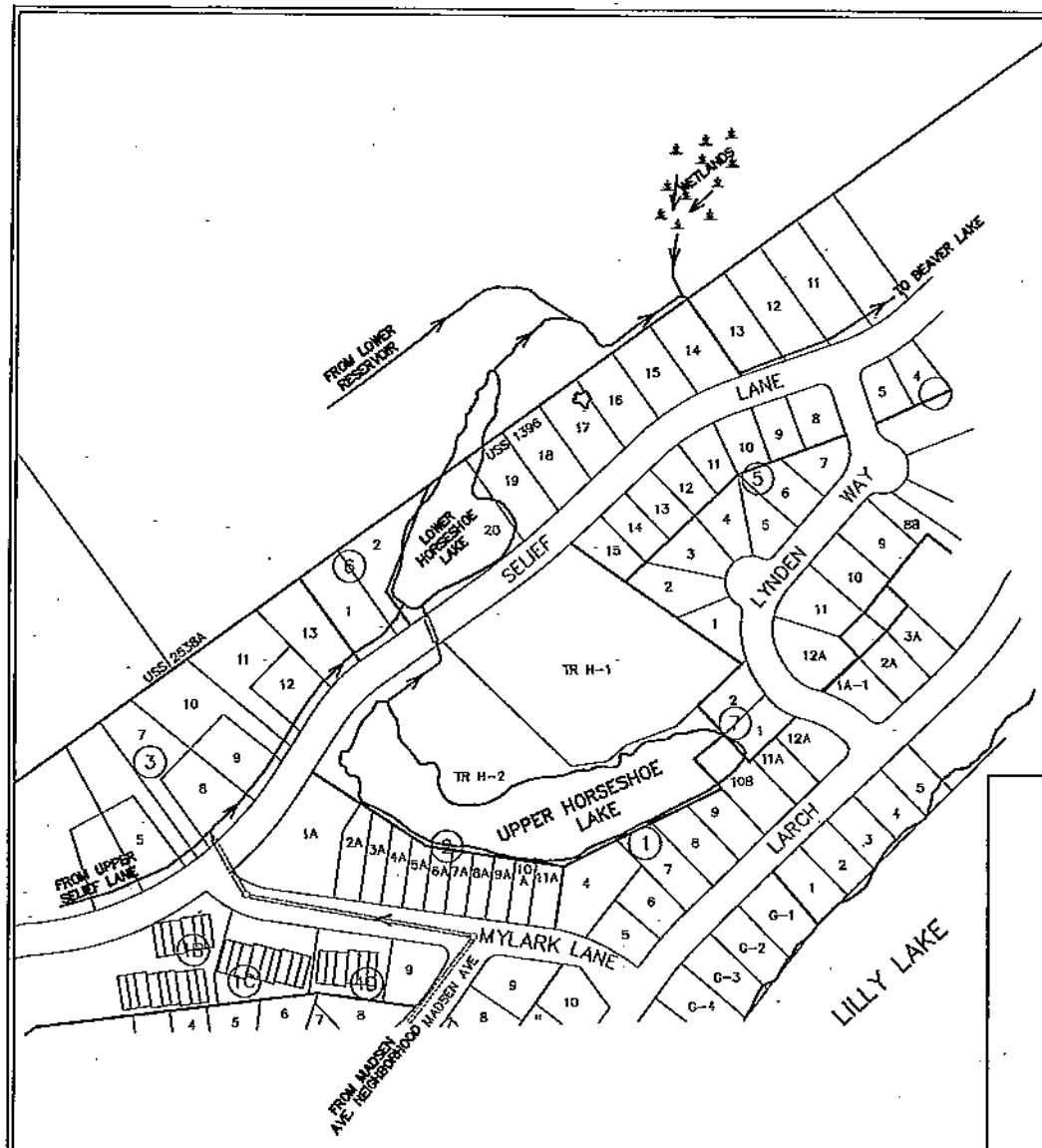


FIGURE 3-2A
HORSESHOE LAKES

UPPER HORSESHOE LAKE

LAKE AREA = 2.2 acres (0.98 hectares)
LAKE VOLUME = 4.4 acre-feet (5400 m^3)
MEAN DEPTH 2.0 feet (0.6 meters)
CONTOUR INTERVAL = N/A

LOWER HORSESHOE LAKE

LAKE AREA = 1.0 acres (0.4 hectares)
LAKE VOLUME = 1.5 acre-feet (1850 m^3)
MEAN DEPTH 1.5 feet (0.5 meters)
CONTOUR INTERVAL = N/A

NOTE: THE VOLUME IS BASED ON AN ESTIMATE OF AVERAGE DEPTH FROM SOUNDINGS RELATED TO LIMNOLOGICAL SAMPLING.

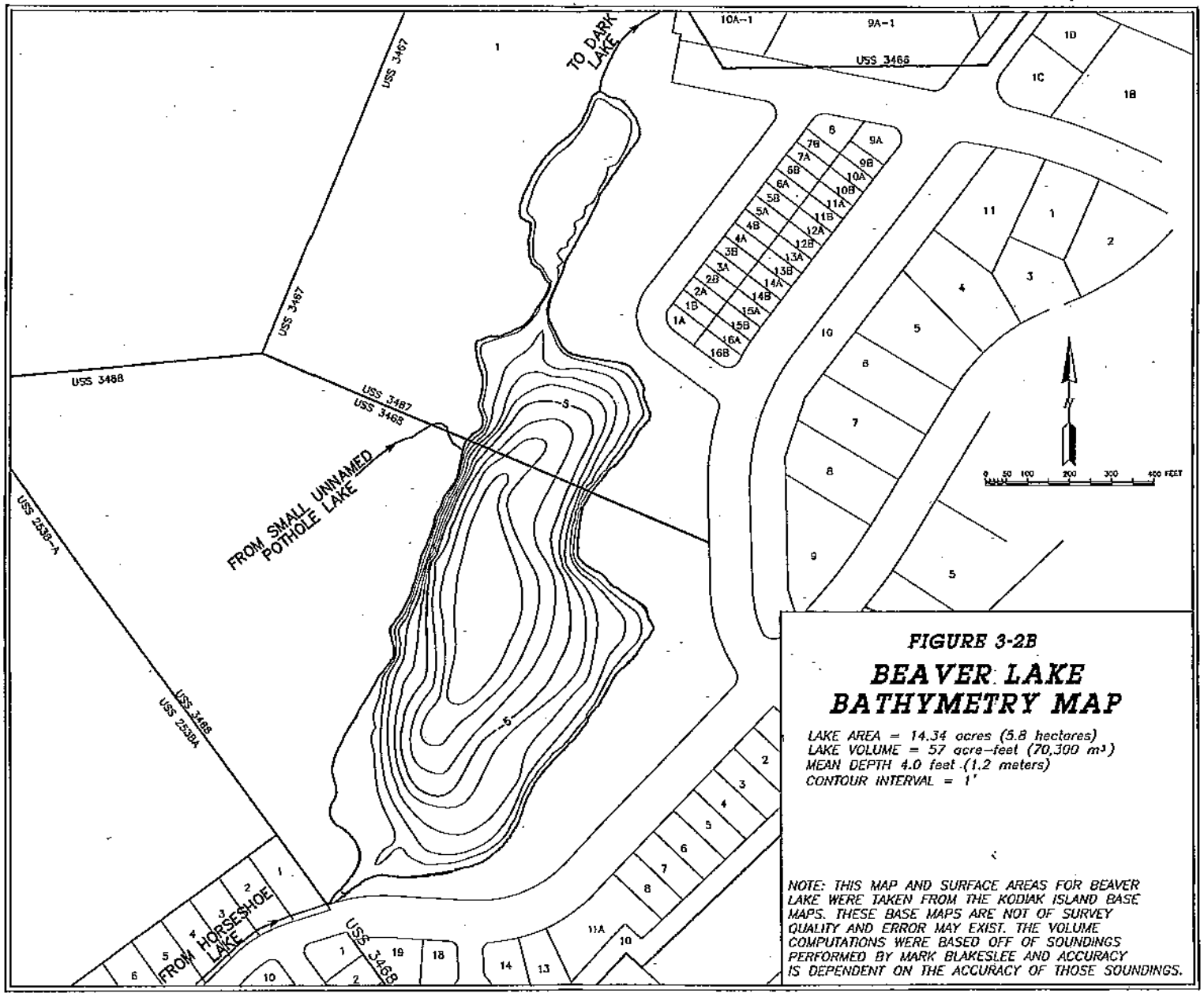


FIGURE 3-2B

BEAVER LAKE BATHYMETRY MAP

LAKE AREA = 14.34 acres (5.8 hectares)
LAKE VOLUME = 57 acre-feet (70,300 m³)
MEAN DEPTH 4.0 feet (1.2 meters)
CONTOUR INTERVAL = 1'

NOTE: THIS MAP AND SURFACE AREAS FOR BEAVER LAKE WERE TAKEN FROM THE KODIAK ISLAND BASE MAPS. THESE BASE MAPS ARE NOT OF SURVEY QUALITY AND ERROR MAY EXIST. THE VOLUME COMPUTATIONS WERE BASED OFF OF SOUNDINGS PERFORMED BY MARK BLAKESLEE AND ACCURACY IS DEPENDENT ON THE ACCURACY OF THOSE SOUNDINGS.

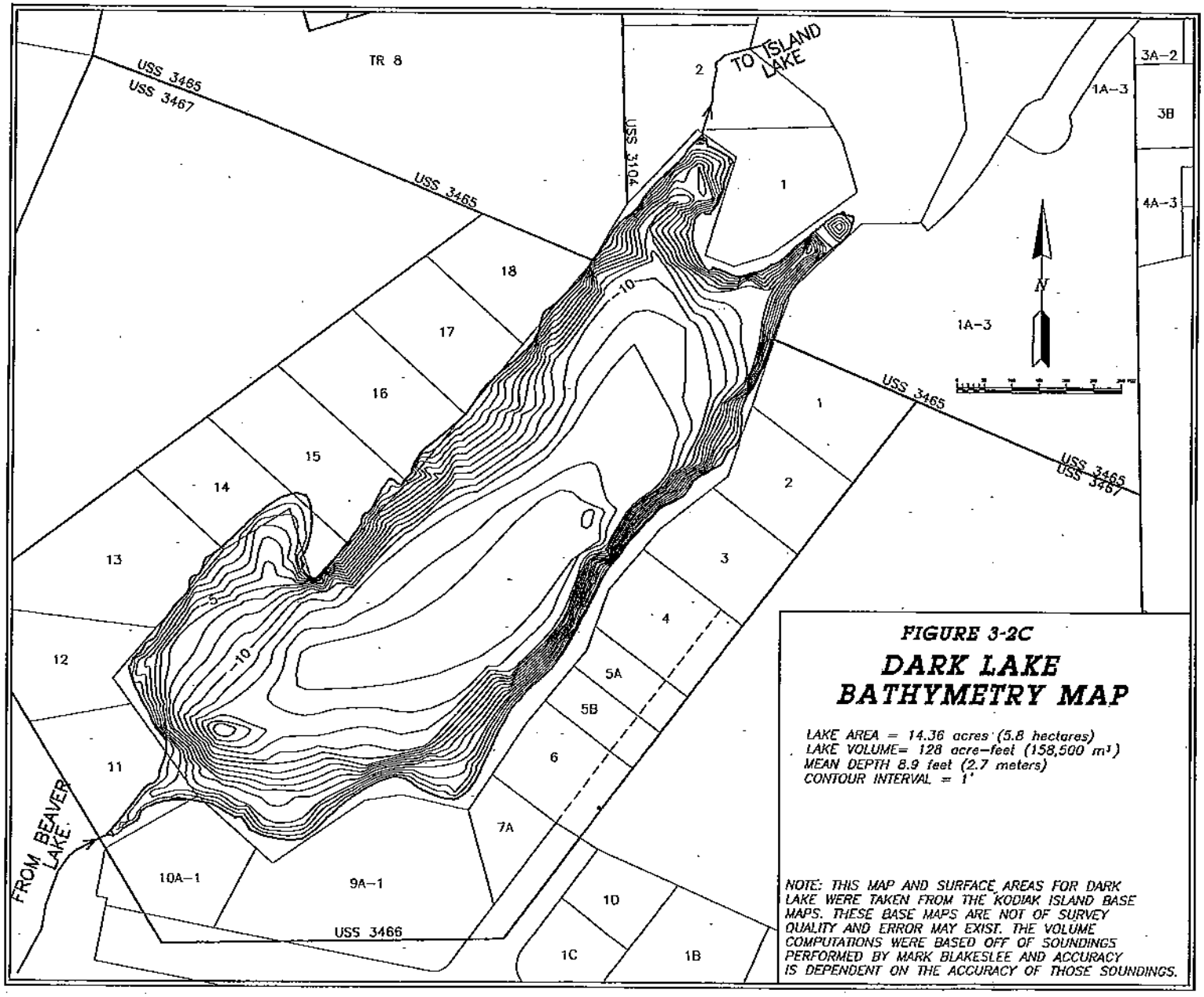


FIGURE 3-2C

DARK LAKE BATHYMETRY MAP

LAKE AREA = 14.36 acres (5.8 hectares)
LAKE VOLUME= 128 acre-feet (158,500 m^3)
MEAN DEPTH 8.9 feet (2.7 meters)
CONTOUR INTERVAL = 1'

NOTE: THIS MAP AND SURFACE AREAS FOR DARK LAKE WERE TAKEN FROM THE KODIAK ISLAND BASE MAPS. THESE BASE MAPS ARE NOT OF SURVEY QUALITY AND ERROR MAY EXIST. THE VOLUME COMPUTATIONS WERE BASED OFF OF SOUNDINGS PERFORMED BY MARK BLAKESLEE AND ACCURACY IS DEPENDENT ON THE ACCURACY OF THOSE SOUNDINGS.

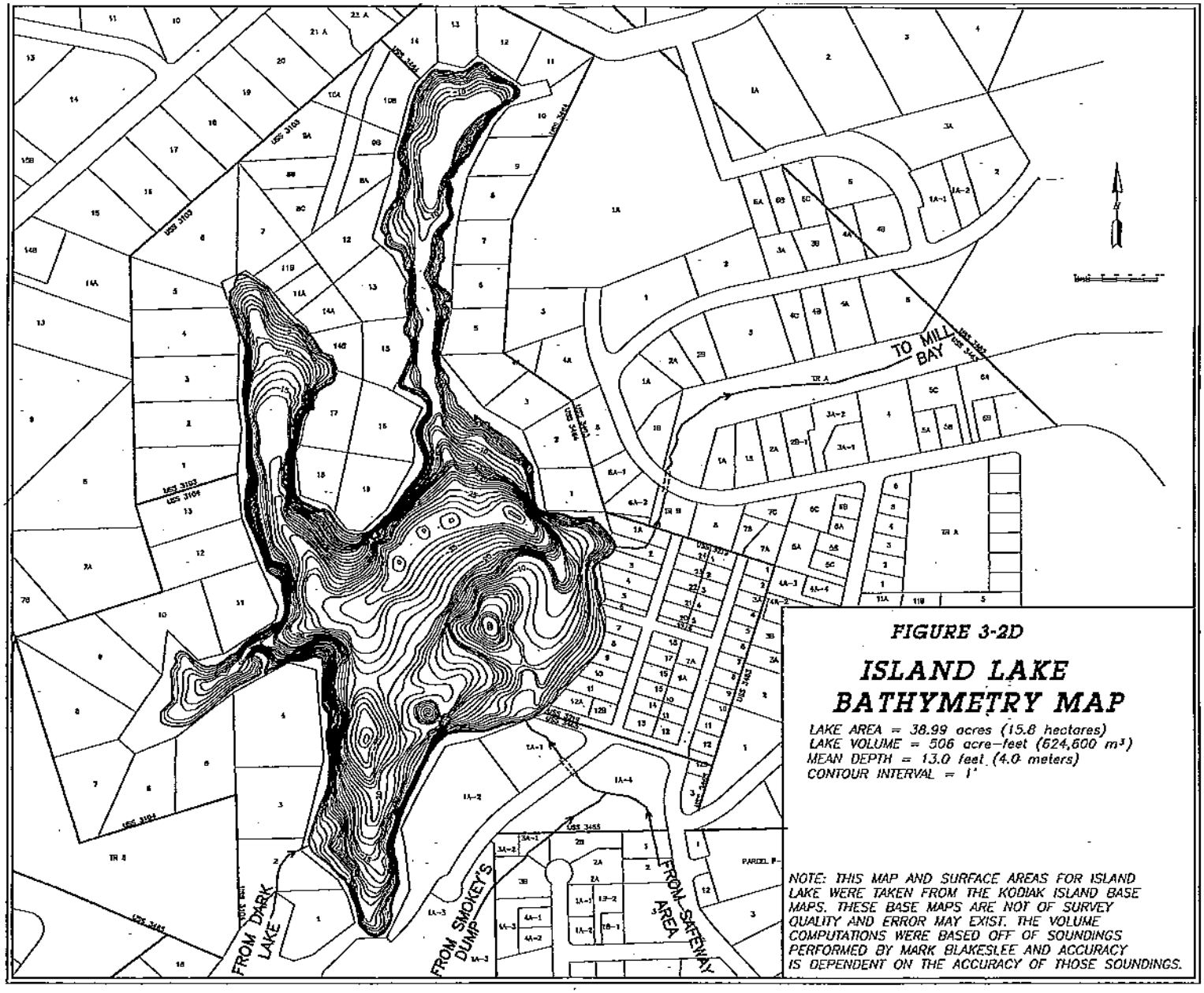


FIGURE 3-2D

ISLAND LAKE BATHYMETRY MAP

LAKE AREA = 38.99 acres (15.8 hectares)
LAKE VOLUME = 506 acre-feet (624,600 m³)
MEAN DEPTH = 13.0 feet (4.0 meters)
CONTOUR INTERVAL = 1'

NOTE: THIS MAP AND SURFACE AREAS FOR ISLAND LAKE WERE TAKEN FROM THE KODIAK ISLAND BASE MAPS. THESE BASE MAPS ARE NOT OF SURVEY QUALITY AND ERROR MAY EXIST. THE VOLUME COMPUTATIONS WERE BASED OFF OF SOUNDINGS PERFORMED BY MARK BLAKESLEE AND ACCURACY IS DEPENDENT ON THE ACCURACY OF THOSE SOUNDINGS.

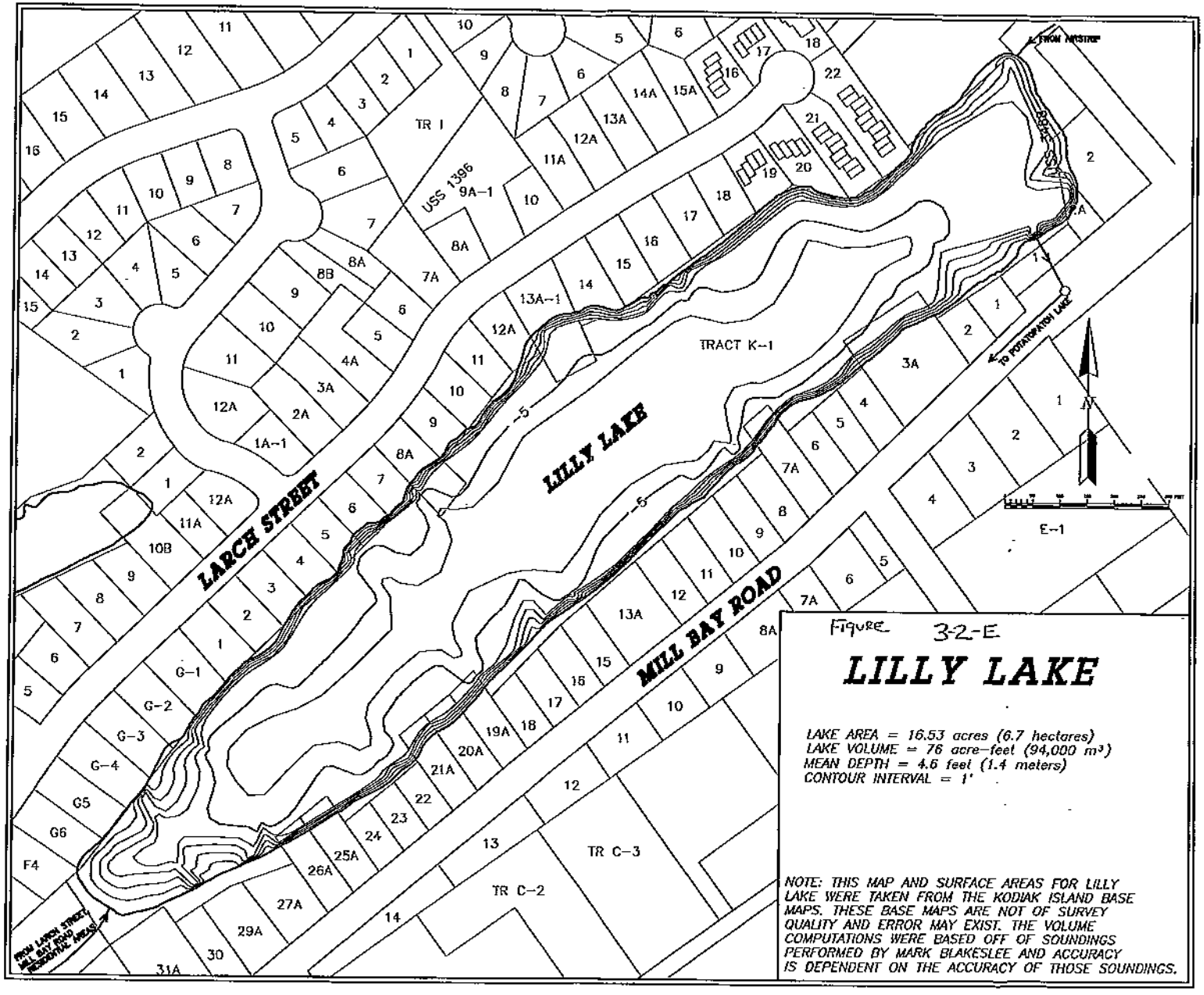


Figure 3-2-E

LILLY LAKE

LAKE AREA = 16.53 acres (6.7 hectares)
LAKE VOLUME = 76 acre-feet (94,000 m³)
MEAN DEPTH = 4.6 feet (1.4 meters)
CONTOUR INTERVAL = 1'

NOTE: THIS MAP AND SURFACE AREAS FOR LILLY LAKE WERE TAKEN FROM THE KODIAK ISLAND BASE MAPS. THESE BASE MAPS ARE NOT OF SURVEY QUALITY AND ERROR MAY EXIST. THE VOLUME COMPUTATIONS WERE BASED OFF OF SOUNDINGS PERFORMED BY MARK BLAKESLEE AND ACCURACY IS DEPENDENT ON THE ACCURACY OF THOSE SOUNDINGS.

