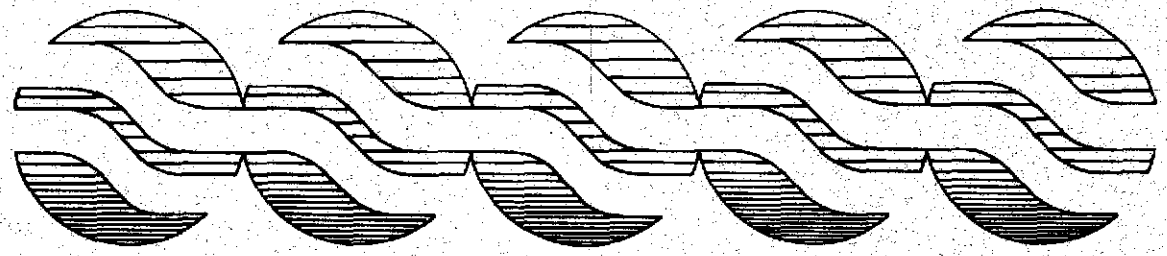
BEAR CREEK RESERVOIR



CLEAN LAKES STUDY

SUPPLEMENTAL REPORT
TECHNICAL APPENDICES

DRCOG
DENVER REGIONAL COUNCIL OF GOVERNMENTS

Supplemental Report

BEAR CREEK RESERVOIR
CLEAN LAKE STUDY

Technical Appendices

Denver Regional Council of Governments
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Denver, Colorado 80211

in cooperation with

Colorado Department of Health
Water Quality Control Division

and

Jefferson County Mountain Water Quality Association
and
City of Lakewood

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ABSTRACT

TITLE:	Bear Creek Reservoir Clean Lake Study Technical Appendices
AUTHOR:	Denver Regional Council of Governments
SUBJECT:	A technical supplemental report containing summaries of water quality data, checklists of biological resources and trend plots of selected water quality parameters.
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ABSTRACT:	This report is supplemental to the Bear Creek Reservoir Clean Lake Study and provides summaries of water quality data, checklists of biological resources and trend plots of selected water quality parameters. Water quality trends were seasonally summarized for the watershed at the headwaters of Turkey and Bear Creeks within the study area, at the inflows to Bear Creek Reservoir and at the outflow from the reservoir. The reservoir data is summarized by season and depth zonation. There are trend plots of this summarized water quality data for selected parameters.

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APPENDIX A

WASTEWATER TREATMENT FACILITY EFFLUENT DATA

Effluent characteristics are routinely monitored at all wastewater treatment facilities permitted under the NPDES and CDPS systems. This effluent monitoring was coordinated with stream sampling for the Bear Creek Clean Lake Study. The water quality and physical discharges data for major wastewater treatment facilities is summarized in this appendix.

TABLE A1. WILLOWSPRING WASTEWATER TREATMENT FACILITY EFFLUENT QUALTY

	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
EFFLUENT DISCHARGE GPD	59372	1559	57500	64300
TOTAL SUSPENDED SOLIDS MG/L	5.29	3.06	1.00	14.00
5-DAY BIOLOGICAL OXYGEN DEMAND MG/L	5.75	4.60	0.00	18.00
PERCENT BOD REMOVAL	97.2	2.0	92.0	100.0
FECAL COLIFORM	1	3	0	10
AMMONIA MG/L	10.41	4.80	3.30	22.10
NITRATE MG/L	2.69	2.89	0.10	7.60
ORTHO PHOSPHORUS MG/L	10.57	3.13	7.60	17.60
TSS LOAD #/DAY	2.64	1.62	0.49	7.50
BOD LOAD #/DAY	2.86	2.30	0.00	8.88
AMMONIA LOAD #/DAY	5.12	2.31	1.67	10.86
NITRATE LOAD #/DAY	1.35	1.46	0.05	3.70
PHOSPHORUS LOAD #/DAY	5.30	1.79	3.72	9.43

TABLE A2. FOREST HILLS METRO WASTEWATER TREATMENT FACILITY EFFLUET QUALITY

	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
EFFLUENT DISCHARGE GPD	3000	0	3000	3000
TOTAL SUSPENDED SOLIDS MG/L	2.00	1.54	1.00	5.00
5-DAY BIOLOGICAL OXYGEN DEMAND MG/L	2.67	4.56	1.00	17.00
PERCENT BOD REMOVAL	92.92	7.99	77.00	99.00
FECAL COLIFORM	259	457	0	1272
AMMONIA MG/L	0.99	2.23	0.10	10.00
TSS LOAD #/DAY	0.05	0.04	0.02	0.12
BOD LOAD #/DAY	0.07	0.11	0.02	0.42
AMMONIA LOAD #/DAY	0.02	0.06	0.00	0.25

TABLE A3. MORRISON WASTEWATER TREATMENT FACILITY EFFLUENT QUALITY

	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
EFFLUENT DISCHARGE GPD	63550	10123	49000	85000
TOTAL SUSPENDED SOLIDS MG/L	4.92	3.37	1.00	12.00
5-DAY BIOLOGICAL OXYGEN DEMAND MG/L	3.83	2.41	1.00	10.00
FECAL COLIFORM	2306	7715	0	26800
AMMONIA MG/L	3.94	3.10	0.00	9.70
NITRATE MG/L	0.46	0.59	0.01	1.80
ORTHO PHOSPHORUS MG/L	2.73	1.31	1.00	5.30
TSS LOAD #/DAY	2.55	1.65	0.53	5.90
BOD LOAD #/DAY	2.06	1.23	0.41	4.83
AMMONIA LOAD #/DAY	2.05	1.63	0.00	5.60
NITRATE LOAD #/DAY	0.25	0.29	0.01	0.85
PHOSPHORUS LOAD #/DAY	1.50	0.68	0.57	2.83

TABLE A4. EVERGREEN WASTEWATER TREATMENT FACILITY EFFLUENT QUALIY

	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
EFFLUENT DISCHARGE GPD	426393	103983	236200	806600
TOTAL SUSPENDED SOLIDS MG/L	1.94	1.12	0.40	7.00
5-DAY BIOLOGICAL OXYGEN DEMAND MG/L	3.01	1.64	1.00	11.00
PERCENT BOD REMOVAL	98.0	1.2	93.0	99.0
FECAL COLIFORM	421	697	0	3800
AMMONIA MG/L	2.27	4.07	0.10	21.70
NITRATE MG/L	14.07	8.99	0.10	40.30
ORTHO PHOSPHORUS MG/L	4.01	1.86	1.00	8.00
TSS LOAD #/DAY	6.98	4.65	1.03	32.51
BOD LOAD #/DAY	10.70	7.16	3.12	48.76
AMMONIA LOAD #/DAY	8.27	14.87	0.23	83.35
NITRATE LOAD #/DAY	46.86	29.00	0.25	135.05
PHOSPHORUS LOAD #/DAY	13.73	6.25	3.65	30.70

TABLE A5. WEST JEFFERSON COUNTY WASTEWATER TREATMENT EFFLUENT QUAITY

	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
EFFLUENT DISCHARGE GPD	201309	44094	109200	340600
TOTAL SUSPENDED SOLIDS MG/L	3.36	2.73	0.40	17.00
5-DAY BIOLOGICAL OXYGEN DEMAND MG/L	4.32	2.57	0.00	13.00
PERCENT BOD REMOVAL	97.6	1.2	94.0	100.0
FECAL COLIFORM	104	388	0	3176
AMMONIA MG/L	1.95	3.28	0.00	18.30
NITRATE MG/L	15.69	8.15	0.10	40.30
ORTHO PHOSPHORUS MG/L	7.34	1.84	1.70	14.00
TSS LOAD #/DAY	5.76	4.87	0.44	24.07
BOD LOAD #/DAY	7.36	4.74	0.00	23.73
AMMONIA LOAD #/DAY	3.05	5.34	0.00	43.19
NITRATE LOAD #/DAY	26.63	14.31	0.15	71.34
PHOSPHORUS LOAD #/DAY	12.62	4.04	2.21	32.16

TABLE A6. KITTRIDGE WASTEWATER TREATMENT FACILITY EFFLUENT QUALITY

	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
EFFLUENT DISCHARGE GPD	39374	9511	17200	59500
TOTAL SUSPENDED SOLIDS MG/L	10.89	7.17	2.00	33.00
5-DAY BIOLOGICAL OXYGEN DEMAND MG/L	8.50	4.64	2.00	19.00
PERCENT BOD REMOVAL	95.9	2.5	88.0	99.0
FECAL COLIFORM	461	1371	0	7150
AMMONIA MG/L	3.09	2.77	0.00	12.10
NITRATE MG/L	13.02	10.51	0.01	34.70
ORTHO PHOSPHORUS MG/L	8.00	3.43	1.00	20.00
TSS LOAD #/DAY	3.74	3.04	0.69	13.82
BOD LOAD #/DAY	2.94	1.98	0.58	8.29
AMMONIA LOAD #/DAY	1.00	0.87	0.00	3.52
NITRATE LOAD #/DAY	4.53	3.94	0.00	13.62
PHOSPHORUS LOAD #/DAY	2.62	1.01	0.48	6.00

TABLE A7. GENESSE WASTEWATER TREATMENT FACILITY EFFLUENT QUALITY

	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
EFFLUENT DISCHARGE GPD	180257	30227	126000	280800
TOTAL SUSPENDED SOLIDS MG/L	3.87	2.40	1.00	9.00
5-DAY BIOLOGICAL OXYGEN DEMAND MG/L	7.35	4.20	2.00	18.00
PERCENT BOD REMOVAL	96.7	2.2	91.0	99.0
FECAL COLIFORM	8	23	1	98
AMMONIA MG/L	8.88	8.85	0.20	25.30
ORTHO PHOSPHORUS MG/L	2.50	0.71	2.00	3.00
TSS LOAD #/DAY	5.67	3.61	1.40	15.09
BOD LOAD #/DAY	10.80	5.84	2.55	24.74
AMMONIA LOAD #/DAY	12.44	12.46	0.28	34.77
PHOSPHORUS LOAD #/DAY	4.01	1.36	3.05	4.97

APPENDIX B

SEASONAL STREAM WATER QUALITY DATA

Water quality characterizations were made for the upper and lower portions of Turkey and Bear Creeks within the study area. There were statistically similar trends in water quality for the upstream stations and inflows into Bear Creek Reservoir. Although Bear Creek has greater flow and contributes more constituent loading than Turkey Creek, the streams have similar constituent concentrations on a seasonal basis. This appendix provides a summary of physical, chemical and biological characteristics of Turkey and Bear Creeks for upstream and reservoir inflow by season. The Bear Creek Clean Lake Study provides the rational for selection of seasons.

TABLE B1. SEASONAL WATER QUALITY DATA FOR BEAR AND TURKEY CREEKS

AREA=UPSTREAM HEADWATERS SEASON=SPRING APRIL MAY MID-JUNE

	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
AMMONIA NITROGEN MG/L	0.007	0.003	0.004	0.011
NITRATE NITROGEN MG/L	0.158	0.086	0.051	0.294
TOTAL SOLUBLE INORGANIC NITROGEN MG/L	0.165	0.088	0.055	0.304
TOTAL DISSOLVED NITROGEN MG/L	0.494	0.096	0.333	0.682
DISSOLVED ORGANIC NITROGEN MG/L	0.329	0.089	0.194	0.465
PARTICULATE NITROGEN MG/L	0.130	0.128	0.050	0.398
TOTAL NITROGEN MG/L	0.621	0.218	0.389	1.080
REACTIVE ORTHO PHOSPHORUS MG/L	0.017	0.009	0.004	0.034
TOTAL DISSOLVED PHOSPHORUS MG/L	0.033	0.014	0.013	0.057
PARTICULATE PHOSPHORUS MG/L	0.027	0.016	0.008	0.057
TOTAL PHOSPHORUS MG/L	0.060	0.029	0.021	0.114
NITROGEN TO PHOSPHORUS RATIO	10.8	4.7	3.8	17.7
RATIO OF TOTAL N TO TOTAL P	12.8	7.3	5.7	27.8
DISSOLVED OXYGEN MG/L	8.0	0.5	7.4	8.8
PH STANDARD UNITS	7.26	0.19	7.00	7.60
SPECIFIC CONDUCTANCE MICROSEIMENS	134.0	43.5	71.0	194.0
ALKAINITY MG/L	36.59	7.77	25.860	47.30
PARTICULATE MATTER MG/L	25.70	21.22	7.97	72.48
TEMPERATURE DEG C	10.5	3.3	7.0	16.0
FECAL COLIFORM CTS/100 ML	268	657	0	1889
TOTAL COLIFORM CTS/100 ML	784	780	0	2000

TABLE B2. SEASONAL WATER QUALITY DATA FOR BEAR AND TURKEY CREEKS

AREA=UPSTREAM HEADWATERS SEASON=SUMMER MID-JUNE JULY AUGUST SEPTEMBER

	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
AMMONIA NITROGEN MG/L	0.019	0.025	0.003	0.090
NITRATE NITROGEN MG/L	0.032	0.020	0.005	0.061
TOTAL SOLUBLE INORGANIC NITROGEN MG/L	0.053	0.035	0.008	0.135
TOTAL DISSOLVED NITROGEN MG/L	0.672	0.369	0.227	1.211
DISSOLVED ORGANIC NITROGEN MG/L	0.380	0.398	0.000	1.151
PARTICULATE NITROGEN MG/L	0.063	0.043	0.006	0.166
TOTAL NITROGEN MG/L	0.725	0.371	0.268	1.249
REACTIVE ORTHO PHOSPHORUS MG/L	0.009	0.012	0.001	0.041
TOTAL DISSOLVED PHOSPHORUS MG/L	0.021	0.012	0.009	0.052
PARTICULATE PHOSPHORUS MG/L	0.017	0.013	0.007	0.054
TOTAL PHOSPHORUS MG/L	0.037	0.020	0.018	0.083
NITROGEN TO PHOSPHORUS RATIO	19.4	21.2	0.5	72.0
RATIO OF TOTAL N TO TOTAL P	26.7	19.4	7.6	69.4
DISSOLVED OXYGEN MG/L	7.8	0.5	6.8	8.9
PH STANDARD UNITS	7.8	0.5	7.1	8.6
SPECIFIC CONDUCTANCE MICROSEIMENS	175.9	111.1	55.0	310.0
ALKAINITY MG/L	54.00	30.67	21.75	94.56
PARTICULATE MATTER MG/L	13.87	17.60	3.58	59.51
TEMPERATURE DEG C	13.2	3.8	6.0	19.0
FECAL COLIFORM CTS/100 ML	63	70	0	200
TOTAL COLIFORM CTS/100 ML	403	672	10	2300

TABLE B3. SEASONAL WATER QUALITY DATA FOR BEAR AND TURKEY CREEKS

AREA=UPSTREAM HEADWATERS SEASON=FALL OCTOBER NOVEMBER DECEMBER

	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
AMMONIA NITROGEN MG/L	0.009	0.013	0.001	0.036
NITRATE NITROGEN MG/L	0.064	0.062	0.006	0.134
TOTAL SOLUBLE INORGANIC NITROGEN MG/L	0.073	0.059	0.010	0.135
TOTAL DISSOLVED NITROGEN MG/L	1.511	0.403	1.000	1.956
DISSOLVED ORGANIC NITROGEN MG/L	0.675	0.808	0.000	1.889
PARTICULATE NITROGEN MG/L	0.029	0.024	0.006	0.067
TOTAL NITROGEN MG/L	1.535	0.414	1.011	2.002
REACTIVE ORTHO PHOSPHORUS MG/L	0.004	0.002	0.002	0.006
TOTAL DISSOLVED PHOSPHORUS MG/L	0.008	0.003	0.005	0.012
PARTICULATE PHOSPHORUS MG/L	0.007	0.004	0.004	0.015
TOTAL PHOSPHORUS MG/L	0.015	0.004	0.010	0.021
NITROGEN TO PHOSPHORUS RATIO	23.6	17.1	2.0	44.3
RATIO OF TOTAL N TO TOTAL P	111.1	27.4	84.2	146.1
DISSOLVED OXYGEN MG/L	9.5	0.9	8.4	10.8
PH STANDARD UNITS	7.82	0.46	7.30	8.40
SPECIFIC CONDUCTANCE MICROSEIMENS	207.2	135.2	81.0	367.0
ALKAINITY MG/L	64.2	35.0	31.7	109.8
PARTICULATE MATTER MG/L	2.26	2.07	0.69	6.11
TEMPERATURE DEG C	5.5	5.1	-1.0	12.0
FECAL COLIFORM CTS/100 ML	1	1	0	2
TOTAL COLIFORM CTS/100 ML	72	85	0	211

TABLE B4. SEASONAL WATER QUALITY DATA FOR BEAR AND TURKEY CREEKS

AREA=UPSTREAM HEADWATERS SEASON=WINTER JANUARY FEBRUARY MARCH

	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
AMMONIA NITROGEN MG/L	0.038	0.050	0.007	0.113
NITRATE NITROGEN MG/L	0.297	0.047	0.231	0.332
TOTAL SOLUBLE INORGANIC NITROGEN MG/L	0.335	0.085	0.238	0.445
TOTAL DISSOLVED NITROGEN MG/L	1.903	0.514	1.469	2.509
DISSOLVED ORGANIC NITROGEN MG/L	1.045	0.911	0.000	2.271
PARTICULATE NITROGEN MG/L	0.049	0.039	0.011	0.099
TOTAL NITROGEN MG/L	1.952	0.512	1.497	2.520
REACTIVE ORTHO PHOSPHORUS MG/L	0.022	0.030	0.002	0.066
TOTAL DISSOLVED PHOSPHORUS MG/L	0.030	0.038	0.004	0.085
PARTICULATE PHOSPHORUS MG/L	0.023	0.021	0.004	0.044
TOTAL PHOSPHORUS MG/L	0.052	0.055	0.008	0.123
NITROGEN TO PHOSPHORUS RATIO	53.1	51.3	6.7	119.0
RATIO OF TOTAL N TO TOTAL P	123.0	139.1	18.3	315.0
DISSOLVED OXYGEN MG/L	10.3	0.3	10.0	10.6
PH STANDARD UNITS	7.2	0.1	7.0	7.3
SPECIFIC CONDUCTANCE MICROSEIMENS	140.5	76.2	88.0	253.0
ALKAINITY MG/L	42.71	15.64	26.84	61.00
PARTICULATE MATTER MG/L	8.78	10.00	1.12	22.20
TEMPERATURE DEG C	0.0	0.8	-1.0	1.0
FECAL COLIFORM CTS/100 ML	5.333	4.509	1.000	10
TOTAL COLIFORM CTS/100 ML	7	0	7	7

