.3	.4	2.2		✓	✓		624	on 7	on 12	549	✓	ADJUSTED RECYCLE GATES	JT
0513	84.6	82.8	71.9	72.3	.4							on 6	off 0	534			
5-31-98	84.9	82.2	70.9	71.1	.1	2.0		✓	✓		600	on 7	on 12	548	✓	ADJUSTED GATES	[illegible]
1000	84.7	83.0	70.9	71.1	.1							on 6	off 0	534			
5-31-98	84.0	80.9	72.3	72.6	.3	2.0		✓	✓		600	on 7	on 12	550		Prior to sluice gate change	DEJ
2230	83.9	82.1	72.3	72.6	.3							on 6	off 0	535			
6-1-98	84.5	81.2	72.3	72.6	.3	2.2	✓		✓		500	on 7	on 12	548	✓	After sluice gate change	DEJ
0126	84.4	82.5	72.3	72.6	.3							on 6	off 0	534			
6-1-98	84.2	81.0	72.3	72.6	.3	2.1	✓		✓		488	on 7	on 12	549	✓	Adjusted Recycle	DEJ
0511	84.0	82.0	72.3	72.6	.3							on 6	off 0	536			
6-1-98	~~88.8~~	81.3	70.6	70.2	-.4	2.1	✓		✓		488	on 7	on 12	548		update	RM
1121	84.9	83.1	70.6	70.2	-.4							on 6	off 0	533			
6-1-98	83.5	81.6	71.9	70.7	-1.2	2.4	✓		✓		575	on 7	on 12	550	✓	ADJUSTED Recycle	RM
1325	83.4	82.1	71.9	70.7	-1.2							on 6	off 0	534			
6-1-98	82.0	82.4	71.8	71.0 ~~71.8~~	-.8	2.6	✓		✓		550	on 6	on 12	552	✓	ADJUSTED RECYCLE DUE TO 123 TOWER DAMAGE	RM
1535	82.1	81.3	71.8	71.0 ~~71.8~~	-.8							off 0	off 0	534			
6-1-98	80.7	82.2	71.2	71.4	.2	3.1		✓	✓		725	on 6	on 12	554	✓	ADJUSTED RECYCLE & SLUICE GATE	[illegible]
2128	81.3	83.9	71.2	71.4	.2							off 0	off 0	532			

Complete log at the following times:

1. Daily between 0700 and 1200.
2. Immediately prior to adjusting discharge flow rate.
3. At equilibrium conditions following a discharge flow rate change.
4. Immediately following a change in the number of in-service cooling towers.

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Retention: 6 yrs.
Document Type: 4.100

DATES: 6-1-98 TO: 6-5-98

EXTERNAL CIRC WATER LOG

DATE / TIME	U1 CDSR INLETS 1T2514A / 1T2514A	U2 CDSR INLETS 2T2513A / 2T2514A	AMBIENT RIVER 1T2576A / 2T2576A	LOCK & DAM NO. 3 1T2528A / 2T2528A	RIVER ΔT 1T2578A / 2T2578A	CANAL TO RIVER ΔH	SLUICE GATES OPEN 5'	6'	7'	8'	PLANT DISCH FLOW	CTP/FANS IN SERVICE 121/12 / 123/12	122/12 / 124/12	U1 MWe 1Q0340A / U2 MWe 2Q0340A	OPCW UPDATED ✓	REMARKS	INIT.
6-1-98	80.6	82.8	70.4	71.2	.8	2.7	✓			✓	745	ON 6	ON 12	555	✓	ADJ. Recycle & SLUICE GATES	A
2344	81.3	84.1	70.4	71.2	.8							OFF 0	OFF 0	532			
6-2-98	80.4	81.1	69.0	69.6	.6	2.4	✓			✓	722	ON 6	ON 12	554	✓	ADJ. Recycle GATES	A
0452	80.2	83.5	69.0	69.6	.6							OFF 0	OFF 0	535			
6-2-98	~~81.3~~ 82.9	82.9	67.9	68.1	.2	2.2	✓			✓	707	ON 6	ON 12	554	✓	Update	[illegible]
1120	80.8	80.6	67.9	68.1	.2							OFF 0	OFF 0	532			
6-3-98	82.5	82.0	67.7	67.9	.2	2.2	✓			✓	707	ON 6	ON 12	552		Prior to power Reduction U1	[illegible]
0025	81.9	82.6	67.7	67.9	.2							OFF 0	OFF 0	533			
6-3-98	74.6	84.2	65.9	65.4	-.5	2.7	✓	✓			434	ON 6	OFF 0	192		update	[illegible]
0812	80.4	82.3	65.9	65.4	-.5							OFF 0	OFF 0	552	✓		
6-4-98	83.6	81.7	66.6	67.0	.4	2.5	✓		✓		538	ON 6	ON 0	255		ADJ. SLUICE + RECYCLE - START 122 CTP	A
0042	83.1	81.3	66.6	67.0	.4							OFF 0	OFF 0	535	✓		
6-4-98	81.2	84.8	66.6	66.3	-.3	2.7	✓		✓		570	ON 6	ON 0	550.	✓	ADJ. RECYCLE STOP ALL FANS	[illegible]
1130	81.3	82.1	66.6	66.3	-.3							OFF 0	OFF 0	531			
6-4-98	80.6	85.5	66.2	66.9	.7	3.0	✓		✓		600	ON 0	ON 0	562	✓	FOLLOWING ADJUSTMENT	[illegible]
1430	80.0	82.4	66.2	66.9	.7							OFF 0	OFF 0	530			
6-5-98	80.7	82.7	65.8	65.8	0	3	✓		✓		600	~~OFF~~ 0	ON 0	554			[illegible]
1100	80.5	85.4	65.8	65.8	0							OFF 0	OFF 0	531			
6-5-98	77.4	73.9	66.4	66.4	0	2.7	✓		✓		560	ON 6	ON 10	0	✓	PRIOR TO RECT. SLUICE ADJ. FOLLOWING UNIT TRIP	[illegible]
2200	77.7	75.5	66.4	66.4	0							OFF 0	OFF 0	543			

Complete log at the following times:

1. Daily between 0700 and 1200.
2. Immediately prior to adjusting discharge flow rate.
3. At equilibrium conditions following a discharge flow rate change.
4. Immediately following a change in the number of in-service cooling towers.

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Retention: 6 yrs.
Document Type: 4.100

DATES: 6-6-98 TO: _____

EXTERNAL CIRC WATER LOG

DATE / TIME	U1 CDSR INLETS 1T2513A / 1T2514A	U2 CDSR INLETS 2T2513A / 2T2514A	AMBIENT RIVER 1T2576A / 2T2576A	LOCK & DAM NO. 3 1T2526A / 2T2526A	RIVER ΔT 1T2578A / 2T2578A	CANAL TO RIVER ΔH	SLUICE GATES OPEN 5'	6'	7'	8'	PLANT DISCH FLOW	CTP/FANS IN SERVICE 121/12 / 123/12	122/12 / 124/12	U1 MWe 1Q0340A / U2 MWe 2Q0340A	OPCW UPDATED ✓	REMARKS	INIT.
6-6-98	83.4	80.0	65.3	65.2	-.1	2.8	✓	✓			445	OFF 0	ON 10	0	✓	UPDATE AFTER 121 COOLING TOWER SHUT DOWN	
0505	82.6	80.3	65.3	65.2	-.1							OFF 0	OFF 0	535			
6-6-98	84.5	80.5	64.8	65.0	.1	2.3	✓	✓			392	OFF 0	ON 10	0	✓	Update Gate adjust	SL
0840	83.8	81.7	64.8	65.0	.1							OFF 0	OFF 0	534			
6-6-98	84.2	80.7	65.7	65.4	-.3	2.2	✓	✓			380	ON 6	ON 10	0	✓	Update After Starting 121 CTP	
2135	83.3	81.6	65.7	65.4	-.3							OFF 0	OFF 0	533			
6-7-98	76.9	73.7	63.4	63.6	0	2.3	✓	✓			392	ON 6	ON 10	0	✓	Update	TH
0730	77.4	75.5	63.6	63.6	0							OFF 0	OFF 0	542			
6-8-98	79.1	77.0	66.9	65.7	-1.2	2.3	✓	✓			392	ON 6	ON 10	0	✓	Stopped 12 CW Pump	
1325	78.7	77.6	66.9	65.7	-1.2							OFF 0	OFF 0	539			
6-9-98	76.5	77.7	64.5	64.4	-.1	2.3	✓	✓			392	ON 6	ON 10	0			
1115	76.0	77.9	64.5	64.4	-.1							OFF 0	OFF 0	542			

Complete log at the following times:

1. Daily between 0700 and 1200.
2. Immediately prior to adjusting discharge flow rate.
3. At equilibrium conditions following a discharge flow rate change.
4. Immediately following a change in the number of in-service cooling towers.

NNNN SSSSSSPPPPPPPPPP Northern States Power Company
NN NN SSS PPP Prairie Island Nuclear Generating Plant
NN NN SSSS PPPPPPPP 1717 Wakonade Drive East
NN NN SSS PPP Welch, Minnesota 55089
NN NNSSSSSSS PPP (612)-388-1121

DATE JUNE 01, 1998

NAME JIM BODENSTEINER
ADDRESS NSP ERAD

SUBJECT: CONTINUOUS CHLORINATION/BROMINATION

We operated in the continuous bromination mode the entire month of May with minimal problems. Had some minor manipulations because of low tank level on May 13th but that was corrected quickly.