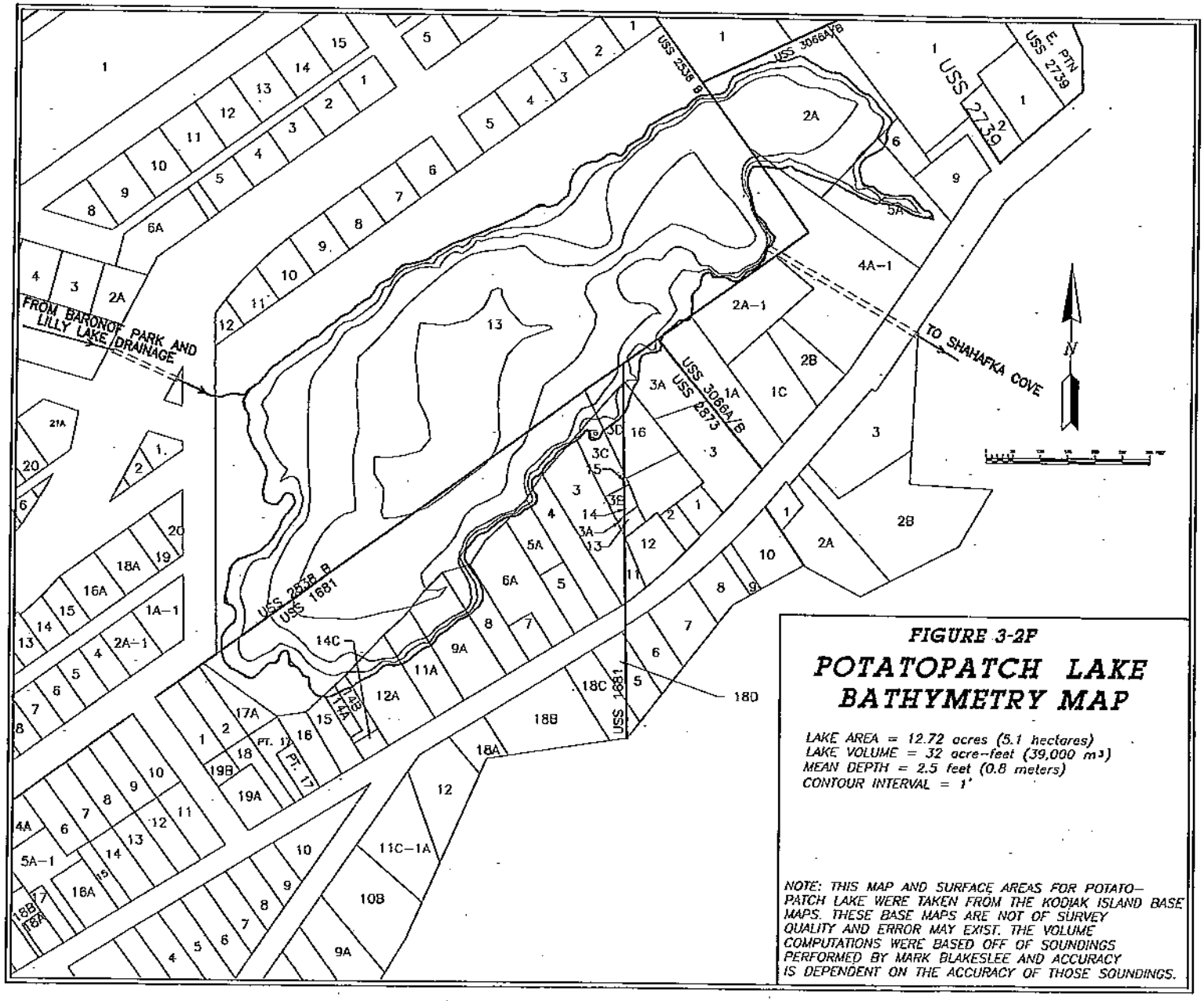


FIGURE 3-2P

POTATOPATCH LAKE BATHYMETRY MAP

LAKE AREA = 12.72 acres (5.1 hectares)
LAKE VOLUME = 32 acre-feet (39,000 m³)
MEAN DEPTH = 2.5 feet (0.8 meters)
CONTOUR INTERVAL = 1'

NOTE: THIS MAP AND SURFACE AREAS FOR POTATO-PATCH LAKE WERE TAKEN FROM THE KODIAK ISLAND BASE MAPS. THESE BASE MAPS ARE NOT OF SURVEY QUALITY AND ERROR MAY EXIST. THE VOLUME COMPUTATIONS WERE BASED OFF OF SOUNDINGS PERFORMED BY MARK BLAKESLEE AND ACCURACY IS DEPENDENT ON THE ACCURACY OF THOSE SOUNDINGS.

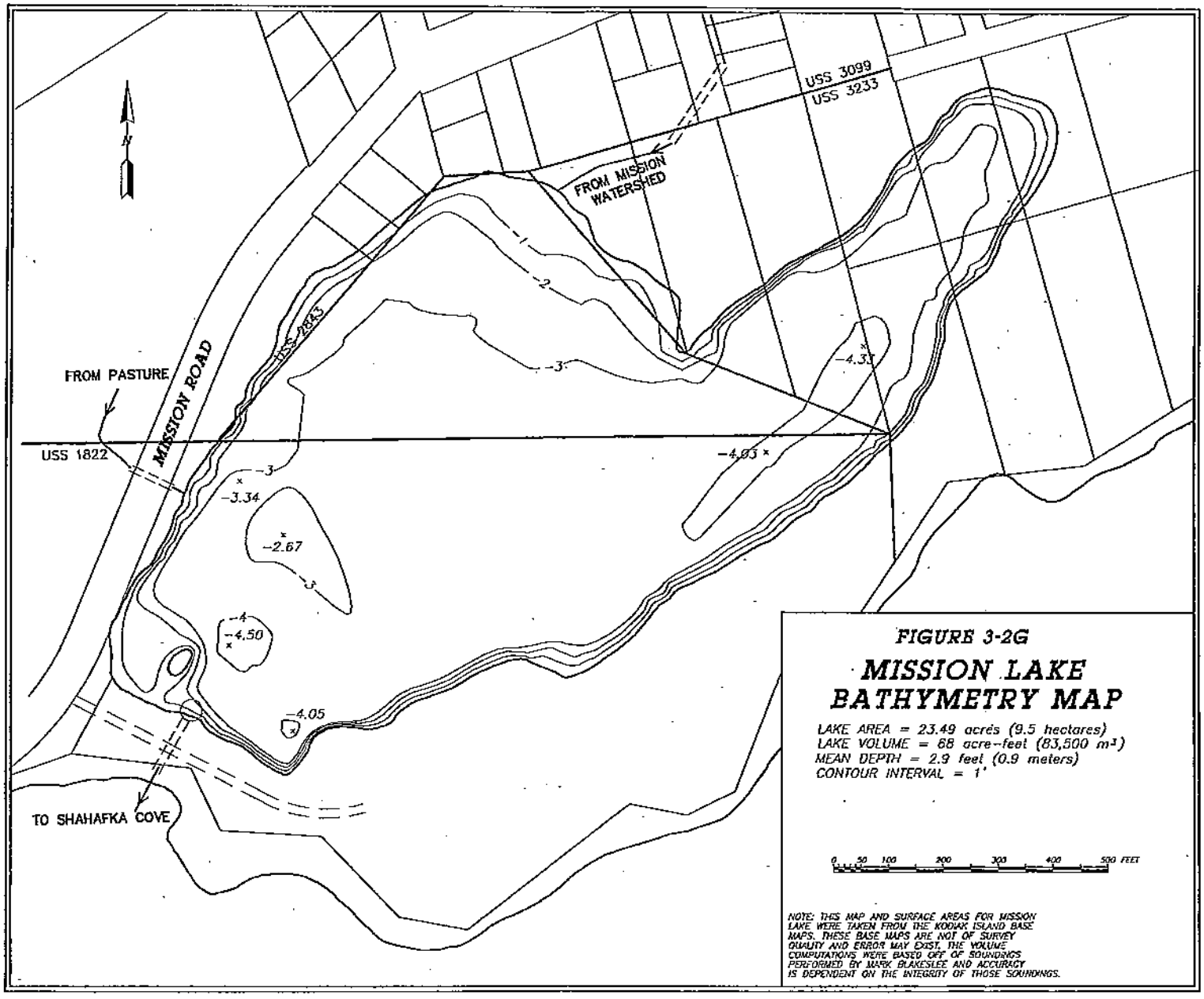
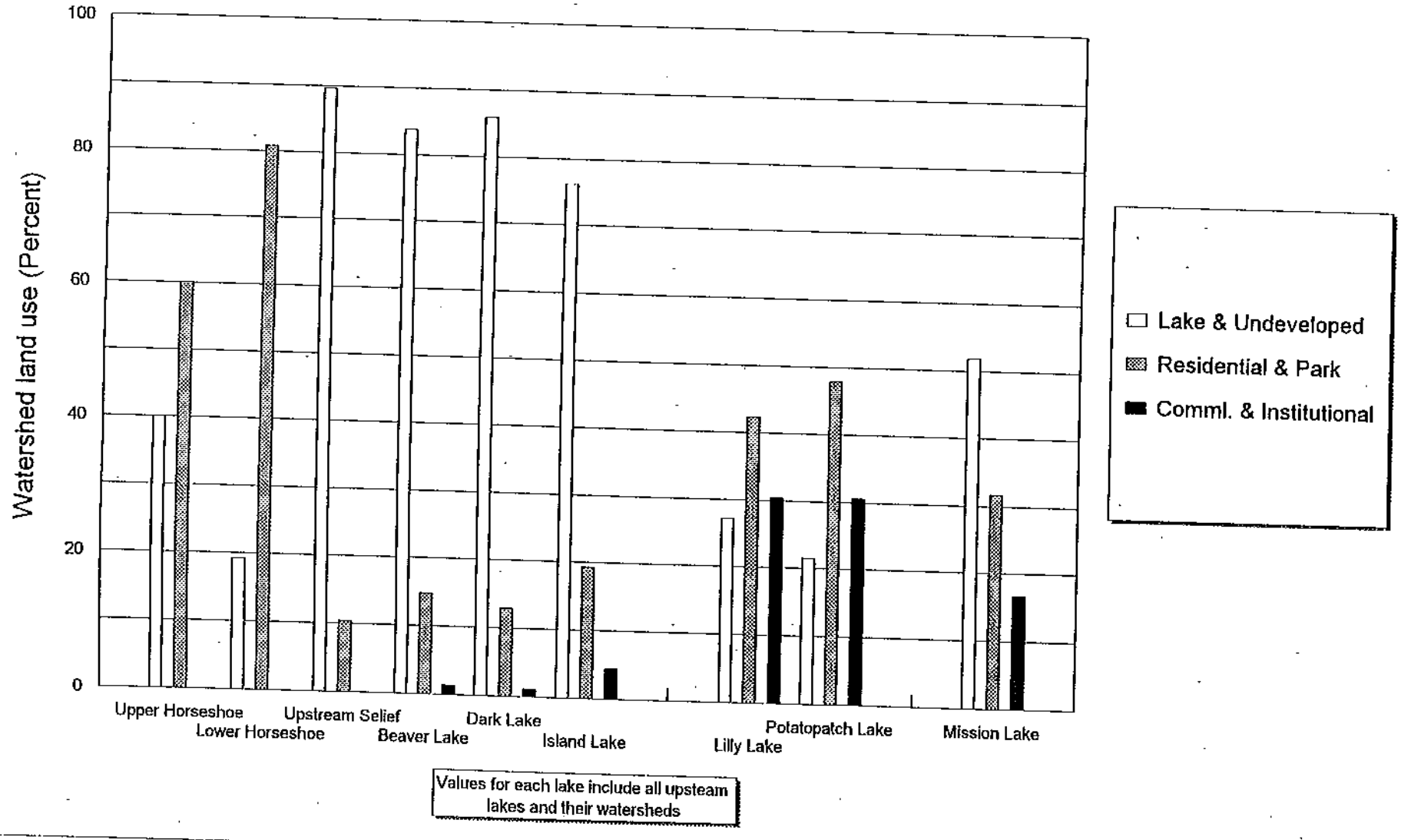

N
USS 3099
USS 3233
FROM MISSION WATERSHED
USS 2845
FROM PASTURE
MISSION ROAD
USS 1822
-1
-2
-3
-4.33
-4.03
-3
-3.34
-2.67
-3
-4
-4.50
-4.05
TO SHAHAFKA COVE
FIGURE 3-2G
MISSION LAKE
BATHYMETRY MAP
LAKE AREA = 23.49 acres (9.5 hectares)
LAKE VOLUME = 68 acre-feet (83,500 m³)
MEAN DEPTH = 2.9 feet (0.9 meters)
CONTOUR INTERVAL = 1'
0 50 100 200 300 400 500 FEET
NOTE: THIS MAP AND SURFACE AREAS FOR MISSION LAKE WERE TAKEN FROM THE KODIAK ISLAND BASE MAPS. THESE BASE MAPS ARE NOT OF SURVEY QUALITY AND ERROR MAY EXIST. THE VOLUME COMPUTATIONS WERE BASED OFF OF SOUNDINGS PERFORMED BY MARK BLAKESLEE AND ACCURACY IS DEPENDENT ON THE INTEGRITY OF THOSE SOUNDINGS.

Figure 4-1: Upstream Watershed Land Use

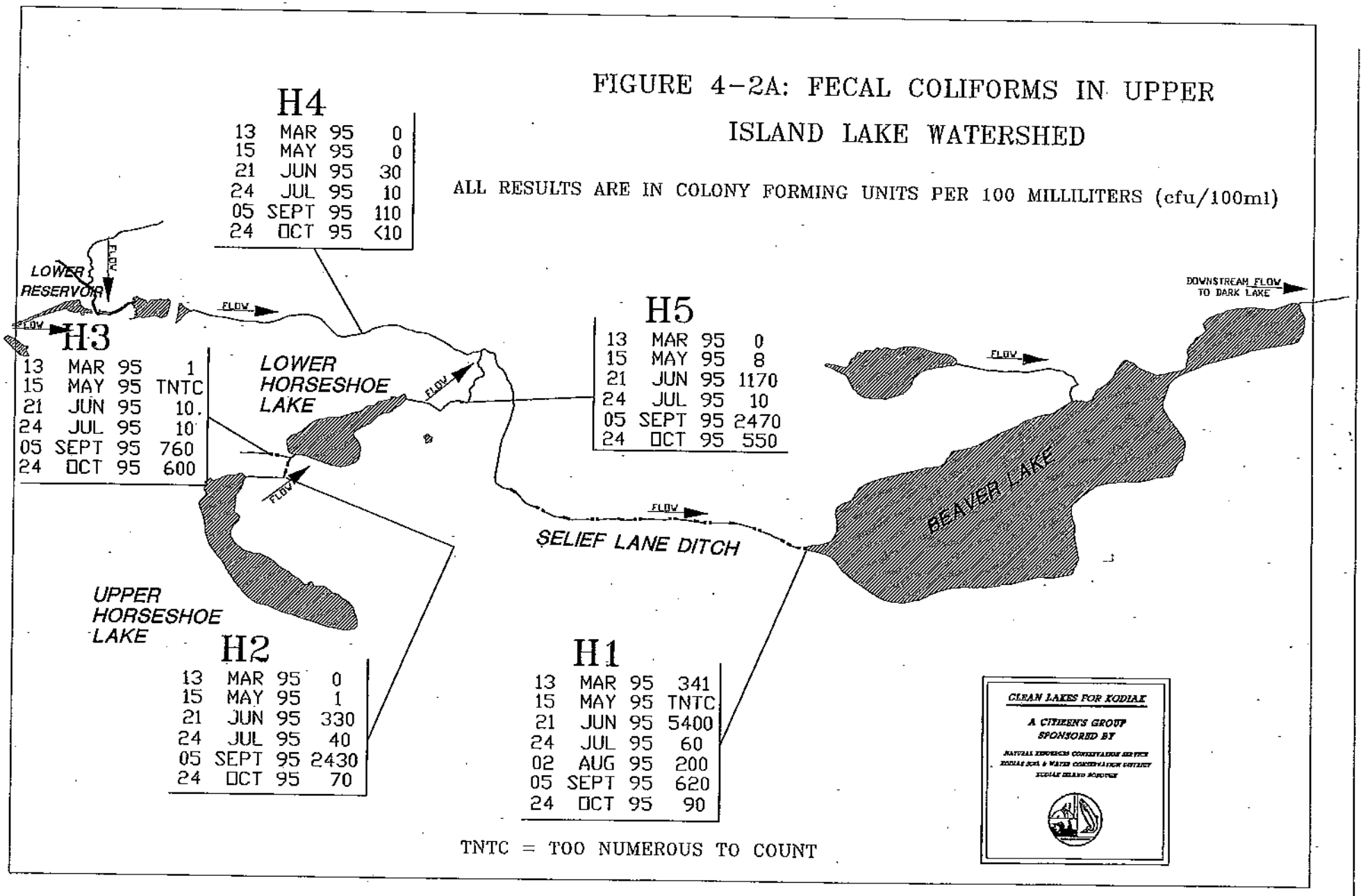
Relative area percentage



Values for each lake include all upsteam lakes and their watersheds

FIGURE 4-2A: FECAL COLIFORMS IN UPPER ISLAND LAKE WATERSHED

ALL RESULTS ARE IN COLONY FORMING UNITS PER 100 MILLILITERS (cfu/100ml)



TNTC = TOO NUMEROUS TO COUNT

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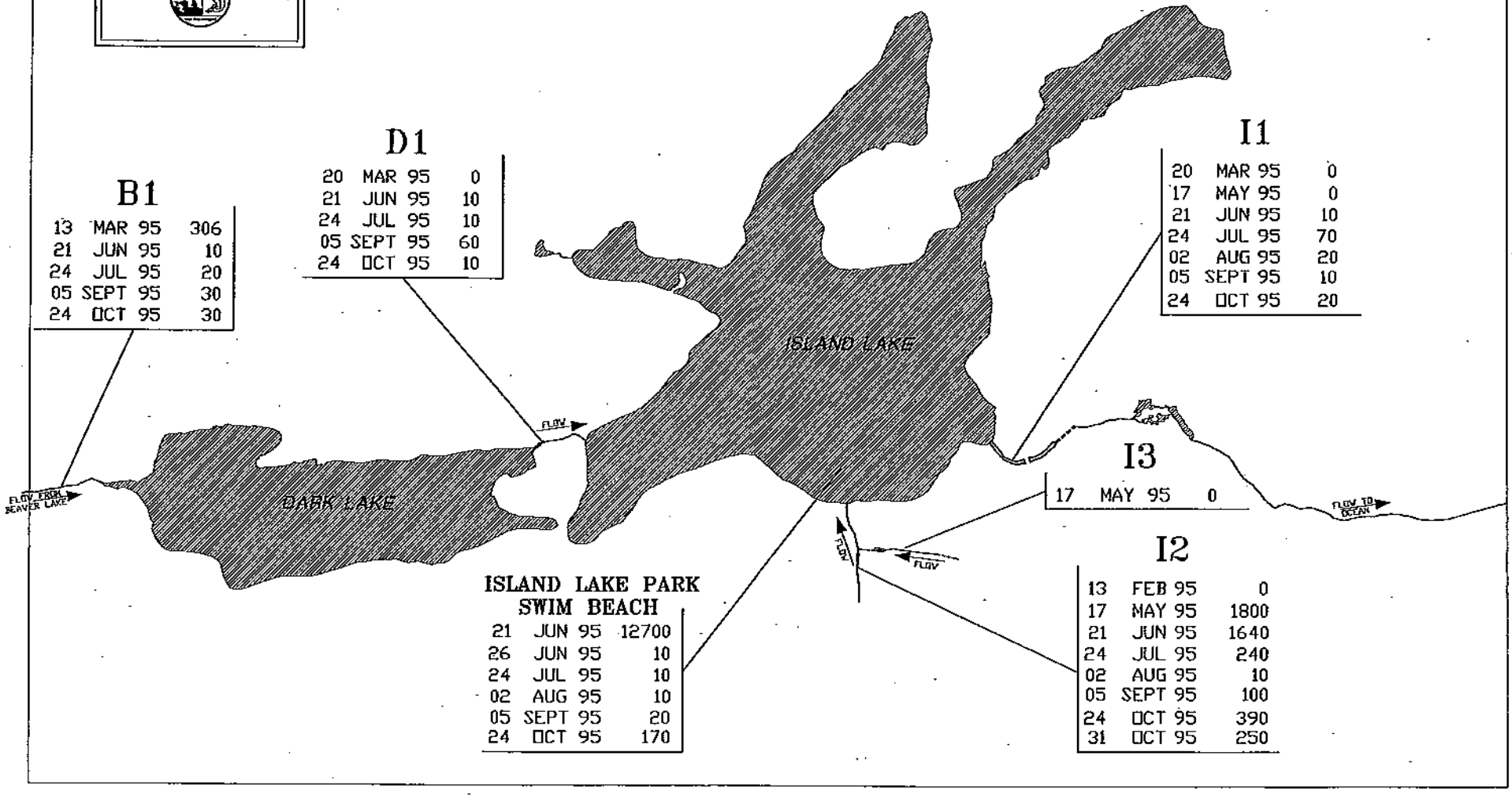
FIGURE 4-2B: FECAL COLIFORMS IN LOWER ISLAND LAKE WATERSHED