TABLE B5. SEASONAL WATER QUALITY DATA FOR BEAR AND TURKEY CREEKS

AREA=RESERVOIR INFLOW SEASON=SPRING APRIL MAY MID-JUNE

	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
AMMONIA NITROGEN MG/L	0.015	0.006	0.006	0.026
NITRATE NITROGEN MG/L	0.296	0.092	0.196	0.478
TOTAL SOLUBLE INORGANIC NITROGEN MG/L	0.311	0.095	0.210	0.504
TOTAL DISSOLVED NITROGEN MG/L	0.650	0.154	0.380	0.910
DISSOLVED ORGANIC NITROGEN MG/L	0.339	0.157	0.170	0.669
PARTICULATE NITROGEN MG/L	0.114	0.066	0.063	0.240
TOTAL NITROGEN MG/L	0.763	0.181	0.447	0.981
REACTIVE ORTHO PHOSPHORUS MG/L	0.063	0.023	0.046	0.115
TOTAL DISSOLVED PHOSPHORUS MG/L	0.079	0.024	0.062	0.133
PARTICULATE PHOSPHORUS MG/L	0.033	0.016	0.011	0.056
TOTAL PHOSPHORUS MG/L	0.112	0.029	0.085	0.177
NITROGEN TO PHOSPHORUS RATIO	5.2	1.5	3.4	7.3
RATIO OF TOTAL N TO TOTAL P	7.0	1.8	4.6	9.6
DISSOLVED OXYGEN MG/L	9.5	1.9	8.0	13.2
PH STANDARD UNITS	7.6	0.2	7.4	8.0
SPECIFIC CONDUCTANCE MICROSEIMENS	209.5	55.5	126.0	296.0
ALKAINITY MG/L	49.29	9.08	37.92	66.47
PARTICULATE MATTER MG/L	30.93	17.95	11.56	66.40
TEMPERATURE DEG C	9.1	3.4	5.0	14.0
FECAL COLIFORM CTS/100 ML	134	306	0	889
TOTAL COLIFORM CTS/100 ML	996	1022	111	3400

TABLE 86. SEASONAL WATER QUALITY DATA FOR BEAR AND TURKEY CREEKS

AREA=RESERVOIR INFLOW SEASON=SUMMER MID-JUNE JULY AUGUST SEPTEMBER

	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
AMMONIA NITROGEN MG/L	0.019	0.022	0.005	0.066
NITRATE NITROGEN MG/L	0.396	0.166	0.210	0.705
TOTAL SOLUBLE INORGANIC NITROGEN MG/L	0.417	0.185	0.216	0.771
TOTAL DISSOLVED NITROGEN MG/L	0.742	0.352	0.142	1.465
DISSOLVED ORGANIC NITROGEN MG/L	0.312	0.360	0.000	1.139
PARTICULATE NITROGEN MG/L	0.121	0.189	0.022	0.679
TOTAL NITROGEN MG/L	0.862	0.404	0.164	1.524
REACTIVE ORTHO PHOSPHORUS MG/L	0.086	0.046	0.010	0.161
TOTAL DISSOLVED PHOSPHORUS MG/L	0.126	0.068	0.022	0.301
PARTICULATE PHOSPHORUS MG/L	0.021	0.007	0.011	0.035
TOTAL PHOSPHORUS MG/L	0.147	0.068	0.057	0.324
NITROGEN TO PHOSPHORUS RATIO	7.5	7.3	2.9	25.7
RATIO OF TOTAL N TO TOTAL P	7.6	5.9	1.1	19.5
DISSOLVED OXYGEN MG/L	8.7	1.0	7.2	10.9
STANDARD UNITS	8.4	0.4	7.5	9.1
SPECIFIC CONDUCTANCE MICROSEIMENS	436.9	285.2	154.0	1054.0
ALKAINITY MG/L	74.31	32.83	42.83	145.90
PARTICULATE MATTER MG/L	9.00	3.70	3.64	13.93
TEMPERATURE DEG C	15.4	5.0	8.0	22.0
FECAL COLIFORM CTS/100 ML	104	110	0	330
TOTAL COLIFORM CTS/100 ML	686	938	30	3100

TABLE B7. SEASONAL WATER QUALITY DATA FOR BEAR AND TURKEY CREEKS

AREA=RESERVOIR INFLOW SEASON=FALL OCTOBER NOVEMBER DECEMBER

	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
AMMONIA NITROGEN MG/L	0.017	0.011	0.009	0.037
NITRATE NITROGEN MG/L	0.902	0.584	0.241	1.752
TOTAL SOLUBLE INORGANIC NITROGEN MG/L	0.919	0.593	0.252	1.789
TOTAL DISSOLVED NITROGEN MG/L	2.331	0.309	1.887	2.600
DISSOLVED ORGANIC NITROGEN MG/L	0.816	0.747	0.000	1.949
PARTICULATE NITROGEN MG/L	0.045	0.013	0.027	0.058
TOTAL NITROGEN MG/L	2.369	0.312	1.922	2.641
REACTIVE ORTHO PHOSPHORUS MG/L	0.304	0.028	0.253	0.334
TOTAL DISSOLVED PHOSPHORUS MG/L	0.322	0.022	0.280	0.342
PARTICULATE PHOSPHORUS MG/L	0.023	0.006	0.016	0.030
TOTAL PHOSPHORUS MG/L	0.343	0.027	0.296	0.372
NITROGEN TO PHOSPHORUS RATIO	3.0	2.0	0.8	5.9
RATIO OF TOTAL N TO TOTAL P	6.7	0.7	5.8	7.5
DISSOLVED OXYGEN MG/L	12.1	1.3	10.8	13.4
PH STANDARD UNITS	8.5	0.7	7.7	9.4
SPECIFIC CONDUCTANCE MICROSEIMENS	747.5	444.9	209.0	1303.0
ALKAINITY MG/L	120.29	55.38	57.14	184.20
PARTICULATE MATTER MG/L	3.38	1.10	2.02	4.75
TEMPERATURE DEG C	11.3	8.6	2.0	22.0
FECAL COLIFORM CTS/100 ML	2	2	0	4
TOTAL COLIFORM CTS/100 ML	109	114	1	240

TABLE B8. SEASONAL WATER QUALITY DATA FOR BEAR AND TURKEY CREEKS

AREA=RESERVOIR INFLOW SEASON=WINTER JANUARY FEBRUARY MARCH

	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
AMMONIA NITROGEN MG/L	0.102	0.069	0.021	0.196
NITRATE NITROGEN MG/L	1.540	0.480	1.118	2.412
TOTAL SOLUBLE INORGANIC NITROGEN MG/L	1.642	0.469	1.178	2.433
TOTAL DISSOLVED NITROGEN MG/L	2.489	0.742	1.465	3.385
DISSOLVED ORGANIC NITROGEN MG/L	0.984	0.790	0.000	1.800
PARTICULATE NITROGEN MG/L	0.064	0.031	0.024	0.113
TOTAL NITROGEN MG/L	2.553	0.761	1.489	3.454
REACTIVE ORTHO PHOSPHORUS MG/L	0.403	0.116	0.269	0.565
TOTAL DISSOLVED PHOSPHORUS MG/L	0.415	0.122	0.270	0.574
PARTICULATE PHOSPHORUS MG/L	0.046	0.019	0.020	0.068
TOTAL PHOSPHORUS MG/L	0.461	0.109	0.330	0.608
NITROGEN TO PHOSPHORUS RATIO	4.2	0.9	3.3	5.7
RATIO OF TOTAL N TO TOTAL P	5.8	2.1	2.8	8.3
DISSOLVED OXYGEN MG/L	10.6	0.4	10.1	11.0
PH STANDARD UNITS	7.8	0.1	7.6	7.9
SPECIFIC CONDUCTANCE MICROSEIMENS	606.2	392.2	237.0	1022.0
ALKAINITY MG/L	113.29	48.21	70.76	179.90
PARTICULATE MATTER MG/L	31.99	42.61	2.67	114.40
TEMPERATURE DEG C	1.5	1.9	0.0	5.0
FECAL COLIFORM CTS/100 ML	22	24	0	60
TOTAL COLIFORM CTS/100 ML	38	54	3	100

APPENDIX C

RESERVOIR DEPTH RELATED SEASONAL WATER QUALITY DATA

The water quality characterization in Bear Creek Reservoir was statistically evaluated by station and depth over time. There was no significant station trend which suggested that the reservoir was a well mixed system. However, there were significant depth related and seasonal trends. The depth trends were generally definable in the reservoir for two depth zones. The upper zone was in the epilimion and it was defined as the zone of light penetration with the 2 percent light transmission measurement used to establish the lower limit. The lower zone was in the hypolimion and it was defined as the aphotic zone. This zonation was consistent throughout the monitoring period. The physical, chemical and biological trends were generally definable within these two primary zones. This appendix summarizes the reservoir water quality by zone and season. The Bear Creek Clean Lake Study provides the rational for selection of seasons.

TABLE C1. PHOTIC ZONE SEASONAL WATER QUALITY DATA FOR BEAR CREEK RESERVOIR

SEASON=SPRING APRIL MAY MID-JUNE WC=PHOTIC ZONE TO 3.5M

	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
AMMONIA NITROGEN MG/L	0.034	0.026	0.005	0.086
NITRATE NITROGEN MG/L	0.335	0.071	0.210	0.450
TOTAL SOLUBLE INORGANIC NITROGEN MG/L	0.369	0.075	0.217	0.471
TOTAL DISSOLVED NITROGEN MG/L	0.691	0.087	0.460	0.820
DISSOLVED ORGANIC NITROGEN MG/L	0.310	0.115	0.000	0.575
PARTICULATE NITROGEN MG/L	0.075	0.027	0.034	0.153
TOTAL NITROGEN MG/L	0.771	0.100	0.515	0.944
REACTIVE ORTHO PHOSPHORUS MG/L	0.053	0.007	0.041	0.065
TOTAL DISSOLVED PHOSPHORUS MG/L	0.070	0.008	0.056	0.086
PARTICULATE PHOSPHORUS MG/L	0.026	0.014	0.006	0.048
TOTAL PHOSPHORUS MG/L	0.096	0.018	0.062	0.128
NITROGEN TO PHOSPHORUS RATIO	6.0	0.9	5.2	8.4
RATIO OF TOTAL N TO TOTAL P	8.0	1.8	5.6	13.4
CHLOROPHYLL A UG/L	10.3	13.3	1.5	36.7
DISSOLVED OXYGEN MG/L	8.2	1.1	6.9	10.9
STANDARD PH UNIT	7.57	0.32	7.20	8.30
SPECIFIC CONDUCTANCE MICROSEIMENS	225.2	55.5	160.0	323.0
ALKAINITY MG/L	54.01	10.19	42.91	75.71
PARTICULATE MATTER MG/L	13.32	8.18	0.09	42.42
TEMPERATURE DEGREE C	10.9	3.6	5.8	17.8
FECAL COLIFORM CTS/100 ML	14	26	0	103
TOTAL COLIFORM CTS/100 ML	392	685	3	2500

TABLE C2. APHOTIC ZONE SEASONAL WATER QUALITY ATA FOR BEAR CREEK RESERVOIR

SEASON=SPRING APRIL MAY MID-JUNE WC=APHOTIC ZONE

	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
AMMONIA NITROGEN MG/L	0.093	0.085	0.015	0.325
NITRATE NITROGEN MG/L	0.341	0.053	0.265	0.436
TOTAL SOLUBLE INORGANIC NITROGEN MG/L	0.434	0.057	0.359	0.590
TOTAL DISSOLVED NITROGEN MG/L	0.778	0.240	0.438	1.295
DISSOLVED ORGANIC NITROGEN MG/L	0.303	0.217	0.000	0.801
PARTICULATE NITROGEN MG/L	0.068	0.019	0.041	0.103
TOTAL NITROGEN MG/L	0.900	0.265	0.479	1.346
REACTIVE ORTHO PHOSPHORUS MG/L	0.059	0.007	0.051	0.080
TOTAL DISSOLVED PHOSPHORUS MG/L	0.075	0.007	0.067	0.095
PARTICULATE PHOSPHORUS MG/L	0.027	0.013	0.008	0.048
TOTAL PHOSPHORUS MG/L	0.102	0.013	0.076	0.120
NITROGEN TO PHOSPHORUS RATIO	7.4	0.6	6.5	8.9
RATIO OF TOTAL N TO TOTAL P	9.0	2.7	6.1	14.7
CHLOROPHYLL A UG/L	6.8	11.3	0.8	35.4
DISSOLVED OXYGEN MG/L	7.2	1.9	2.5	10.1
STANDARD PH UNIT	7.4	0.3	7.0	8.1
SPECIFIC CONDUCTANCE MICROSEIMENS	223.3	49.3	163.0	315.0
ALKAINITY MG/L	55.28	8.22	43.92	70.82
PARTICULATE MATTER MG/L	15.33	7.54	7.48	32.08
TEMPERATURE DEGREE C	9.0	1.9	5.6	13.5

TABLE C3. PHOTIC ZONE SEASONAL WATER QUALITY DATA FOR BEAR CREEK RESERVOIR

SEASON=SUMMER MID-JUNE JULY AUGUST SEPTEMBER WC=PHOTIC ZONE TO 3.5M

	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
AMMONIA NITROGEN MG/L	0.064	0.052	0.007	0.305
NITRATE NITROGEN MG/L	0.113	0.082	0.000	0.234
TOTAL SOLUBLE INORGANIC NITROGEN MG/L	0.164	0.093	0.007	0.347
TOTAL DISSOLVED NITROGEN MG/L	0.715	0.292	0.150	1.564
DISSOLVED ORGANIC NITROGEN MG/L	0.454	0.357	0.000	1.485
PARTICULATE NITROGEN MG/L	0.206	0.275	0.029	1.273
TOTAL NITROGEN MG/L	0.919	0.401	0.348	2.737
REACTIVE ORTHO PHOSPHORUS MG/L	0.055	0.035	0.004	0.115
TOTAL DISSOLVED PHOSPHORUS MG/L	0.087	0.031	0.055	0.178
PARTICULATE PHOSPHORUS MG/L	0.024	0.013	0.007	0.067
TOTAL PHOSPHORUS MG/L	0.111	0.039	0.064	0.206
NITROGEN TO PHOSPHORUS RATIO	4.4	3.6	0.6	19.8
RATIO OF TOTAL N TO TOTAL P	8.9	3.7	3.3	18.6
CHLOROPHYLL A UG/L	19.2	24.2	1.6	98.9
DISSOLVED OXYGEN MG/L	6.8	1.3	1.9	10.3
STANDARD PH UNIT	8.4	0.5	7.4	9.4
SPECIFIC CONDUCTANCE MICROSEIMENS	237.1	36.0	187.0	373.0
ALKAINITY MG/L	60.95	8.21	43.80	76.01
PARTICULATE MATTER MG/L	6.50	5.06	1.60	23.48
TEMPERATURE DEGREE C	19.9	1.9	14.7	22.1
FECAL COLIFORM CTS/100 ML	3	5	0	20
TOTAL COLIFORM CTS/100 ML	55	113	0	380

TABLE C4. APHOTIC ZONE SEASONAL WATER QUALITY ATA FOR BEAR CREEK RESERVOIR

SEASON=SUMMER MID-JUNE JULY AUGUST SEPTEMBER APHOTIC ZONE

	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
AMMONIA NITROGEN MG/L	0.527	0.369	0.066	1.594
NITRATE NITROGEN MG/L	0.071	0.064	0.000	0.182
TOTAL SOLUBLE INORGANIC NITROGEN MG/L	0.533	0.257	0.120	1.036
TOTAL DISSOLVED NITROGEN MG/L	0.806	0.168	0.469	1.114
DISSOLVED ORGANIC NITROGEN MG/L	0.255	0.249	0.000	0.827
PARTICULATE NITROGEN MG/L	0.087	0.093	0.027	0.461
TOTAL NITROGEN MG/L	0.893	0.188	0.502	1.256
REACTIVE ORTHO PHOSPHORUS MG/L	0.156	0.094	0.014	0.336
TOTAL DISSOLVED PHOSPHORUS MG/L	0.284	0.180	0.097	0.853
PARTICULATE PHOSPHORUS MG/L	0.044	0.030	0.007	0.119
TOTAL PHOSPHORUS MG/L	0.329	0.206	0.111	0.949
NITROGEN TO PHOSPHORUS RATIO	6.1	7.0	1.0	23.4
RATIO OF TOTAL N TO TOTAL P	3.5	1.7	1.0	6.9
CHLOROPHYLL A UG/L	2.3	3.1	0.2	13.8
DISSOLVED OXYGEN MG/L	1.4	1.8	0.0	5.5
STANDARD PH UNIT	7.5	0.4	7.0	8.6
SPECIFIC CONDUCTANCE MICROSEIMENS	224.2	24.8	185.0	262.0
ALKALNITY MG/L	65.92	10.74	48.86	97.36
PARTICULATE MATTER MG/L	7.05	3.69	2.55	18.36
TEMPERATURE DEGREE C	15.3	2.7	10.7	19.6

TABLE C5. PHOTIC ZONE SEASONAL WATER QUALITY DATA FOR BEAR CREEK RESERVOIR

SEASON=FALL OCTOBER NOVEMBER DECEMBER PHOTIC ZONE TO 3.5M

	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
AMMONIA NITROGEN MG/L	0.156	0.111	0.010	0.308
NITRATE NITROGEN MG/L	0.230	0.104	0.097	0.369
TOTAL SOLUBLE INORGANIC NITROGEN MG/L	0.385	0.206	0.107	0.677
TOTAL DISSOLVED NITROGEN MG/L	1.788	0.377	1.359	2.438
DISSOLVED ORGANIC NITROGEN MG/L	0.801	0.697	0.000	2.016
PARTICULATE NITROGEN MG/L	0.091	0.089	0.024	0.421
TOTAL NITROGEN MG/L	1.841	0.374	1.416	2.490
REACTIVE ORTHO PHOSPHORUS MG/L	0.077	0.002	0.074	0.081
TOTAL DISSOLVED PHOSPHORUS MG/L	0.090	0.004	0.085	0.098
PARTICULATE PHOSPHORUS MG/L	0.021	0.004	0.016	0.036
TOTAL PHOSPHORUS MG/L	0.111	0.005	0.105	0.127
NITROGEN TO PHOSPHORUS RATIO	5.0	2.8	1.5	9.027
RATIO OF TOTAL N TO TOTAL P	16.8	3.6	13.0	23.5
CHLOROPHYLL A UG/L	9.5	5.5	1.5	23.3
DISSOLVED OXYGEN MG/L	8.3	1.1	6.7	10.0
STANDARD PH UNIT	8.1	0.3	7.7	8.6
SPECIFIC CONDUCTANCE MICROSEIMENS	304.2	28.9	268.0	345.0
ALKAINITY MG/L	77.05	3.68	70.30	82.96
PARTICULATE MATTER MG/L	4.61	1.18	3.31	8.53
TEMPERATURE DEGREE C	8.5	4.3	3.1	14.3
FECAL COLIFORM CTS/100 ML	1	1	0	1
TOTAL COLIFORM CTS/100 ML	2	4	0	11