The bromine river demand completed on May 15th had results of 1.18 ppm which is a significant increase from the April value. Probably due to increasing river water temperature. Daily injection kilograms has increased to cover this increased demand.

Please contact me at Ext. 4440 if additional information is needed. Thank you.

Sincerely yours,

Gerald Joachim
Senior Radiation Protection Specialist

MAY 1998

	BROMINE Kgrs /d ay	CHLORIDE Kgrs / day	TIME Hrs/day	U-1 residual	U- 2 residual	Cal Res. Oxd. ppm
1	33.6	54.8	1440	.12	.07	<.001
2	33.6	53.0	1440	.10	.07	<.001
3	33.6	58.2	1440	.11	.06	<.001
4	33.6	55.7	1440	.13	.06	<.001
5	33.6	56.0	1440	.13	.05	<.001
6	33.6	64.2	1440	.17	.14	<.001
7	33.6	57.4	1440	.10	.11	<.001
8	33.6	66.1	1440	.12	.10	<.001
9	33.6	62.2	1440	.12	.09	<.001
10	28.0	58.4	1440	.11	.08	<.001
11	39.1	61.0	1440	.08	.11	<.001
12	22.4	50.7	1440	.09	.11	<.001
13	44.7	58.4	1440	<.01/.08	<.01/.11	<.001
14	33.6	58.4	1440	.11	.10	<.001
15	33.6	57.4	1440	.07	.08	<.001
16	28.0	59.3	1440	.09	.09	<.001
17	33.6	58.4	1440	.07	.06	<.001
18	33.6	56.8	1440	.06	.08	<.001
19	28.0	60.9	1440	.06	.07	<.001
20	33.6	57.4	1440	.06	.07	<.001
21	39.1	57.4	1440	.09	.09	<.001
22	39.1	51.3	1440	.10	.10	<.001
23	22.4	52.5	1440	.08	.10	<.001
24	33.6	57.4	1440	.09	.10	<.001
25	33.6	53.5	1440	.06	.08	<.001
26	33.6	57.4	1440	.05	.07	<.001
27	33.6	64.4	1440	.05	.05	<.001
28	33.6	64.4	1440	.06	.07	<.001
29	33.6	63.8	1440	.07	.08	<.001
30	33.6	69.1	1440	.07	.08	<.001
31	33.6	71.0	1440	.08	.08	<.001

PRAIRIE ISLAND CIRC WATER TOTAL PHOSPHOROUS CONCENTRATION (PPB)

		INLET	OUTLET
MAY	04	257	226
			235
MAY	11	244	238
			263
MAY	18	295	296
			258
MAY	26	325	213
			242

The UNIT 2 descaler pump was running all the month of May at 14.0 gallons per day.

PERMITTEE NAME/ADDRESS:

NSP-PRAIRIE ISLAND PLANT
414 NICOLLET MALL
MINNEAPOLIS MN 55401

NSP-PRAIRIE ISLAND PLANT
WELCH MN 55089
ATTN: MR. MICHAEL HESTICK

WASTEWATER TREATMENT

DISCHARGE MONITORING REPORT

PERMIT #	OUTFALL #
MN0004006	010 M

MONITORING PERIOD	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	98	05	01	TO	98	05	31

Combined Effl frm 011 thru 02
(SUBR 05) 12345
F - FINAL
MAJOR

*** NO DISCHARGE !__! ***

PARAMETER		QUANTITY AVERAGE	QUANTITY MAXIMUM	QUANTITY UNITS	CONCENTRATION MINIMUM	CONCENTRATION AVERAGE	CONCENTRATION MAXIMUM	CONCENTRATION UNITS	FREQUENCY OF ANALYSIS	SAMPLE TYPE
PLANT CAPACITY FACT. PERCENT OF CAPACITY	SAMPLE MEASUREMENT	******	******		******	96.7	******	(23)	Cont	MEAS
00180 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	******	******	******	REPORT MO AVG	******	PER-CENT	CONTINUOUS	MEASRD
PH	SAMPLE MEASUREMENT	******	******		8.4	******	8.5	(12)	1/7	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	******	******	6.0 MO MIN	******	9.0 MO MAX	SU	WEEKLY	GRAB
OXIDANTS, TOTAL RESIDUAL	SAMPLE MEASUREMENT	******	******		******			(19)		
34044 A 0 0 DISINFECT,PRCS CMPLT	PERMIT REQUIREMENT	******	******	******	******	OPTIONAL MO AVG	.05 DAILY MX	MG/L	ONCE/ DISCHG	GRAB
OXIDANTS, TOTAL RESIDUAL	SAMPLE MEASUREMENT	******	******		******			(19)		
34044 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	******	******	******	REPORT MO AVG	.04 MX DA AV	MG/L	CONTINUOUS	CONTIN
OXIDANTS RELEASED, TOTAL RESIDUAL	SAMPLE MEASUREMENT	******	******		******			(19)		
34046 A 0 0 DISINFECT,PRCS CMPLT	PERMIT REQUIREMENT	******	******	******	******	OPTIONAL MO AVG	.2 DAILY MX	MG/L	ONCE/ DISCHG	GRAB
OXIDANTS RELEASED, TOTAL RESIDUAL	SAMPLE MEASUREMENT	******	******		******	<0.001	<0.001	(19)	31/31	CALC
34046 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	******	******	******	REPORT MO AVG	.001 MX DA AV	MG/L	CONTINUOUS	CONTIN
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	******	******		10323	333		(03)	Cont	Est
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	******	******	REPORT MO TOTAL	REPORT AVERAGE	OPTIONAL DAILY MX	MGD		

Send white copy with supplemental DMR form by 21st day of month following reporting period to:
MINNESOTA POLLUTION CONTROL AGENCY
520 LAFAYETTE ROAD
ST. PAUL, MINNESOTA 55155
ATTN: W.Q. POINT SOURCE COMPLIANCE

I certify that I am familiar with the information contained in this report and that to the best of my knowledge and belief the information is true, complete, and accurate.

D.A. Schueck — SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT — DATE: 6-9-98

SIGNATURE OF CHIEF OPERATOR — DATE — CERTIFICATION # — ☐ √ IF NEW

COMMENTS:

1)EFL:no floatg solids,foam or film 2)See Part I.C.6 for flow restrictions 3)See Part I.C.5 for thermal limitations 4)Amount and Time of Chlorine and/or Bromine continuous and/or intermittent application shall be recorded daily and submitted with the monthly DMRs in addition to the values reported on this DMR.

PERMITTEE NAME/ADDRESS:

NSP PRAIRIE ISLAND PLANT
414 NICOLLET MALL
MINNEAPOLIS MN 55401

NSP-PRAIRIE ISLAND PLANT
WELCH MN 55089
ATTN: MR. MICHAEL HESTICK

WASTEWATER TREATMENT
DISCHARGE MONITORING REPORT

PERMIT #	OUTFALL #
MN0004006	701 M

MONITORING PERIOD	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	98	05	01	TO	98	05	31

Miss R Imdtly Blw Lock & Dam#3
(SUBR 05) 12345
F - FINAL
MAJOR

*** NO DISCHARGE !__! ***

PARAMETER		QUANTITY AVERAGE	QUANTITY MAXIMUM	QUANTITY UNITS	CONCENTRATION MINIMUM	CONCENTRATION AVERAGE	CONCENTRATION MAXIMUM	CONCENTRATION UNITS	FREQUENCY OF ANALYSIS	SAMPLE TYPE
TEMPERATURE, WATER DEG. FAHRENHEIT 00011 6 N 0 DOWNSTREAM MONITOR	SAMPLE MEASUREMENT	******	******		64.3	70.9	76.8	(15)	Cont	MEAS
	PERMIT REQUIREMENT	******	******	********	REPORT MO MIN	86.0 MX DA AV	REPORT MO MAX	DEG.F	CONTINUOUS	INSITU
TEMPERATURE, WATER DEG. FAHRENHEIT 00011 7 N 0 INTAKE FROM STREAM	SAMPLE MEASUREMENT	******	******		63.3	70.7	76.8	(15)	cont	MEAS
	PERMIT REQUIREMENT	******	******	********	REPORT	REPORT	REPORT	DEG.F	CONTINUOUS	CONTI
TEMP. DIFF. BETWEEN SAMP. & UPSTRM DEG.F 00018 6 N 0 DOWNSTREAM MONITOR	SAMPLE MEASUREMENT	******	******			0.2		(15)		
	PERMIT REQUIREMENT	******	******	********	OPTIONAL MO MIN	5.0 MO AVG	OPTIONAL MO MAX	DEG.F	CONTINUOUS	INSITU
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									

Send white copy with supplemental DMR form by 21st day of month following reporting period to:
MINNESOTA POLLUTION CONTROL AGENCY
520 LAFAYETTE ROAD
ST. PAUL, MINNESOTA 55155
ATTN: W.Q. POINT SOURCE COMPLIANCE

I certify that I am familiar with the information contained in this report and that to the best of my knowledge and belief the information is true, complete, and accurate.