ALL RESULTS ARE IN COLONY FORMING UNITS PER 100 MILLILITERS (cfu/100ml)



B1

13	MAR 95	306
21	JUN 95	10
24	JUL 95	20
05	SEPT 95	30
24	OCT 95	30

D1

20	MAR 95	0
21	JUN 95	10
24	JUL 95	10
05	SEPT 95	60
24	OCT 95	10

I1

20	MAR 95	0
17	MAY 95	0
21	JUN 95	10
24	JUL 95	70
02	AUG 95	20
05	SEPT 95	10
24	OCT 95	20

I3

17	MAY 95	0

ISLAND LAKE PARK SWIM BEACH

21	JUN 95	12700
26	JUN 95	10
24	JUL 95	10
02	AUG 95	10
05	SEPT 95	20
24	OCT 95	170

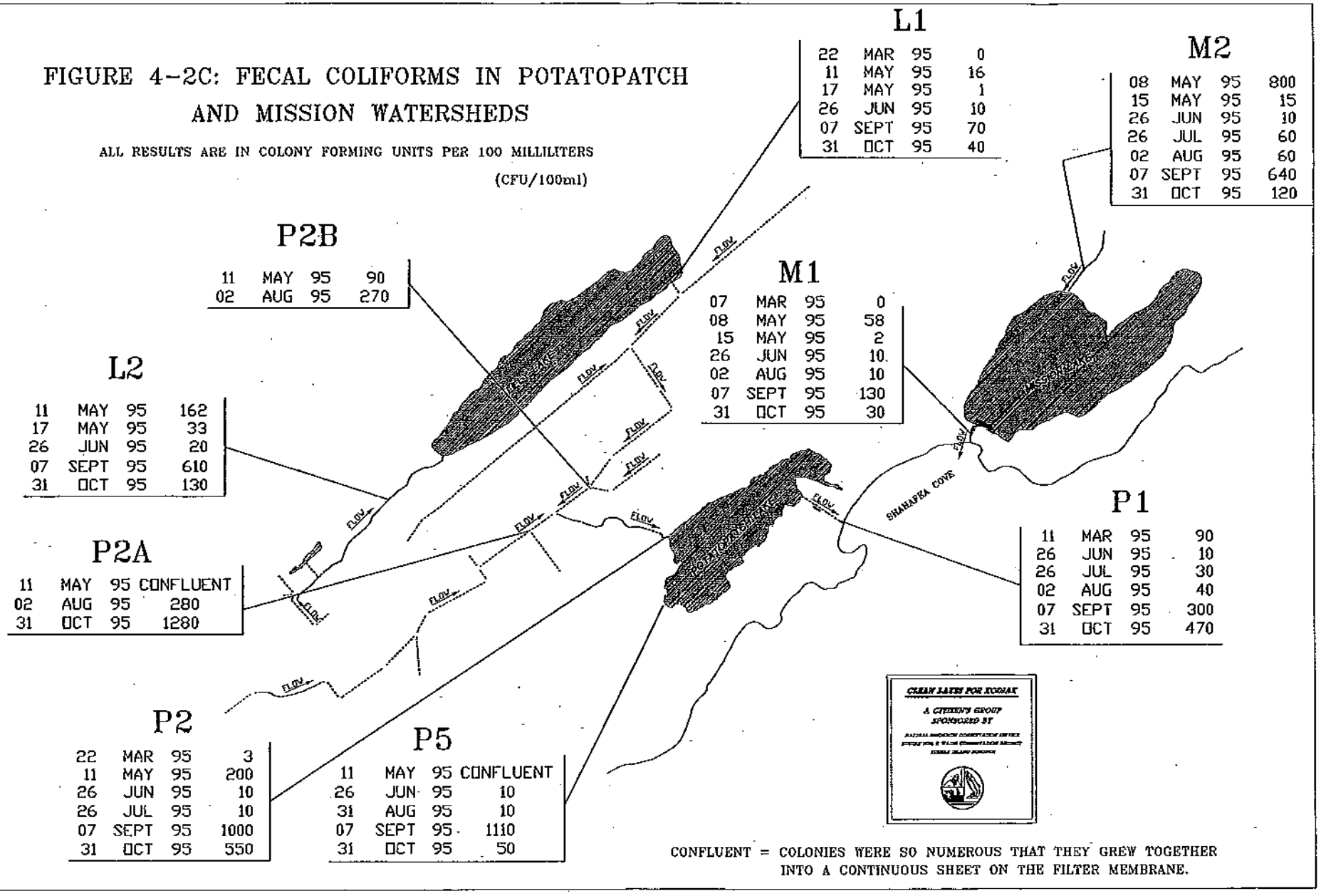
I2

13	FEB 95	0
17	MAY 95	1800
21	JUN 95	1640
24	JUL 95	240
02	AUG 95	10
05	SEPT 95	100
24	OCT 95	390
31	OCT 95	250

FIGURE 4-2C: FECAL COLIFORMS IN POTATOPATCH AND MISSION WATERSHEDS

ALL RESULTS ARE IN COLONY FORMING UNITS PER 100 MILLILITERS

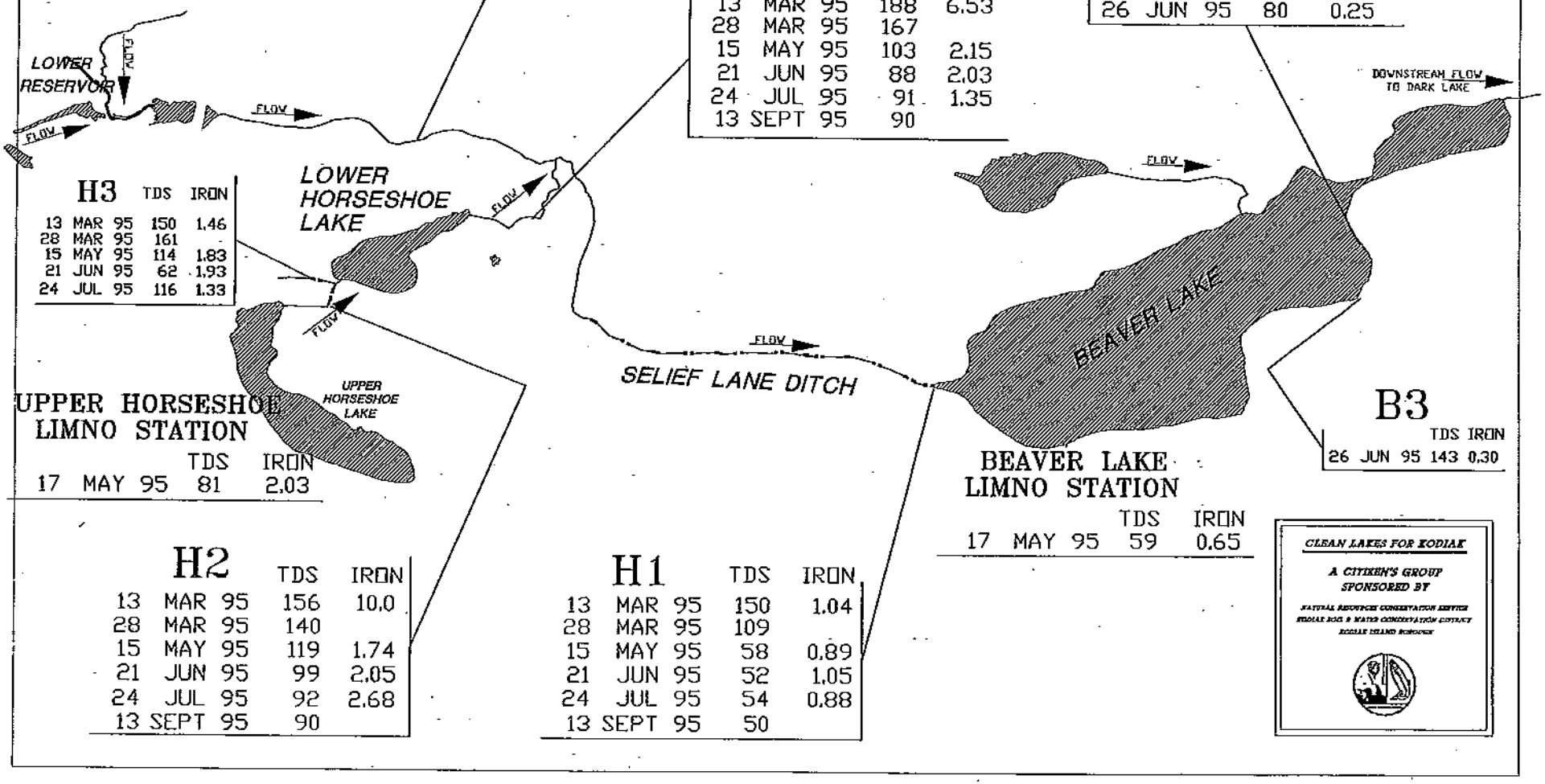
(CFU/100ml)



CONFLUENT = COLONIES WERE SO NUMEROUS THAT THEY GREW TOGETHER INTO A CONTINUOUS SHEET ON THE FILTER MEMBRANE.

FIGURE 4-3A: TOTAL DISSOLVED SOLIDS AND TOTAL IRON IN UPPER ISLAND LAKE WATERSHED

ALL RESULTS ARE IN mg/liter



LOWER HORSESHOE LIMNO STATION

	TDS	IRON
17 MAY 95	112	1.66

H4

	TDS	IRON
13 MAR 95	45	0.34
28 MAR 95	80	
15 MAY 95	50	0.61
21 JUN 95	45	0.72
24 JUL 95	46	0.45
13 SEPT 95	40	

H5

	TDS	IRON
13 MAR 95	188	6.53
28 MAR 95	167	
15 MAY 95	103	2.15
21 JUN 95	88	2.03
24 JUL 95	91	1.35
13 SEPT 95	90	

B2

	TDS	IRON
26 JUN 95	80	0.25

H3

	TDS	IRON
13 MAR 95	150	1.46
28 MAR 95	161	
15 MAY 95	114	1.83
21 JUN 95	62	1.93
24 JUL 95	116	1.33

UPPER HORSESHOE LIMNO STATION

	TDS	IRON
17 MAY 95	81	2.03

BEAVER LAKE LIMNO STATION

	TDS	IRON
17 MAY 95	59	0.65

B3

	TDS	IRON
26 JUN 95	143	0.30

H2

	TDS	IRON
13 MAR 95	156	10.0
28 MAR 95	140	
15 MAY 95	119	1.74
21 JUN 95	99	2.05
24 JUL 95	92	2.68
13 SEPT 95	90	

H1

	TDS	IRON
13 MAR 95	150	1.04
28 MAR 95	109	
15 MAY 95	58	0.89
21 JUN 95	52	1.05
24 JUL 95	54	0.88
13 SEPT 95	50	

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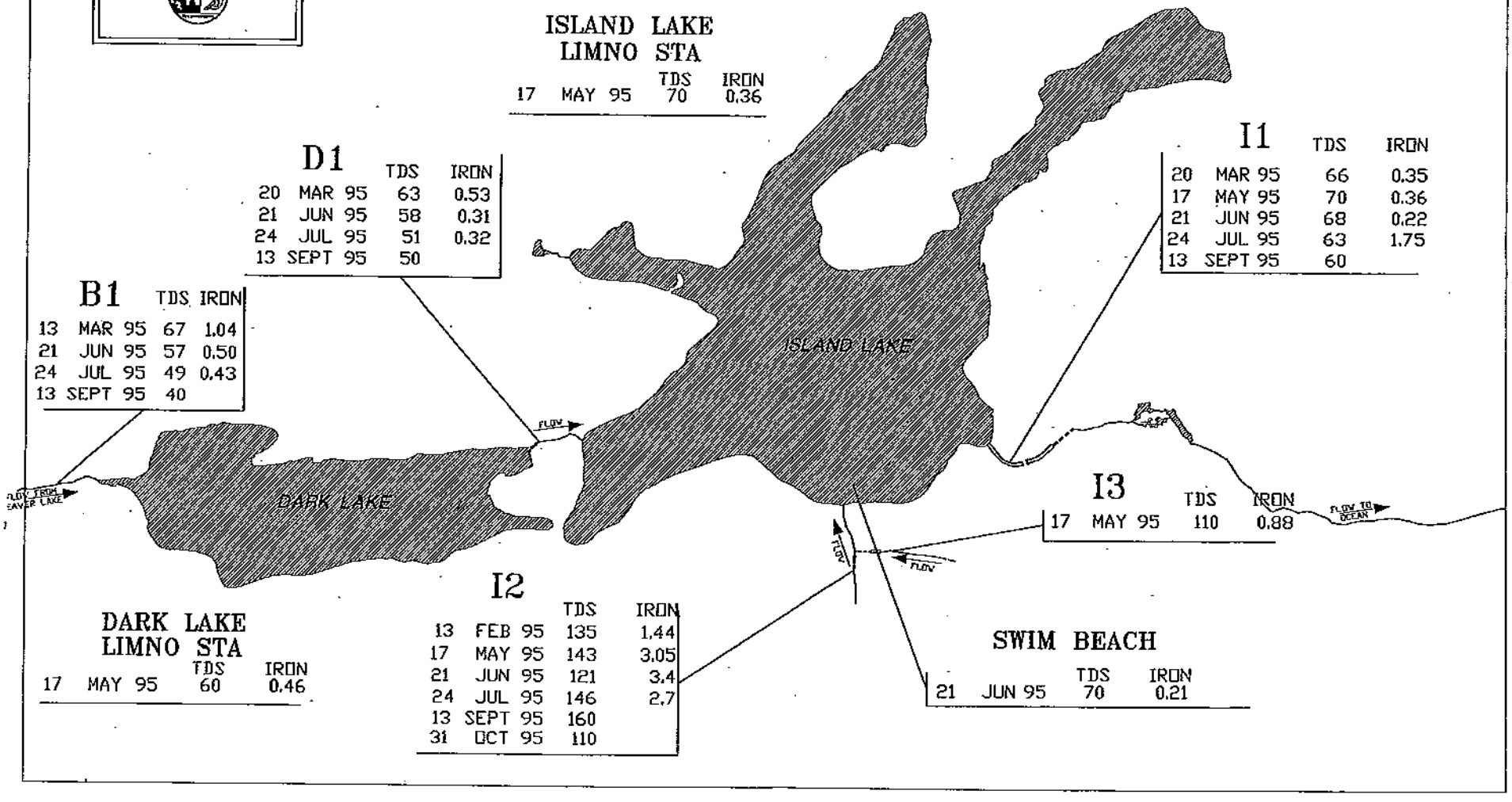
FIGURE 4-3B: TOTAL DISSOLVED SOLIDS AND TOTAL IRON IN LOWER ISLAND LAKE WATERSHED