TABLE C6. APHOTIC ZONE SEASONAL WATER QUALITY ATA FOR BEAR CREEK RESERVOIR

SEASON=FALL OCTOBER NOVEMBER DECEMBER APHOTIC ZONE

	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
AMMONIA NITROGEN MG/L	0.155	0.123	0.004	0.351
NITRATE NITROGEN MG/L	0.252	0.084	0.151	0.367
TOTAL SOLUBLE INORGANIC NITROGEN MG/L	0.407	0.191	0.155	0.714
TOTAL DISSOLVED NITROGEN MG/L	1.472	0.210	1.206	1.847
DISSOLVED ORGANIC NITROGEN MG/L	0.638	0.497	0.000	1.414
PARTICULATE NITROGEN MG/L	0.095	0.053	0.031	0.215
TOTAL NITROGEN MG/L	1.559	0.245	1.261	2.062
REACTIVE ORTHO PHOSPHORUS MG/L	0.079	0.005	0.071	0.087
TOTAL DISSOLVED PHOSPHORUS MG/L	0.091	0.005	0.083	0.100
PARTICULATE PHOSPHORUS MG/L	0.024	0.005	0.020	0.037
TOTAL PHOSPHORUS MG/L	0.113	0.006	0.104	0.126
NITROGEN TO PHOSPHORUS RATIO	5.3	2.8	1.9	10.1
RATIO OF TOTAL N TO TOTAL P	14.1	2.1	11.4	18.1
CHLOROPHYLL A UG/L	7.2	1.3	5.2	8.9
DISSOLVED OXYGEN MG/L	7.7	1.3	6.3	10.0
STANDARD PH UNIT	8.0	0.3	7.6	8.4
SPECIFIC CONDUCTANCE MICROSEIMENS	306.0	33.1	263.0	348.0
ALKAINITY MG/L	77.39	3.67	72.18	83.00
PARTICULATE MATTER MG/L	6.26	2.64	3.78	12.36
TEMPERATURE DEGREE C	8.1	3.8	3.2	12.4

TABLE C7. PHOTIC ZONE SEASONAL WATER QUALITY DATA FOR BEAR CREEK RESERVOIR

SEASON=WINTER JANUARY FEBRUARY MARCH PHOTIC ZONE TO 3.5M

	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
AMMONIA NITROGEN MG/L	0.157	0.167	0.011	0.552
NITRATE NITROGEN MG/L	1.154	0.332	0.715	1.742
TOTAL SOLUBLE INORGANIC NITROGEN MG/L	1.311	0.238	0.987	1.791
TOTAL DISSOLVED NITROGEN MG/L	1.611	0.172	1.368	1.861
DISSOLVED ORGANIC NITROGEN MG/L	0.100	0.174	0.000	0.625
PARTICULATE NITROGEN MG/L	0.108	0.051	0.063	0.229
TOTAL NITROGEN MG/L	1.719	0.188	1.431	1.954
REACTIVE ORTHO PHOSPHORUS MG/L	0.198	0.057	0.116	0.303
TOTAL DISSOLVED PHOSPHORUS MG/L	0.232	0.064	0.138	0.332
PARTICULATE PHOSPHORUS MG/L	0.023	0.003	0.018	0.027
TOTAL PHOSPHORUS MG/L	0.256	0.064	0.162	0.352
NITROGEN TO PHOSPHORUS RATIO	6.9	1.6	5.8	10.9
RATIO OF TOTAL N TO TOTAL P	7.1	1.9	5.2	10.9
CHLOROPHYLL A UG/L	16.7	12.1	0.9	30.8
DISSOLVED OXYGEN MG/L	12.8	3.8	6.4	18.0
STANDARD PH UNIT	8.1	0.5	7.3	8.9
SPECIFIC CONDUCTANCE MICROSEIMENS	383.8	66.5	317.0	511.0
ALKAINITY MG/L	91.08	7.70	80.52	102.40
PARTICULATE MATTER MG/L	2.56	0.42	1.84	2.95
TEMPERATURE DEGREE C	2.1	1.2	0.1	3.5
FECAL COLIFORM CTS/100 ML	1	2	0	3
TOTAL COLIFORM CTS/100 ML	2	2	0	5

TABLE C8. APHOTIC ZONE SEASONAL WATER QUALITY ATA FOR BEAR CREEK RESERVOIR

SEASON=WINTER JANUARY FEBRUARY MARCH APHOTIC ZONE

	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
AMMONIA NITROGEN MG/L	0.606	0.447	0.240	1.254
NITRATE NITROGEN MG/L	0.634	0.155	0.420	0.757
TOTAL SOLUBLE INORGANIC NITROGEN MG/L	1.240	0.311	0.997	1.674
TOTAL DISSOLVED NITROGEN MG/L	1.959	0.184	1.824	2.215
DISSOLVED ORGANIC NITROGEN MG/L	0.240	0.368	0.000	0.939
PARTICULATE NITROGEN MG/L	0.122	0.090	0.048	0.254
TOTAL NITROGEN MG/L	2.081	0.143	1.913	2.263
REACTIVE ORTHO PHOSPHORUS MG/L	0.091	0.050	0.025	0.138
TOTAL DISSOLVED PHOSPHORUS MG/L	0.111	0.054	0.036	0.157
PARTICULATE PHOSPHORUS MG/L	0.024	0.005	0.019	0.030
TOTAL PHOSPHORUS MG/L	0.135	0.049	0.066	0.179
NITROGEN TO PHOSPHORUS RATIO	24.3	28.5	7.2	67.0
RATIO OF TOTAL N TO TOTAL P	18.3	10.8	11.6	34.3
CHLOROPHYLL A UG/L	0.6	0.1	0.4	0.7
DISSOLVED OXYGEN MG/L	4.1	2.1	1.2	6.0
STANDARD PH UNIT	7.2	0.1	7.1	7.3
SPECIFIC CONDUCTANCE MICROSEIMENS	496.0	33.7	454.0	530.0
ALKAINITY MG/L	110.9	4.21	107.30	114.60
PARTICULATE MATTER MG/L	2.09	0.41	1.57	2.50
TEMPERATURE DEGREE C	3.70	0.4	3.3	4.3

APPENDIX D

RESERVOIR OUTFLOW SEASONAL WATER QUALITY DATA

The water quality trends below Bear Creek Reservoir were characterized at the outflow. This water quality data was collected as a means of mass balancing constituent loadings to the reservoir. This appendix provides a summary of physical, chemical and biological characteristics of lower Bear Creek as reservoir outflow by season. The Bear Creek Clean Lake Study provides the rational for selection of seasons.

TABLE D1. SEASONAL WATER QUALITY DATA FOR BEAR CREEK RESERVOIR

AREA=RESERVOIR OUTFLOW SEASON=SPRING APRIL MAY MID-JUNE

	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
AMMONIA NITROGEN MG/L	0.030	0.032	0.007	0.066
NITRATE NITROGEN MG/L	0.343	0.067	0.257	0.401
TOTAL SOLUBLE INORGANIC NITROGEN MG/L	0.353	0.070	0.273	0.397
TOTAL DISSOLVED NITROGEN MG/L	0.622	0.188	0.341	0.720
DISSOLVED ORGANIC NITROGEN MG/L	0.178	0.169	0.000	0.323
PARTICULATE NITROGEN MG/L	0.096	0.042	0.060	0.142
TOTAL NITROGEN MG/L	0.686	0.248	0.401	0.858
REACTIVE ORTHO PHOSPHORUS MG/L	0.053	0.008	0.045	0.062
TOTAL DISSOLVED PHOSPHORUS MG/L	0.068	0.009	0.057	0.076
PARTICULATE PHOSPHORUS MG/L	0.025	0.014	0.007	0.042
TOTAL PHOSPHORUS MG/L	0.093	0.020	0.064	0.108
NITROGEN TO PHOSPHORUS RATIO	7.0	0.9	6.1	7.9
RATIO OF TOTAL N TO TOTAL P	7.5	1.1	6.3	8.5
DISSOLVED OXYGEN MG/L	8.6	0.5	8.1	9.3
PH STANDARD UNITS	7.6	0.4	7.4	8.2
SPECIFIC CONDUCTANCE MICROSEIMENS	222.7	62.9	162.0	311.0
ALKAINITY MG/L	53.72	10.75	44.72	69.19
PARTICULATE MATTER MG/L	12.53	5.75	7.73	18.90
TEMPERATURE DEG C	10.88	2.25	9.0	14.0
FECAL COLIFORM CTS/100 ML	5	10	0	20
TOTAL COLIFORM CTS/100 ML	227	160	8	360

TABLE D2. SEASONAL WATER QUALITY DATA FOR BEAR CREEK RESERVOIR

AREA=RESERVOIR OUTFLOW SEASON=SUMMER MID-JUNE JULY AUGUST SEPTEMBER

	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
AMMONIA NITROGEN MG/L	0.102	0.086	0.057	0.277
NITRATE NITROGEN MG/L	0.104	0.078	0.009	0.195
TOTAL SOLUBLE INORGANIC NITROGEN MG/L	0.213	0.149	0.066	0.443
TOTAL DISSOLVED NITROGEN MG/L	0.592	0.151	0.383	0.781
DISSOLVED ORGANIC NITROGEN MG/L	0.300	0.209	0.000	0.531
PARTICULATE NITROGEN MG/L	0.218	0.257	0.008	0.714
TOTAL NITROGEN MG/L	0.810	0.315	0.582	1.405
REACTIVE ORTHO PHOSPHORUS MG/L	0.098	0.034	0.072	0.151
TOTAL DISSOLVED PHOSPHORUS MG/L	0.111	0.034	0.085	0.169
PARTICULATE PHOSPHORUS MG/L	0.021	0.005	0.014	0.028
TOTAL PHOSPHORUS MG/L	0.132	0.037	0.099	0.192
NITROGEN TO PHOSPHORUS RATIO	2.2	1.2	0.8	3.7
RATIO OF TOTAL N TO TOTAL P	6.6	3.4	3.2	12.8
DISSOLVED OXYGEN MG/L	6.9	0.7	5.8	7.6
PH STANDARD UNITS	8.4	0.5	7.8	9.2
SPECIFIC CONDUCTANCE MICROSEIMENS	232.3	35.1	185.0	276.0
ALKAINITY MG/L	62.20	7.50	51.88	72.10
PARTICULATE MATTER MG/L	4.97	2.04	3.30	8.88
TEMPERATURE DEG C	16.4	5.3	9.0	22.0
FECAL COLIFORM CTS/100 ML	2	3	0	7
TOTAL COLIFORM CTS/100 ML	22	25	0	50

TABLE D3. SEASONAL WATER QUALITY DATA FOR BEAR CREEK RESERVOIR

AREA=RESERVOIR OUTFLOW SEASON=FALL OCTOBER NOVEMBER DECEMBER

	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
AMMONIA NITROGEN MG/L	0.169	0.122	0.033	0.270
NITRATE NITROGEN MG/L	0.233	0.130	0.114	0.372
TOTAL SOLUBLE INORGANIC NITROGEN MG/L	0.402	0.248	0.147	0.642
TOTAL DISSOLVED NITROGEN MG/L	1.278	0.387	1.005	1.552
DISSOLVED ORGANIC NITROGEN MG/L	0.499	0.461	0.000	0.910
PARTICULATE NITROGEN MG/L	0.060	0.038	0.023	0.098
TOTAL NITROGEN MG/L	1.319	0.412	1.028	1.610
REACTIVE ORTHO PHOSPHORUS MG/L	0.076	0.003	0.074	0.079
TOTAL DISSOLVED PHOSPHORUS MG/L	0.091	0.005	0.087	0.096
PARTICULATE PHOSPHORUS MG/L	0.022	0.002	0.020	0.024
TOTAL PHOSPHORUS MG/L	0.113	0.006	0.107	0.118
NITROGEN TO PHOSPHORUS RATIO	5.2	3.2	2.0	8.4
RATIO OF TOTAL N TO TOTAL P	11.9	4.5	8.7	15.0
DISSOLVED OXYGEN MG/L	9.0	1.4	7.7	10.4
PH STANDARD UNITS	8.1	0.2	7.9	8.4
SPECIFIC CONDUCTANCE MICROSEIMENS	304.0	39.6	269.0	347.0
ALKAINITY MG/L	77.86	4.43	75.02	82.96
PARTICULATE MATTER MG/L	5.69	2.67	3.69	8.72
TEMPERATURE DEG C	9.3	6.0	3.0	15.0
FECAL COLIFORM CTS/100 ML	1	2	0	3
TOTAL COLIFORM CTS/100 ML	8	14	0	25

TABLE D4. SEASONAL WATER QUALITY DATA FOR BEAR CREEK RESERVOIR

AREA=RESERVOIR OUTFLOW SEASON=WINTER JANUARY FEBRUARY MARCH

	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
AMMONIA NITROGEN MG/L	0.027	0.017	0.008	0.040
NITRATE NITROGEN MG/L	1.037	0.439	0.571	1.444
TOTAL SOLUBLE INORGANIC NITROGEN MG/L	1.064	0.456	0.579	1.484
TOTAL DISSOLVED NITROGEN MG/L	2.148	0.684	1.685	2.934
DISSOLVED ORGANIC NITROGEN MG/L	1.084	1.128	0.201	2.355
PARTICULATE NITROGEN MG/L	0.187	0.134	0.078	0.336
TOTAL NITROGEN MG/L	2.335	0.817	1.763	3.270
REACTIVE ORTHO PHOSPHORUS MG/L	0.195	0.075	0.110	0.250
TOTAL DISSOLVED PHOSPHORUS MG/L	0.223	0.097	0.119	0.310
PARTICULATE PHOSPHORUS MG/L	0.040	0.020	0.022	0.061
TOTAL PHOSPHORUS MG/L	0.262	0.077	0.180	0.332
NITROGEN TO PHOSPHORUS RATIO	5.4	0.5	5.0	5.9
RATIO OF TOTAL N TO TOTAL P	10.2	6.9	5.3	18.2
DISSOLVED OXYGEN MG/L	11.4	0.2	11.2	11.6
PH STANDARD UNITS	8.5	0.3	8.2	8.8
SPECIFIC CONDUCTANCE MICROSEIMENS	338.0	12.2	330.0	352.0
ALKAINITY MG/L	83.76	3.70	80.52	87.80
PARTICULATE MATTER MG/L	7.10	3.42	3.21	9.60
TEMPERATURE DEG C	3.5	0.7	3.0	4.0
FECAL COLIFORM CTS/100 ML	3	0	3	3
TOTAL COLIFORM CTS/100 ML	9	8	3	15

APPENDIX E

CHECKLIST OF PLANTS AND ANIMALS

The common vegetation and wildlife associated with Bear Creek Reservoir, the surrounding Park and adjacent watershed were tabulated from observations and existing checklists. The checklist of commonly occurring wildlife includes both the common name and scientific name. Bear Creek Park was shown to be an important wildlife retreat in the metropolitan region.

TABLE E1. CHECKLIST OF COMMON VEGETATION ASSOCIATED WITH BEAR CREEK PARK

TREES AND SHRUBS

Common Name	Scientific Name
Boxelder	Acer negundo
Rabbitbrush	Chrysothamnus nauseosus
Russian olive	Elaeagnus angustifolia
Plains cottonwood	Populus sargentii
Golden currant	Ribes aureum
Peachleaf willow	Salix amygdaloides
Sandbar willow	Salix exigua
Snowberry	Symphoricarpos alba

HERBS

Rough pigweed	Amaranthus retroflexus
Roman wormwood	Ambrosia artemisiifolia
Giant ragweed	Ambrosia trifida
Indian hemp	Apocynum cannabinum
Burdock	Arctium minus
Showy milkweed	Asclepias speciosa
Aster	Aster laevis
Porter's aster	Aster porteri
Smallseed falseflax	Camelina microcarpa
Bristle thistle	Carduus nutans
Chickory	Cichorium intybus
Canada thistle	Cirsium arvense
Bull thistle	Cirsium lanceolatum
Western virgin's bower	Clematis ligusticifolia
Poison hemlock	Conium maculatum
Field bindweed	Convolvulus arvensis
Queen Anne's lace	Daucus carota
Butterfly weed	Gaura parviflora
Gumweed	Grindelia squarrosa
Common sunflower	Helianthus annuus
Burning bush	Kochia scoparia
Wild lettuce	Lactuca scariola
Greenflowered pepperweed	Lepidium densiflorum
Pepper-grass	Lepidium virginicum
Common mallow	Malva neglecta
White sweet-clover	Melilotus alba
Yellow sweet-clover	Melilotus officinalis

TABLE E1. CONTINUED

HERBS

Common Name	Scientific Name
Prostrate knotweed	Polygonum aviculare
Bushy smartweed	Polygonum ramosissimum
Sheep Sorrel	Rumex acetosella
Curly dock	Rumex crispus
Russian thistle	Salsola kali
Bouncing bet	Saponaria officinalis
Goldenrod	Solidago canadensis
Perennial sow-thistle	Sonchus arvensis
Annual sow-thistle	Sonchus oleraceus
Dandelion	Taraxacum officinale
Oyster plant	Tragopogon porrifolius

GRASSES AND GRASS-LIKES

Crested wheatgrass	Agropyron cristatum
Tall wheatgrass	Agropyron elongatum
Intermediate wheatgrass	Agropyron intermedium
Quackgrass	Agropyron repens
Smooth Brome	Bromus inermis
Cheat-grass	Bromus tectorum
Sedge	Carex sp.
Nutgrass	Cyperus
Spikerush	Eleocharis sp.
Foxtail barley	Hordeum jubatum
Timonthy	Phleum pratense
Prairie cordgrass	Spartina pectinata
Common cattail	Typha latifolia
Perennial ryegrass	Lolium perenne

TABLE E2. CHECKLIST OF WILDLIFE ASSOCIATED WITH BEAR CREEK RESERVOIR, PARK AND ADJACENT WATERSHED.