D.A. Schueck — SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT — DATE: 6-8-98

SIGNATURE OF CHIEF OPERATOR — DATE — CERTIFICATION # — ☐ √ IF NEW

COMMENTS:

1)See Permit Part I.C.5. for Thermal Restrictions. 2)Notify MPCA & MDNR when winter temp GE 43F.
3)Use 701N to summarize NOV-MAR days when river temp is GT 43F. 4)Parameter 00018 is Delta T=Trive-Tintk
5)MIN=LOW DLY MAX IN MONTH 6)AVG=Monthly avgerage of daily maximum 7)MAX=HIGH DLY MAX IN MONTH

PERMITTEE NAME/ADDRESS:

NSP-PRAIRIE ISLAND PLANT
414 NICOLLET MALL
MINNEAPOLIS MN 55401

NSP-PRAIRIE ISLAND PLANT
WELCH MN 55089
ATTN: MR. MICHAEL HESTICK

WASTEWATER TREATMENT
DISCHARGE MONITORING REPORT

MN0004006 — PERMIT #
011 M — OUTFALL #

MONITORING PERIOD

	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	98	05	01	TO	98	05	31

Steam Generator Blowdown Schs
(SUBR 05)
F - FINAL
MAJOR

*** NO DISCHARGE ! ! ***

PARAMETER		QUANTITY AVERAGE	QUANTITY MAXIMUM	UNITS	CONCENTRATION MINIMUM	CONCENTRATION AVERAGE	CONCENTRATION MAXIMUM	UNITS	FREQUENCY OF ANALYSIS	SAMPLE TYPE
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	0	0	(01)	ND	ND	ND	(19)	1/31	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	65.3 MO AVG	217.0 MO MAX	KG/ DAY	45.0 MX WK AV	30.0 MO AVG	100.0 MO MAX	MG/L	ONCE/ MONTH	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	******	******		0.062	0.002		(03)	1/31	Est
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	******	**** ****	REPORT MO TOTAL	REPORT AVERAGE	OPTIONAL DAILY MX	MGD	ONCE/ MONTH	ESTIMA
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									

Send white copy with supplemental DMR form by 21st day of month following reporting period to:
MINNESOTA POLLUTION CONTROL AGENCY
520 LAFAYETTE ROAD
ST. PAUL, MINNESOTA 55155
ATTN: W.Q. POINT SOURCE COMPLIANCE

I certify that I am familiar with the information contained in this report and that to the best of my knowledge and belief the information is true, complete, and accurate.

D.H. Schuelke — SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT — DATE: 6-9-98

SIGNATURE OF CHIEF OPERATOR — DATE — CERTIFICATION # — ☐ √ IF NEW

COMMENTS:

1)EFL:no floatg solids,foam or film

PQ00592-03 MPCA 03 04/25/95

00119/980408-0905

PAGE

PERMITTEE NAME/ADDRESS:

NSP PRAIRIE ISLAND PLANT
414 NICOLLET MALL
MINNEAPOLIS MN 55401

NSP-PRAIRIE ISLAND PLANT
WELCH MN 55089
ATTN: MR. MICHAEL HESTICK

WASTEWATER TREATMENT DISCHARGE MONITORING REPORT

PERMIT #	OUTFALL #
MN0004006	012 M

MONITORING PERIOD	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	98	05	01	TO	98	05	31

Radwaste Treatment Effl
(SUBR 05) 1234
F - FINAL
MAJOR

*** NO DISCHARGE !__! ***

PARAMETER		QUANTITY AVERAGE	QUANTITY MAXIMUM	QUANTITY UNITS	CONCENTRATION MINIMUM	CONCENTRATION AVERAGE	CONCENTRATION MAXIMUM	CONCENTRATION UNITS	FREQUENCY OF ANALYSIS	SAMPLE TYPE
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	<0.1	<0.1	(01)	0.7	0.7	0.7	(19)	1/31	6RAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	26.0 MO AVG	86.9 KG/ MO MAX	DAY	45.0 MX WK AV	30.0 MO AVG	100.0 MO MAX	MG/L	ONCE/ MONTH	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	******	******		0.031	0.001		(03)	1/31	Est
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	******	**** ****	REPORT MO TOTAL	REPORT AVERAGE	OPTIONAL DAILY MX	MGD	ONCE/ MONTH	ESTIM
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									

Send white copy with supplemental DMR form by 21st day of month following reporting period to:
MINNESOTA POLLUTION CONTROL AGENCY
520 LAFAYETTE ROAD
ST. PAUL, MINNESOTA 55155
ATTN: W.Q. POINT SOURCE COMPLIANCE

I certify that I am familiar with the information contained in this report and that to the best of my knowledge and belief the information is true, complete, and accurate.

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT — DATE: 6-9-98

SIGNATURE OF CHIEF OPERATOR — DATE — CERTIFICATION # — ☐ √ IF NEW

COMMENTS:

1)EFL:no floatg solids,foam or film

PERMITTEE NAME/ADDRESS:

NSP-PRAIRIE ISLAND PLANT
414 NICOLLET MALL
MINNEAPOLIS MN 55401

NSP-PRAIRIE ISLAND PLANT
WELCH MN 55089
ATTN: MR. MICHAEL HESTICK

WASTEWATER TREATMENT DISCHARGE MONITORING REPORT

PERMIT #: MN0004006
OUTFALL #: 013 M

MONITORING PERIOD

	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	98	05	01	TO	98	05	31

Neutrlizer + Resin Rinse Disch
(SUBR 05) 12345
F - FINAL
MAJOR

*** NO DISCHARGE !__! ***

PARAMETER		QUANTITY AVERAGE	QUANTITY MAXIMUM	UNITS	CONCENTRATION MINIMUM	CONCENTRATION AVERAGE	CONCENTRATION MAXIMUM	UNITS	FREQUENCY OF ANALYSIS	SAMPLE TYPE
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	0.4	3.7	(01)	18.8	10.3	24.5	(19)	8/31	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	97.9 MO AVG	326.0 MO MAX	KG/DAY	45.0 MX WK AV	30.0 MO AVG	100.0 MO MAX	MG/L	ONCE/MONTH	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	******	******		0.270	0.009		(03)	8/31	Est
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	******	********	REPORT MO TOTAL	REPORT AVERAGE	OPTIONAL DAILY MX	MGD	ONCE/MONTH	ESTIMA
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									

Send white copy with supplemental DMR form by 21st day of month following reporting period to:
MINNESOTA POLLUTION CONTROL AGENCY
520 LAFAYETTE ROAD
ST. PAUL, MINNESOTA 55155
ATTN: W.Q. POINT SOURCE COMPLIANCE

I certify that I am familiar with the information contained in this report and that to the best of my knowledge and belief the information is true, complete, and accurate.

Jeff Schueck — 6-9-98
SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT — DATE

SIGNATURE OF CHIEF OPERATOR — DATE — CERTIFICATION # — ☐ √ IF NEW

COMMENTS:

1) EFL: no floatg solids, foam or film

PERMITTEE NAME/ADDRESS:

NSP PRAIRIE ISLAND PLANT
414 NICOLLET MALL
MINNEAPOLIS MN 55401

NSP-PRAIRIE ISLAND PLANT
WELCH MN 55089

ATTN: MR. MICHAEL HESTICK

WASTEWATER TREATMENT DISCHARGE MONITORING REPORT

PERMIT #	OUTFALL #
MN0004006	014 M

Unit 1 Turbine Bldg Sump Sch
(SUBR 05) 12345
F - FINAL
MAJOR

MONITORING PERIOD	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	98	05	01	TO	98	05	31

*** NO DISCHARGE !__! ***

PARAMETER		QUANTITY AVERAGE	QUANTITY MAXIMUM	UNITS	CONCENTRATION MINIMUM	CONCENTRATION AVERAGE	CONCENTRATION MAXIMUM	UNITS	FREQUENCY OF ANALYSIS	SAMPLE TYPE
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	******	******		17.5	17.5	17.5	(19)	1/31	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	******	**** ****	45.0 MX WK AV	30.0 MO AVG	100.0 MO MAX	MG/L	ONCE/ MONTH	GRAB
OIL AND GREASE FREON EXTR-GRAV METH	SAMPLE MEASUREMENT	******	******		******	1	1	(19)	1/31	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	******	**** ****	******	10.0 MO AVG	15.0 MO MAX	MG/L	ONCE/ MONTH	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	******	******		2.666	0.086		(03)	1/7	Est
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	******	**** ****	REPORT MO TOTAL	REPORT AVERAGE	OPTIONAL DAILY MX	MGD	WEEKLY	ESTIMA
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									

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MINNESOTA POLLUTION CONTROL AGENCY
520 LAFAYETTE ROAD
ST. PAUL, MINNESOTA 55155
ATTN: W.Q. POINT SOURCE COMPLIANCE

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D H Schuelke — SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT — DATE: 6-9-98

SIGNATURE OF CHIEF OPERATOR — DATE — CERTIFICATION # — ☐ √ IF NEW

COMMENTS:

1)EFL:no floatg solids,foam or film

PERMITTEE NAME/ADDRESS:

NSP-PRAIRIE ISLAND PLANT
414 NICOLLET MALL
MINNEAPOLIS MN 55401

NSP-PRAIRIE ISLAND PLANT
WELCH MN 55089
ATTN: MR. MICHAEL HESTICK

WASTEWATER TREATMENT DISCHARGE MONITORING REPORT

PERMIT #	OUTFALL #
MN0004006	015 M

Unit 2 Turbine Bldg Sump Dsch
(SUBR 05) 12345
F - FINAL
MAJOR

MONITORING PERIOD	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	98	05	01	TO	98	05	31