ALL RESULTS ARE IN mg/liter



ISLAND LAKE LIMNO STA

			TDS	IRON
17	MAY	95	70	0.36

D1

			TDS	IRON
20	MAR	95	63	0.53
21	JUN	95	58	0.31
24	JUL	95	51	0.32
13	SEPT	95	50	

I1

			TDS	IRON
20	MAR	95	66	0.35
17	MAY	95	70	0.36
21	JUN	95	68	0.22
24	JUL	95	63	1.75
13	SEPT	95	60	

B1

			TDS	IRON
13	MAR	95	67	1.04
21	JUN	95	57	0.50
24	JUL	95	49	0.43
13	SEPT	95	40	

I3

			TDS	IRON
17	MAY	95	110	0.88

I2

			TDS	IRON
13	FEB	95	135	1.44
17	MAY	95	143	3.05
21	JUN	95	121	3.4
24	JUL	95	146	2.7
13	SEPT	95	160	
31	OCT	95	110	

DARK LAKE LIMNO STA

			TDS	IRON
17	MAY	95	60	0.46

SWIM BEACH

			TDS	IRON
21	JUN	95	70	0.21

FIGURE 4-3C: TOTAL DISSOLVED SOLIDS AND TOTAL IRON IN POTATOPATCH AND MISSION WATERSHEDS

ALL RESULTS ARE IN mg/liter

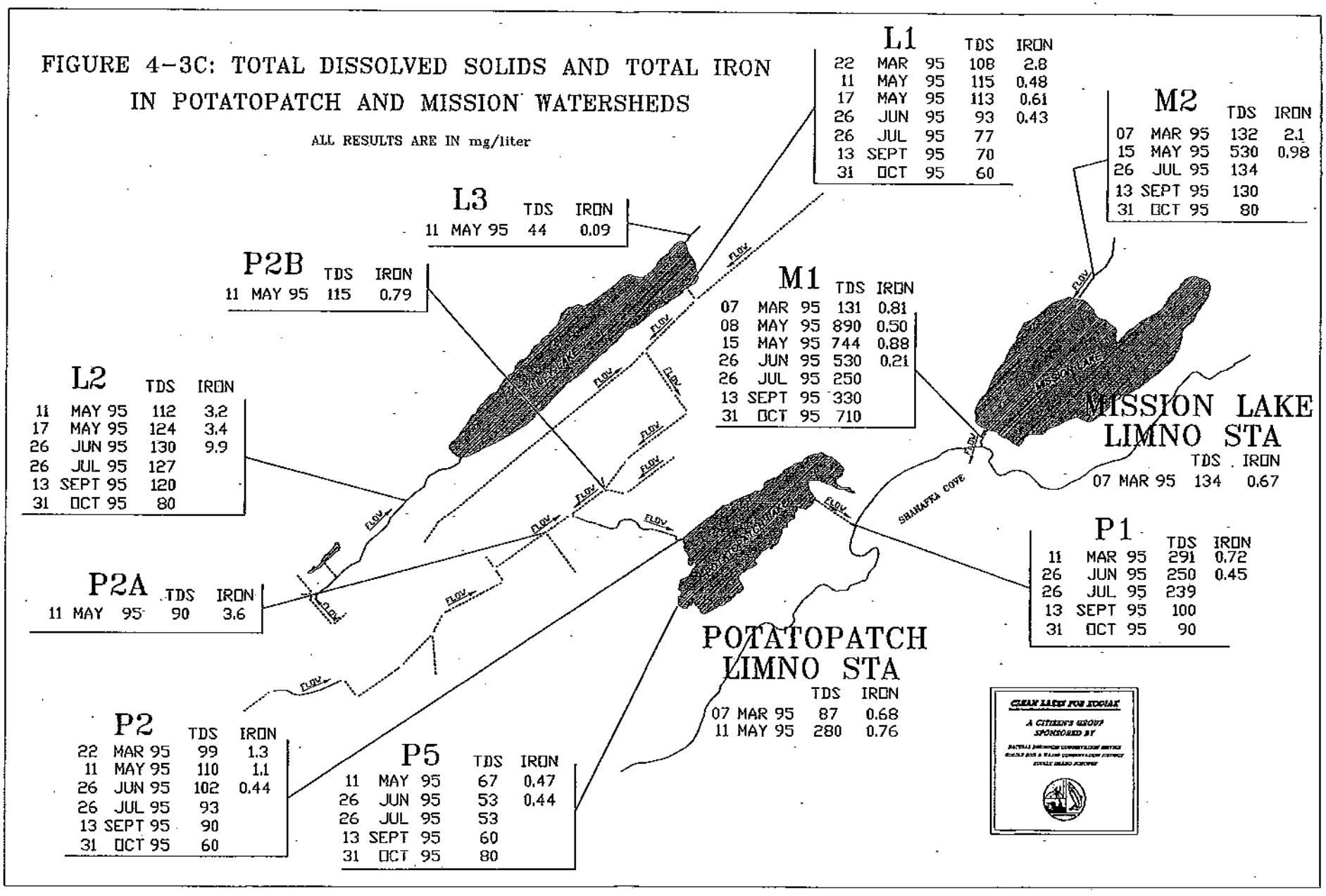
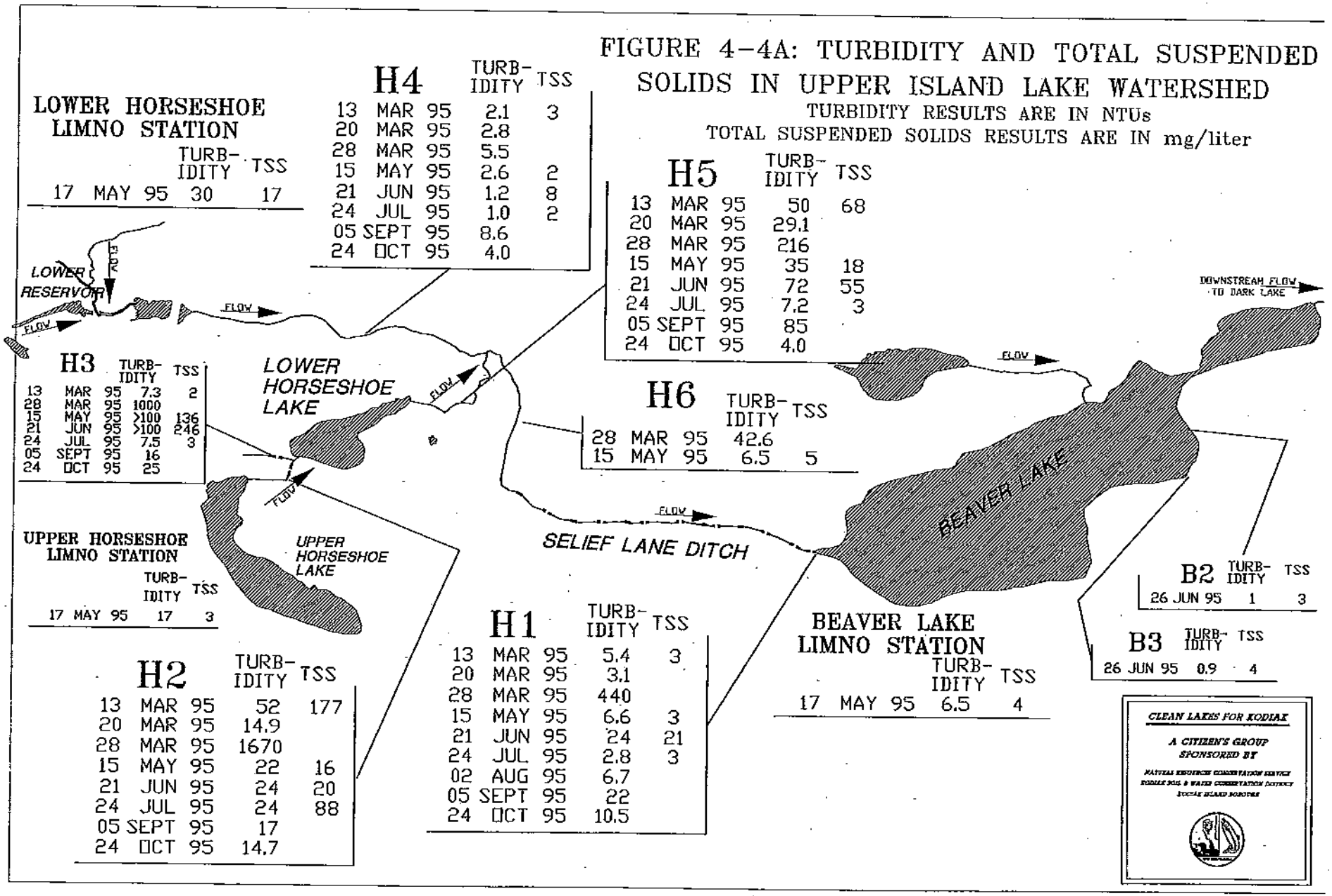


FIGURE 4-4A: TURBIDITY AND TOTAL SUSPENDED SOLIDS IN UPPER ISLAND LAKE WATERSHED

TURBIDITY RESULTS ARE IN NTUs

TOTAL SUSPENDED SOLIDS RESULTS ARE IN mg/liter



LOWER HORSESHOE LIMNO STATION

			TURB-IDITY	TSS
17	MAY	95	30	17

H4

			TURB-IDITY	TSS
13	MAR	95	2.1	3
20	MAR	95	2.8	
28	MAR	95	5.5	
15	MAY	95	2.6	2
21	JUN	95	1.2	8
24	JUL	95	1.0	2
05	SEPT	95	8.6	
24	OCT	95	4.0	

H5

			TURB-IDITY	TSS
13	MAR	95	50	68
20	MAR	95	29.1	
28	MAR	95	216	
15	MAY	95	35	18
21	JUN	95	72	55
24	JUL	95	7.2	3
05	SEPT	95	85	
24	OCT	95	4.0	

H3

			TURB-IDITY	TSS
13	MAR	95	7.3	2
28	MAR	95	1000	
15	MAY	95	>100	136
21	JUN	95	>100	246
24	JUL	95	7.5	3
05	SEPT	95	16	
24	OCT	95	25	

H6

			TURB-IDITY	TSS
28	MAR	95	42.6	
15	MAY	95	6.5	5

UPPER HORSESHOE LIMNO STATION

			TURB-IDITY	TSS
17	MAY	95	17	3

H2

			TURB-IDITY	TSS
13	MAR	95	52	177
20	MAR	95	14.9	
28	MAR	95	1670	
15	MAY	95	22	16
21	JUN	95	24	20
24	JUL	95	24	88
05	SEPT	95	17	
24	OCT	95	14.7	

H1

			TURB-IDITY	TSS
13	MAR	95	5.4	3
20	MAR	95	3.1	
28	MAR	95	440	
15	MAY	95	6.6	3
21	JUN	95	24	21
24	JUL	95	2.8	3
02	AUG	95	6.7	
05	SEPT	95	22	
24	OCT	95	10.5	

BEAVER LAKE LIMNO STATION

			TURB-IDITY	TSS
17	MAY	95	6.5	4

B2

	TURB-IDITY	TSS
26 JUN 95	1	3

B3

	TURB-IDITY	TSS
26 JUN 95	0.9	4

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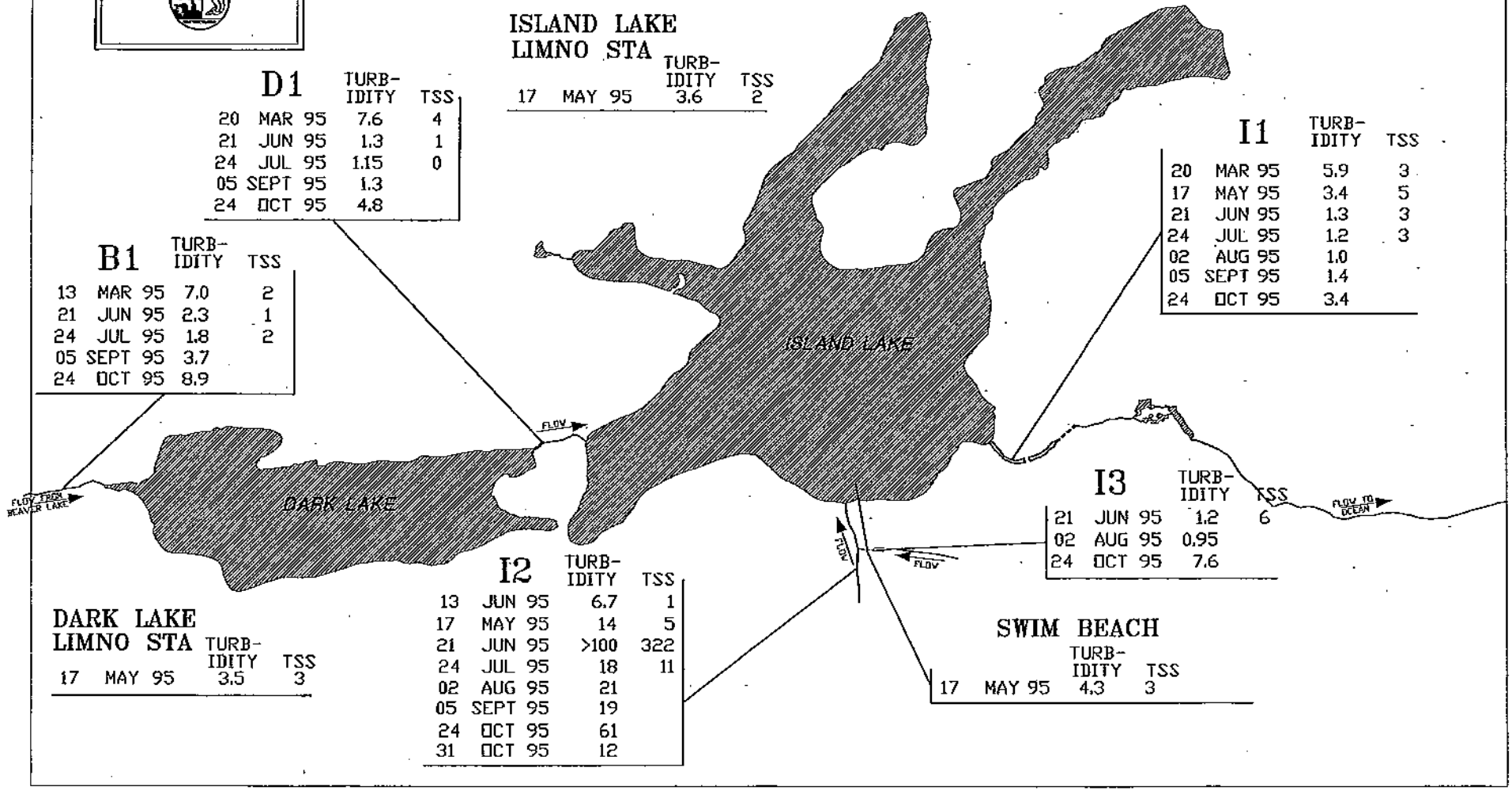
FIGURE 4-4B: TURBIDITY AND TOTAL SUSPENDED SOLIDS IN LOWER ISLAND LAKE WATERSHED

TURBIDITY RESULTS ARE IN NTUs
TOTAL SUSPENDED SOLIDS RESULTS ARE IN mg/liter



ISLAND LAKE LIMNO STA

		TURB-IDITY	TSS
17	MAY 95	3.6	2

D1

		TURB-IDITY	TSS
20	MAR 95	7.6	4
21	JUN 95	1.3	1
24	JUL 95	1.15	0
05	SEPT 95	1.3	
24	OCT 95	4.8	

B1

		TURB-IDITY	TSS
13	MAR 95	7.0	2
21	JUN 95	2.3	1
24	JUL 95	1.8	2
05	SEPT 95	3.7	
24	OCT 95	8.9	

I1

		TURB-IDITY	TSS
20	MAR 95	5.9	3
17	MAY 95	3.4	5
21	JUN 95	1.3	3
24	JUL 95	1.2	3
02	AUG 95	1.0	
05	SEPT 95	1.4	
24	OCT 95	3.4	

I3

		TURB-IDITY	TSS
21	JUN 95	1.2	6
02	AUG 95	0.95	
24	OCT 95	7.6	

I2

		TURB-IDITY	TSS
13	JUN 95	6.7	1
17	MAY 95	14	5
21	JUN 95	>100	322
24	JUL 95	18	11
02	AUG 95	21	
05	SEPT 95	19	
24	OCT 95	61	
31	OCT 95	12	

DARK LAKE LIMNO STA

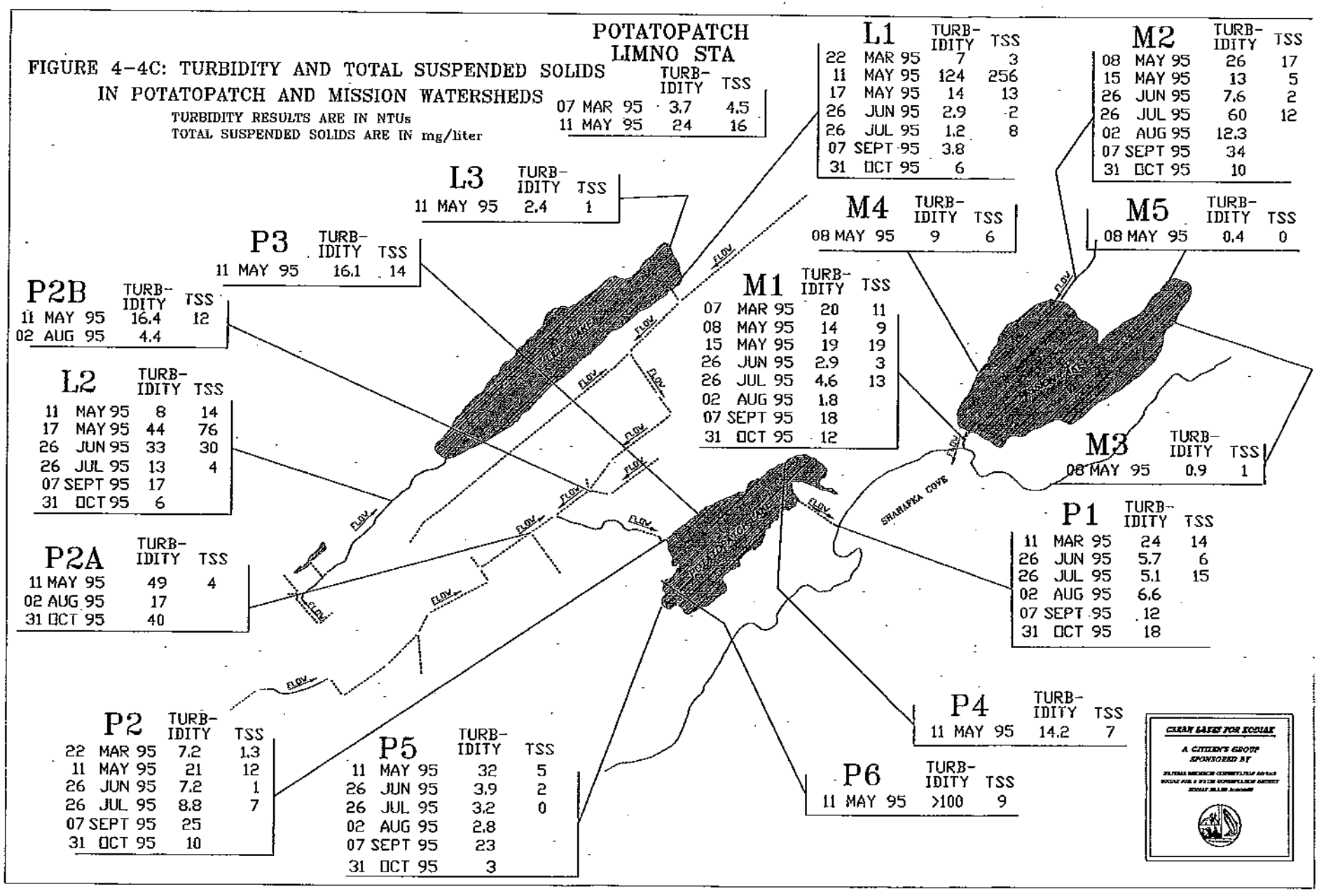
		TURB-IDITY	TSS
17	MAY 95	3.5	3

SWIM BEACH

		TURB-IDITY	TSS
17	MAY 95	4.3	3

FIGURE 4-4C: TURBIDITY AND TOTAL SUSPENDED SOLIDS IN POTATOPATCH AND MISSION WATERSHEDS

TURBIDITY RESULTS ARE IN NTUs
TOTAL SUSPENDED SOLIDS ARE IN mg/liter



POTATOPATCH LIMNO STA

	TURB-IDITY	TSS
07 MAR 95	3.7	4.5
11 MAY 95	24	16

L1

	TURB-IDITY	TSS
22 MAR 95	7	3
11 MAY 95	124	256
17 MAY 95	14	13
26 JUN 95	2.9	2
26 JUL 95	1.2	8
07 SEPT 95	3.8	
31 OCT 95	6	

M2

	TURB-IDITY	TSS
08 MAY 95	26	17
15 MAY 95	13	5
26 JUN 95	7.6	2
26 JUL 95	60	12
02 AUG 95	12.3	
07 SEPT 95	34	
31 OCT 95	10	

L3

	TURB-IDITY	TSS
11 MAY 95	2.4	1

M4

	TURB-IDITY	TSS
08 MAY 95	9	6

M5

	TURB-IDITY	TSS
08 MAY 95	0.4	0

P3

	TURB-IDITY	TSS
11 MAY 95	16.1	14

M1

	TURB-IDITY	TSS
07 MAR 95	20	11
08 MAY 95	14	9
15 MAY 95	19	19
26 JUN 95	2.9	3
26 JUL 95	4.6	13
02 AUG 95	1.8	
07 SEPT 95	18	
31 OCT 95	12	

P2B

	TURB-IDITY	TSS
11 MAY 95	16.4	12
02 AUG 95	4.4	

L2

	TURB-IDITY	TSS
11 MAY 95	8	14
17 MAY 95	44	76
26 JUN 95	33	30
26 JUL 95	13	4
07 SEPT 95	17	
31 OCT 95	6	

M3

	TURB-IDITY	TSS
08 MAY 95	0.9	1

P1

	TURB-IDITY	TSS
11 MAR 95	24	14
26 JUN 95	5.7	6
26 JUL 95	5.1	15
02 AUG 95	6.6	
07 SEPT 95	12	
31 OCT 95	18	

P2A

	TURB-IDITY	TSS
11 MAY 95	49	4
02 AUG 95	17	
31 OCT 95	40	

P4

	TURB-IDITY	TSS
11 MAY 95	14.2	7

P2

	TURB-IDITY	TSS
22 MAR 95	7.2	1.3
11 MAY 95	21	12
26 JUN 95	7.2	1
26 JUL 95	8.8	7
07 SEPT 95	25	
31 OCT 95	10	

P5

	TURB-IDITY	TSS
11 MAY 95	32	5
26 JUN 95	3.9	2
26 JUL 95	3.2	0
02 AUG 95	2.8	
07 SEPT 95	23	
31 OCT 95	3	

P6

	TURB-IDITY	TSS
11 MAY 95	>100	9

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FIGURE 4-5A: pH IN UPPER ISLAND LAKE WATERSHED