Birds

Water and Shore Birds

Grebe- horned grebe; eared grebe; western grebe; pied-billed grebe
Heron- great blue heron; black-crowned night heron
Snowy Egret
American Bittern
Canada Goose
Ducks- mallard; gadwall; pintail; american green-winged teal;
Blue-winged teal; cinnamon teal; american widgeon; northern shoveler;
redhead; ring-necked duck;canvasback; greater scaup; lesser scaup;
common goldeneye; barrow's goldeneye; bufflehead; ruddy duck;
american coot
Merganser- hooded merganser; common merganser; red-breasted merganser

Virginia Rail
Sora
Semipalmated Plover
Killdeer
Common Snipe
Long-billed curlew
Sandpiper- spotted sandpiper; solitary sandpiper; pectoral sandpiper;
white-rumped sandpiper; baird's sandpiper; least sandpiper;
semipalmated sandpiper; western sandpiper
Gulls- glaucous gull; herring gull; california gull; ring-billed gull;
franklin's gull bonaparte's gull
Dipper
American woodcock
Belted kingfisher
Water pipit

Predators and Scavengers

Hawks- red-tailed hawk; broad-winged hawk; swainson's hawk; rough-legged
hawk; marshhawk; merlin; american kestrel
Owls- barn owl; screech owl; great-horned owl; pigmy owl; long-eared
owl; short-eared owl; saw-whet owl
Golden Eagle
Shrike- northern shrike; loggerhead shrike
Turkey vulture

TABLE E2. CONTINUED

Upland Ground Birds

Ring-necked pheasant
Common nighthawk

Hummingbirds

Hummingbirds- broad-tailed hummingbird; rufous hummingbird; calliope Hummingbird; rivoli's hummingbird

Tree-Clingers

Tree-Clingers- common flicker; lewis' woodpecker; yellow-bellied sapsucker; hairy woodpecker; downy woodpecker; white-breasted nuthatch; red-breasted nuthatch; pigmy nuthatch; brown creeper

Perching Birds

Kingbirds- eastern kingbird; western kingbird; cassin's kingbird
Flycatchers- great crested flycatcher; ash-throated flycatcher willow flycatcher; least flycatcher; dusky flycatcher western flycatcher; olive-sided flycatcher; blue-gray gnatcatcher
Vermilion
Phoebe- say's phoebe; eastern phoebe
Western wood pewee
Horned lark

Swallows- violet-green swallow; tree swallow; bank swallow; Rough-winged swallow; barn swallow; cliff swallow
Chiminey swift

Blue jay
Black-billed magpie
Common raven
Common crow
Starling
Blackbirds- yellow-headed blackbird; red-winged blackbird; brewers blackbird; common grackle brown-headed cowbird; rusty blackbird

Tanagers- western tanager; scarlet tanager; summer tanager
Grosbeaks- rose-breasted grosbeak; black-headed grosbeak; blue grosbeak; evening grosbeak
Cuckoo- yellow-billed cuckoo; black-billed cuckoo
Buntings- indigo bunting; lazuli bunting; lark bunting
Common redpoll
Pine siskin
Towhee- green-tailed towhee; rufous-sider towhee
Junco- dark-eyed junco; gray-headed junco
Bobolink
Western meadowlark

TABLE E2. CONTINUED

Black-capped chickadee
Bushtit
Wrens- house wren; winter wren; carolian wren; long-billed marshwren

Dove- rock dove; mourning dove
American robin
Ovenbird
Mockingbird
Gray catbird
Brown thrasher
Thrush- varied thrush; hermit thrush; swainson's thrush; gray-cheeked Thrush; northern waterthrush
Veery
Bluebird- eastern bluebird; western bluebird
Townsend's solitaire

Warblers- macgillivray's warbler; common yellowthroat; hooded warbler; wilson's warbler black and white warbler; worm-eating warbler; golden- winged warbler; tennessee warbler; orange-crowned warbler; nashville warbler; virginia's warbler; yellow warbler; magnolia warbler; cape may warbler; yellow-rumped warbler; black-throated gray warbler; townsend's warbler; black-throated green warbler; blackburnian warbler; chestnut-sided warbler; bay-breasted warbler; black poll warbler; palm warbler
Orioles- orchard oriole; northern oriole
Vireo- bell's vireo; yellow-throated vireo; solitary vireo; red-eyed vireo; philadelphia vireo; warbling vireo
Kinglet- golden-crowned kinglet; ruby-crowned kinglet
Yellow-breasted chat
American redstart
Northern parula

Finch- purple finch; house finch; gray-crowned rosy finch; black rosy finch; brown-capped rosy finch; american goldfinch; lesser goldfinch
Sparrows- house sparrow; savannah sparrow; baird's sparrow; vesper sparrow; lark sparrow; tree sparrow; chipping sparrow; clay-colored sparrow; brewer's sparrow; harris sparrow; white-crowned sparrow;white-throated sparow; fox sparrow; lincoln's sparrow; swamp sparrow; song sparrow
Waxwing- cedar waxwing; bohemian waxwing

Mammals

Order Marsupialia
Opposum

Order Insectivora

TABLE E2. CONTINUED

Shrew- masked shrew; wandering shrew; merriam's shrew; water shrew; short- tailed shrew

Order Chiroptera
Bats- long-ear myotis; long-legged myotis; small-footed myotis; silver-haired bat; big brown bat; red bat; hoary bat

Order Lagomorpha
Rabbit- desert cottontail; nuttall's cottontail; black-tailed jackrabbit

Order Rodentia
Squirrel- fox squirrel; thirteen-lined ground squirrel; rock squirrel
Chipmunk- least chipmunk
Gopher- northern pocket gopher; plains pocket gopher
Meadow vole
Norway rat
Mice- olive-backed pocket mouse; hispid pocket mouse; deer mouse; western harvest mouse; northern grasshopper mouse; meadow jumping mouse; house mouse
Black-tailed prairie dog
Beaver
Muskrat

Order Carnivora
Fox- red fox; gray fox
Coyote
Raccoon
Long-tailed weasel
Skunk- spotted skunk; striped skunk

Order Cervidae
Deer- white-tailed; mule

Reptiles and Amphibians

Order Squamata
suborder serpentes
Snakes - eastern yellow bellied racer; northern water snake; bullsnake; wandering western terrestrial garter snake; western plains garter snake; red-sided common grater snake

Suborder Lacertilia
Lizards - lesser earless lizard; eastern short-horned; red-lipped plateau lizard; six-lined racerunner lizard; eastern yellow-bellied lizard

Order Salientia
Frogs - boreal chorus frog; northern leopard frog; bullfrog

TABLE E2. CONTINUED

Toads - great plains toad; woodhouse toad

Order Testidines
Turtles - common snapping turtle; western painted; ornate box turtle

Order Caudata
Salamanders - barred tiger salamander; arizonia salamanders

Fish and Invertebrates

Trout - rainbow; brown
Bass - smallmouth bass; bigmouth bass
Sunfish - green sunfish
Tigermuskie
Sucker - longnosed sucker; white sucker
Minnows- fathead minnow; longnose dace; creek chub; mosquitofish; sand shiner; golden shiner (?)
Crayfish

TABLE E3. CHECKLIST OF COMMONLY OCCURRING WILDLIFE ASSOCIATED WITH BEAR CREEK RESERVOIR AND PARK.

COMMON NAME	SCIENTIFIC NAME
BIRDS	
WATER AND SHORE BIRDS	
Great Blue Heron	Ardea herodias
Canada Goose	Branta canadensis
Mallard	Anas platyrhynchos
Gadwall	Anas strepera
Pintail	Anas acuta
American Green-Winged Teal	Anas carolinensis
Blue-Winged Teal	Anas discors
American Widgeon	Mareca americana
Northern Shoveler	Spatula clypeata
Common Goldeneye	Bucephala clangula
Ruddy Ruck	Oxyura jamaicensis
American Coot	Fulica americana
Common Merganser	Mergus merganser
Red-Breasted Merganser	Mergus serrator
Killdeer	Charadrius vociferus
Common Snipe	Capella gallinago
Least Sandpiper	Erolia minutilla
Franklin's Gull	Larus pipixcan
Dipper	Cinclus mexicanus
American Woodcock	Philohela minor
Belted Kingfisher	Megaceryle alcyon
Water Pipit	Anthus spinoletta
PREDATORS AND SCAVENGERS	
Turkey Vulture	Cathartes aura
Red-Tailed Hawk	Buteo jamaicensis
Swainson's Hawk	Buteo swainsoni
Rough-Legged Hawk	Buteo lagopus
Marshhawk	Circus cyaneus
American Kestrel	Falco sparverius
Great-Horned Owl	Bubo virginianus
UPLAND GROUND BIRDS	
Ring-Necked Pheasant	Phasianus colchicus
Common Nighthawk	Chordeiles minor

TABLE E3. CONTINUED

COMMON NAME	SCIENTIFIC NAME
HUMMINGBIRDS	
Broad-Tailed Hummingbird	Selasphorus platycercus
Rufous Hummingbird	Selasphorus rufus
TREE-CLINGERS	
Common Flicker	Colaptes auratus
Downy Woodpecker	Dendrocopos pubescens
PERCHING BIRDS	
Rock Dove	Columba livia
Mourning Dove	Zenaidura macroura
Western Kingbird	Tyrannus verticalis
Cassin's Kingbird	Tyrannus vociferans
Willow Flycatcher	Empidomax traillii
Dusky Flycatcher	Empidonax oberholseri
Western Flycatcher	Empidonax difficilis
Western Wood Pewee	Contopus sordidulus
Horned Lark	Eremophila alpestris
Violet-Green Swallow	Tachycineta thalassina
Tree Swallow	Iridoprocne bicolor
Bank Swallow	Riparia riparia
Rough-Winged Swallow	Stelgidopteryx ruficollis
Barn Swallow	Hirundo rustica
Cliff Swallos	Petrochelidon pyrrhonota
Chimney Swift	Chaetura pelagica
Blue Jay	Cyanocitta cristata
Black-Billed Magpie	Pica pica
Common Crow	Corvus brachyrhynchos
Starling	Sturnus vulgaris
Yellow-Headed Blackbird	Xanthocephalus xanthocephalus
Red-Winged Blackbird	Agelaius phoeniceus
Brewers Blackbird	Euphagus cyanocephalus
Common Grackle	Quiscalus quiscula
Brown-Headed Cowbird	Molothrus ater
Black-Capped Chickadee	Parus atricapillus
American Robin	Turdus migratorius
Brown Thrasher	Toxostoma rufun
Western Bluebird	Sialia mexicana
Yellow Warbler	Dendroica petechia
Yellow-Rumped Warbler	Dendroica coronata

TABLE E3. CONTINUED

COMMON NAME	SCIENTIFIC NAME
PERCHING BIRDS (Cont.)	
Ruby-Crowned Kinglet	Regulus calendula
House Finch	Carpodacus mexicanus
Gray-Crowned Rosy Finch	Leucosticte tephrocotis
PERCHING BIRDS	
Pine Siskin	Spinus pinus
Dark-Eyed Junco	Junco hyemalis
Western Meadowlark	Sternella neglecta
House Sparrow	Passer domesticus
Chipping Sparrow	Spizella passerina
White-Crowned Sparrow	Zonotrichia leucophrys
MAMMALS	
Thirteen-Lined Ground Squirrel	Spermophilus tridecemlineatus
Wandering Shrew	Sorex vagrans
Water Shrew	Sorex palustris
Long-Ear Myotis (Bat)	Myotis evotis
Long-Legged Myotis (Bat)	Myotis volans
Small-Footed Myotis (Bat)	Myotis leibii
Big Brown Bat	Eptesicus fuscus
Deer Mouse	Peromyscus maniculatus
Western Harvest Mouse	Reithrodontomys megalotis
House Mouse	Mus musculus
Beaver	Castor canadensis
Spotted Skunk	Spilogale putorius
Striped Skunk	Mephitis mephitis
Blacked-Tailed Prairie Dog	Cynomys ludovicianus
Mule Deer	Odocoileus hemionus
REPTILES AND AMPHIBIANS	
Northern Water Snake	Nerodia sipendon sipendon
Western Plains Garter Snake	Thamnophis radix haydeni
Boreal Chorus Frog	Pseudacris triseriata maculata
Bullfrog	Rana catesbiana
Great Plains Toad	Bufo cognatus
Woodhouse Toad	Bufo woodhousei woodhousei
Red-Lipped Plateau Lizard	Sceloporus undulatus erythrocheilus
Six-Lined Racerunner Lizard	Cnemidophorus sexlineatus

TABLE E3. CONTINUED

COMMON NAME	SCIENTIFIC NAME
REPTILES AND AMPHIBIANS (Cont.)	
Eastern Yellow-Bellied Lizard	Coluber constrictor flaviventris
Barred Tiger Salamander	Ambystoma tigrinum mavortium
Arizona Salamanders	Ambystoma tigrinum nebulosum
FISH	
Rainbow Trout	Salmo gairdneri
Smallmouth Bass	Micropterus dolomieui
Longnose Sucker	Catostomus catostomus
White Sucker	Catostomus commersoni
Fathead Minnow	Pimephales promelas
Longnose Dace	Rhinichthys cataractae

APPENDIX F

TREND PLOTS FOR HEADWATERS, INFLOW, RESERVOIR AND OUTFLOW

Water quality trend plots were made for selected parameters monitored in the Bear Creek Clean Lake Study. These plots provide a visual method for assessing seasonal trends in relation to concentrations. Separate plots were made for headwaters, reservoir inflow, entire reservoir water quality and reservoir outflow. The dark bands in the plots are a measure of the data range for the sampling period.

Figure F1.

WATER QUALITY TREND PLOTS FOR HEADWATERS, INFLOW, RESERVOIR AND OUTFLOW. UNITS ARE IN MILLIGRAMS PER LITER (MG/L) UNLESS OTHERWISE SHOWN.

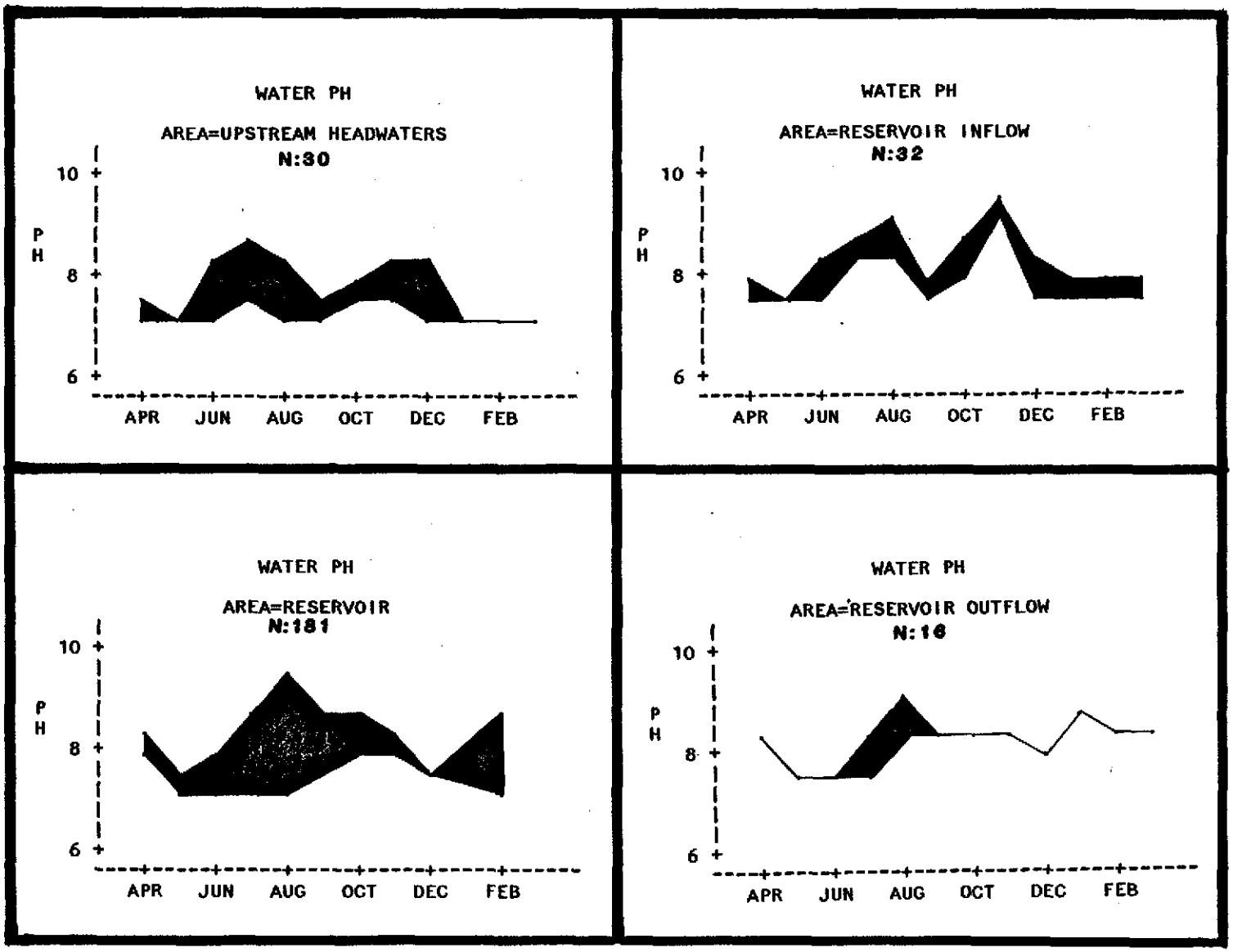


Figure F2.

WATER QUALITY TREND PLOTS FOR HEADWATERS, INFLOW, RESERVOIR AND OUTFLOW. UNITS ARE IN MILLIGRAMS PER LITER (MG/L) UNLESS OTHERWISE SHOWN.

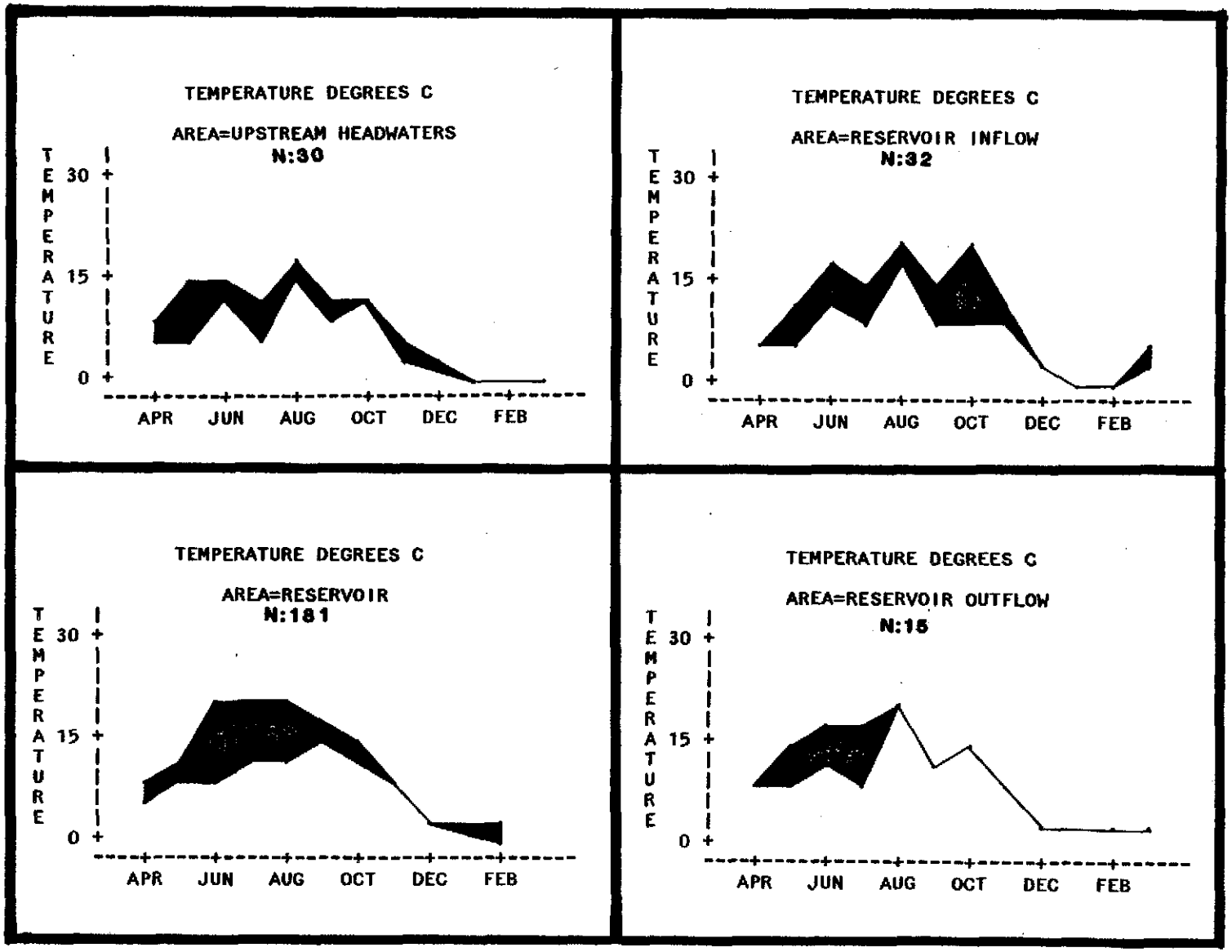


Figure F3.

WATER QUALITY TREND PLOTS FOR HEADWATERS, INFLOW, RESERVOIR AND OUTFLOW. UNITS ARE IN MILLIGRAMS PER LITER (MG/L) UNLESS OTHERWISE SHOWN.