*** NO DISCHARGE !__! ***

PARAMETER		QUANTITY AVERAGE	QUANTITY MAXIMUM	UNITS	CONCENTRATION MINIMUM	CONCENTRATION AVERAGE	CONCENTRATION MAXIMUM	UNITS	FREQUENCY OF ANALYSIS	SAMPLE TYPE
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	******	******		4.2	4.2	4.2	(19)	1/31	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	******	**** ****	45.0 MX WK AV	30.0 MO AVG	100.0 MO MAX	MG/L	ONCE/ MONTH	GRAB
OIL AND GREASE FREON EXTR-GRAV METH	SAMPLE MEASUREMENT	******	******		******	ND	ND	(19)	1/31	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	******	**** ****	******	10.0 MO AVG	15.0 MO MAX	MG/L	ONCE/ MONTH	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	******	******		0.403	0.013		(03)	1/7	Est
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	******	**** ****	REPORT MO TOTAL	REPORT AVERAGE	OPTIONAL DAILY MX	MGD	WEEKLY	ESTIMA
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									

Send white copy with supplemental DMR form by 21st day of month following reporting period to:
MINNESOTA POLLUTION CONTROL AGENCY
520 LAFAYETTE ROAD
ST. PAUL, MINNESOTA 55155
ATTN: W.Q. POINT SOURCE COMPLIANCE

I certify that I am familiar with the information contained in this report and that to the best of my knowledge and belief the information is true, complete, and accurate.

D H Schuelke — 6-9-98
SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT — DATE

SIGNATURE OF CHIEF OPERATOR — DATE — CERTIFICATION # — ☐ √ IF NEW

COMMENTS:

1)EFL:no floatg solids,foam or film

PERMITTEE NAME/ADDRESS:

NSP-PRAIRIE ISLAND PLANT
414 NICOLLET MALL
MINNEAPOLIS MN 55401

NSP-PRAIRIE ISLAND PLANT
WELCH MN 55089
ATTN: MR. MICHAEL HESTICK

WASTEWATER TREATMENT DISCHARGE MONITORING REPORT

PERMIT #	OUTFALL #
MN0004006	016 M

Metal Cleaning Effluent Dring
(SUBR 05) 12345
F - FINAL
MAJOR

MONITORING PERIOD

	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	98	05	01	TO	98	05	31

*** NO DISCHARGE ! X ! ***

PARAMETER		QUANTITY AVERAGE	QUANTITY MAXIMUM	QUANTITY UNITS	CONCENTRATION MINIMUM	CONCENTRATION AVERAGE	CONCENTRATION MAXIMUM	CONCENTRATION UNITS	FREQUENCY OF ANALYSIS	SAMPLE TYPE
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT			(01)				(19)		
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	.6 MO AVG	1.9 MO MAX	KG/ DAY	45.0 MX WK AV	30.0 MO AVG	100.0 MO MAX	MG/L	ONCE/ BATCH	GRAB
OIL AND GREASE FREON EXTR-GRAV METH	SAMPLE MEASUREMENT			(01)	******			(19)		
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	.2 MO AVG	.3 MO MAX	KG/ DAY	******	10.0 MO AVG	15.0 MO MAX	MG/L	ONCE/ BATCH	GRAB
COPPER, TOTAL (AS CU)	SAMPLE MEASUREMENT			(01)	******			(19)		
01042 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	.02 MO AVG	.02 MO MAX	KG/ DAY	******	1.0 MO AVG	1.0 MO MAX	MG/L	ONCE/ BATCH	GRAB
IRON, TOTAL (AS FE)	SAMPLE MEASUREMENT			(01)	******			(19)		
01045 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	.02 MO AVG	.02 MO MAX	KG/ DAY	******	1.0 MO AVG	1.0 MO MAX	MG/L	ONCE/ BATCH	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	******	******					(03)		
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	******	**** ****	REPORT MO TOTAL	REPORT AVERAGE	OPTIONAL DAILY MX	MGD	ONCE/ BATCH	ESTIMA
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									

Send white copy with supplemental DMR form by 21st day of month following reporting period to:
MINNESOTA POLLUTION CONTROL AGENCY
520 LAFAYETTE ROAD
ST. PAUL, MINNESOTA 55155
ATTN: W.Q. POINT SOURCE COMPLIANCE

I certify that I am familiar with the information contained in this report and that to the best of my knowledge and belief the information is true, complete, and accurate.

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT — DATE: 6-9-98

SIGNATURE OF CHIEF OPERATOR — DATE — CERTIFICATION # — ☐ √ IF NEW

COMMENTS:

1)EFL:no floatg solids,foam or film

PERMITTEE NAME/ADDRESS:

NSP-PRAIRIE ISLAND PLANT
414 NICOLLET MALL
MINNEAPOLIS MN 55401

NSP-PRAIRIE ISLAND PLANT
WELCH MN 55089
ATTN: MR. MICHAEL HESTICK

WASTEWATER TREATMENT DISCHARGE MONITORING REPORT

PERMIT #	OUTFALL #
MN0004006	017 M

Unit 1 Condensate Blowdo
(SUBR 05) 12345
F - FINAL
MAJOR

MONITORING PERIOD	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	98	05	01	TO	98	05	31

*** NO DISCHARGE !__! ***

PARAMETER		QUANTITY AVERAGE	QUANTITY MAXIMUM	UNITS	CONCENTRATION MINIMUM	CONCENTRATION AVERAGE	CONCENTRATION MAXIMUM	UNITS	FREQUENCY OF ANALYSIS	SAMPLE TYPE
SOLIDS, TOTAL SUSPENDED 00530 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	0	0	(01)	ND	ND	ND	(19)	1/31	GRAB
	PERMIT REQUIREMENT	28.4 MO AVG	94.6 MO MAX	KG/ DAY	45.0 MX WK AV	30.0 MO AVG	100.0 MO MAX	MG/L	ONCE/ MONTH	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT 50050 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	******	******		0.155	0.005		(03)	1/31	Est
	PERMIT REQUIREMENT	******	******	**** ****	REPORT MO TOTAL	REPORT AVERAGE	OPTIONAL DAILY MX	MGD	ONCE/ MONTH	ESTIMA
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									

Send white copy with supplemental DMR form by 21st day of month following reporting period to:
MINNESOTA POLLUTION CONTROL AGENCY
520 LAFAYETTE ROAD
ST. PAUL, MINNESOTA 55155
ATTN: W.Q. POINT SOURCE COMPLIANCE

I certify that I am familiar with the information contained in this report and that to the best of my knowledge and belief the information is true, complete, and accurate.

D H Schuecke — SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT — DATE: 6-9-98

SIGNATURE OF CHIEF OPERATOR — DATE — CERTIFICATION # — ☐ √ IF NEW

COMMENTS:

1)EFL:no floatg solids,foam or film
2)TSS kg/day values equal the sum for 017 and 018.

PERMITTEE NAME/ADDRESS:

NSP-PRAIRIE ISLAND PLANT
414 NICOLLET MALL
MINNEAPOLIS MN 55401

NSP-PRAIRIE ISLAND PLANT
WELCH MN 55089
ATTN: MR. MICHAEL HESTICK

WASTEWATER TREATMENT DISCHARGE MONITORING REPORT

PERMIT #: MN0004006
OUTFALL #: 018 M

Unit 2 Condensate Blowdo
(SUBR 05) 12345
F - FINAL
MAJOR

MONITORING PERIOD

FROM YEAR	MO.	DAY	TO YEAR	MO.	DAY
98	05	01	98	05	31

*** NO DISCHARGE !__! ***

PARAMETER		QUANTITY AVERAGE	QUANTITY MAXIMUM	UNITS	CONCENTRATION MINIMUM	CONCENTRATION AVERAGE	CONCENTRATION MAXIMUM	UNITS	FREQUENCY OF ANALYSIS	SAMPLE TYPE
SOLIDS, TOTAL SUSPENDED 00530 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	0	0	(01)	ND	ND	ND	(19)	1/31	GRAB
	PERMIT REQUIREMENT	28.4 MO AVG	94.6 KG/ MO MAX	DAY	45.0 MX WK AV	30.0 MO AVG	100.0 MO MAX	MG/L	ONCE/ MONTH	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT 50050 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	******	******		0.372	0.012		(03)	1/31	Est
	PERMIT REQUIREMENT	******	****** ****	****	REPORT MO TOTAL	REPORT AVERAGE	OPTIONAL DAILY MX	MGD	ONCE/ MONTH	ESTIM
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									

Send white copy with supplemental DMR form by 21st day of month following reporting period to:
MINNESOTA POLLUTION CONTROL AGENCY
520 LAFAYETTE ROAD
ST. PAUL, MINNESOTA 55155
ATTN: W.Q. POINT SOURCE COMPLIANCE

I certify that I am familiar with the information contained in this report and that to the best of my knowledge and belief the information is true, complete, and accurate.

D H Schueke — SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT — DATE: 6-9-98

SIGNATURE OF CHIEF OPERATOR — DATE — CERTIFICATION # — ☐ √ IF NEW

COMMENTS:

1) EFL: no floatg solids, foam or film
2) TSS kg/day values equal the sum for 017 and 018.