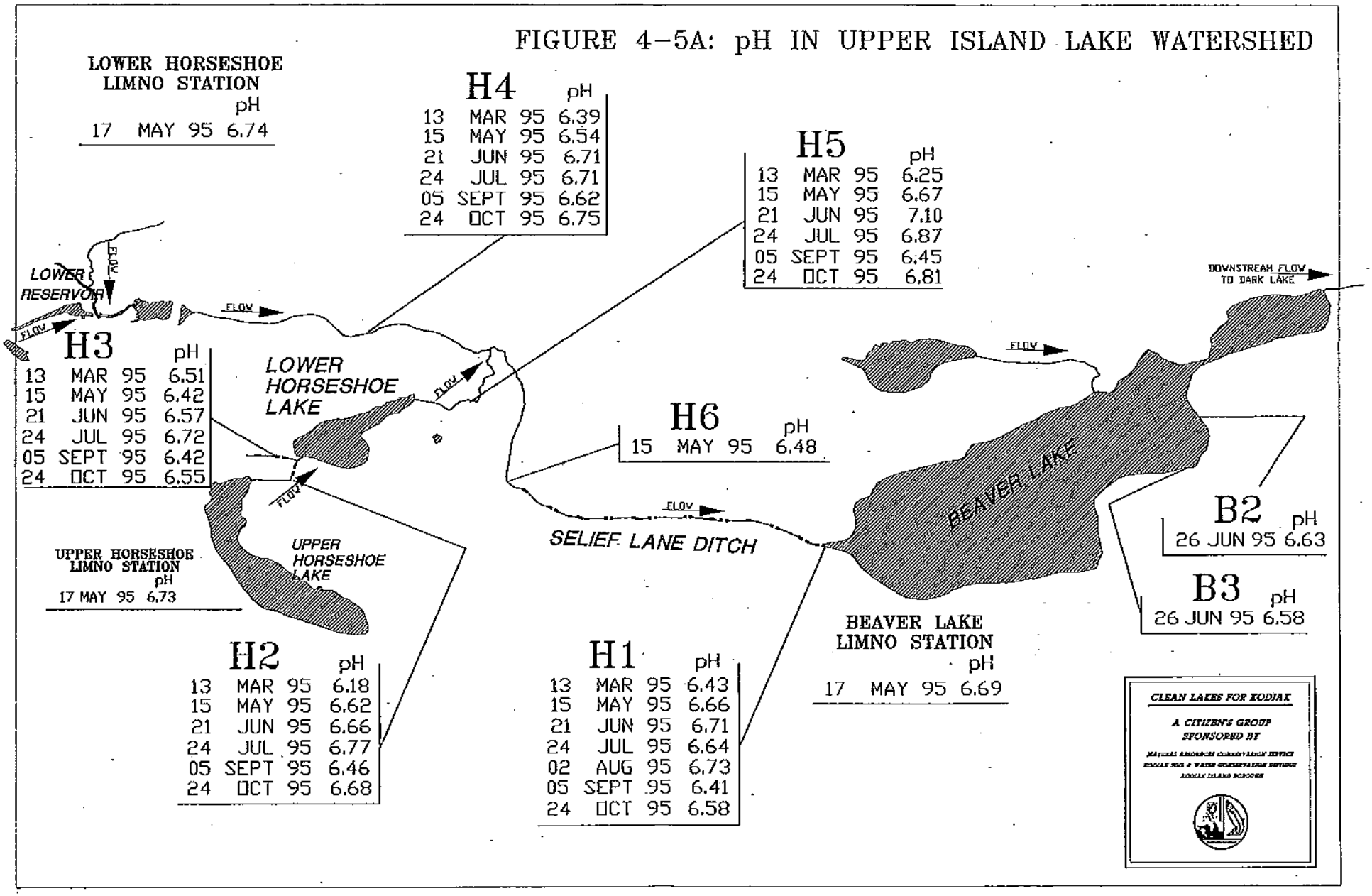

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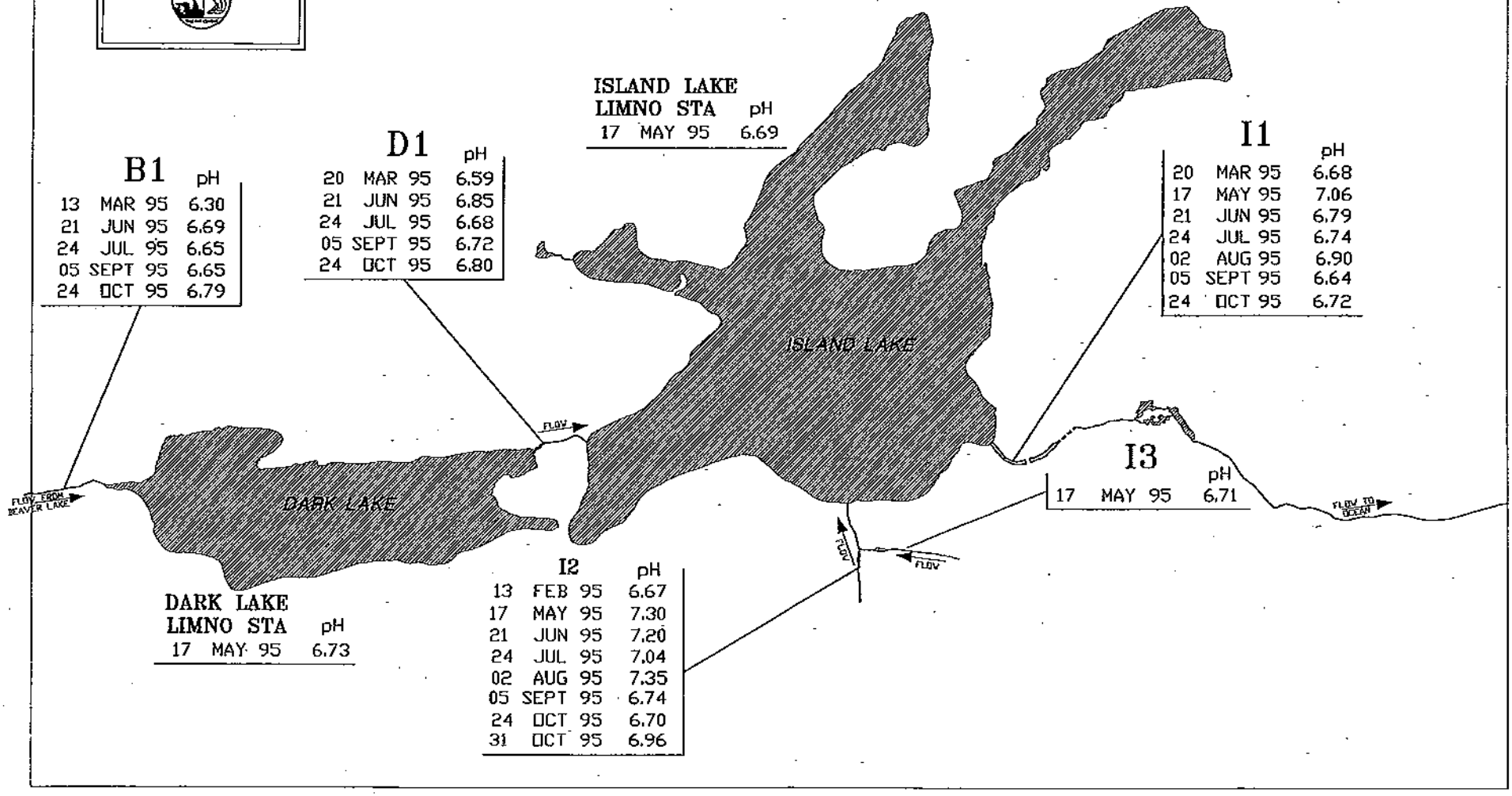
FIGURE 4-5B: pH IN LOWER ISLAND LAKE WATERSHED



ISLAND LAKE LIMNO STA

	pH
17 MAY 95	6.69

B1

	pH
13 MAR 95	6.30
21 JUN 95	6.69
24 JUL 95	6.65
05 SEPT 95	6.65
24 OCT 95	6.79

D1

	pH
20 MAR 95	6.59
21 JUN 95	6.85
24 JUL 95	6.68
05 SEPT 95	6.72
24 OCT 95	6.80

I1

	pH
20 MAR 95	6.68
17 MAY 95	7.06
21 JUN 95	6.79
24 JUL 95	6.74
02 AUG 95	6.90
05 SEPT 95	6.64
24 OCT 95	6.72

I3

	pH
17 MAY 95	6.71

DARK LAKE LIMNO STA

	pH
17 MAY 95	6.73

I2

	pH
13 FEB 95	6.67
17 MAY 95	7.30
21 JUN 95	7.20
24 JUL 95	7.04
02 AUG 95	7.35
05 SEPT 95	6.74
24 OCT 95	6.70
31 OCT 95	6.96

FIGURE 4-5C: pH IN POTATOPATCH AND MISSION WATERSHEDS

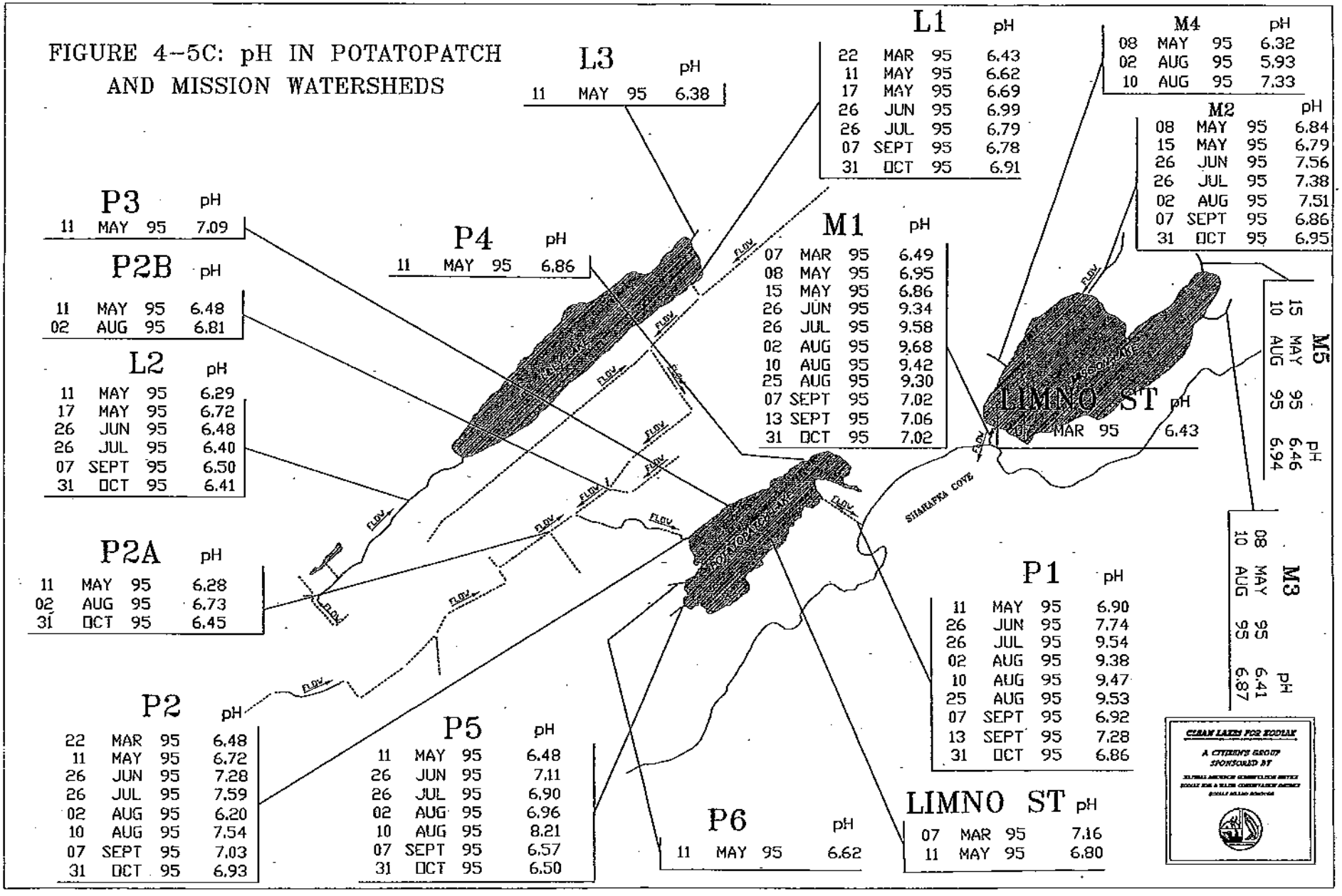


Figure 4-6. Secchi clarity vs. Turbidity
1995 Limnology Samples

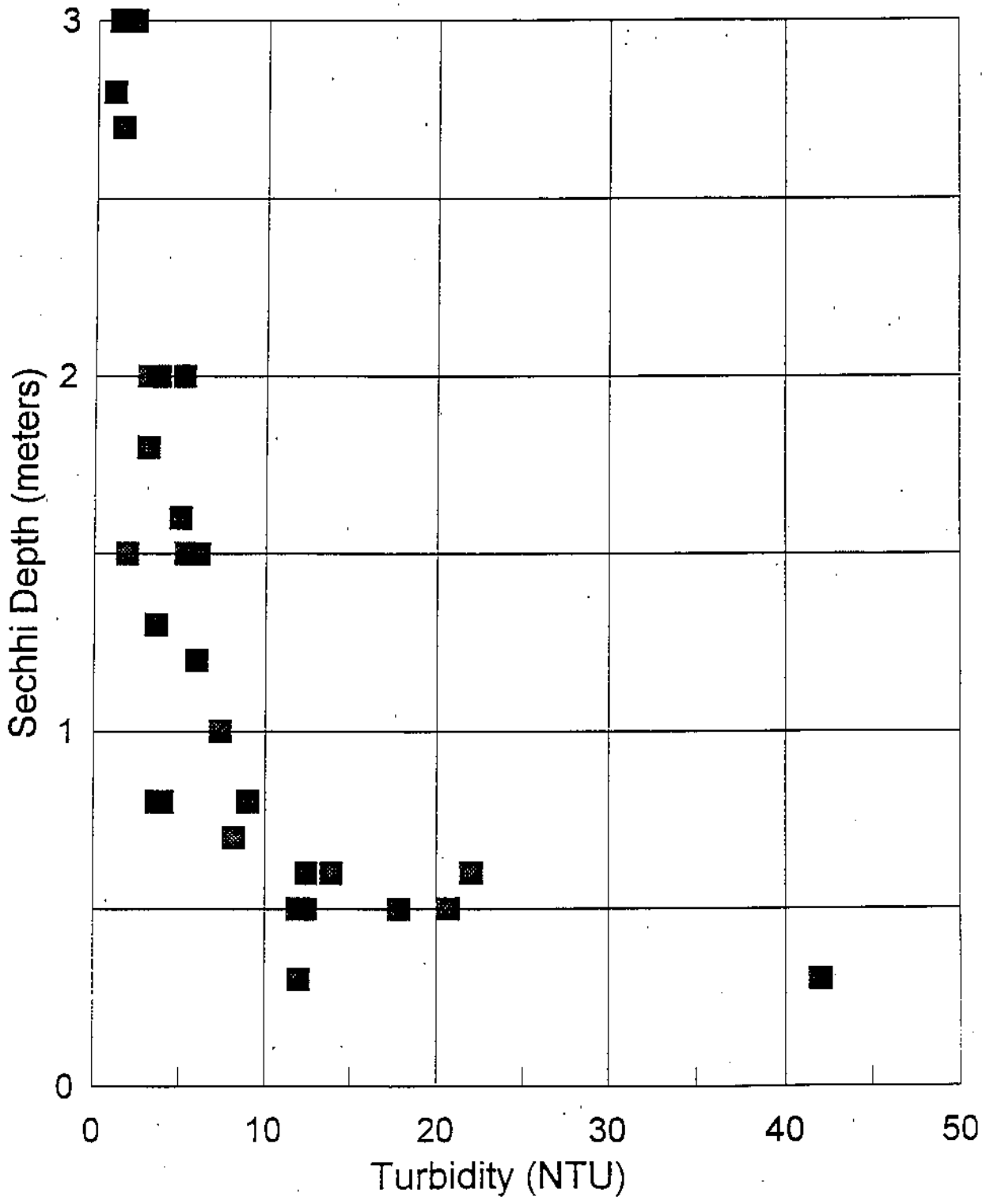


Figure 4-7A: Iron/Turbidity vs. Turbidity

Fe/T <400, T <25, 1995 limno samples

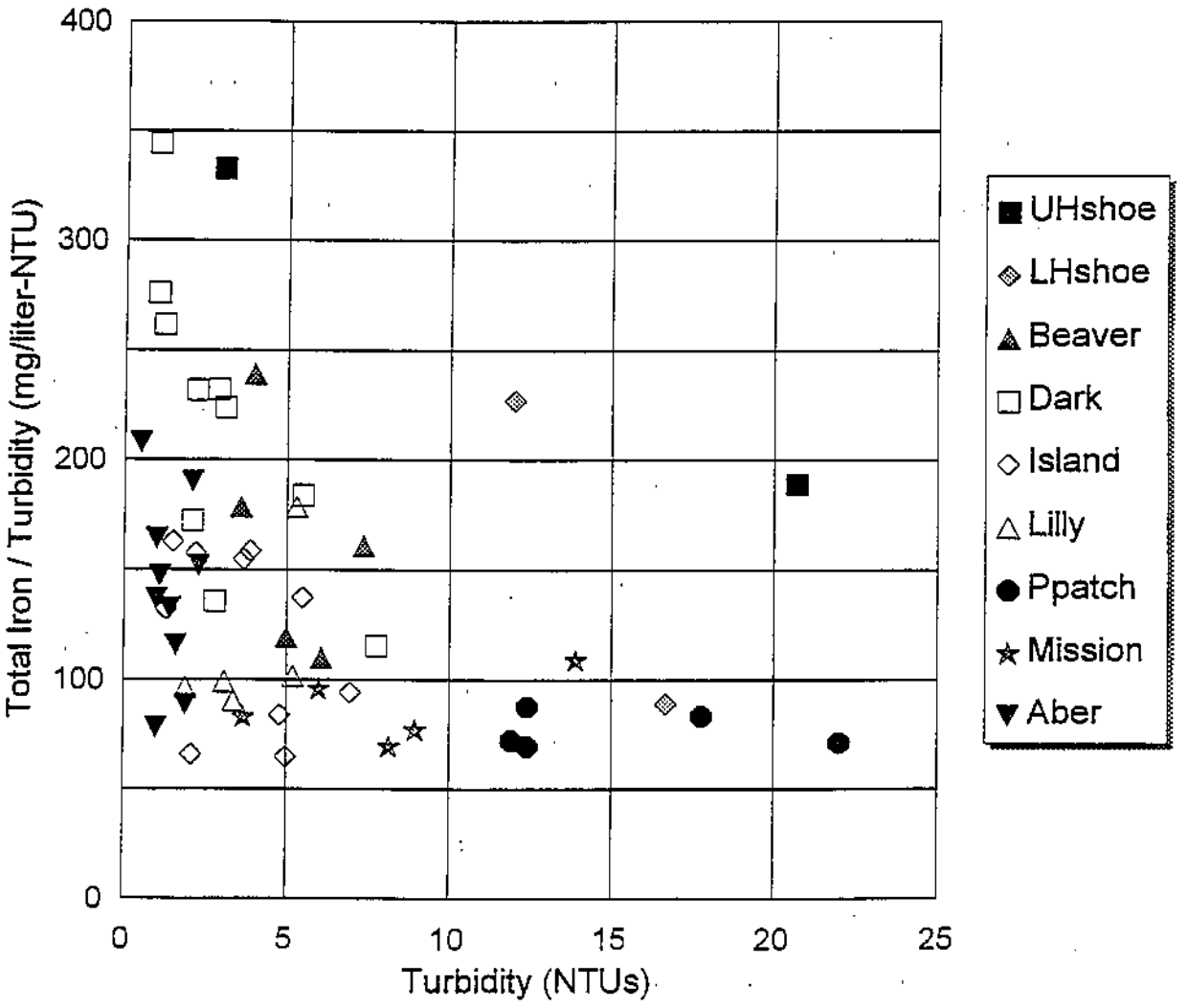
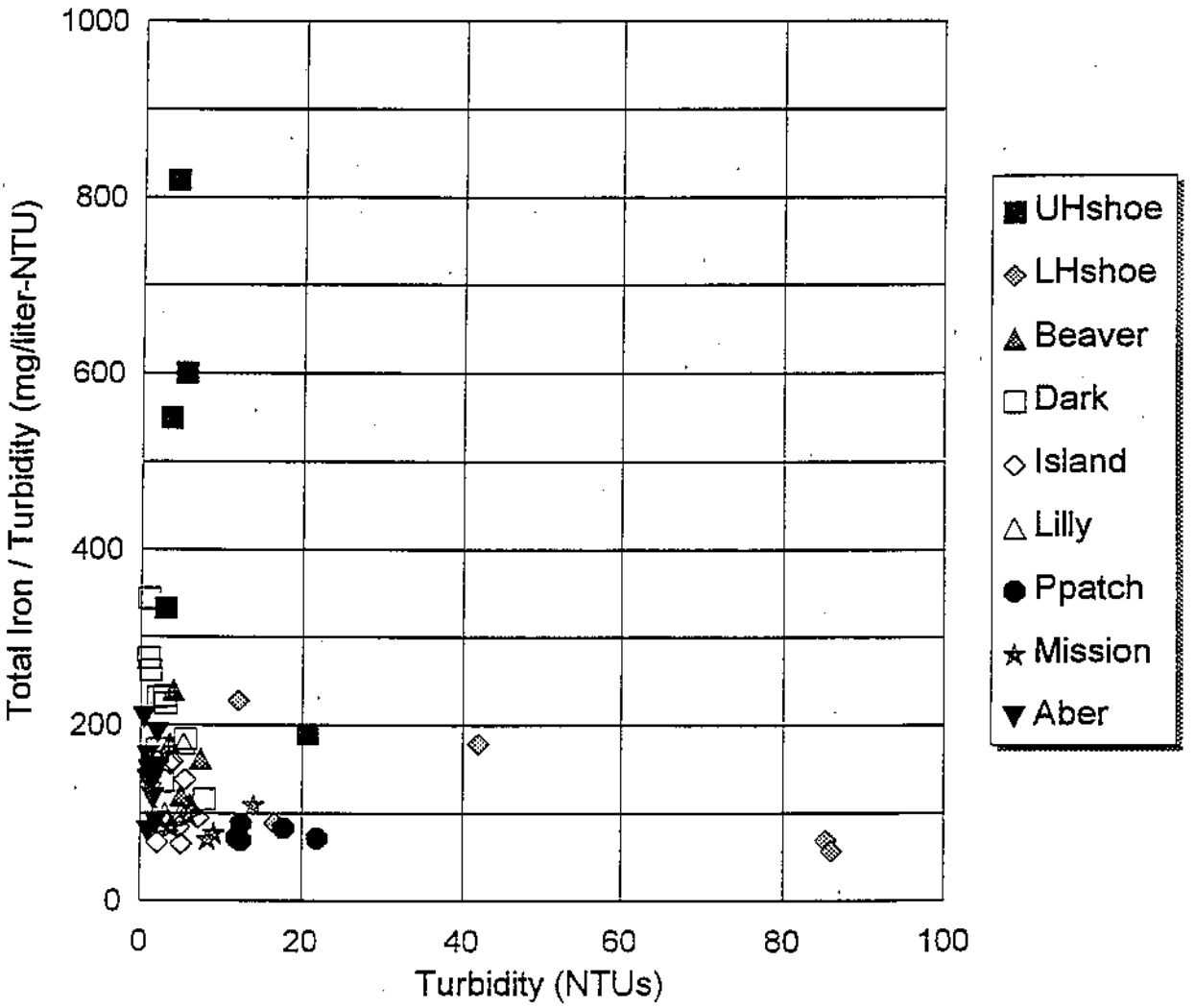