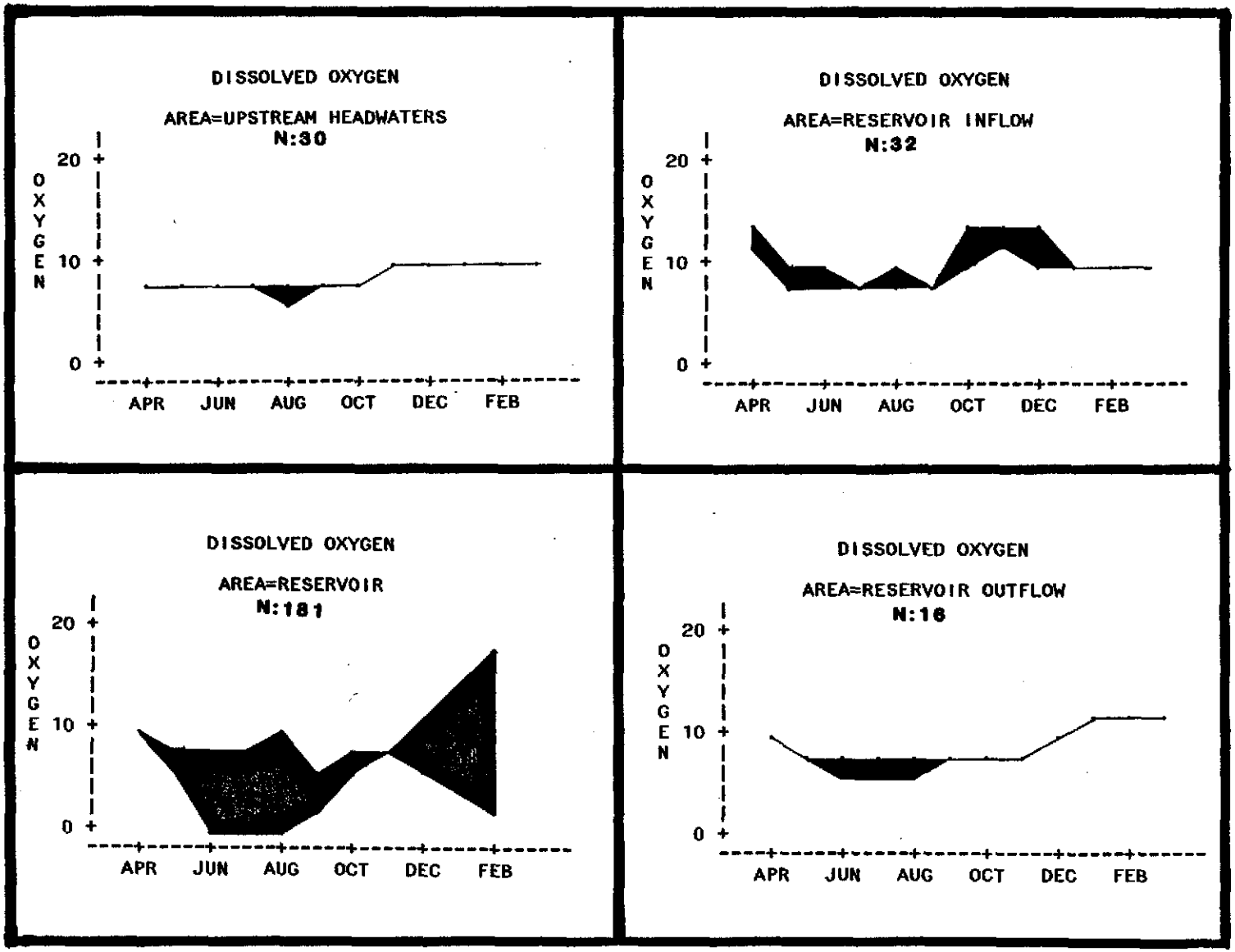


Figure F4.

WATER QUALITY TREND PLOTS FOR HEADWATERS, INFLOW, RESERVOIR AND OUTFLOW. UNITS ARE IN MILLIGRAMS PER LITER (MG/L) UNLESS OTHERWISE SHOWN.

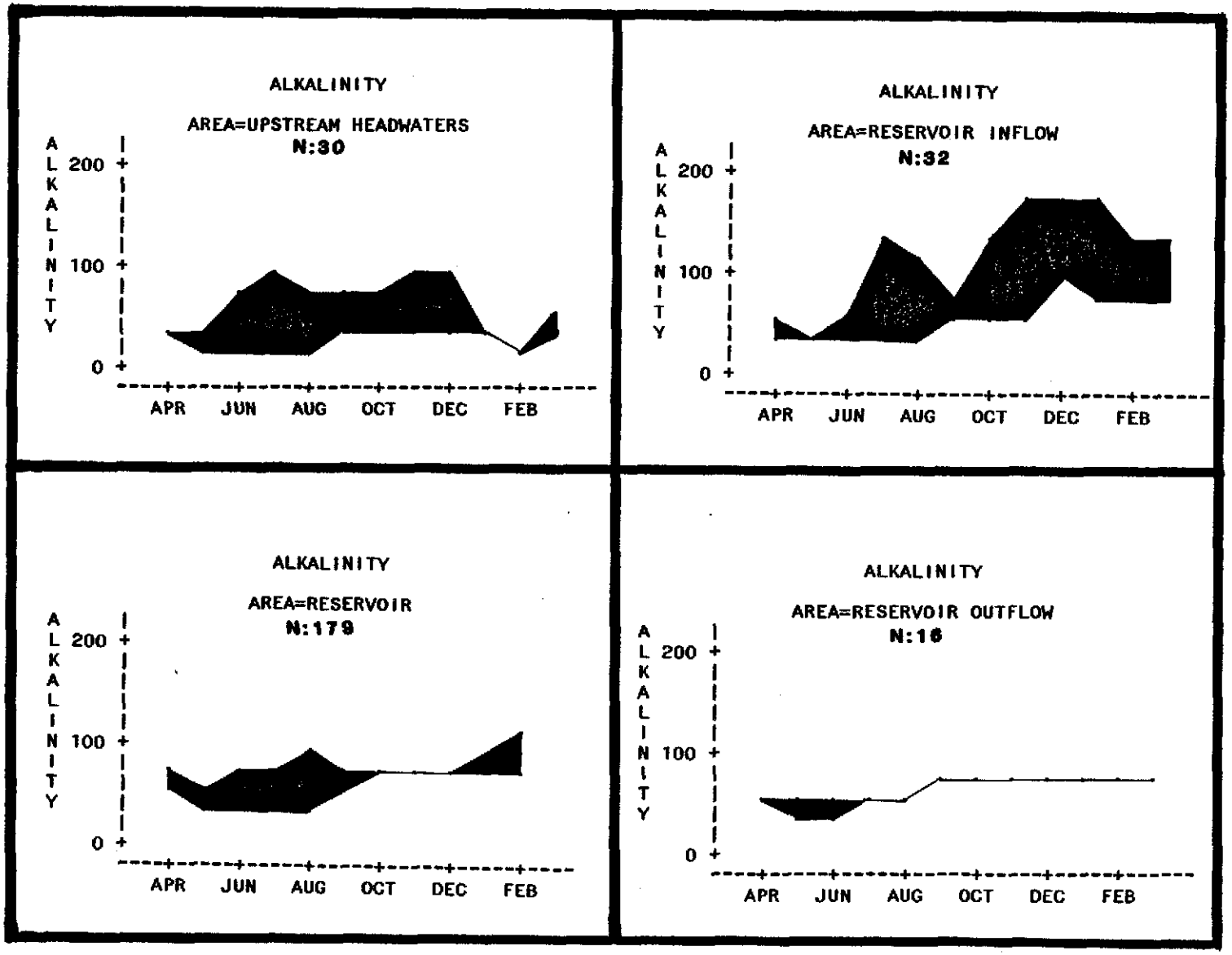


Figure F5.

WATER QUALITY TREND PLOTS FOR HEADWATERS, INFLOW, RESERVOIR AND OUTFLOW. UNITS ARE IN MILLIGRAMS PER LITER (MG/L) UNLESS OTHERWISE SHOWN.

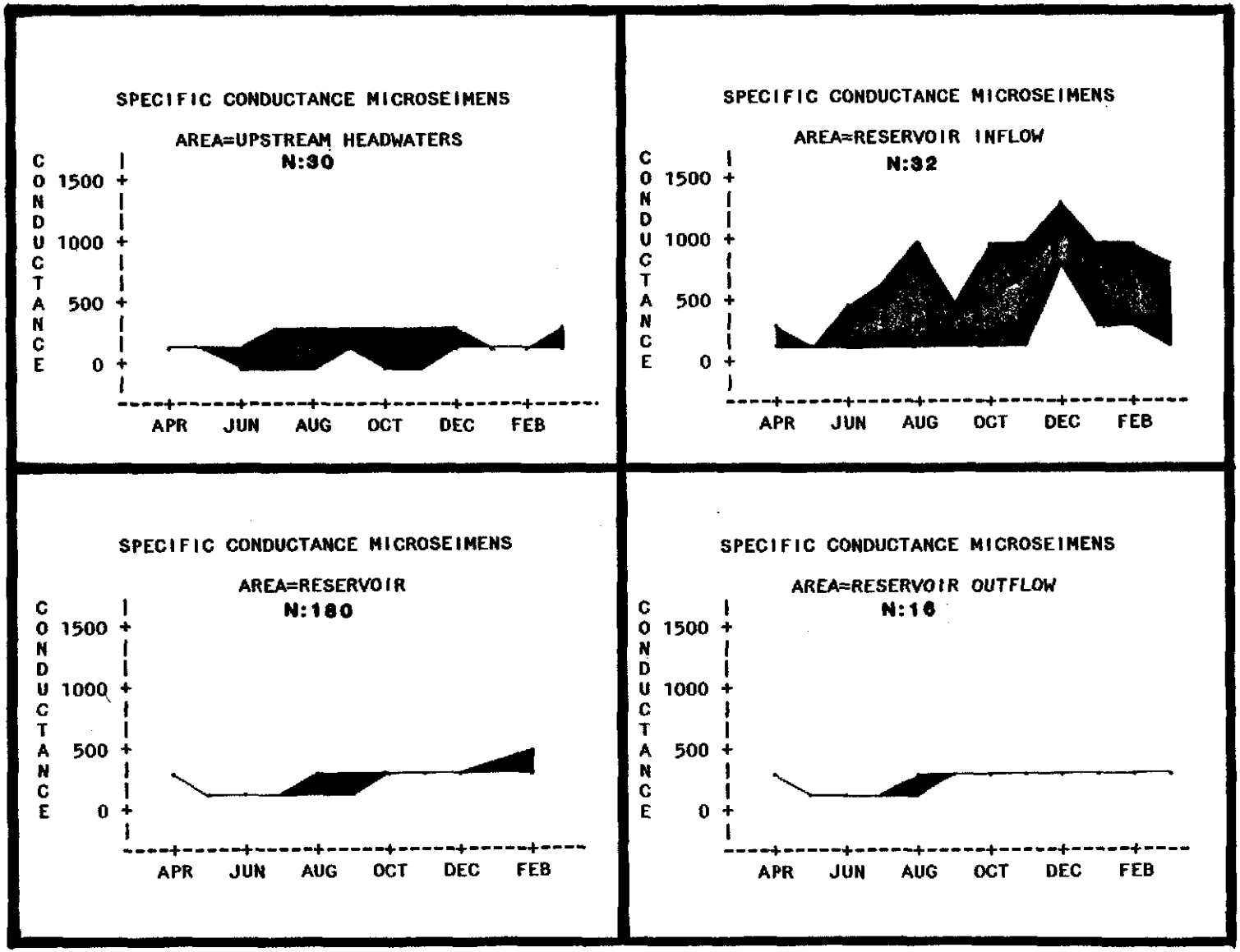


Figure F6.

WATER QUALITY TREND PLOTS FOR HEADWATERS, INFLOW, RESERVOIR AND OUTFLOW. UNITS ARE IN MILLIGRAMS PER LITER (MG/L) UNLESS OTHERWISE SHOWN.

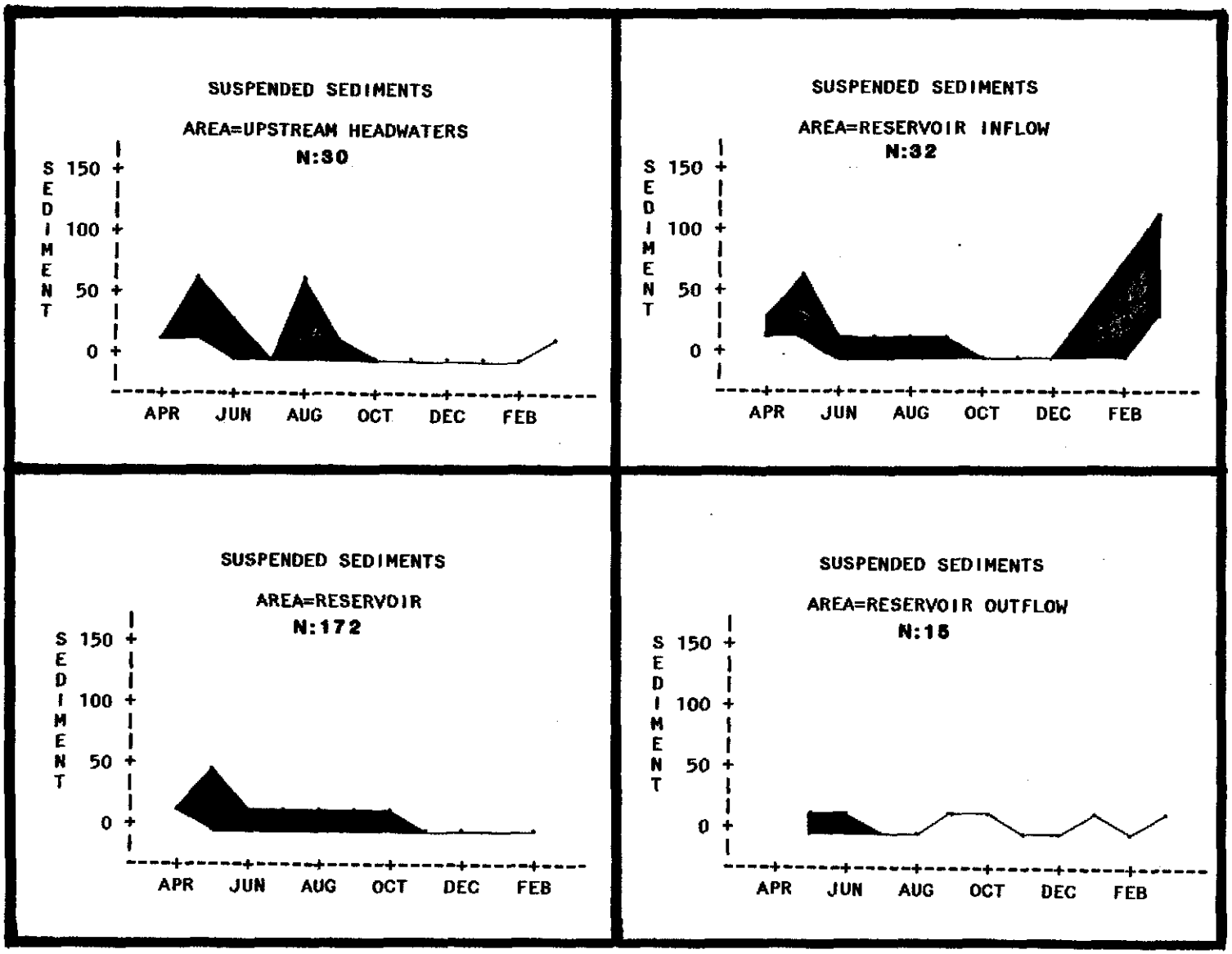


Figure F7.

WATER QUALITY TREND PLOTS FOR HEADWATERS, INFLOW, RESERVOIR AND OUTFLOW. UNITS ARE IN MILLIGRAMS PER LITER (MG/L) UNLESS OTHERWISE SHOWN.

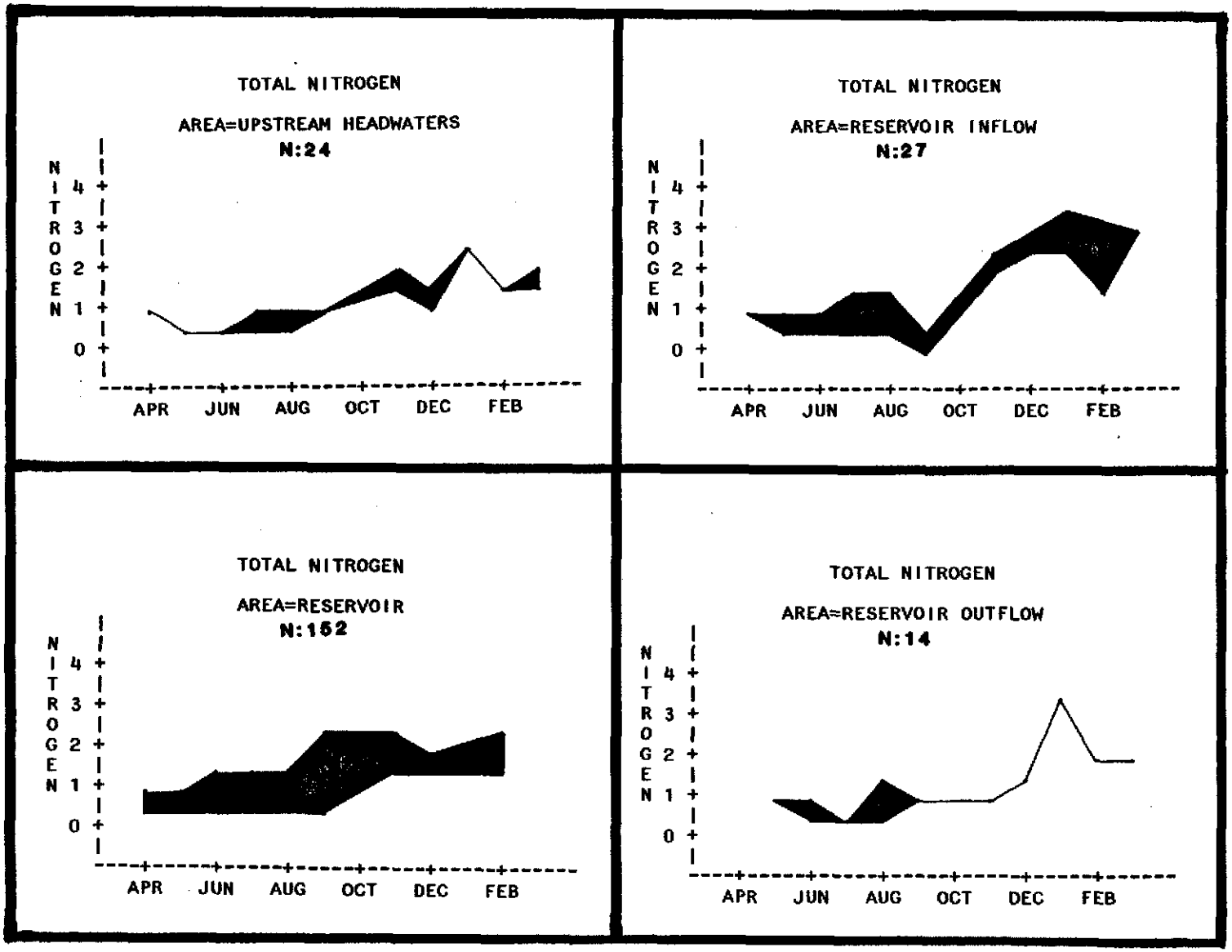


Figure F8.