PERMITTEE NAME/ADDRESS:

NSP-PRAIRIE ISLAND PLANT
414 NICOLLET MALL
MINNEAPOLIS MN 55401

NSP-PRAIRIE ISLAND PLANT
WELCH MN 55089
ATTN: MR. MICHAEL HESTICK

WASTEWATER TREATMENT DISCHARGE MONITORING REPORT

PERMIT #	OUTFALL #
MN0004006	021 M

MONITORING PERIOD

	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	98	05	01	TO	98	05	31

Heating System Blowdown Dschg
(SUBR 05) 12345
F - FINAL
MAJOR

*** NO DISCHARGE !X! ***

PARAMETER		QUANTITY AVERAGE	QUANTITY MAXIMUM	QUANTITY UNITS	CONCENTRATION MINIMUM	CONCENTRATION AVERAGE	CONCENTRATION MAXIMUM	CONCENTRATION UNITS	FREQUENCY OF ANALYSIS	SAMPLE TYPE
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT			(01)				(19)		
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	9.1 MO AVG	30.3 MO MAX	KG/ DAY	45.0 MX WK AV	30.0 MO AVG	100.0 MO MAX	MG/L	ONCE/ MONTH	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	******	******					(03)		
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	******	**** ****	REPORT MO TOTAL	REPORT AVERAGE	OPTIONAL MO MAX	MGD	ONCE/ MONTH	ESTIMA
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									

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MINNESOTA POLLUTION CONTROL AGENCY
520 LAFAYETTE ROAD
ST. PAUL, MINNESOTA 55155
ATTN: W.Q. POINT SOURCE COMPLIANCE

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SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT — DATE

SIGNATURE OF CHIEF OPERATOR — DATE — CERTIFICATION #

☐ √ IF NEW

COMMENTS:

PERMITTEE NAME/ADDRESS:

NSP-PRAIRIE ISLAND PLANT
414 NICOLLET MALL
MINNEAPOLIS MN 55401

NSP-PRAIRIE ISLAND PLANT
WELCH MN 55089
ATTN: MR. MICHAEL HESTICK

WASTEWATER TREATMENT DISCHARGE MONITORING REPORT

PERMIT #	OUTFALL #
MN0004006	022 M

MONITORING PERIOD	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	98	05	01	TO	98	05	31

Unit 1 Plant Cooling Wtr Chs
(SUBR 05) 12345
F - FINAL
MAJOR

*** NO DISCHARGE !__! ***

PARAMETER		QUANTITY AVERAGE	QUANTITY MAXIMUM	QUANTITY UNITS	CONCENTRATION MINIMUM	CONCENTRATION AVERAGE	CONCENTRATION MAXIMUM	CONCENTRATION UNITS	FREQUENCY OF ANALYSIS	SAMPLE TYPE
OXIDANTS, TOTAL RESIDUAL	SAMPLE MEASUREMENT	******	******		******		0.17	(19)	31/31	GRAB
34044 A 0 0 DISINFECT,PRCS CMPLT	PERMIT REQUIREMENT	******	******	********	******	OPTIONAL MO AVG	2.0 DAILY MX	MG/L	ONCE/ DISCHG	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	******	******		1035	33.4		(03)	31/31	Est
50050 8 0 0 OTHER TRT,PRCS CMPLT	PERMIT REQUIREMENT	******	******	********	REPORT MO TOTAL	REPORT AVERAGE	OPTIONAL MO MAX	MGD	CONTINUOUS	ESTIM
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									

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MINNESOTA POLLUTION CONTROL AGENCY
520 LAFAYETTE ROAD
ST. PAUL, MINNESOTA 55155
ATTN: W.Q. POINT SOURCE COMPLIANCE

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SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT — DATE: 6-9-98

SIGNATURE OF CHIEF OPERATOR — DATE — CERTIFICATION #

☐ √ IF NEW

COMMENTS:
NOTE: FLOW IS A TOTAL OF OUTFALL 022 & 023

PERMITTEE NAME/ADDRESS:

NSP-PRAIRIE ISLAND PLANT
414 NICOLLET MALL
MINNEAPOLIS MN 55401

NSP-PRAIRIE ISLAND PLANT
WELCH MN 55089
ATTN: MR. MICHAEL HESTICK

WASTEWATER TREATMENT DISCHARGE MONITORING REPORT

PERMIT #: MN0004006

OUTFALL #: 023 M

Unit 2 Plant Cooling Wtr Dischg
(SUBR 05) 12345
F - FINAL
MAJOR

MONITORING PERIOD

FROM YEAR	MO.	DAY	TO YEAR	MO.	DAY
98	05	01	98	05	31

*** NO DISCHARGE !!! ***

PARAMETER		QUANTITY AVERAGE	QUANTITY MAXIMUM	UNITS	CONCENTRATION MINIMUM	CONCENTRATION AVERAGE	CONCENTRATION MAXIMUM	UNITS	FREQUENCY OF ANALYSIS	SAMPLE TYPE
OXIDANTS, TOTAL RESIDUAL	SAMPLE MEASUREMENT	******	******		******		0.14	(19)	31/31	GRAB
34044 A 0 0 DISINFECT,PRCS CMPLT	PERMIT REQUIREMENT	******	******	********	******	OPTIONAL MO AVG	2.0 DAILY MX	MG/L	ONCE/ DISCHG	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	******	******		1035	33.4		(03)	31/31	Est
50050 8 0 0 OTHER TRT,PRCS CMPLT	PERMIT REQUIREMENT	******	******	********	REPORT MO TOTAL	REPORT AVERAGE	OPTIONAL MO MAX	MGD	CONTINUOUS	ESTIMA
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									

Send white copy with supplemental DMR form by 21st day of month following reporting period to:
MINNESOTA POLLUTION CONTROL AGENCY
520 LAFAYETTE ROAD
ST. PAUL, MINNESOTA 55155
ATTN: W.Q. POINT SOURCE COMPLIANCE

I certify that I am familiar with the information contained in this report and that to the best of my knowledge and belief the information is true, complete, and accurate.

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT: [signature] DATE: 6-9-88

SIGNATURE OF CHIEF OPERATOR: DATE: CERTIFICATION #: ☐ √ IF NEW

COMMENTS:

NOTE: FLOW IS A TOTAL OF OUTFALLS 022 & 023

PERMITTEE NAME/ADDRESS:

NSP-PRAIRIE ISLAND PLANT
414 NICOLLET MALL
MINNEAPOLIS MN 55401

NSP-PRAIRIE ISLAND PLANT
WELCH MN 55089
ATTN: MR. MICHAEL HESTICK

WASTEWATER TREATMENT DISCHARGE MONITORING REPORT

PERMIT #: MN0004006

OUTFALL #: 030 M

Intake Screen Bkwsh+Fish Retn
(SUBR 05) 12345
F - FINAL
MAJOR

MONITORING PERIOD

FROM YEAR	MO.	DAY	TO YEAR	MO.	DAY
98	05	01	98	05	31

*** NO DISCHARGE !__! ***

PARAMETER		QUANTITY AVERAGE	QUANTITY MAXIMUM	QUANTITY UNITS	CONCENTRATION MINIMUM	CONCENTRATION AVERAGE	CONCENTRATION MAXIMUM	CONCENTRATION UNITS	FREQUENCY OF ANALYSIS	SAMPLE TYPE
FLOW, IN CONDUIT OR THRU TREATMENT PLANT 50050 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	******	******		62	2		(03)	1/31	Est
	PERMIT REQUIREMENT	******	******	********	REPORT MO TOTAL	REPORT AVERAGE	OPTIONAL DAILY MX	MGD	ONCE/ MONTH	ESTIMA
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									

Send white copy with supplemental DMR form by 21st day of month following reporting period to:
MINNESOTA POLLUTION CONTROL AGENCY
520 LAFAYETTE ROAD
ST. PAUL, MINNESOTA 55155
ATTN: W.Q. POINT SOURCE COMPLIANCE

I certify that I am familiar with the information contained in this report and that to the best of my knowledge and belief the information is true, complete, and accurate.

DH Schueck — SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT — DATE 6-9-98

SIGNATURE OF CHIEF OPERATOR — DATE — CERTIFICATION # — ☐ √ IF NEW

COMMENTS:

1) EFL: no floatg solids, foam or film
2) Large debris shall not be discharged.