Figure 4-7B: Iron/Turbidity vs. Turbidity

Full data range, 1995 limno samples



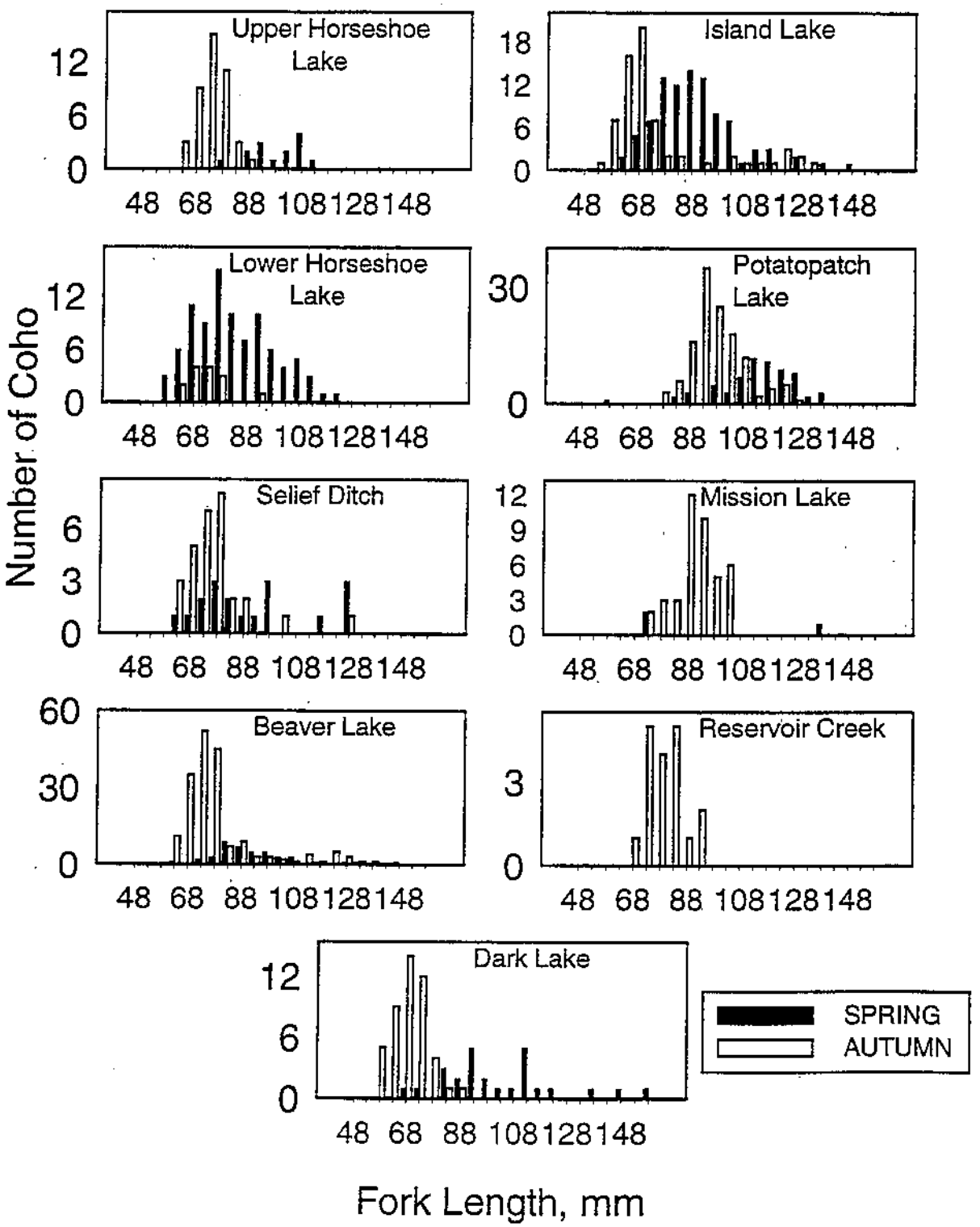


Figure 4-8. Length frequencies of coho from Kodiak urban lakes.

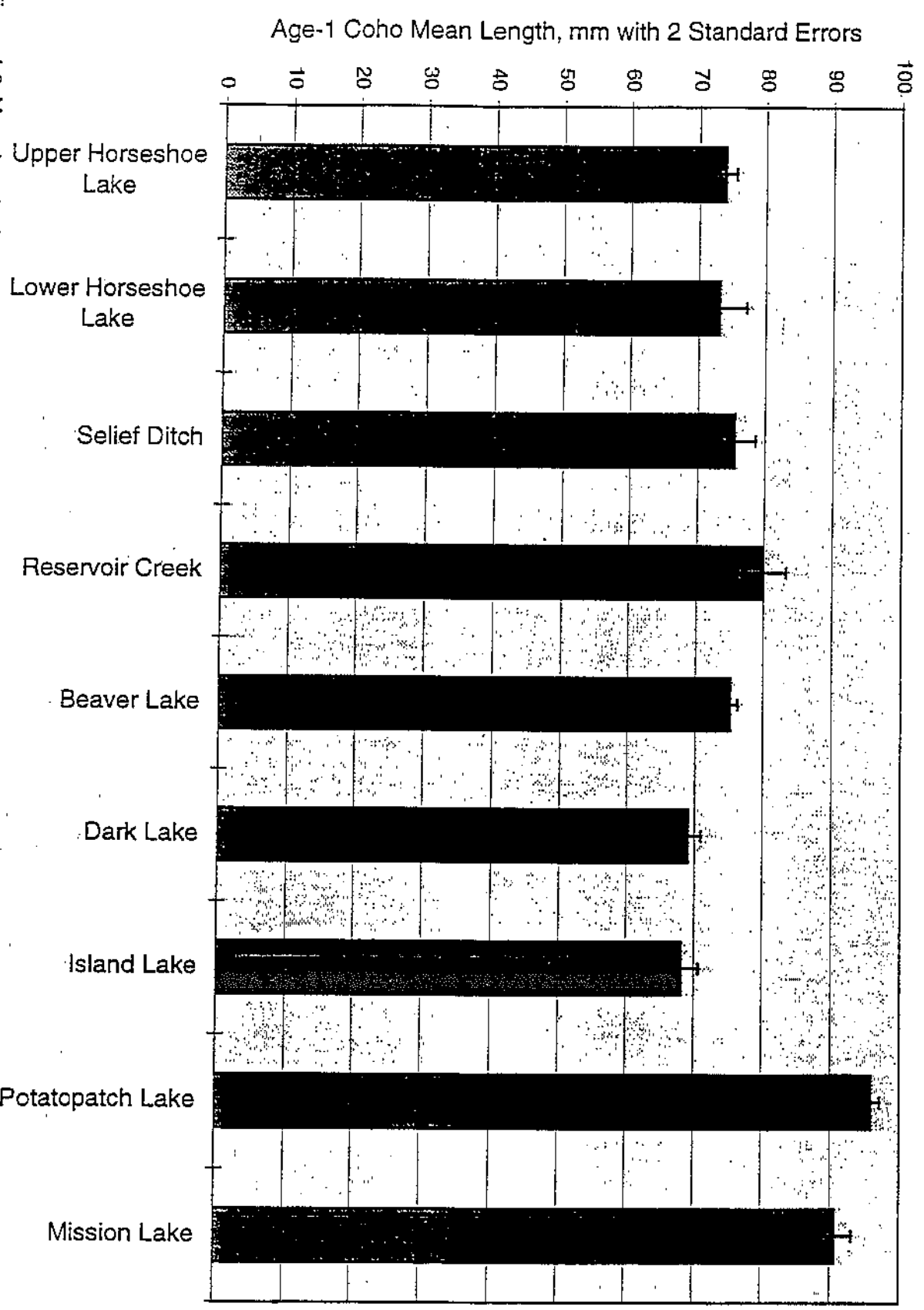


Figure 4-9. Mean length of autumn coho, plus and minus two standard errors. Where error bars do not overlap, differences are significant.

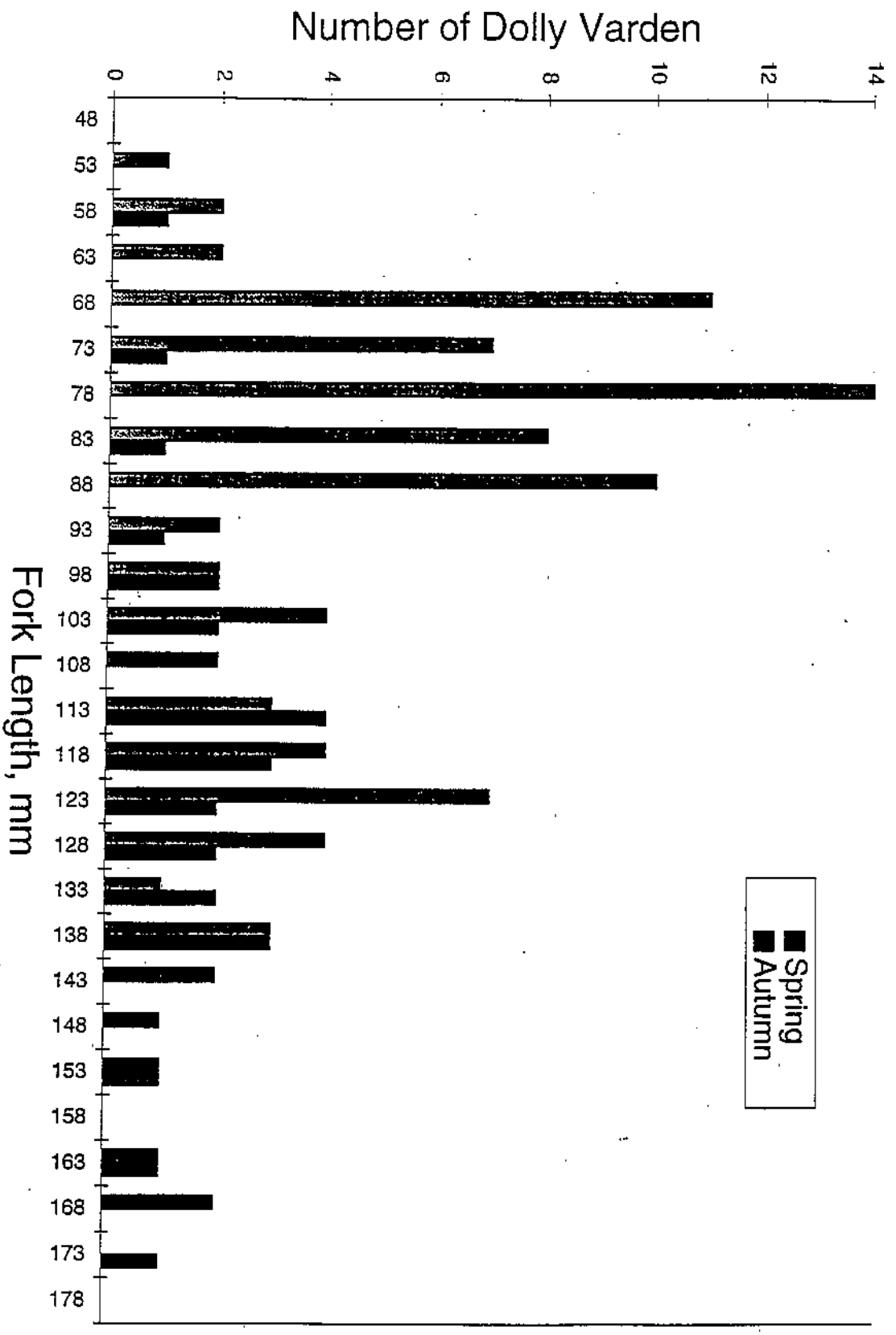


Figure 4-10. Size frequency of Dolly Varden from Kodiak urban lakes, 1995.

Figure WATRA 4-11A

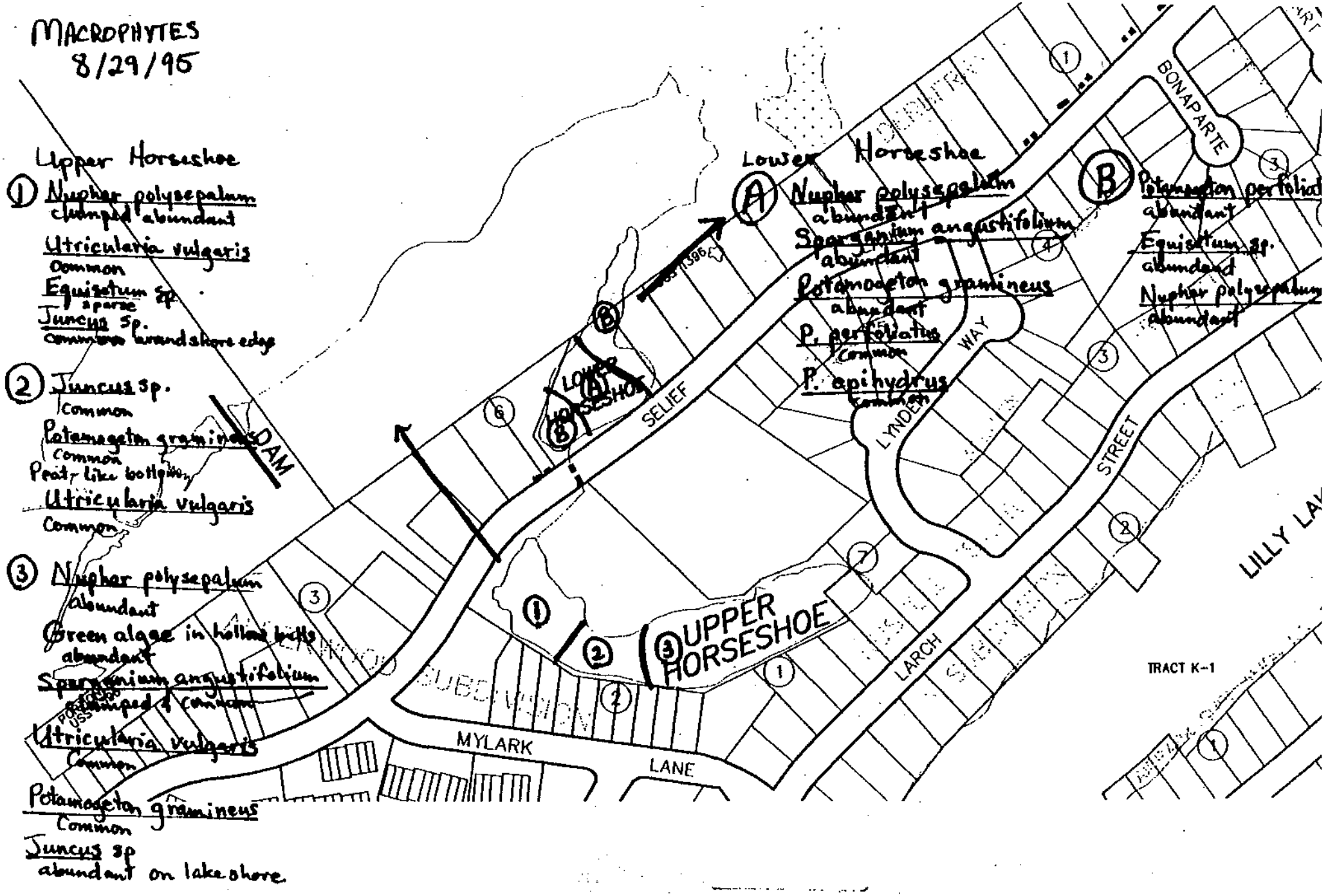


Figure 4-11B

MACROPHYTES
8/29/95
A Equisetum fluviatile
abundant
B Nuphar polysepalum
abundant
Potamogeton gramineus
Comm to 30-40' from shore
Sparganium angustifolium
Comm to 30-40' from shore
Juncus sp.
Common nearshore
C Potamogeton gramineus
common
P. perfoliatus
Common
D Nuphar polysepalum
Clumped
Equisetum fluviatile
Clumped
Green algae filament and
hollow ball colonies sparse
60% bottom covered
w/vegetation
open water area
mostly mud bottom
BEAVER LAKE
open water
BEAVER LAKE LOOP ROAD
BEAVER LAKE DRIVE
SELIEF LANE
VON
USS 3468
USS 3467
USS 3466
USS 3098
USS 2538A
A
B
C
D
1
2
3

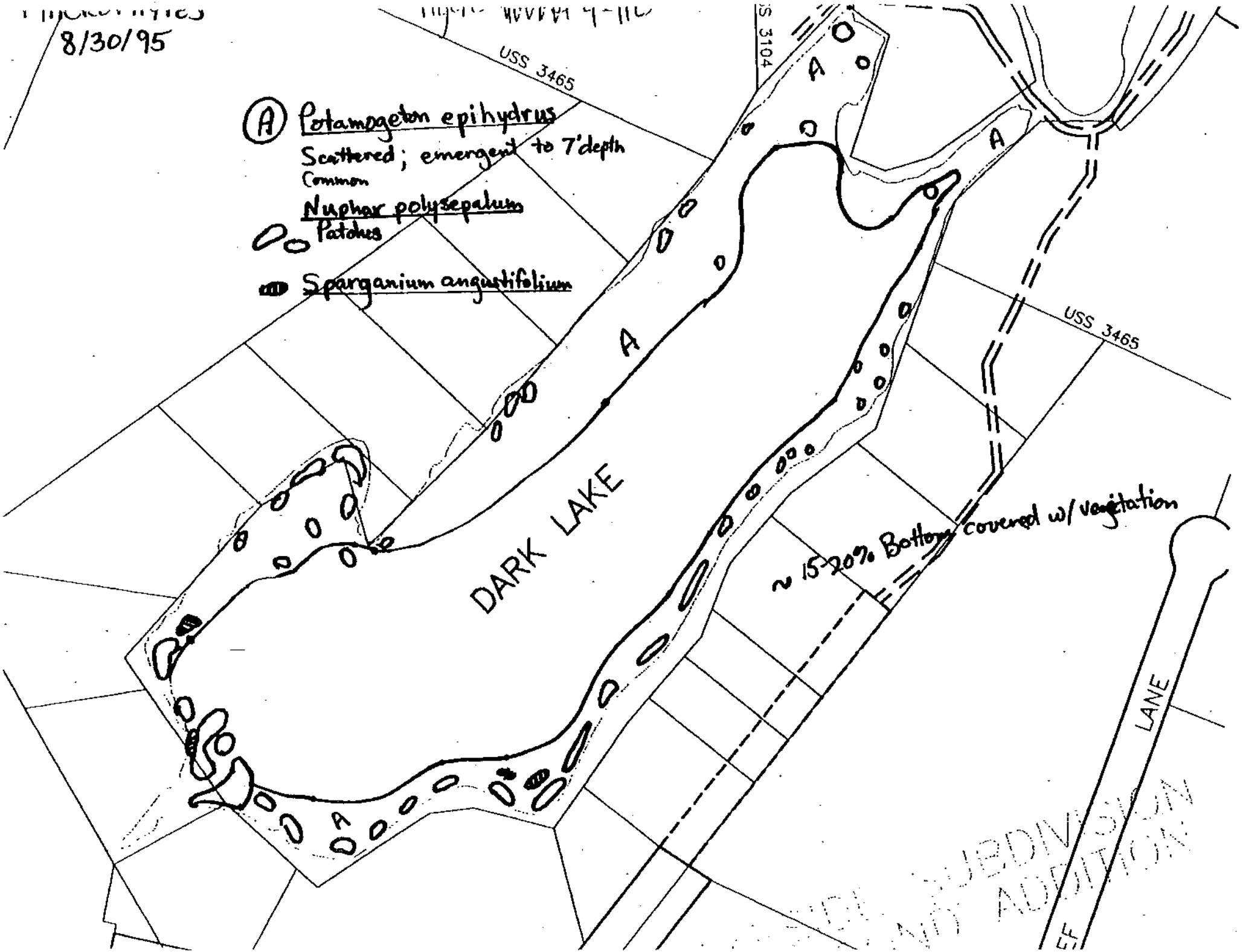

8/30/95
USS 3465
USS 3104
A Potamogeton epihydrus
Scattered; emergent to 7' depth
Common
Nuphar polysepalum
Patches
Sparganium angustifolium
A
A
A
A
USS 3465
DARK LAKE
~ 15-20% Bottom covered w/ vegetation
LANE