WATER QUALITY TREND PLOTS FOR HEADWATERS, INFLOW, RESERVOIR AND OUTFLOW. UNITS ARE IN MILLIGRAMS PER LITER (MG/L) UNLESS OTHERWISE SHOWN.

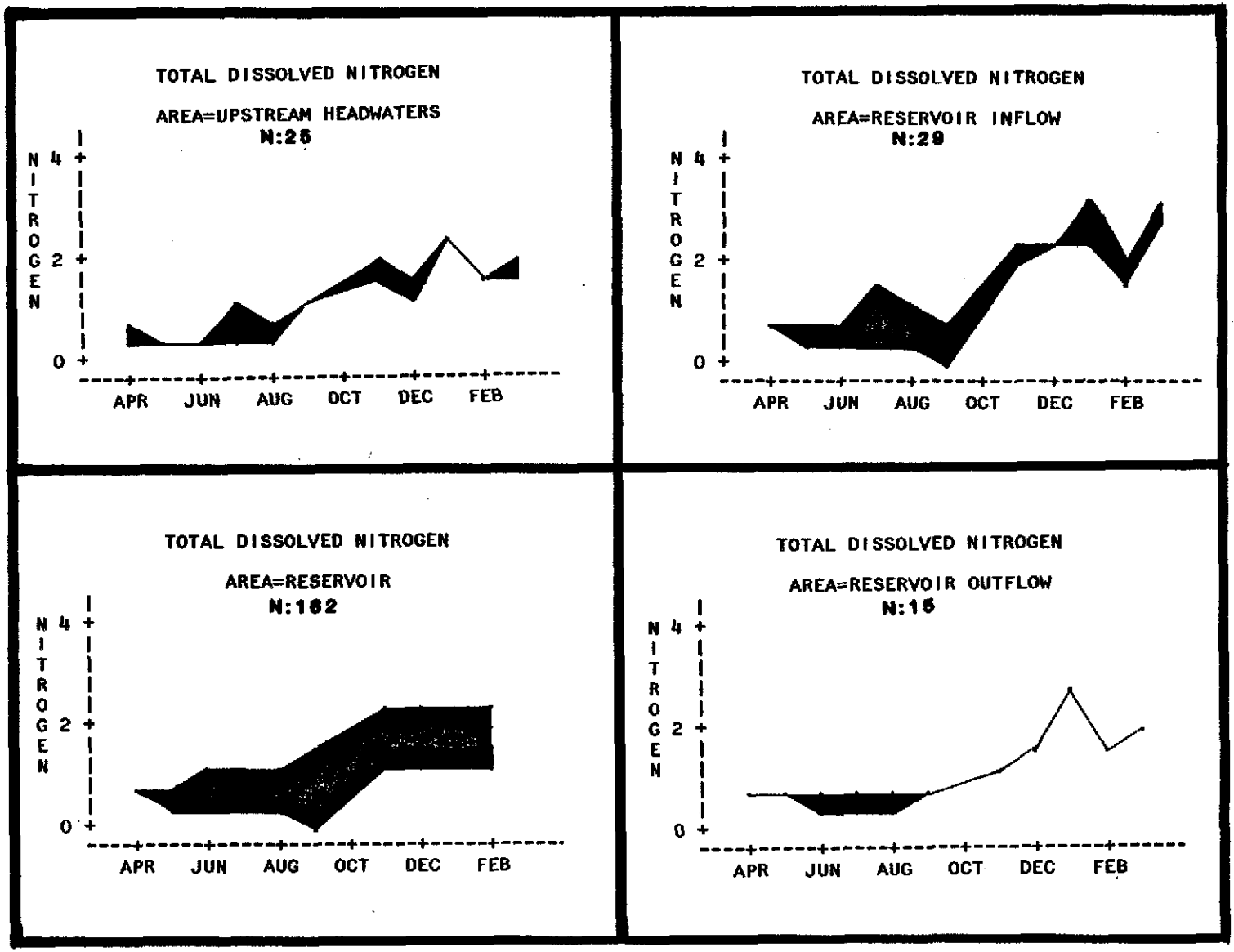


Figure F9.

WATER QUALITY TREND PLOTS FOR HEADWATERS, INFLOW, RESERVOIR AND OUTFLOW. UNITS ARE IN MILLIGRAMS PER LITER (MG/L) UNLESS OTHERWISE SHOWN.

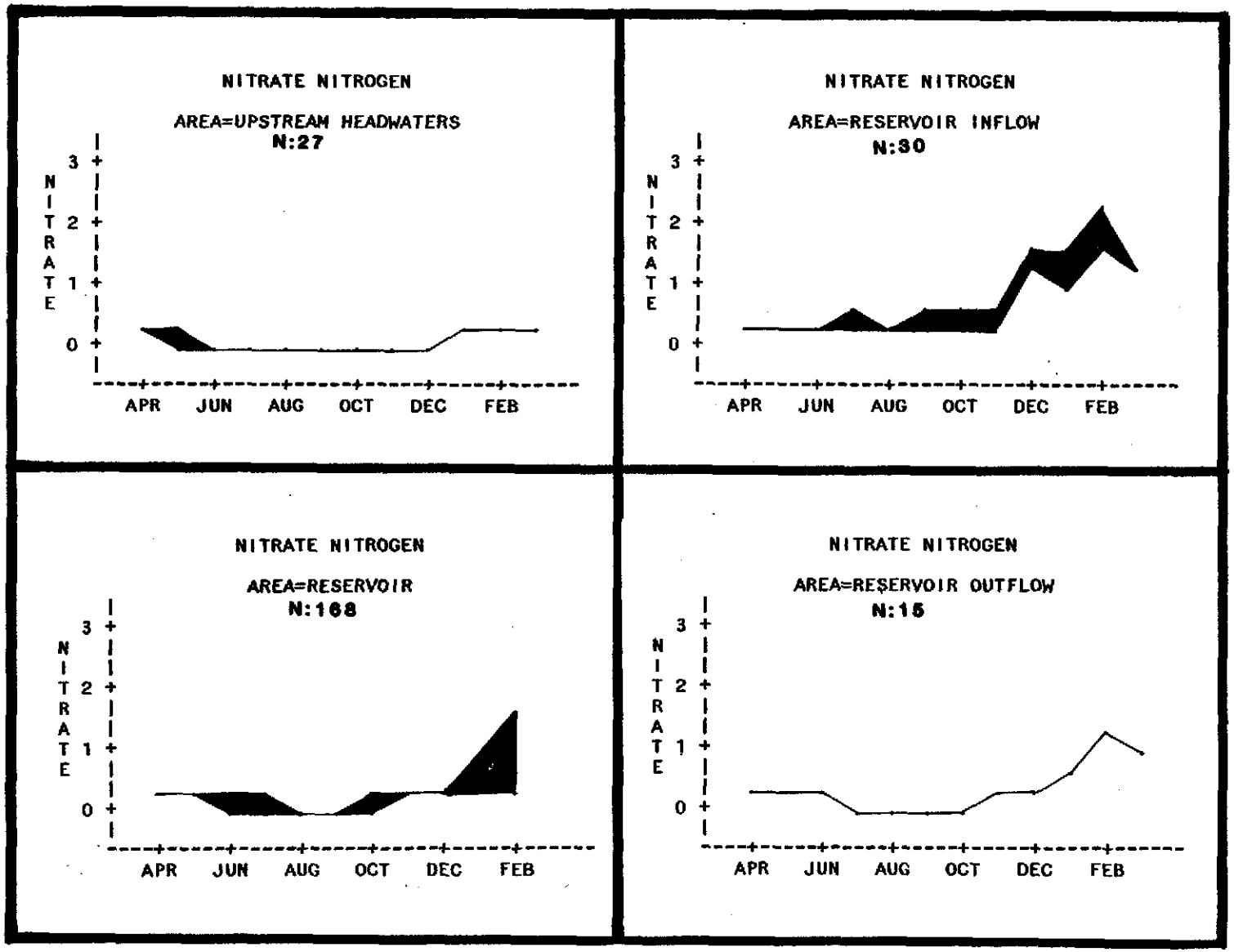


Figure F10.

WATER QUALITY TREND PLOTS FOR HEADWATERS, INFLOW, RESERVOIR AND OUTFLOW. UNITS ARE IN MILLIGRAMS PER LITER (MG/L) UNLESS OTHERWISE SHOWN.

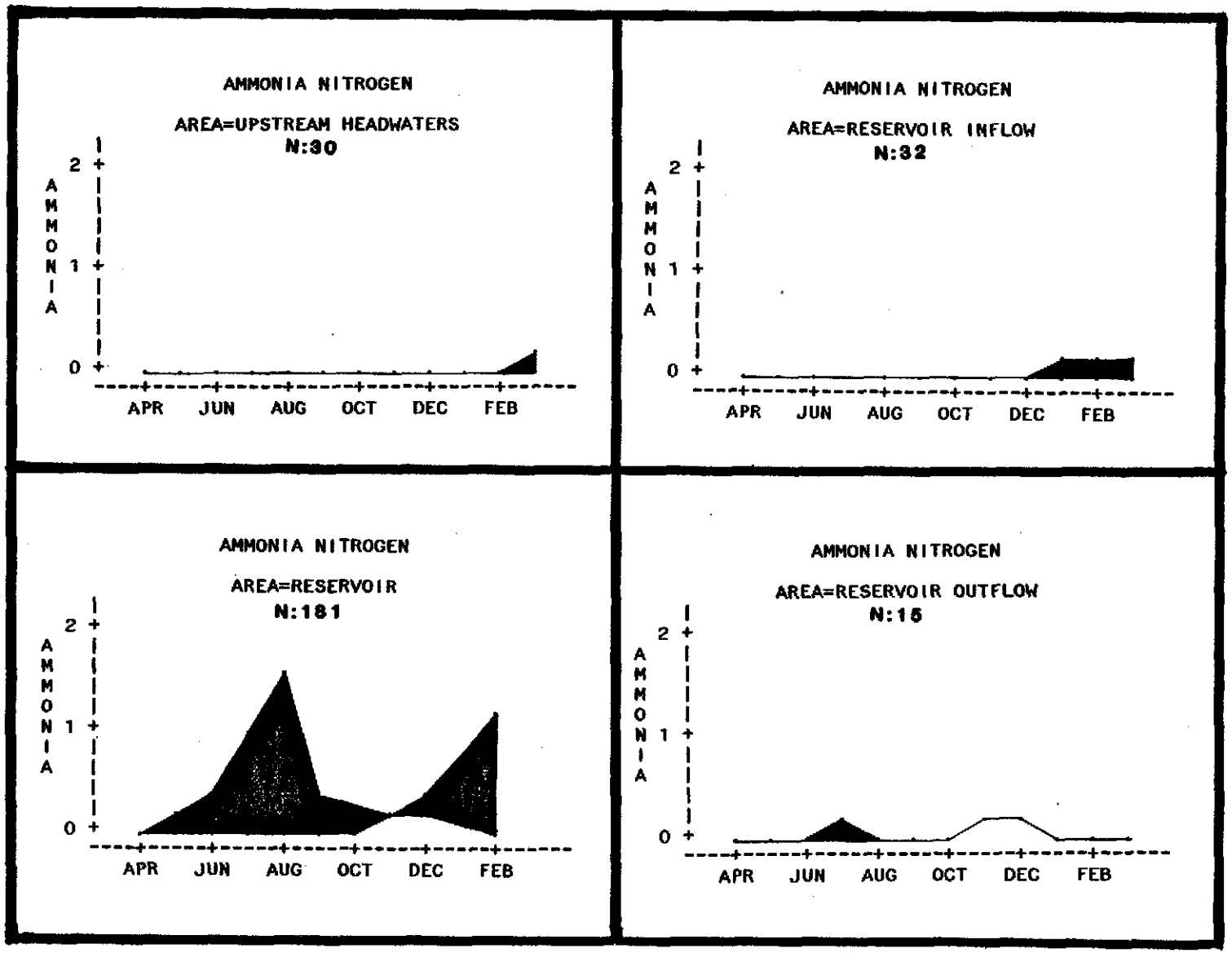


Figure F11.

WATER QUALITY TREND PLOTS FOR HEADWATERS, INFLOW, RESERVOIR AND OUTFLOW. UNITS ARE IN MILLIGRAMS PER LITER (MG/L) UNLESS OTHERWISE SHOWN.

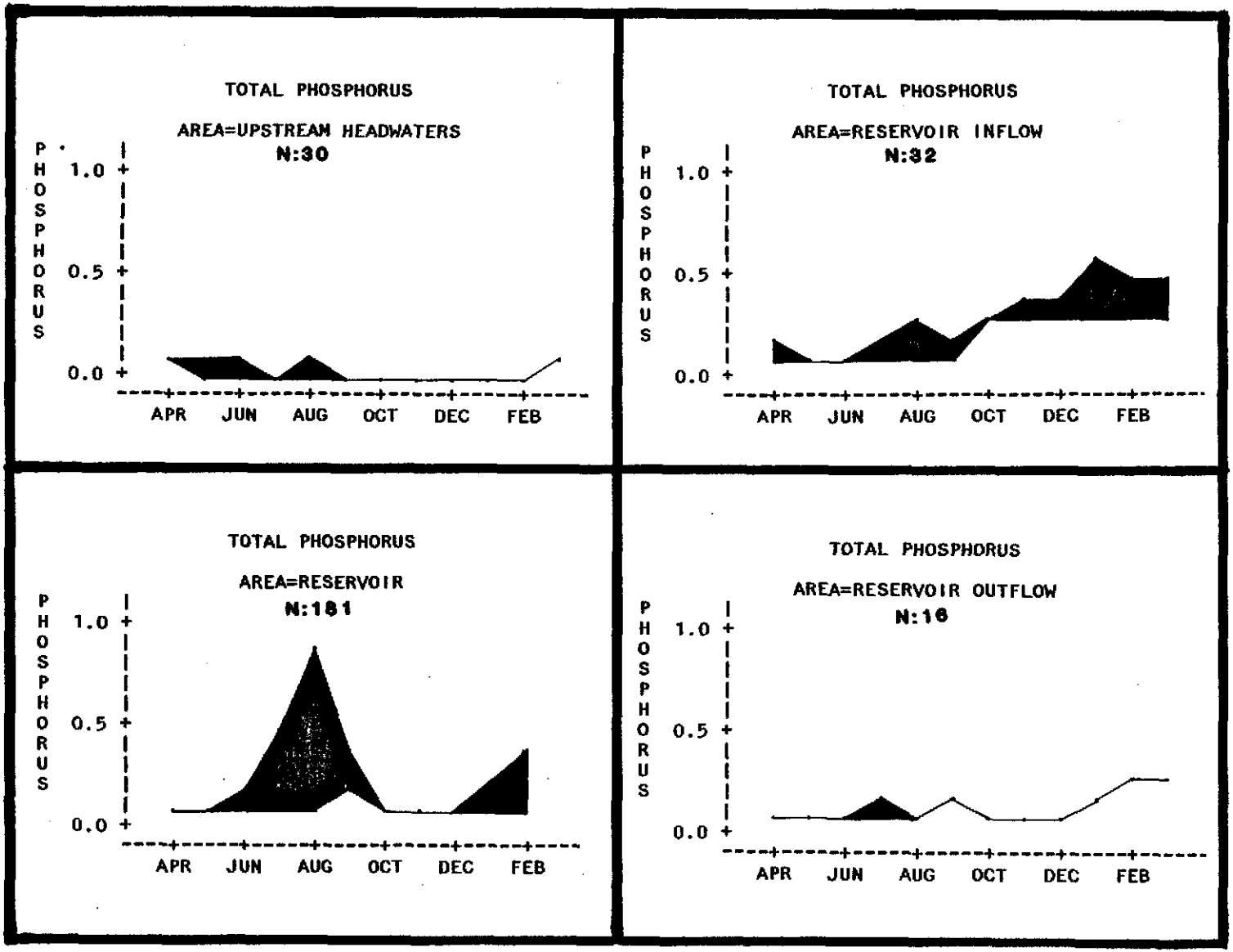
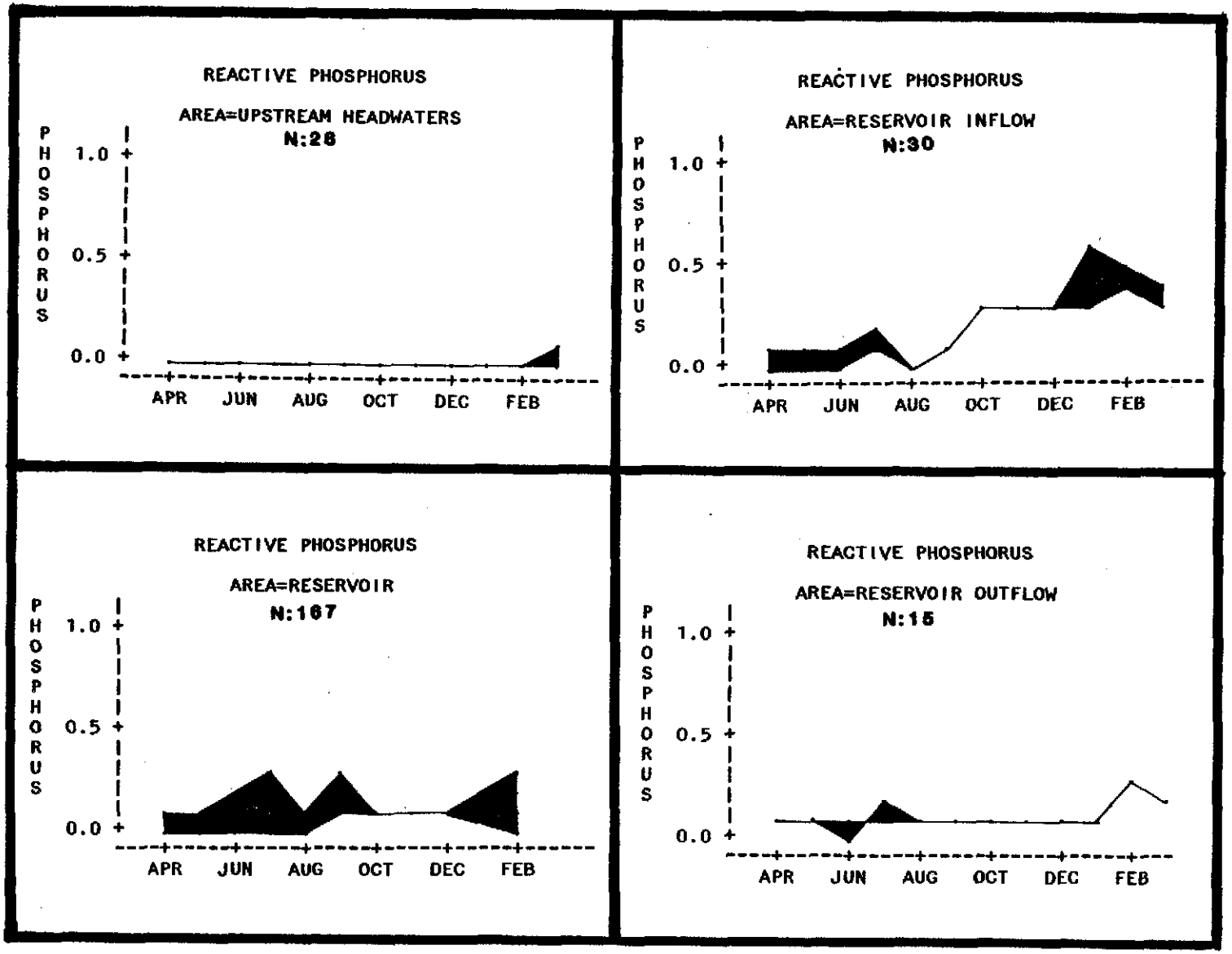


Figure F12.