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

MAY 02,98
00:01:53

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 05/02/98 TIME: 00:01:50

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	66.5	60.9	63.6	Good
1T2571A	STURGEON LAKE TEMP 2	65.9	60.5	62.9	
1T2572A	DIAMOND BLUFF TEMP	65.2	55.1	58.9	
1T2573A	LOCK & DAM PIER 1 TEMP	82.3	76.8	79.3	Bad T/C (Removed from calculation)
1T2574A	LOCK & DAM PIER 2 TEMP	65.4	61.3	63.0	Good
1T2575A	LOCK & DAM PIER 3 TEMP	66.1	61.3	63.4	
1T2527A	SCREENHOUSE INLT TEMP	66.2	61.5	63.7	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	93.9	84.7	89.4	

E-O-J

Tom Van Gorp

Tom Quinlan

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

MAY 03,98
00:02:11

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 05/03/98 TIME: 00:02:07

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	64.8	61.5	62.3	
1T2571A	STURGEON LAKE TEMP 2	63.4	61.9	62.5	
1T2572A	DIAMOND BLUFF TEMP	63.1	61.7	62.4	
1T2573A	LOCK & DAM PIER 1 TEMP	78.1	66.6	71.7	- Bad T/C (Removed from Calculation)
1T2574A	LOCK & DAM PIER 2 TEMP	63.7	62.3	63.1	
1T2575A	LOCK & DAM PIER 3 TEMP	64.8	62.4	63.3	Good
1T2527A	SCREENHOUSE INLT TEMP	64.6	61.7	62.8	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	90.4	85.9	88.0	

E-O-J

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

MAY 04,98
00:02:25

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 05/04/98 TIME: 00:02:21

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	65.3	60.0	62.4	Good
1T2571A	STURGEON LAKE TEMP 2	65.3	60.7	62.6	
1T2572A	DIAMOND BLUFF TEMP	64.4	60.4	62.4	
1T2573A	LOCK & DAM PIER 1 TEMP	71.9	63.8	67.4	Bad T/C (Removed from calculation
1T2574A	LOCK & DAM PIER 2 TEMP	64.8	61.2	62.8	Good
1T2575A	LOCK & DAM PIER 3 TEMP	65.3	61.0	62.9	
1T2527A	SCREENHOUSE INLT TEMP	64.9	60.3	62.3	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	93.1	83.0	87.9	

E-O-J

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

MAY 05,98
00:02:35

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 05/05/98 TIME: 00:02:32

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	67.3	61.9	64.4	Good
1T2571A	STURGEON LAKE TEMP 2	68.2	61.7	64.7	
1T2572A	DIAMOND BLUFF TEMP	67.6	62.3	64.8	
1T2573A	LOCK & DAM PIER 1 TEMP	75.8	67.7	71.4	Air temp (Removed from Average calculation)
1T2574A	LOCK & DAM PIER 2 TEMP	67.4	63.2	65.0	Good
1T2575A	LOCK & DAM PIER 3 TEMP	67.6	63.1	65.2	
1T2527A	SCREENHOUSE INLT TEMP	66.7	62.6	64.5	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	94.2	84.3	89.4	

E-O-J

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

MAY 06,98
00:02:43

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 05/06/98 TIME: 00:02:39

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	67.7	62.9	65.2	Good
1T2571A	STURGEON LAKE TEMP 2	67.8	62.7	65.0	
1T2572A	DIAMOND BLUFF TEMP	67.4	61.8	64.7	
1T2573A	LOCK & DAM PIER 1 TEMP	75.7	70.3	73.1	Air Temp Bad T/C (Removed from Down Stream River Average)
1T2574A	LOCK & DAM PIER 2 TEMP	67.5	63.4	65.4	
1T2575A	LOCK & DAM PIER 3 TEMP	67.6	63.7	65.7	Good
1T2527A	SCREENHOUSE INLT TEMP	67.4	63.9	65.6	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	92.2	85.2	89.5	

E-O-J

Tom Kerbert

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

MAY 07,98
00:02:55

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 05/07/98 TIME: 00:02:51

Computer went down Real lows

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	68.4	0.0	65.6	64.8
1T2571A	STURGEON LAKE TEMP 2	68.3	0.0	65.2	64.5
1T2572A	DIAMOND BLUFF TEMP	67.8	0.0	65.1	65.2
1T2573A	LOCK & DAM PIER 1 TEMP	76.7	0.0	73.0	Bad TIC (Taken out of upstream Average)
1T2574A	LOCK & DAM PIER 2 TEMP	68.2	0.0	65.8	65.6
1T2575A	LOCK & DAM PIER 3 TEMP	68.2	0.0	66.0	65.8
1T2527A	SCREENHOUSE INLT TEMP	68.6	64.0	66.3	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	92.8	83.2	88.8	

E-O-J

Tim Vanscoy

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

MAY 08,98
00:03:11

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 05/08/98 TIME: 00:03:07

POINT ID	DESCRIPTION	MAX	MIN	AVE
1T2570A	STURGEON LAKE TEMP 1	67.4	64.3	65.3
1T2571A	STURGEON LAKE TEMP 2	66.2	64.2	65.1
1T2572A	DIAMOND BLUFF TEMP	66.5	64.7	65.5
1T2573A	LOCK & DAM PIER 1 TEMP	76.2	66.3	71.1
1T2574A	LOCK & DAM PIER 2 TEMP	67.4	65.3	66.1
1T2575A	LOCK & DAM PIER 3 TEMP	67.4	65.6	66.3
1T2527A	SCREENHOUSE INLT TEMP	67.8	64.4	65.7
1T2530A	DISCHARGE CANAL AVERAGE TEMP	91.7	87.0	90.1

-Bad T/C Taken out of upstream average

E-O-J

To: Tom Verbout

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

MAY 09,98
00:03:24

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 05/09/98 TIME: 00:03:21

POINT ID	DESCRIPTION	MAX	MIN	AVE
1T2570A	STURGEON LAKE TEMP 1	65.8	62.8	64.3
1T2571A	STURGEON LAKE TEMP 2	66.6	63.8	64.9
1T2572A	DIAMOND BLUFF TEMP	66.0	64.0	65.0
1T2573A	LOCK & DAM PIER 1 TEMP	69.0	63.3	65.8
1T2574A	LOCK & DAM PIER 2 TEMP	66.2	64.4	65.3
1T2575A	LOCK & DAM PIER 3 TEMP	66.5	64.3	65.4
1T2527A	SCREENHOUSE INLT TEMP	65.5	63.0	64.2
1T2530A	DISCHARGE CANAL AVERAGE TEMP	93.6	84.3	89.1

— Bad TIC (TAKEN OUT of UPSTREAM average CALCULATION)

E-O-J

Verbal

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

MAY 10,98
00:03:40

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 05/10/98 TIME: 00:03:35

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	68.1	63.0	65.4	Good
1T2571A	STURGEON LAKE TEMP 2	68.3	63.0	65.3	Good
1T2572A	DIAMOND BLUFF TEMP	68.1	63.4	65.5	Good
1T2573A	LOCK & DAM PIER 1 TEMP	72.1	63.9	67.9	Bad TIC (Taken out of upstream avg. calculation)
1T2574A	LOCK & DAM PIER 2 TEMP	68.3	64.0	65.9	Good
1T2575A	LOCK & DAM PIER 3 TEMP	68.1	64.1	65.9	Good
1T2527A	SCREENHOUSE INLT TEMP	67.9	63.6	65.5	Good
1T2530A	DISCHARGE CANAL AVERAGE TEMP	93.8	84.7	90.1	Good

E-O-J

10. 10m verdowl

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

MAY 11,98
00:03:51

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 05/11/98 TIME: 00:03:48

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	69.5	64.8	67.2	Good
1T2571A	STURGEON LAKE TEMP 2	69.6	64.2	66.8	
1T2572A	DIAMOND BLUFF TEMP	69.5	64.9	66.9	
1T2573A	LOCK & DAM PIER 1 TEMP	74.7	68.4	71.4	Bad T/C (taken out of upstream ave calculation)
1T2574A	LOCK & DAM PIER 2 TEMP	69.7	65.7	67.5	Good
1T2575A	LOCK & DAM PIER 3 TEMP	69.7	65.8	67.6	
1T2527A	SCREENHOUSE INLT TEMP	69.5	65.5	67.3	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	91.8	84.2	88.4	

E-O-J

Tom Overbout

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

MAY 12,98
00:04:10

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 05/12/98 TIME: 00:04:06

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	68.6	65.6	67.3	Good
1T2571A	STURGEON LAKE TEMP 2	69.6	65.1	67.3	
1T2572A	DIAMOND BLUFF TEMP	69.6	66.0	67.5	
1T2573A	LOCK & DAM PIER 1 TEMP	76.3	70.4	73.3	Bad TIC (Removed from ~~up~~ DOWN stream calculation)
1T2574A	LOCK & DAM PIER 2 TEMP	69.6	66.7	68.1	Good
1T2575A	LOCK & DAM PIER 3 TEMP	69.5	66.7	68.1	
1T2527A	SCREENHOUSE INLT TEMP	68.8	66.2	67.6	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	89.9	85.1	87.5	

E-O-J

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

MAY 13,98
00:04:24

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 05/13/98 TIME: 00:04:19

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	68.1	64.9	66.0	Good
1T2571A	STURGEON LAKE TEMP 2	67.8	64.6	66.2	
1T2572A	DIAMOND BLUFF TEMP	68.5	65.2	66.8	
1T2573A	LOCK & DAM PIER 1 TEMP	75.6	71.2	73.1	Bad TIC (Removed from DOWN stream Calculation)
1T2574A	LOCK & DAM PIER 2 TEMP	69.1	66.2	67.4	Good
1T2575A	LOCK & DAM PIER 3 TEMP	68.8	66.2	67.4	
1T2527A	SCREENHOUSE INLT TEMP	68.3	65.6	66.5	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	91.3	83.9	87.4	