Figure 4-11D

MACROPHYTES

H:\ACADR12\KOD\MARK20 Fri May 26 11:21:17 1995

9/8/95

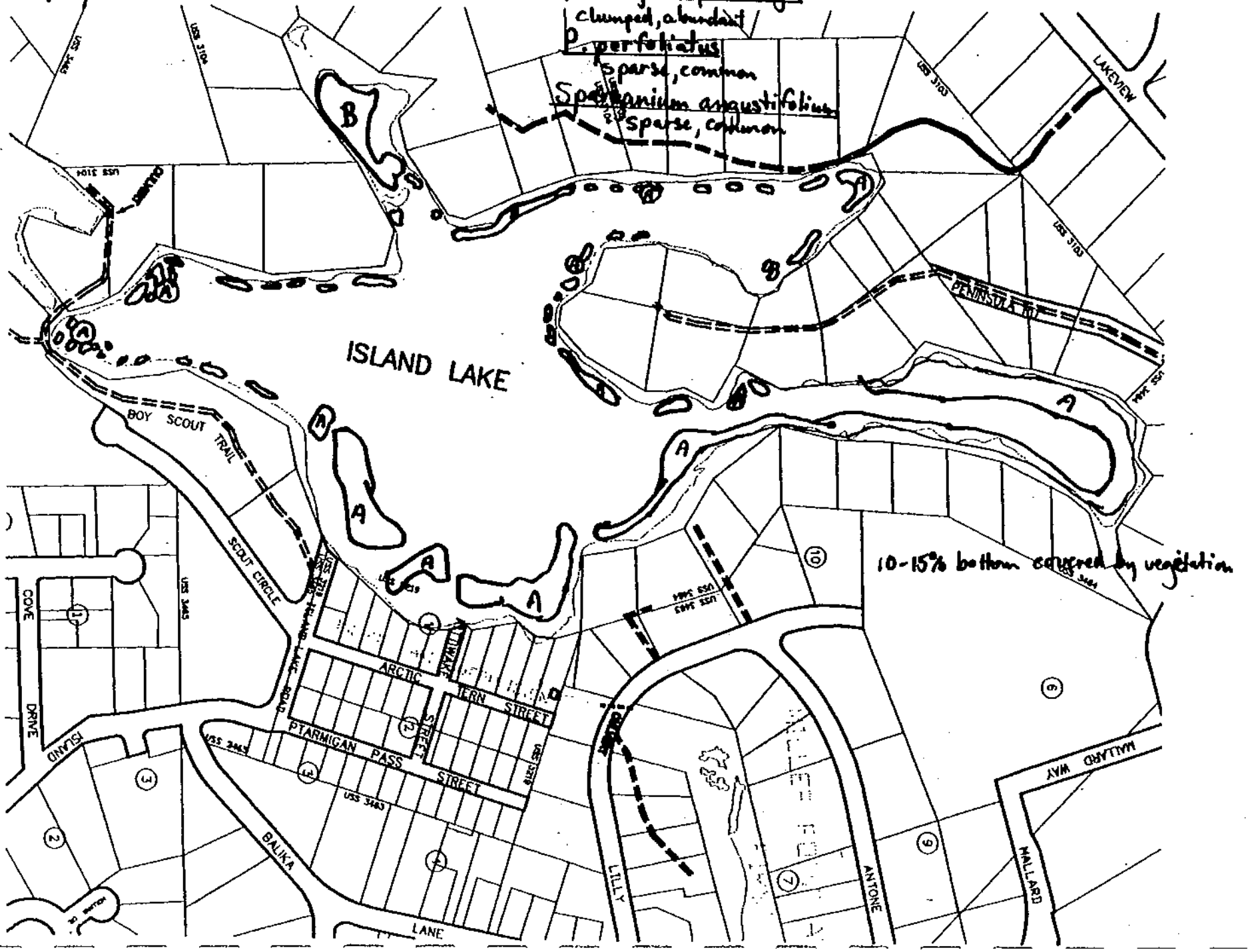
(A) Nuphar polysepalum abundant

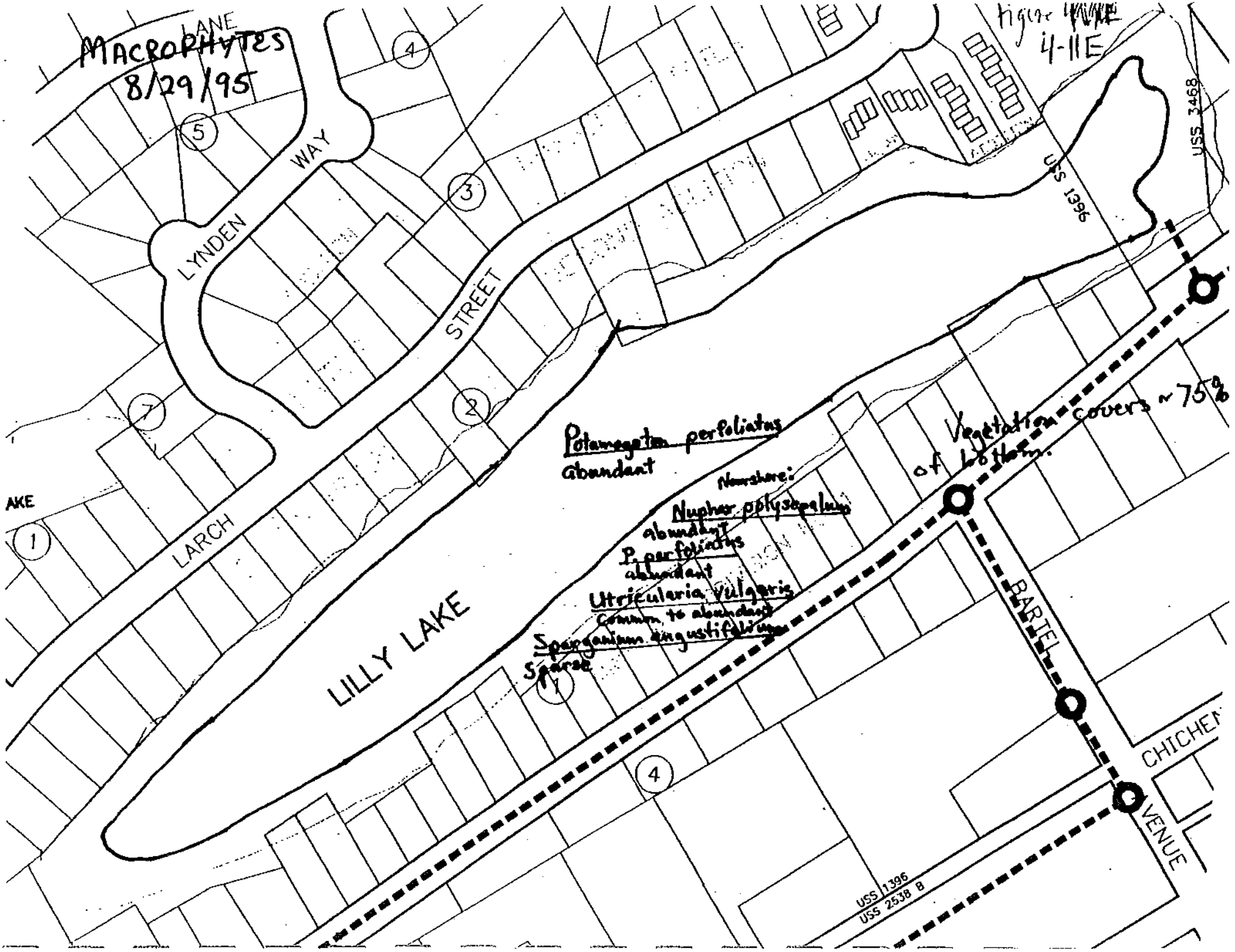
Potamogeton praelongus clumped, abundant

P. perfoliatus sparse, common

Sparganium angustifolium sparse, common

(B) Nuphar polysepalum only




MACROPHYTES
8/29/95
Figure
4-11E
LANE
WAY
LYNDEN
STREET
LARCH
LILLY LAKE
AKE
USS 1396
USS 3468
USS 1396
USS 2538 B
BARTEL
VENUE
CHICHEN
Potamogeton perfoliatus
abundant
Nearshore:
Nuphar polysepalum
abundant
P. perfoliatus
abundant
Utricularia vulgaris
Common to abundant
Sparganium angustifolium
Sparse
Vegetation
of bottom.
Covers ~ 75%
1
2
3
4
5
6
7

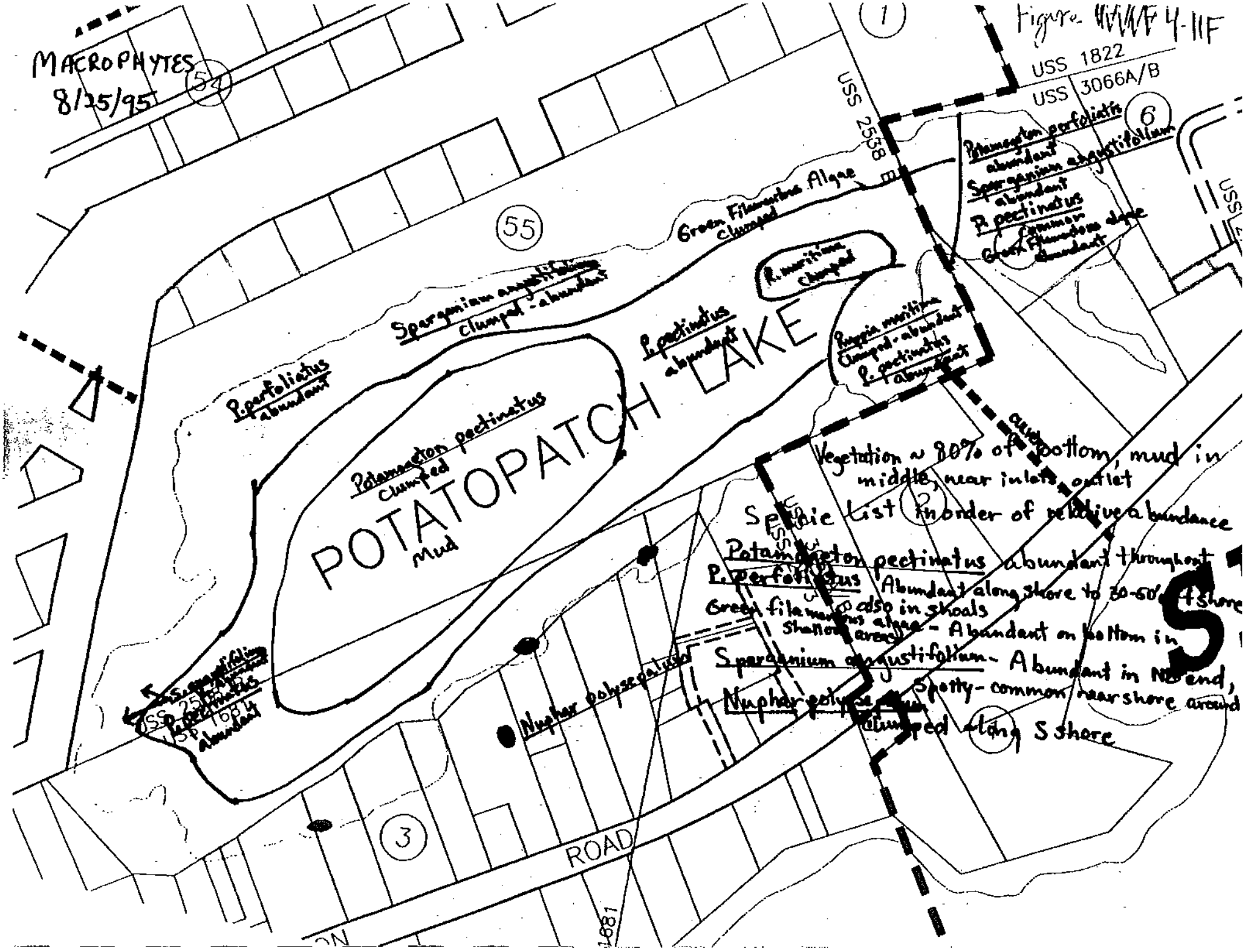


Figure 4-11F
MACROPHYTES
8/25/95
USS 1822
USS 3066A/B
USS 2558
POTATOPATCH LAKE
Mud
Green Filamentous Algae clumped
Spargonium angustifolium clumped - abundant
P. perfoliatus abundant
P. pectinatus clumped
P. pectinatus abundant
P. nuttallii clumped
Ruppia maritima clumped - abundant
P. pectinatus abundant
Potamogeton perfoliatus abundant
Spargonium angustifolium abundant
P. pectinatus common
Green Filamentous algae abundant
Nuphar polysepalum
ROAD
Vegetation ~ 80% of bottom, mud in middle, near inlets, outlet
Species List in order of relative abundance
Potamogeton pectinatus abundant throughout
P. perfoliatus Abundant along shore to 30-50' from shore
Green filamentous algae - also in shoals
Shallow areas - Abundant on bottom in
Spargonium angustifolium - Abundant in NE end,
Nuphar polysepalum Spotty - common nearshore around
clumped along S shore
S

MACROPHYTES
8/24/95
Figure 4-11G
USS 3099
USS 3233
USS 2843
USS 1822
P. perfoliatus sparse → common
P. Berchtoldi common
P. pectinatus
P. perfoliatus abundant
Very abundant
P. Berchtoldi
Common
Ruppia spiralis
common
Potamogeton Berchtoldi abundant
P. perfoliatus common
P. pectinatus abundant
Potamogeton pectinatus most abundant
Ruppia spiralis abundant
MISSION LAKE
Potamogeton pectinatus abundant
Ruppia spiralis abundant
Ruppia spiralis most abundant
Potamogeton pectinatus abundant
P. perfoliatus abundant along edges
Vegetation covers ~ 90% of bottom
few areas bare w/ mud or rock
Specie list in order of relative abundance
Potamogeton pectinatus - Abundant throughout la
Ruppia spiralis most abundant near outlet
P. perfoliatus Abundant to common esp on N. sho
P. Berchtoldi Abundant in NE arm, common alon
N shore
A

Albercrombie Lake
MACROPHYTES
9/8/95

Figure 4A/M
4-11H

areas of Nuphar polysepalum
Potamogeton praelongus

Nuphar polysepalum
Potamogeton praelongus
Sparganium angustifolium
Utricularia vulgaris
P. epihydrus
P. gramineus
Isoëtes muricata

Sparganium angustifolium abundant
Potamogeton epihydrus abundant
Utricularia vulgaris abundant
P. praelongus abundant
P. gramineus sparse

Vegetation covers 10% bot
90% bare w/ash, rock, detritus

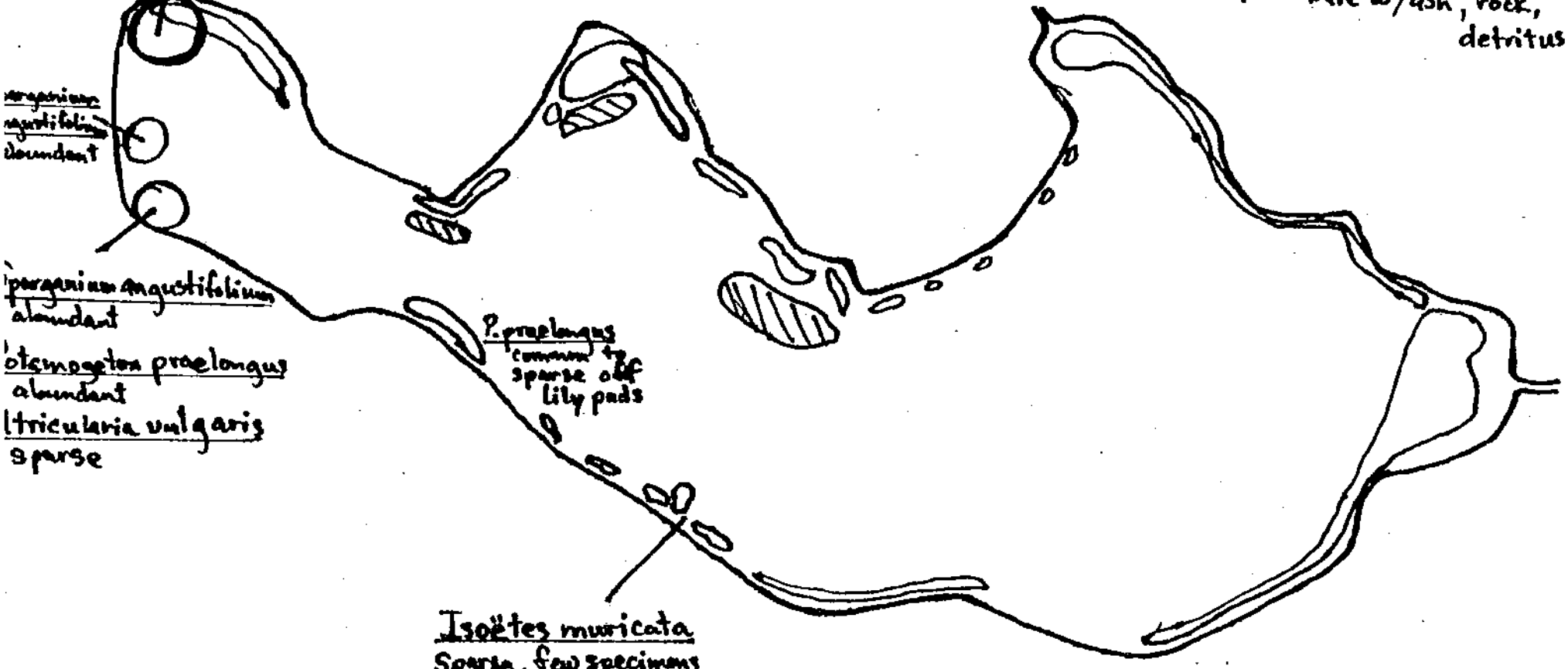
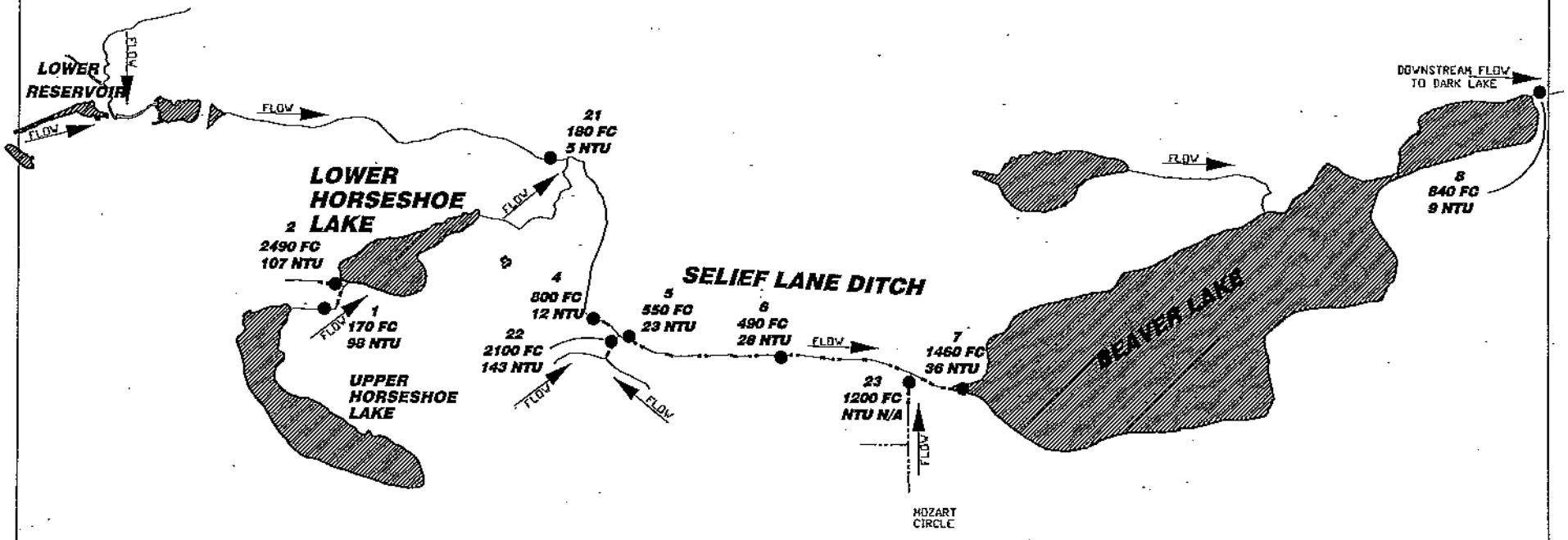


FIGURE 4-12A: INTENSIVE SAMPLING FOR FECAL COLIFORMS AND TURBIDITY - UPPER ISLAND LAKE WATERSHED - 13 SEPTEMBER 1996

FECAL COLIFORMS ARE IN COLONY FORMING UNITS (cfu's)/100 ml
TURBIDITY IS IN NEPHELOMETRIC TURBIDITY UNITS (NTU's)



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CLEAN LAKES FOR KODIAK

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FIGURE 4-12B: INTENSIVE SAMPLING FOR FECAL COLIFORMS AND TURBIDITY - LOWER ISLAND LAKE WATERSHED - 13 SEPTEMBER 1996

FECAL COLIFORMS ARE IN COLONY FORMING UNITS (cfu's)/100 ml
TURBIDITY IS IN NEPHELOMETRIC TURBIDITY UNITS (NTU's)