WATER QUALITY TREND PLOTS FOR HEADWATERS, INFLOW, RESERVOIR AND OUTFLOW. UNITS ARE IN MILLIGRAMS PER LITER (MG/L) UNLESS OTHERWISE SHOWN.



APPENDIX G

RESERVOIR SEASONAL AND DEPTH RELATED TREND PLOTS

Water quality trend plots were made for selected parameters by depth zone and season in Bear Creek Reservoir. These plots provide a visual method for assessing seasonal and depth related trends in relation to concentrations. The dark bands in the plots are a measure of the data range for the sampling period.

Figure G1.

WATER QUALITY TREND PLOTS FOR PHOTIC AND APHOTIC ZONES IN BEAR CREEK RESERVOIR.

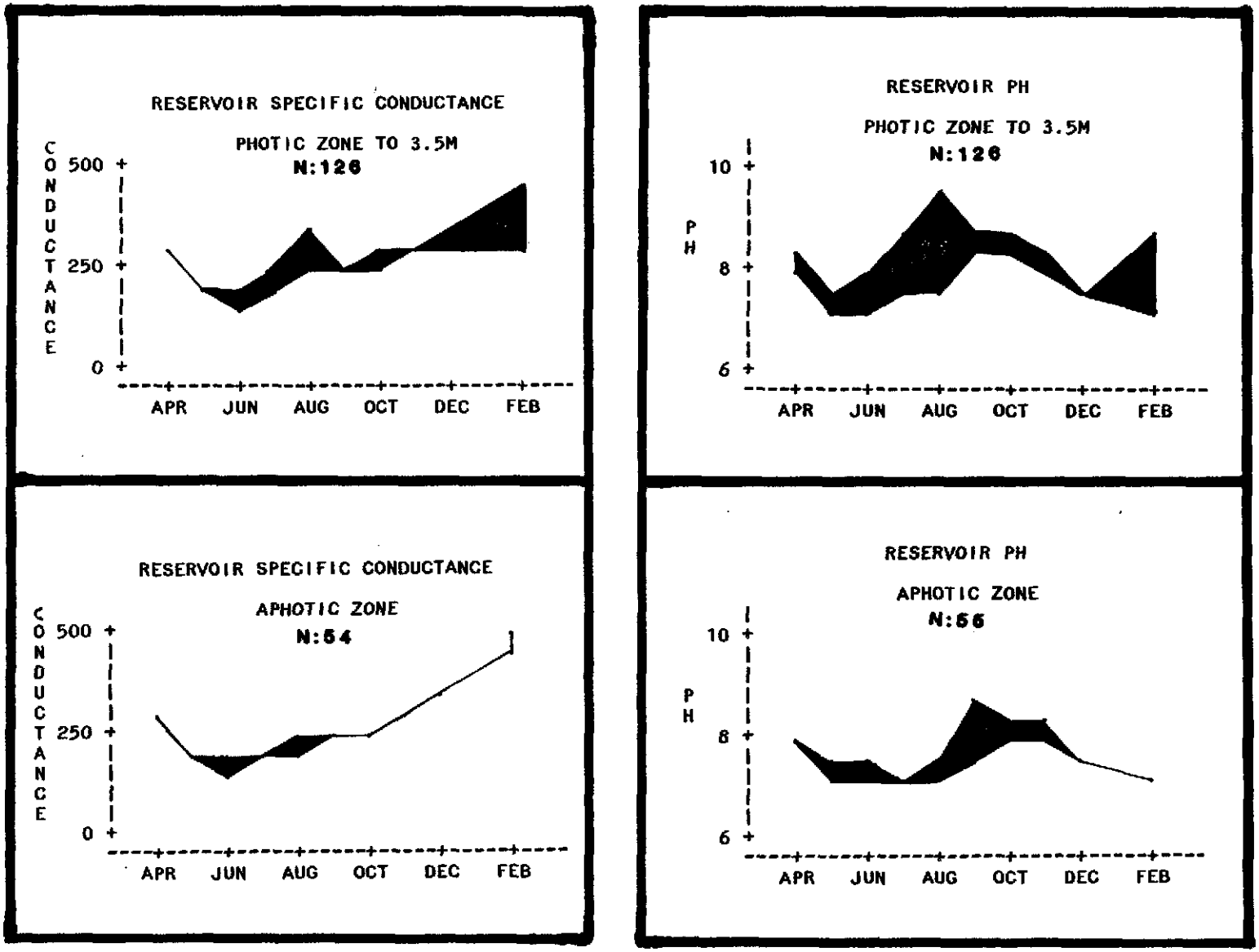


Figure G2.

WATER QUALITY TREND PLOTS FOR PHOTIC AND APHOTIC ZONES IN BEAR CREEK RESERVOIR.

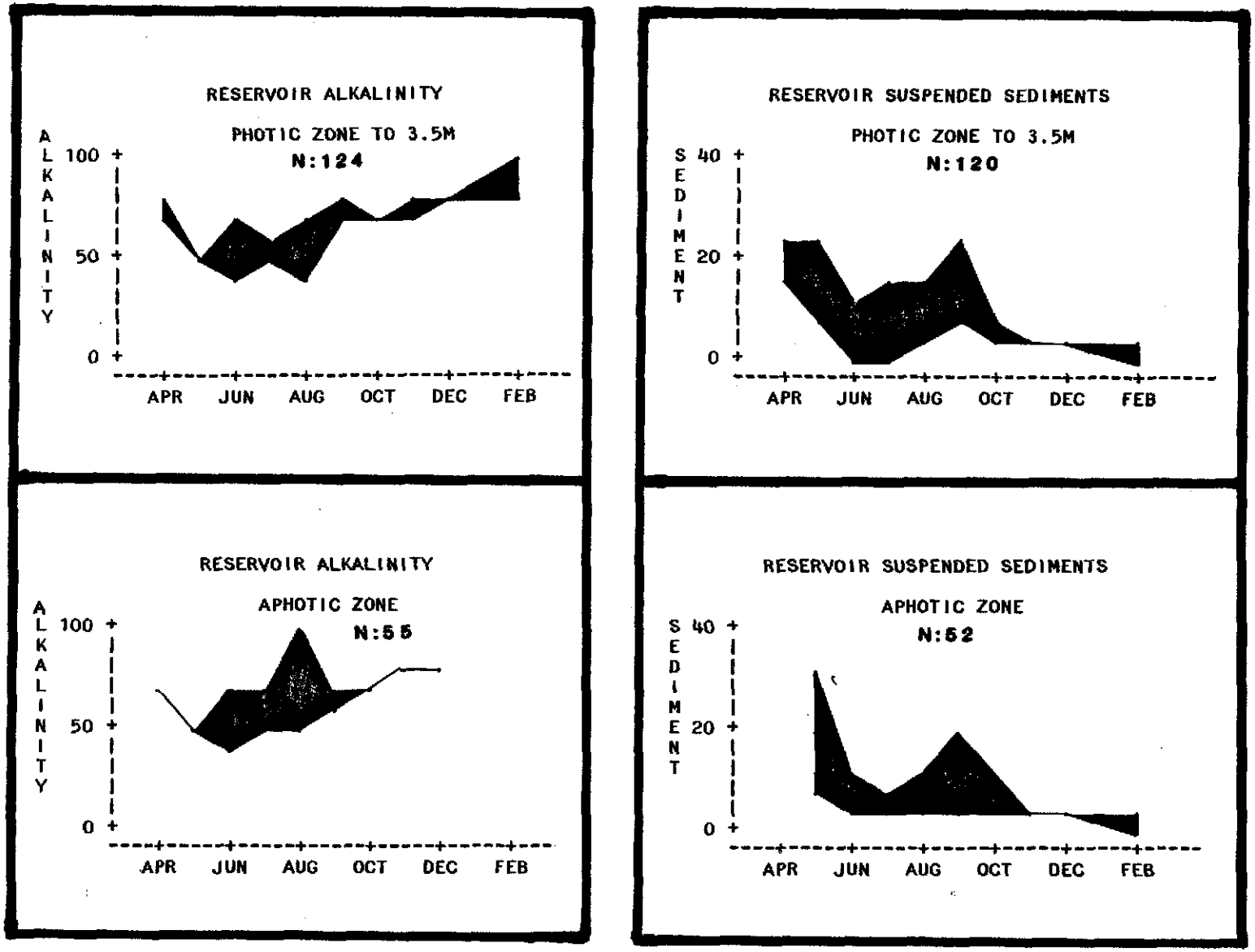
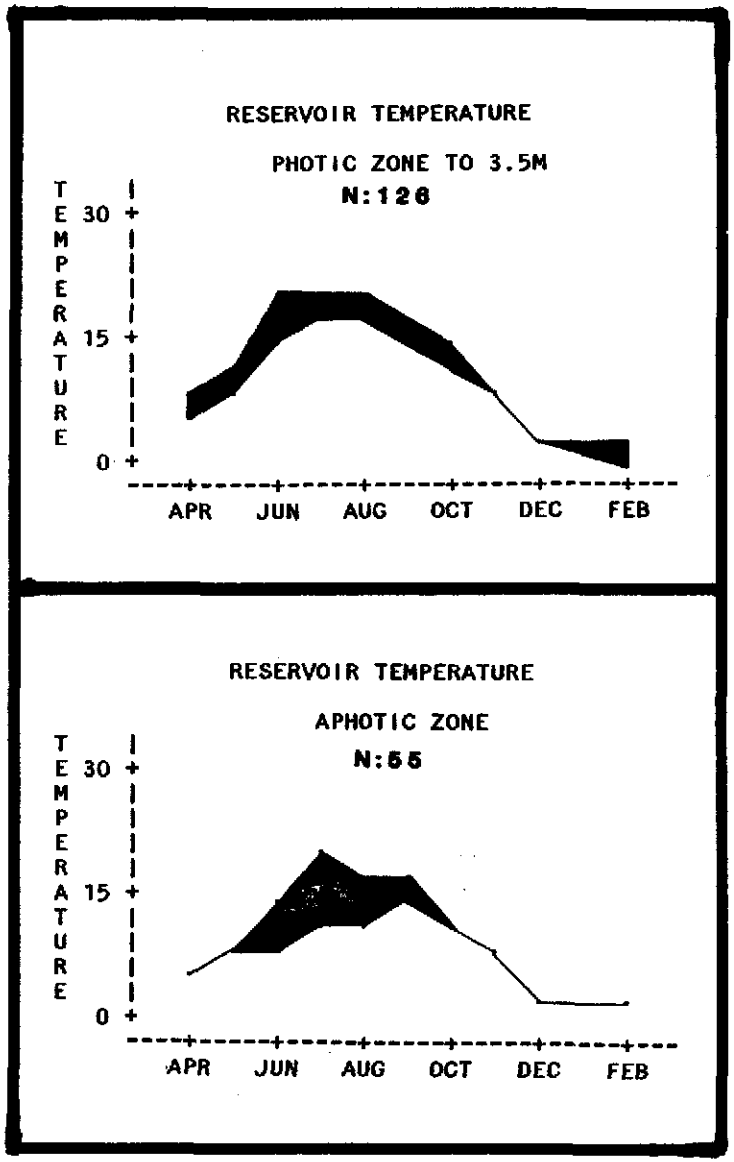


Figure G3.

WATER QUALITY TREND PLOTS FOR PHOTIC AND APHOTIC ZONES IN BEAR CREEK RESERVOIR.



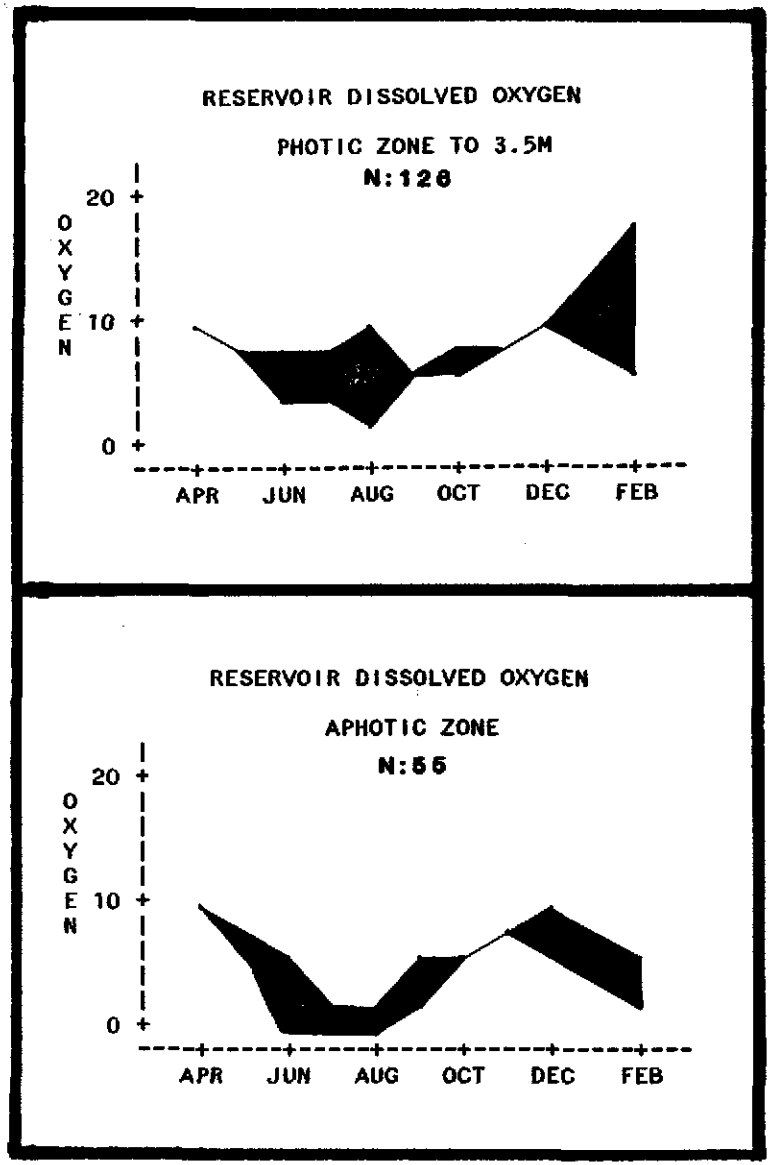


Figure G4.

WATER QUALITY TREND PLOTS FOR PHOTIC AND APHOTIC ZONES IN BEAR CREEK RESERVOIR.

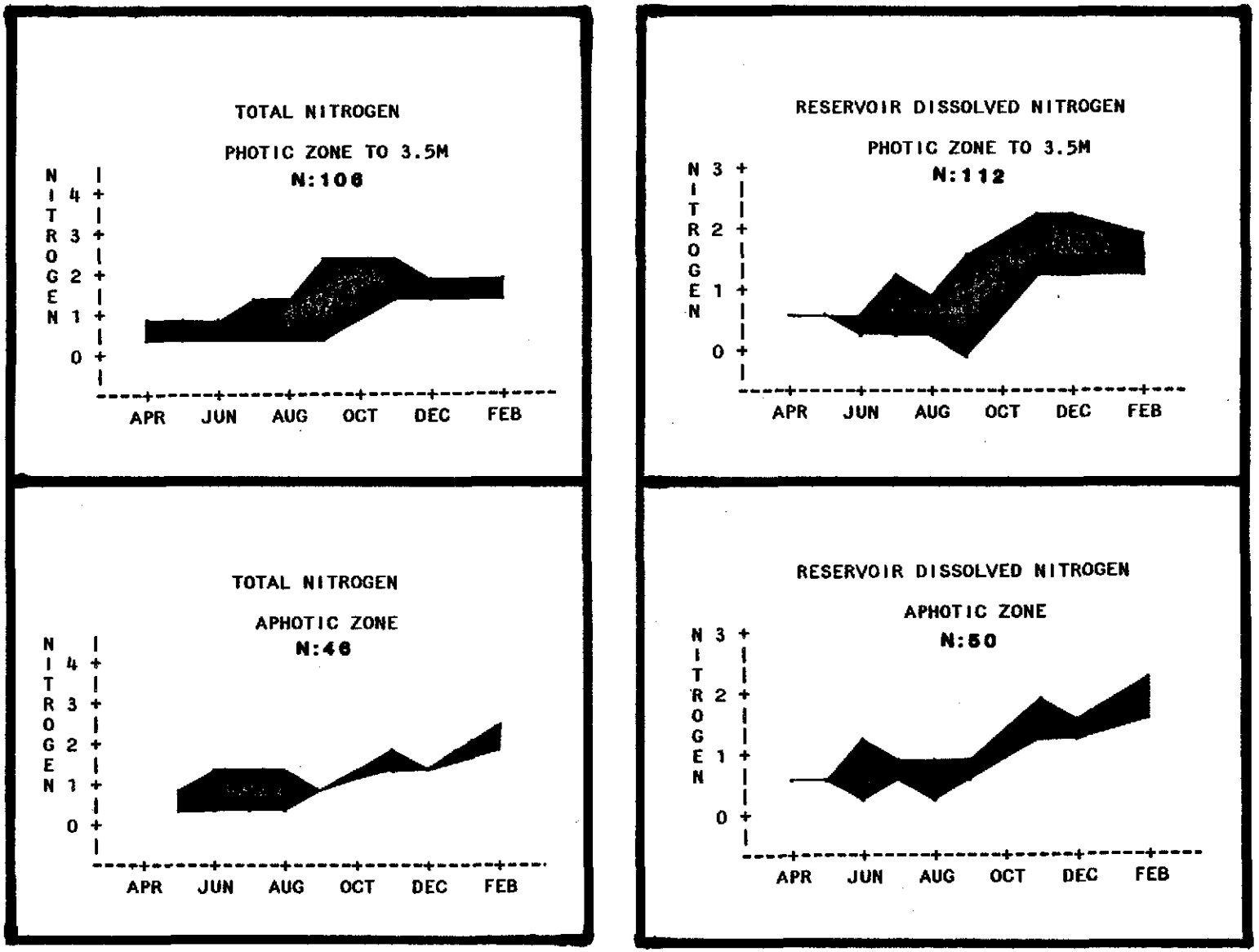


Figure G5.

WATER QUALITY TREND PLOTS FOR PHOTIC AND APHOTIC ZONES IN BEAR CREEK RESERVOIR.