E-O-J

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

MAY 14,98
00:04:36

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 05/14/98 TIME: 00:04:32

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	68.2	63.7 ~~0.0~~	65.0	
1T2571A	STURGEON LAKE TEMP 2	68.3	66.2 ~~0.0~~	65.1	
1T2572A	DIAMOND BLUFF TEMP	68.1	63.2 0.0	65.5	
1T2573A	LOCK & DAM PIER 1 TEMP	75.3	67.9 0.0	70.7	BAD TC
1T2574A	LOCK & DAM PIER 2 TEMP	68.2	64.5 0.0	66.2	
1T2575A	LOCK & DAM PIER 3 TEMP	68.2	64.7 0.0	66.1	
1T2527A	SCREENHOUSE INLT TEMP	68.6	63.9 63.7	66.0	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	89.0	82.9 82.7	86.1	

E-O-J

PROGRAM NAME :NSCWSP.E TASK NUMBER: 39000037
NSP PRAIRIE ISLAND PLANT - UNIT 1

MAY 15,98
00:04:25

TO: TOM VERBOUT

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 05/15/98 TIME: 00:04:17

POINT ID	DESCRIPTION	MAX	MIN	AVE	
1T2570A	STURGEON LAKE TEMP 1	69.9	64.3	67.5	
1T2571A	STURGEON LAKE TEMP 2	70.8	64.1	68.6	
1T2572A	DIAMOND BLUFF TEMP	70.7	65.1	68.7	
1T2573A	LOCK & DAM PIER 1 TEMP	81.8	65.9	70.1	BAD
1T2574A	LOCK & DAM PIER 2 TEMP	71.0	65.6	68.7	
1T2575A	LOCK & DAM PIER 3 TEMP	70.6	65.6	68.4	
1T2527A	SCREENHOUSE INLT TEMP	69.6	64.6	67.5	
1T2530A	DISCHARGE CANAL AVERAGE TEMP	94.2	84.6	91.6	

OK [signature] 5/18/98

E-O-J

PROGRAM NAME :NSCWSP.E TASK NUMBER: 39000037
NSP PRAIRIE ISLAND PLANT - UNIT 1

MAY 16,98
00:04:28

TO: TOM VERBOUT

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 05/16/98 TIME: 00:04:24

POINT ID	DESCRIPTION	MAX	MIN	AVE
1T2570A	STURGEON LAKE TEMP 1	70.5	67.7	69.1
1T2571A	STURGEON LAKE TEMP 2	70.9	67.4	69.0
1T2572A	DIAMOND BLUFF TEMP	73.1	67.9	69.4
1T2573A	LOCK & DAM PIER 1 TEMP	70.2	67.1	68.5
1T2574A	LOCK & DAM PIER 2 TEMP	72.5	69.3	70.5
1T2575A	LOCK & DAM PIER 3 TEMP	72.5	69.0	70.2
1T2527A	SCREENHOUSE INLT TEMP	70.5	67.7	69.2
1T2530A	DISCHARGE CANAL AVERAGE TEMP	99.4	92.2	95.8

OK 6/2/98

E-O-J

PROGRAM NAME :NSCWSP.E TASK NUMBER: 39000037
NSP PRAIRIE ISLAND PLANT - UNIT 1

MAY 17,98
00:04:39

TO: TOM VERGOUT

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 05/17/98 TIME: 00:04:35

POINT ID	DESCRIPTION	MAX	MIN	AVE
1T2570A	STURGEON LAKE TEMP 1	69.5	65.9	67.7
1T2571A	STURGEON LAKE TEMP 2	70.2	66.1	68.1
1T2572A	DIAMOND BLUFF TEMP	71.0	67.1	68.9
1T2573A	LOCK & DAM PIER 1 TEMP	69.2	66.2	67.7
1T2574A	LOCK & DAM PIER 2 TEMP	71.0	68.2	69.7
1T2575A	LOCK & DAM PIER 3 TEMP	70.9	68.0	69.5
1T2527A	SCREENHOUSE INLT TEMP	69.8	66.8	68.2
1T2530A	DISCHARGE CANAL AVERAGE TEMP	96.1	93.1	94.6

OK
[illegible] 6/2/98

E-O-J

PROGRAM NAME :NSCWSP.E TASK NUMBER: 39000037
NSP PRAIRIE ISLAND PLANT - UNIT 1

MAY 18,98
00:04:52

TO: TOM VERBOET

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 05/18/98 TIME: 00:04:48

POINT ID	DESCRIPTION	MAX	MIN	AVE
1T2570A	STURGEON LAKE TEMP 1	70.8	66.3	68.3
1T2571A	STURGEON LAKE TEMP 2	71.5	66.4	68.6
1T2572A	DIAMOND BLUFF TEMP	70.8	66.0	68.7
1T2573A	LOCK & DAM PIER 1 TEMP	69.8	65.7	67.7
1T2574A	LOCK & DAM PIER 2 TEMP	71.6	67.9	69.8
1T2575A	LOCK & DAM PIER 3 TEMP	71.4	67.8	69.4
1T2527A	SCREENHOUSE INLT TEMP	70.6	66.7	68.5
1T2530A	DISCHARGE CANAL AVERAGE TEMP	98.1	89.8	94.6

OK
JS
6/2/98

E-O-J

TO. 10m Verbal

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

MAY 19,98
00:00:15

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 05/19/98 TIME: 00:00:03

POINT ID	DESCRIPTION	MAX	MIN	AVE
1T2570A	STURGEON LAKE TEMP 1	74.7	0.0	70.8
1T2571A	STURGEON LAKE TEMP 2	74.7	0.0	71.9
1T2572A	DIAMOND BLUFF TEMP	73.9	69.1	72.1
1T2573A	LOCK & DAM PIER 1 TEMP	72.6	67.9	70.9
1T2574A	LOCK & DAM PIER 2 TEMP	77.6	70.0	72.9
1T2575A	LOCK & DAM PIER 3 TEMP	78.1	69.9	72.9
1T2527A	SCREENHOUSE INLT TEMP	74.0	68.6	71.3
1T2530A	DISCHARGE CANAL AVERAGE TEMP	100.8	93.5	98.5

OK
6/2/98

E-O-J

To. Tom Verdoll

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

MAY 20,98
00:00:29

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 05/20/98 TIME: 00:00:13

POINT ID	DESCRIPTION	MAX	MIN	AVE
1T2570A	STURGEON LAKE TEMP 1	75.3	70.1	72.7
1T2571A	STURGEON LAKE TEMP 2	75.3	70.0	72.6
1T2572A	DIAMOND BLUFF TEMP	75.5	71.0	73.1
1T2573A	LOCK & DAM PIER 1 TEMP	74.0	70.2	71.9
1T2574A	LOCK & DAM PIER 2 TEMP	75.9	71.9	73.9
1T2575A	LOCK & DAM PIER 3 TEMP	76.3	72.2	74.1
1T2527A	SCREENHOUSE INLT TEMP	75.0	70.6	72.7
1T2530A	DISCHARGE CANAL AVERAGE TEMP	98.9	92.3	95.8

OK
AS 6/2/98

E-O-J

10 - 10m Verbal

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

MAY 21,98
00:00:38

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 05/21/98 TIME: 00:00:22

POINT ID	DESCRIPTION	MAX	MIN	AVE
1T2570A	STURGEON LAKE TEMP 1	74.7	70.8	73.0
1T2571A	STURGEON LAKE TEMP 2	75.2	71.5	73.5
1T2572A	DIAMOND BLUFF TEMP	75.2	72.3	73.5
1T2573A	LOCK & DAM PIER 1 TEMP	73.7	71.2	72.3
1T2574A	LOCK & DAM PIER 2 TEMP	76.1	73.1	74.7
1T2575A	LOCK & DAM PIER 3 TEMP	75.9	73.4	74.8
1T2527A	SCREENHOUSE INLT TEMP	74.5	71.3	73.0
1T2530A	DISCHARGE CANAL AVERAGE TEMP	101.0	97.4	99.2

OK 6/2/98

E-O-J

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

Tom VERSOUT

MAY 22,98
00:00:30

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 05/22/98 TIME: 00:00:24

POINT ID	DESCRIPTION	MAX	MIN	AVE
1T2570A	STURGEON LAKE TEMP 1	75.2	70.7	73.0
1T2571A	STURGEON LAKE TEMP 2	75.7	70.9	72.9
1T2572A	DIAMOND BLUFF TEMP	75.8	71.9	73.4
1T2573A	LOCK & DAM PIER 1 TEMP	75.0	70.8	72.3
1T2574A	LOCK & DAM PIER 2 TEMP	76.8	73.0	74.7
1T2575A	LOCK & DAM PIER 3 TEMP	76.8	73.1	74.7
1T2527A	SCREENHOUSE INLT TEMP	75.0	71.3	73.2
1T2530A	DISCHARGE CANAL AVERAGE TEMP	100.6	95.8	98.7

OK 5/26/98

E-O-J

Tom Verkbuch

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

MAY 23,98
00:00:35

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 05/23/98 TIME: 00:00:29

POINT ID	DESCRIPTION	MAX	MIN	AVE
1T2570A	STURGEON LAKE TEMP 1	73.3	69.4	70.7
1T2571A	STURGEON LAKE TEMP 2	72.9	69.7	71.3
1T2572A	DIAMOND BLUFF TEMP	73.3	70.8	72.4
1T2573A	LOCK & DAM PIER 1 TEMP	73.0	69.6	71.0
1T2574A	LOCK & DAM PIER 2 TEMP	75.4	71.7	73.2
1T2575A	LOCK & DAM PIER 3 TEMP	75.3	71.8	73.3
1T2527A	SCREENHOUSE INLT TEMP	73.9	69.7	71.0
1T2530A	DISCHARGE CANAL AVERAGE TEMP	99.9	94.8	97.6

OK
6/2/98

E-O-J

PROGRAM NAME :NSCWSP.B TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

Tom VERBOUT

MAY 24,98
00:00:44

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 05/24/98 TIME: 00:00:37

POINT ID	DESCRIPTION	MAX	MIN	AVE
1T2570A	STURGEON LAKE TEMP 1	69.5	67.3	68.9
1T2571A	STURGEON LAKE TEMP 2	70.8	68.2	69.7
1T2572A	DIAMOND BLUFF TEMP	71.3	69.3	70.7
1T2573A	LOCK & DAM PIER 1 TEMP	69.8	68.0	69.1
1T2574A	LOCK & DAM PIER 2 TEMP	72.0	69.7	71.1
1T2575A	LOCK & DAM PIER 3 TEMP	71.9	69.5	71.0
1T2527A	SCREENHOUSE INLT TEMP	69.9	67.1	68.4
1T2530A	DISCHARGE CANAL AVERAGE TEMP	96.8	91.1	93.5

OK AS 6/2/98

E-O-J

Tom VanBoot

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

MAY 25,98
00:01:00

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 05/25/98 TIME: 00:00:53

POINT ID	DESCRIPTION	MAX	MIN	AVE
1T2570A	STURGEON LAKE TEMP 1	68.1	66.0	66.6
1T2571A	STURGEON LAKE TEMP 2	68.4	67.0	67.4
1T2572A	DIAMOND BLUFF TEMP	69.7	68.5	69.1
1T2573A	LOCK & DAM PIER 1 TEMP	68.2	66.7	67.3
1T2574A	LOCK & DAM PIER 2 TEMP	70.3	68.3	69.0
1T2575A	LOCK & DAM PIER 3 TEMP	70.0	68.3	68.9
1T2527A	SCREENHOUSE INLT TEMP	68.3	65.7	66.5
1T2530A	DISCHARGE CANAL AVERAGE TEMP	95.1	91.3	93.0

OK
JJ 6/2/98

E-O-J

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

MAY 26,98
00:01:18

TO: TOM VERHOUT

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 05/26/98 TIME: 00:01:11

POINT ID	DESCRIPTION	MAX	MIN	AVE
		N C A L	N C A L	N C A L
1T2570A	STURGEON LAKE TEMP 1			
1T2571A	STURGEON LAKE TEMP 2	71.0	66.3	68.4
1T2572A	DIAMOND BLUFF TEMP	71.4	66.4	68.9
1T2573A	LOCK & DAM PIER 1 TEMP	69.1	65.8	67.2
1T2574A	LOCK & DAM PIER 2 TEMP	71.4	67.4	69.1
1T2575A	LOCK & DAM PIER 3 TEMP	71.1	67.1	69.0
1T2527A	SCREENHOUSE INLT TEMP	70.7	64.7	67.3
1T2530A	DISCHARGE CANAL AVERAGE TEMP	97.3	91.2	94.9

← USE 68.4 (AVE. OF 1L, 2)

E-O-J

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

MAY 27,98
00:01:28

TO: TOM VERBOUT

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 05/27/98 TIME: 00:01:20

POINT ID	DESCRIPTION	MAX	MIN	AVE
		N C A L	N C A L	N C A L
1T2570A	STURGEON LAKE TEMP 1	73.7	0.0	68.7
1T2571A	STURGEON LAKE TEMP 2	73.2	2188-85	69.5
1T2572A	DIAMOND BLUFF TEMP	71.6	2188-85	68.0
1T2573A	LOCK & DAM PIER 1 TEMP	73.7	2188-85	70.2
1T2574A	LOCK & DAM PIER 2 TEMP	73.5	2188-85	70.0
1T2575A	LOCK & DAM PIER 3 TEMP	72.7	68.2	70.0
1T2527A	SCREENHOUSE INLT TEMP	97.5	92.1	95.3
1T2530A	DISCHARGE CANAL AVERAGE TEMP			

← USE THIS (AVG OF 1 & 2)

A 6/3/98

E-O-J

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

MAY 28,98
00:01:34

TO: TOM VERBOUT

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 05/28/98 TIME: 00:01:28

POINT ID	DESCRIPTION	MAX	MIN	AVE
1T2570A	STURGEON LAKE TEMP 1	N C A L	N C A L	N C A L
1T2571A	STURGEON LAKE TEMP 2	74.2	68.4	71.2
1T2572A	DIAMOND BLUFF TEMP	73.7	69.4	71.5
1T2573A	LOCK & DAM PIER 1 TEMP	71.9	68.5	70.0
1T2574A	LOCK & DAM PIER 2 TEMP	74.1	70.6	72.2
1T2575A	LOCK & DAM PIER 3 TEMP	74.0	70.5	72.1
1T2527A	SCREENHOUSE INLT TEMP	72.7	69.1	70.8
1T2530A	DISCHARGE CANAL AVERAGE TEMP	98.2	93.0	95.9

← USE 71.2 (AVE. OF 3 L.T.)

E-O-J

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

MAY 29,98
00:01:41

TO: TOM VERBOUT

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 05/29/98 TIME: 00:01:33

POINT ID	DESCRIPTION	MAX	MIN	AVE
1T2570A	STURGEON LAKE TEMP 1	0.0	0.0	0.0
1T2571A	STURGEON LAKE TEMP 2	75.2	0.0	64.8
1T2572A	DIAMOND BLUFF TEMP	75.2	0.0	70.2
1T2573A	LOCK & DAM PIER 1 TEMP	73.7	0.0	68.5
1T2574A	LOCK & DAM PIER 2 TEMP	75.4	0.0	70.5
1T2575A	LOCK & DAM PIER 3 TEMP	75.5	0.0	70.9
1T2527A	SCREENHOUSE INLT TEMP	74.9	70.2	72.3
1T2530A	DISCHARGE CANAL AVERAGE TEMP	98.5	94.3	96.8

NOT IN CALC. USE C4 T (AVG. OF 1-L-2)

6/3/98

E-O-J

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

MAY 30,98
00:01:45

TO: TOM VERBOUT

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 05/30/98 TIME: 00:01:36

POINT ID	DESCRIPTION	MAX	MIN	AVE
		N C A L	N C A L	N C A L
1T2570A	STURGEON LAKE TEMP 1			
1T2571A	STURGEON LAKE TEMP 2	76.3	71.3	73.7
1T2572A	DIAMOND BLUFF TEMP	76.9	72.4	74.4
1T2573A	LOCK & DAM PIER 1 TEMP	74.7	71.4	72.9
1T2574A	LOCK & DAM PIER 2 TEMP	77.0	73.5	75.1
1T2575A	LOCK & DAM PIER 3 TEMP	77.1	73.4	75.2
1T2527A	SCREENHOUSE INLT TEMP	75.7	72.2	73.8
1T2530A	DISCHARGE CANAL AVERAGE TEMP	97.9	93.8	96.1

← USE 73.7 (AVG. OF 2)

6/3/98

E-O-J

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

MAY 31,98
00:01:48

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 05/31/98 TIME: 00:01:45

to: TOM VEIHOUT

POINT ID	DESCRIPTION	MAX	MIN	AVE
		N C A L	N C A L	N C A L
1T2570A	STURGEON LAKE TEMP 1	74.2	71.1	72.6
1T2571A	STURGEON LAKE TEMP 2	75.3	72.0	74.0
1T2572A	DIAMOND BLUFF TEMP	74.1	71.6	72.5
1T2573A	LOCK & DAM PIER 1 TEMP	76.2	73.5	74.5
1T2574A	LOCK & DAM PIER 2 TEMP	76.3	73.1	74.4
1T2575A	LOCK & DAM PIER 3 TEMP	75.1	70.9	72.5
1T2527A	SCREENHOUSE INLT TEMP	99.1	92.9	95.6
1T2530A	DISCHARGE CANAL AVERAGE TEMP			

← USF 72.6 (AVE. OF 5.L.2)

6/3/98

E-O-J

PROGRAM NAME :NSCWSP.E TASK NUMBER: 2C00002A
NSP PRAIRIE ISLAND PLANT - UNIT 1

JUN 01,98
00:02:27

PRAIRIE ISLAND RIVER TEMPERATURE REPORT

DATE: 06/01/98 TIME: 00:01:54

TO: Tom Verbout

POINT ID	DESCRIPTION	MAX	MIN	AVE
1T2570A	STURGEON LAKE TEMP 1	N C A L	N C A L	N C A L
1T2571A	STURGEON LAKE TEMP 2	72.9	69.9	71.4
1T2572A	DIAMOND BLUFF TEMP	74.3	71.1	72.6
1T2573A	LOCK & DAM PIER 1 TEMP	73.1	70.0	71.1
1T2574A	LOCK & DAM PIER 2 TEMP	74.8	71.6	72.9
1T2575A	LOCK & DAM PIER 3 TEMP	74.5	71.5	72.9
1T2527A	SCREENHOUSE INLT TEMP	72.4	70.1	71.1
1T2530A	DISCHARGE CANAL AVERAGE TEMP	97.7	92.4	94.7

← use 71.4 (AVG. of SL 2)
6/3/98

E-O-J