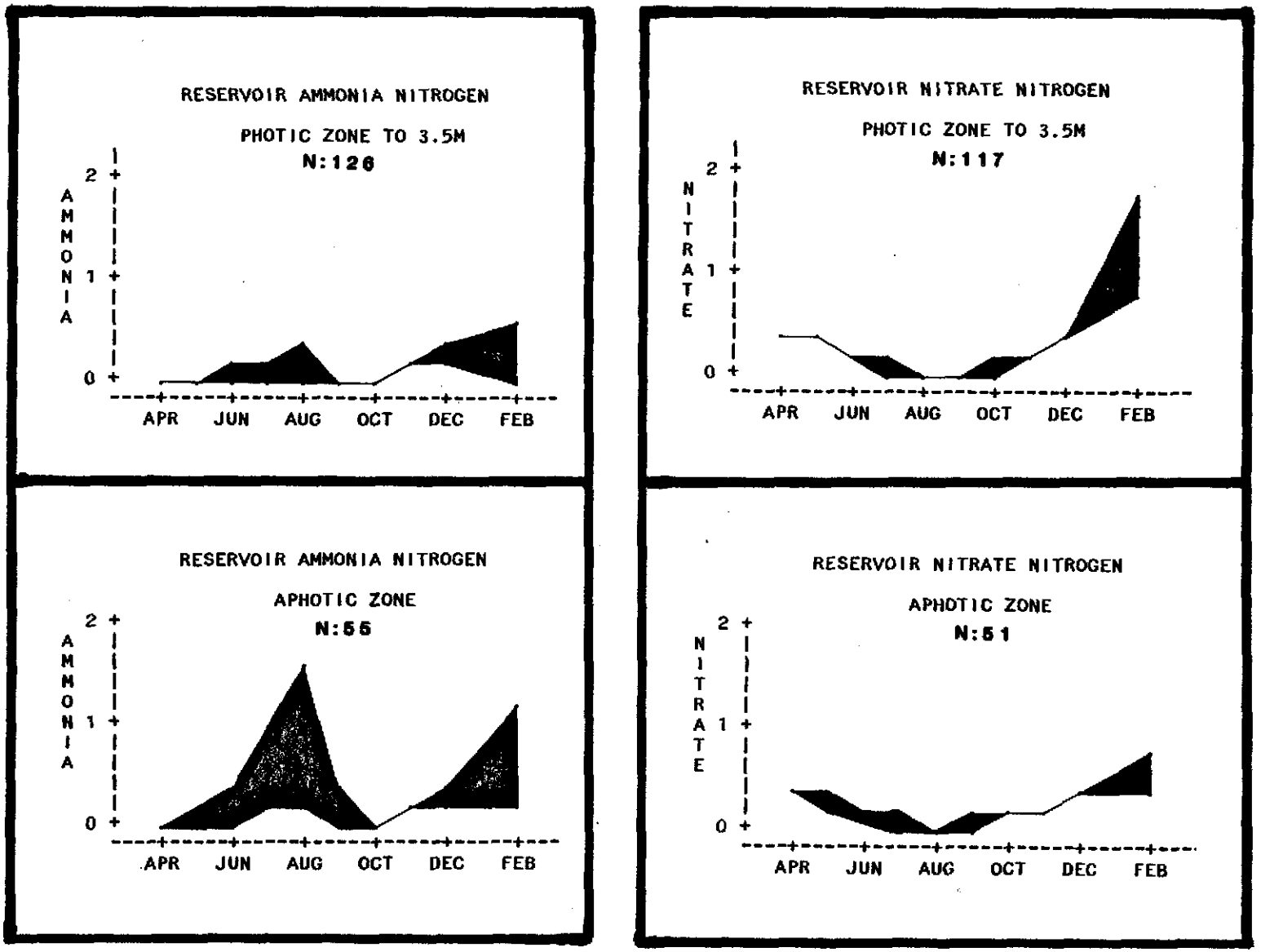


Figure G6.

WATER QUALITY TREND PLOTS FOR PHOTIC AND APHOTIC ZONES IN BEAR CREEK RESERVOIR.

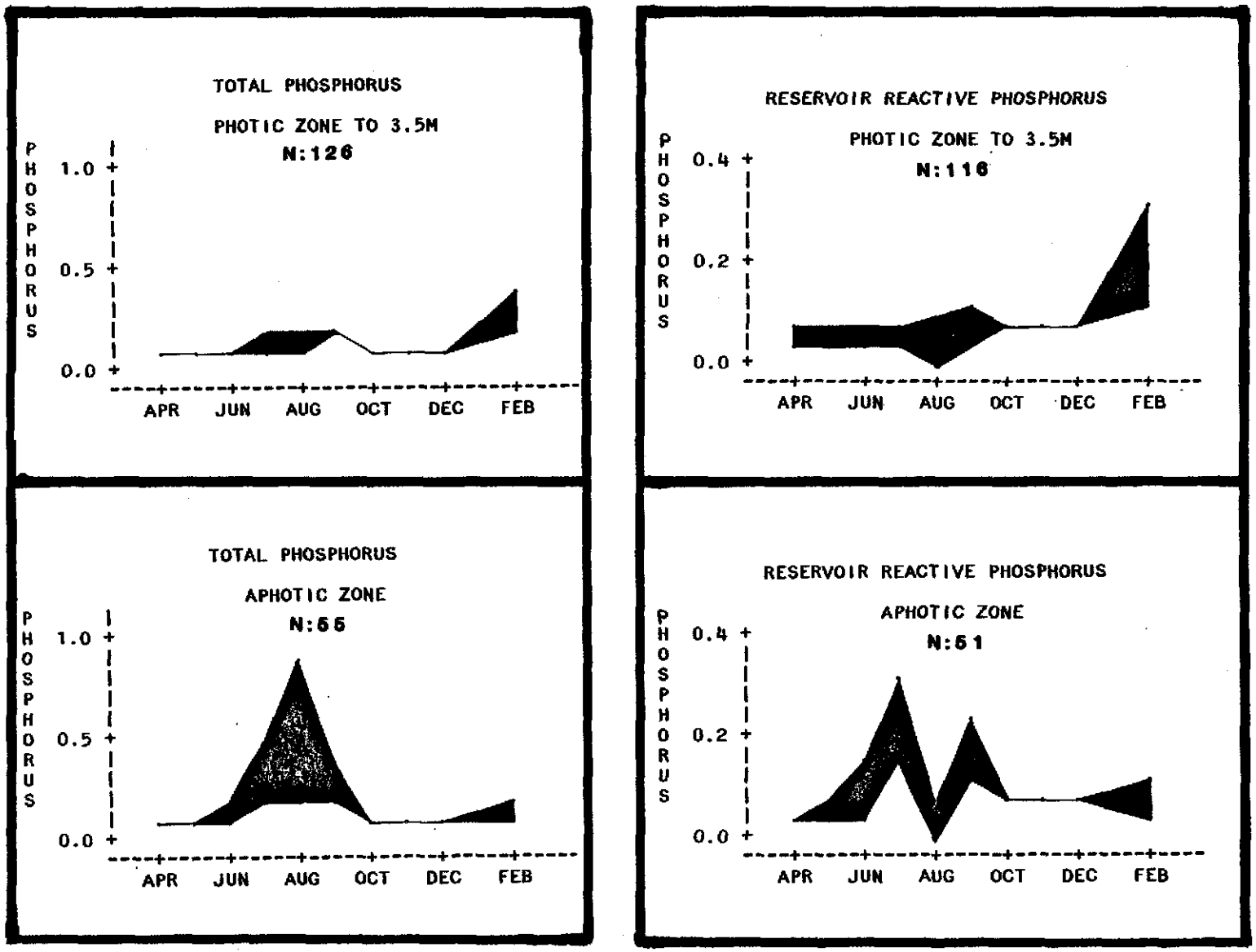


Figure G7.

WATER QUALITY TREND PLOTS FOR PHOTIC AND APHOTIC ZONES IN BEAR CREEK RESERVOIR.

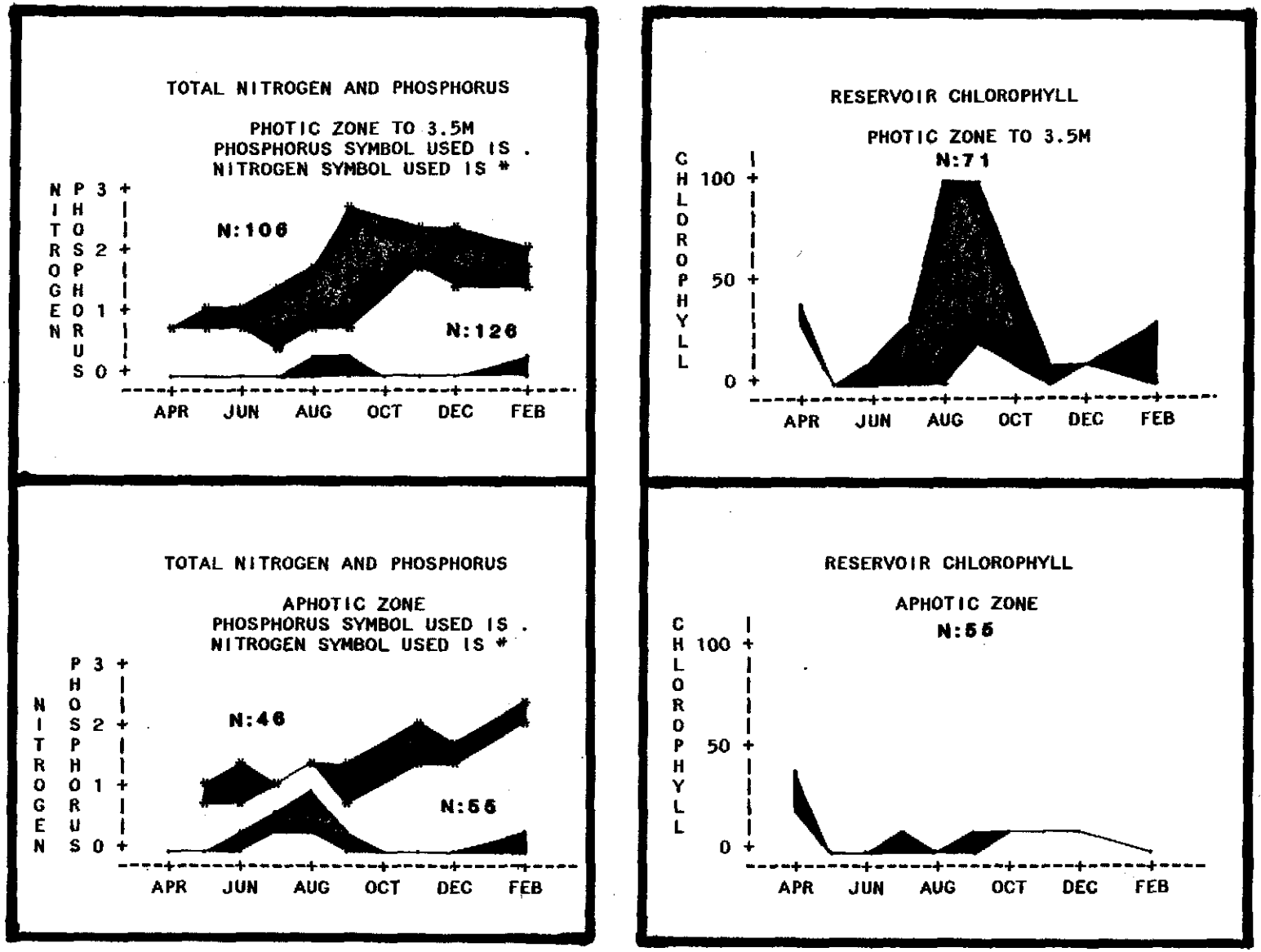


Figure G8.

TEMPERTURE PROFILE PLOTS FOR BEAR CREEK RESERVOIR.

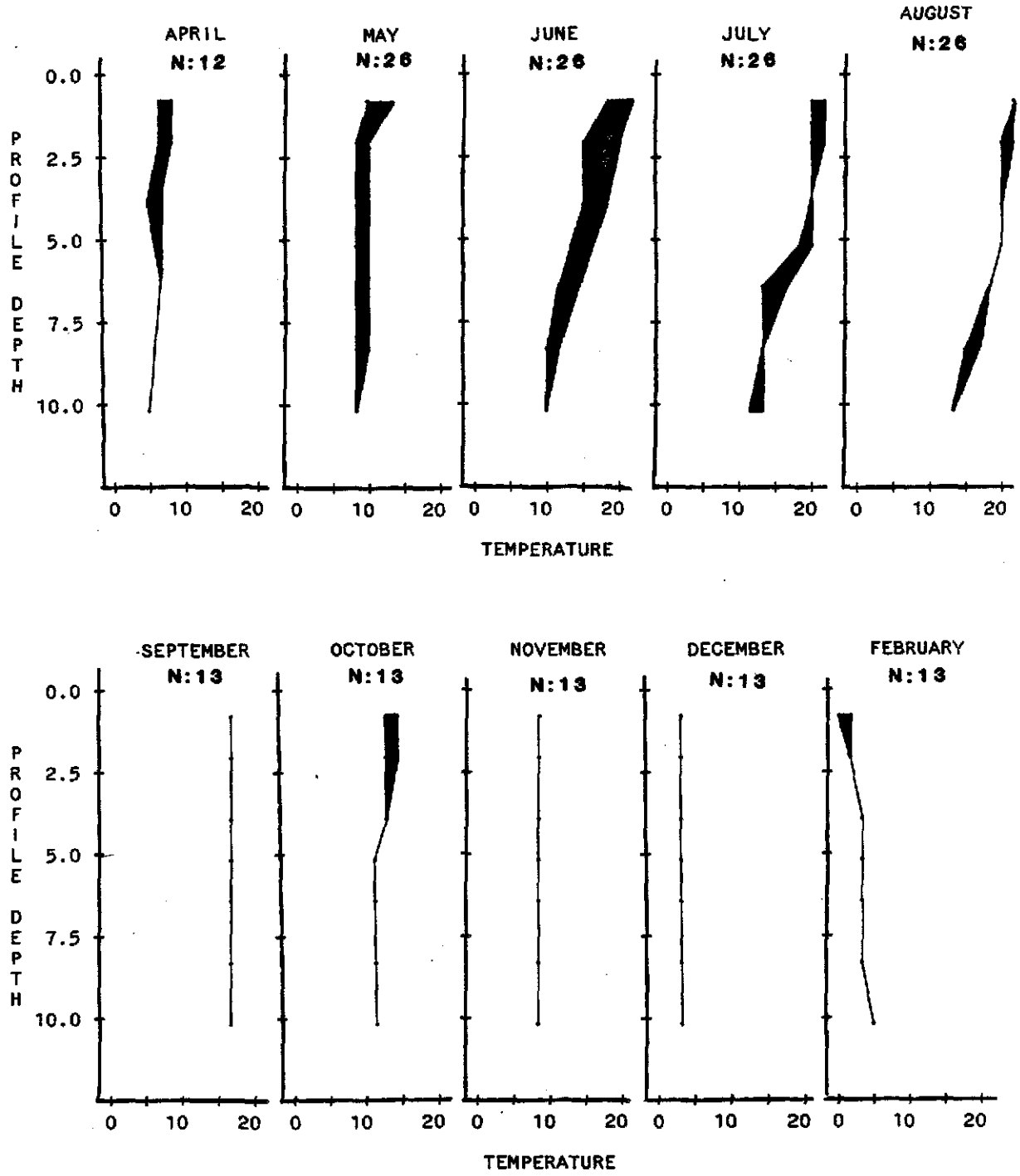


Figure G9.

DISSOLVED OXYGEN PROFILE PLOTS FOR BEAR CREEK RESERVOIR.
UNITS ARE IN MILLIGRAMS PER LITER (MG/L).

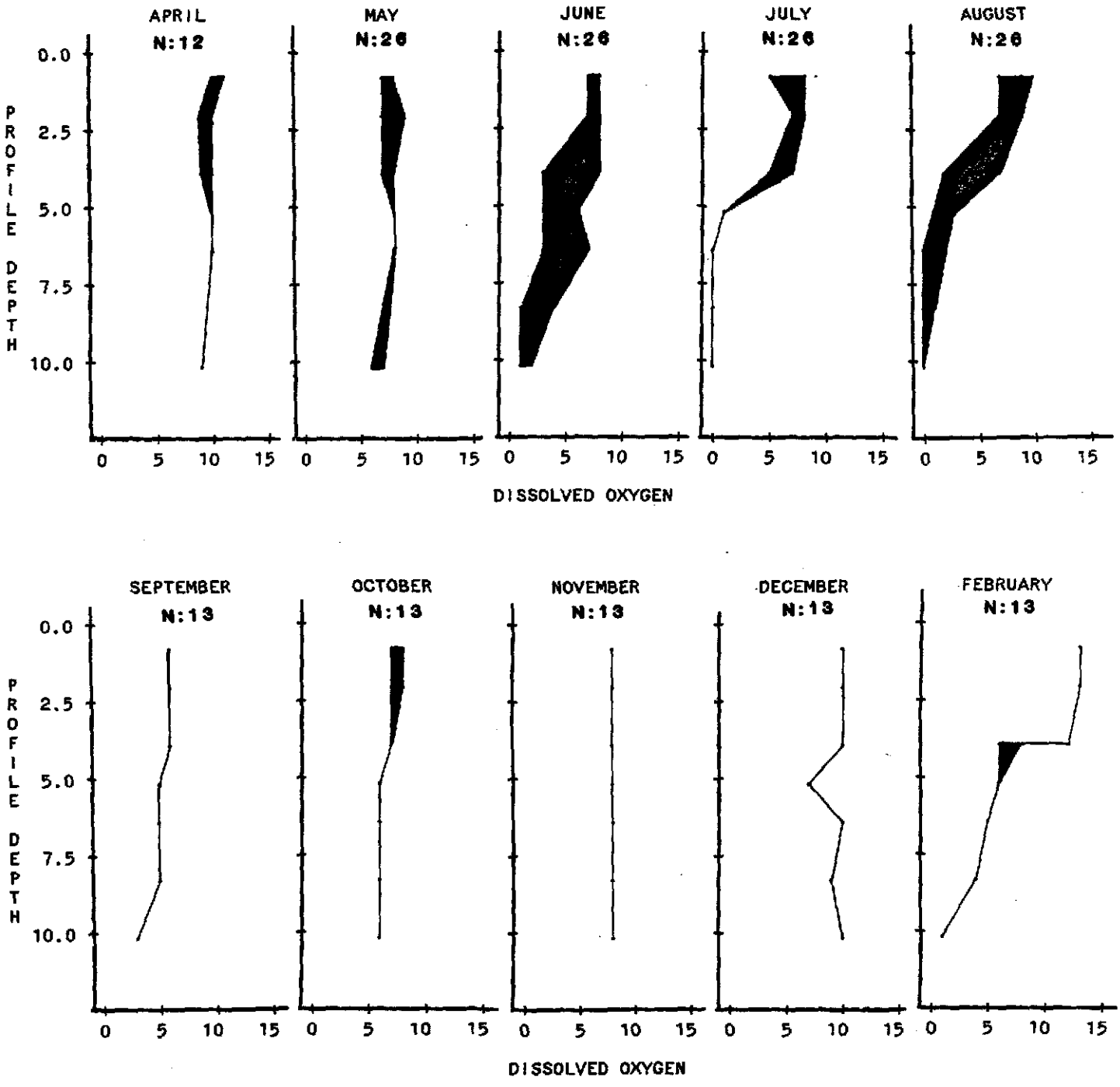


Figure G10.

RATIO OF TOTAL SOLUBLE INORGANIC NITROGEN TO ORTHO-PHOSPHORUS. NITROGEN TO PHOSPHORUS RATIOS GREATER THAN 10 ARE CONSIDERED TO BE PHOSPHORUS LIMITED.