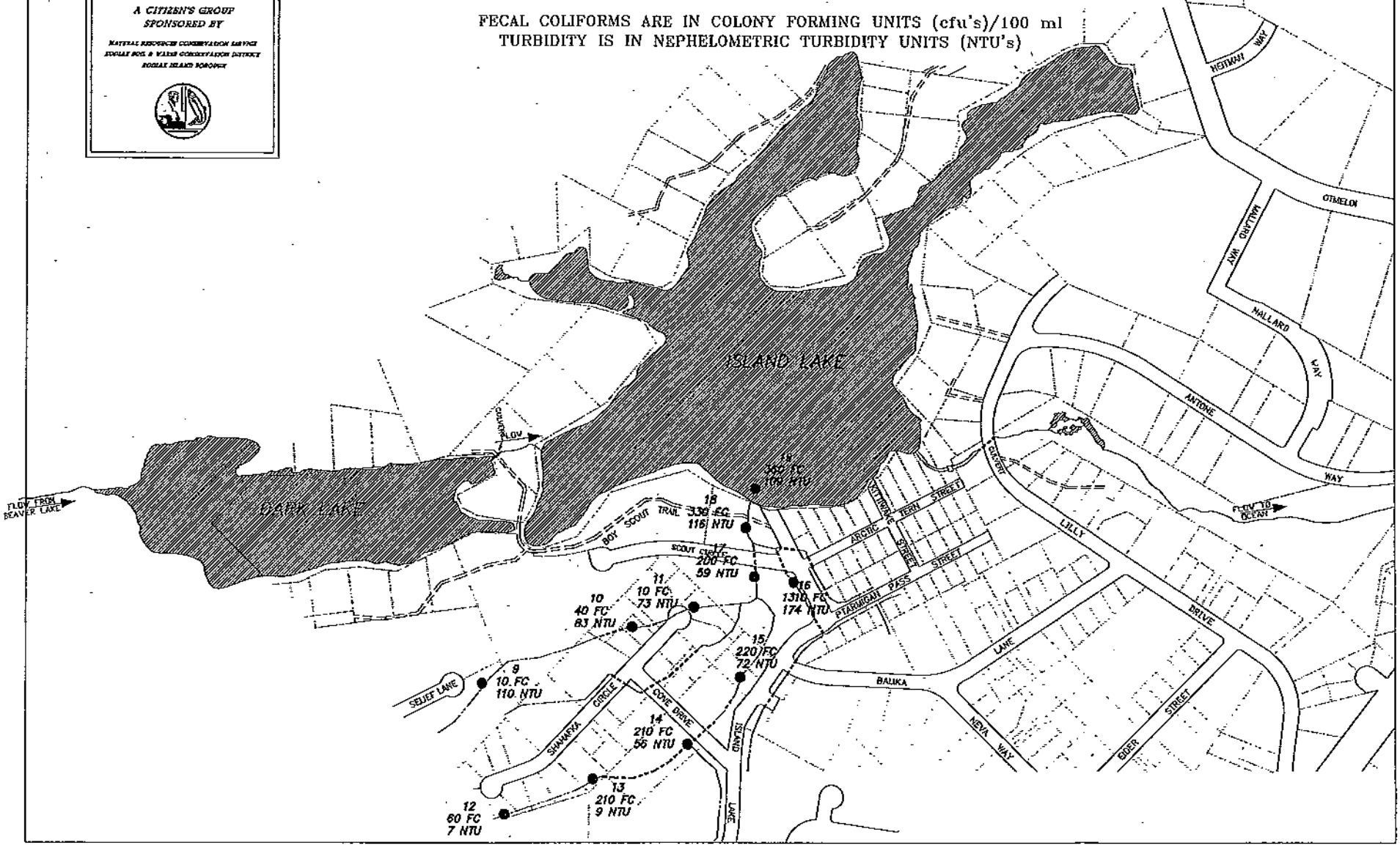

Table 3-1A: Upper Horseshoe Lake

Overview:
This lake is small, very shallow, and the watershed area is only about 9 acres. There is no inlet stream, and much of the lake water is recharged by groundwater, although there is also considerable surface runoff from adjacent residential lots during storms. The high groundwater component resulted in elevated color and iron concentration. Juvenile silver salmon were present. The lake is moderately fertilized (mesotrophic), and had moderately high fecal coliform bacteria counts. The lake is nearly covered by yellow lilies during the summer, and its appearance could be improved by increasing the depth of water. A design project to accomplish this has been funded by the City of Kodiak, and construction is scheduled for Fall 1997.

Surface Area: 2.6 acre
Average Depth: 2 feet
Maximum Depth: 3.5 feet
Sept. Weed Cover: 90%; yellow lily dominant with burr reed, bladderwort, and pondweed common.

Cumulative Watershed Area: 10 acres
Upstream lakes: 0 acres
Undeveloped: 1.4 acres
Residential: 5.5 acres
Commercial / Institutional: 0 acres

Trophic State Indicators:
Total Phosphorus: 16 ug/L meso
Chlorophyll a: 1.8 ug/L oligo
Secchi Clarity: 0.9+ m eu

Theoretical Water Retention Time: 54 days
Zooplankton Biomass: 216 mg/m2
Fish Catch Rate and Condition: 8.4 fish/trap; Avg. Length 74 mm; Avg. Condition 1.20

Water Quality:
Fecal Coliform Bacteria (cfu/100 ml): Average 574 ; 2 of 6 samples >100; Max. 2430
Turbidity: 7.3 NTU
Color: 24.8 Pt units
Iron: 2673 ug/l
pH: 6.76
Conductivity: 150 umhos/cm

Other: The outlet elevation of this lake is controlled by a culvert which passes under Selief Lane. The lake level will be raised by 6" to 12" by regrading this culvert in Fall 1997.

Table 3-1B: Lower Horseshoe Lake

Overview: This lake is small and very shallow. The outflow of Upper Horseshoe enters this lake, as does the runoff from another 24 acres of residential land. This includes 1700 linear feet of the unpaved section of Selief Lane. Silt produced by the breakdown of the gravel used to build the road enters Lower Horseshoe Lake, and results in the highest levels of turbidity of all the lakes studied. This looks unattractive, cuts light available for photosynthesis, and may adversely affect rearing silver salmon by decreasing their feed and interfering with their ability to see their prey. Color, iron, phosphorus, and organic carbon were all quite high. Fecal coliform bacteria were very high at times. The retention time is very short, and zooplankton abundance is low.

Surface Area: 1.2 acres
Average Depth: 1.5 feet
Maximum Depth: 3 feet
Sept. Weed Cover: 60%; yellow lily dominant with burr reed, horsetail, and pondweeds.

Cumulative Watershed Area: 37 acres
Upstream lakes: 2.6 acres
Undeveloped: 3.7 acres
Residential: 29 acres
Commercial / Institutional: 0 acres

Trophic State Indicators:
Total Phosphorus: 55 ug/L eu
Chlorophyll a: 1.1 ug/L oligo
Secchi Clarity: 0.4 m eu

Theoretical Water Retention Time: 5 days
Zooplankton biomass: 7 mg/m2
Fish Catch Rate and Condition: 4.7 fish/trap; Avg. Length 73 mm; Avg. Condition 1.20

Water Quality:
Fecal Coliform Bacteria (cfu/100 ml): Average 840, 3 of 6 samples >100, Max. 2470
Turbidity: 48.4 NTU
Color: 41.8 Pt units
Iron: 4462 ug/l
pH: 6.94
Conductivity: 199 umhos/cm

Other: If Selief Lane were paved, the turbidity and siltation problems in Lower Horseshoe Lake would be greatly reduced.

Table 3-1C: Beaver Lake

Overview: The runoff from approximately 250 acres of undeveloped brush and forest on the side of Pillar Mountain joins the water leaving Lower Horseshoe Lake before the combined flow follows Selief Lane in a ditch next to the road. The runoff from about 30 acres of additional residential land (including about 2500 additional linear feet of unpaved roadway) drains into the ditch. This flow enters Beaver Lake. Fecal coliform bacteria counts were very high at the inlet to Beaver Lake. There may be a problem with a sewage leak somewhere along the Selief ditch. Beaver Lake is relatively shallow, and the retention time is short. Zooplankton abundance is low. The heavy input of clean water off Pillar Mountain dilutes the silt and nutrients from Selief Lane and nearby residences.

Surface Area: 14.3 acres
Average Depth: 4.0 feet
Maximum Depth: 7.5 feet
Sept. Weed Cover: 40%; yellow lily dominant, horsetail, burr reed, rush, and pondweeds common.

Cumulative Watershed Area: 421 acres
Upstream lakes: 6.3 acres
Undeveloped: 336 acres
Residential: 62 acres
Commercial / Institutional: 6 acres

Trophic State Indicators:

Total Phosphorus:	10 ug/L	meso
Chlorophyll a:	1.0 ug/L	oligo
Secchi Clarity:	1.2 m	eu

Theoretical Water Retention Time: 12 days
Zooplankton Biomass: 15 mg/m2
Fish Catch Rate and Condition: 26 fish/trap; Avg. Length 79 mm; Avg. Condition 1.17

Water Quality:
Fecal Coliform Bacteria (cfu/100 ml):
at inlet to lake: Average 1120, 5 of 7 samples >100, Max. 5400
at outlet from lake: Average 79, 1 of 5 samples >100, Max. 310
Turbidity: 5.2 NTU
Color: 17.4 Pt units
Iron: 811 ug/l
pH: 6.82
Conductivity: 113 umhos/cm

Other: Freshwater mussels (Anodonta beringiana) are present in Beaver Lake and downstream. They filter the water, and remove silt particles as well as phytoplankton (microalgae).

Table 3-1D: Dark Lake

Overview: Dark Lake is surrounded by sitka spruce, and lies to the north of a ridge. This shades the lake for much of the fall and winter. The ice melts about two weeks later in Dark Lake than in the other nearby lakes. The watershed above Dark Lake is 86% undeveloped. This is greater than for any of the other lakes except Gertrude Lake at Ft. Abercrombie Park. The water quality is proportionately good, with low levels of turbidity, color, iron, phosphorus, and fecal coliforms. The lake is comparatively deep, and the retention time is moderate. A moderate zooplankton population is sustained.

Surface Area: 14.4 acres
Average Depth: 8.9 feet
Maximum Depth: 15.2 feet
Sept. Weed Cover: 10%; pondweed scattered, yellow lily in patches.

Cumulative Watershed Area: 495 acres
Upstream lakes: 17 acres
Undeveloped: 396 acres
Residential: 64 acres
Commercial / Institutional: 6 acres

Trophic State Indicators:

Total Phosphorus:	9 ug/L	oligo
Chlorophyll a:	0.6 ug/L	oligo
Secchi Clarity:	2.7 m	eu

Theoretical Water Retention Time: 23 days
Zooplankton Biomass: 190 mg/m2
Fish Catch Rate and Condition: 7.7 fish/trap; Avg. Length 69 mm; Avg. Condition 1.21

Water Quality:
Fecal Coliform Bacteria (cfu/100 ml): Average 18, 0 of 5 samples >100, Max. 60
Turbidity: 3.2 NTU
Color: 15.3 Pt units
Iron: 576 ug/l
pH: 6.73
Conductivity: 111 umhos/cm

Table 3-1E: Island Lake

Overview: Island Lake is the largest and deepest of the lakes studied. 76% of the upstream watershed is undeveloped, so the water quality is good (although not quite as good as Dark Lake), with low levels of turbidity, color, iron, phosphorus, and fecal coliforms. This lake is often used by neighborhood children for swimming. Very high fecal coliform bacteria counts were measured sporadically in the creek near Island Lake Park and at the Island Lake Park beach in the lake. This creek drains the residential, commercial, and industrial areas near Safeway. Coliform counts remained low at the lake outlet. Fecal coliform bacteria monitoring during the summer is recommended to ensure that there is no significant health risk to swimmers.

Surface Area: 39.0 acres
Average Depth: 13.0 feet
Maximum Depth: 30 feet
Sept. Weed Cover: 10%; yellow lily locally abundant, pondweed and burr reed in sparse patches.

Cumulative Watershed Area: 745 acres
Upstream lakes: 29 acres
Undeveloped: 503 acres
Residential: 145 acres
Commercial / Institutional: 34 acres

Trophic State Indicators:
Total Phosphorus: 11 ug/L meso
Chlorophyll a: 0.9 ug/L oligo
Secchi Clarity: 2.4 m meso

Theoretical Water Retention Time: 60 days
Zooplankton Biomass: 427 mg/m2
Fish Catch Rate and Condition: 11 fish/trap; Avg. Length 75 mm; Avg. Condition 1.13

Water Quality:
Fecal Coliform Bacteria:
inlet near Island Lake Park: Average 440, 6 of 8 samples >100, Max. 1800
outlet from Island Lake: Average 19, 0 of 7 samples >100, Max. 70
Turbidity: 3.9 NTU
Color: 11.3 Pt units
Iron: 431 ug/l
pH: 6.81
Conductivity: 135 umhos/cm

Table 3-1F: Lilly Lake

Overview: Lilly Lake's primary use is as a seaplane base. The municipal airstrip adjoins the lake to the north. Commercial lots adjoin the lake to the east, and residential lots adjoin the lake to the west. The appearance of the lake shore is marred by trash behind some of the commercial lots. The watershed is relatively small relative to the size of the lake, so the water retention time is long compared to most of the other study lakes. Zooplankton are not abundant in Lilly Lake, however. This is inconsistent with the trend in other lakes, where zooplankton abundance tracks with increasing depth and longer retention time. The lake is not particularly nutrient enriched in comparison with Potatopatch Lake (into which it drains) or Mission Lake. Lilly Lake has been stocked with rainbow trout.

Surface Area: 16.5 acres
Average Depth: 4.6 feet
Maximum Depth: 7.5 feet
Sept. Weed Cover: 40%; yellow lily dominant, pondweed abundant submerged, bladderwort abundant, burr reed sparse.

Cumulative Watershed Area: 95 acres
Upstream lakes: 0 acres
Undeveloped: 9 acres
Residential: 40 acres
Commercial / Institutional: 29 acres

Trophic State Indicators:

Total Phosphorus:	11 ug/L	meso
Chlorophyll a:	2.0 ug/L	oligo
Secchi Clarity:	1.8+ m	eu

Theoretical Water Retention Time: 75 days
Zooplankton Biomass: 13 mg/m2
Fish Catch Rate and Condition: Stocked with rainbow trout. 4.2 fish/trap; Avg. Length 81 mm: Avg. Condition 1.04

Water Quality:
Fecal Coliform Bacteria (cfu/100 ml): Average 23, 0 of 6 samples >100, Max. 70
Turbidity: 3.8 NTU
Color: 11.6 Pt units
Iron: 454 ug/l
pH: 6.98
Conductivity: 186 umhos/cm

Other: ADF&G has suggested that a hydrocarbons analysis of some rainbow trout from Lilly Lake might be advisable to check for avgas or fuel oil contamination. Oil slicks and small oil have occassionally affected Lilly Lake in recent years.

Table 3-1G: Potatopatch Lake

Overview: Potatopatch Lake is chronically turbid, and the unattractive brown color of the water was one of the motivators behind the formation of the Clean Lakes for Kodiak group. The Potatopatch Lake watershed has the least percentage of undeveloped land of all the study lakes except Lower Horseshoe. The lake is quite shallow, and the average water retention time is only 10 days. Zooplankton biomass is very small, but fish trapping results indicated high relative abundance and the best growth of stocked silver salmon in comparison with the other lakes. Turbidity values track well with iron concentrations in the lake, and they may reflect precipitated high concentrations of iron in water from the Baranof Park area, which was formerly a lake bed and town dump. Alternatively, the high turbidity may be caused by non-point silt inputs from the watershed or by wind action on the shallow soft bottom sediments. Further study is needed to determine which is the dominant cause.

Surface Area: 12.7 acres
Average Depth: 2.5 feet
Maximum Depth: 4.3 feet
Sept. Weed Cover: 60%; pondweeds dominant, burr reed common NE end, yellow lily sparse clumps E shore, ditch grass (Ruppia maritima) common near outlet.

Cumulative Watershed Area: 298 acres
Upstream lakes: 17 acres
Undeveloped: 35 acres
Residential / Parks: 143 acres
Commercial / Institutional: 91 acres

Trophic State Indicators:

Total Phosphorus:	43 ug/L	eu
Chlorophyll a:	4.7 ug/L	meso
Secchi Clarity:	0.5 m	eu

Theoretical Water Retention Time: 10 days
Zooplankton Biomass: 1 mg/m2
Fish Catch Rate and Condition: 21 fish/trap; Avg. Length 98 mm; Avg. Condition 1.10

Water Quality:
Fecal Coliform Bacteria (cfu/100 ml): Average 157, 2 of 6 samples >100, Max. 470
Turbidity: 15.3 NTU
Color: 16.2 Pt units
Iron: 1170 ug/l
pH: 7.44
Conductivity: 530 umhos/cm

Other: The elevation of the bottom of the outlet culvert is 9.7 feet above mean lower low water (MLLW). Lake level is about +10.4 MLLW. Inspection of the tide tables shows that seawater can flow into the lake on about 20 high tides per year. Seaweed was seen in the lake on several occasions, and conductivity, calcium, magnesium, and alkalinity are elevated.

Table 3-1H: Mission Lake

Overview: Mission Lake is high in nutrients and very productive. The lake is shallow, and it has been heavily colonized by aquatic weeds. Seawater frequently enters the lake when the tide gate gets clogged by debris. An overflowing sewer line has discharged raw sewage to the lake for brief periods in 1994, 1995, and 1997. The water retention time is about 22 days. Zooplankton biomass is very low, but primary production in the form of aquatic weeds and microalgae blooms is high. Excessive production could lead to oxygen depletion following a period of sunny days with little wind. Fish trapping efforts in 1995 indicated fast growth of silver salmon compared with that in the Island Lake watershed. Some outmigrating smolt are lost to predators in the intertidal zone when they leave the lake at low tide.

Surface Area: 23.5 acres
Average Depth: 2.9 feet
Maximum Depth: 4.5 feet
Sept. Weed Cover: 80%; pondweeds dominant, ditch grass (Ruppia maritima) common near the tide gate.

Cumulative Watershed Area: 281 acres
Upstream lakes: 0 acres
Undeveloped: 123 acres
Residential / Parks: 90 acres
Commercial / Institutional: 47 acres

Trophic State Indicators:
Total Phosphorus: 33 ug/L eu
Chlorophyll a: 4.5 ug/L meso
Secchi Clarity: 0.8 m eu

Theoretical Water Retention Time: 22 days
Zooplankton Biomass: 1 mg/m2
Fish Catch Rate and Condition: 5.9 fish/trap; Avg. Length 91 mm; Avg. Condition 1.10

Water Quality:
Fecal Coliform Bacteria (cfu/100 ml):
Inlet near Horn & Burch residences: Average 243, 3 of 7 samples >100, Max. 800
Outlet from Mission Lake: Average 34, 1 of 7 samples >100, Max. 130
Turbidity: 8.2 NTU
Color: 18.0 Pt units
Iron: 731 ug/l
pH: 8.34
Conductivity: 1406 umhos/cm

Other: The elevation of the rim of the outlet weir is 8.9 feet above mean lower low water (MLLW). Lake level is about +9.0 MLLW. Inspection of the tide tables shows that sea level is higher than lake level on about 160 high tides per year. The tide gate is in need of repair and continuing maintenance if the lake is to remain freshwater.

Table 3-1I: Gertrude Lake (Ft. Abercrombie State Park)

Overview: Gertrude Lake is within the boundaries of Fort Abercrombie State Park. There is very little development within the watershed, and that is reflected in the excellent water quality. Gertrude Lake is relatively deep, so the water retention time is over 100 days. The undeveloped watershed and long retention time produce the highest zooplankton biomass and the lowest turbidity and iron of all the study lakes. Gertrude Lake is popular with swimmers.

Surface Area: 18.7 acres
Average Depth: 13.0 feet
Maximum Depth: 28 feet
Sept. Weed Cover: 5%; yellow lily dominant; pondweeds, burr reed, bladderwort common; quillwort sparse

Cumulative Watershed Area: 200 acres
Upstream lakes: 0 acres
Undeveloped: 181 acres
Residential / Parks: 0 acres
Commercial / Institutional: 0 acres

Trophic State Indicators:
Total Phosphorus: 10 ug/L meso
Chlorophyll a: 0.8 ug/L oligo
Secchi Clarity: 4.3 m meso

Theoretical Water Retention Time: 111 days
Zooplankton Biomass: 884 mg/m2
Fish Catch Rate and Condition: Stocked with rainbow trout. 1.7 fish/trap; Avg. Length 71 mm; Avg. Condition 1.18

Water Quality:
Fecal Coliform Bacteria (cfu/100 ml):
Inlet to Lake: Average 36, 0 of 3 samples >100, Max. 100
Limno sampling station in lake: 1 sample only, 0 cfu/100 ml
Turbidity: 1.4 NTU
Color: 15.9 Pt units
Iron: 193 ug/l
pH: 6.93
Conductivity: 194 umhos/cm

Table 4-1A

Kodiak Urban Lakes - Individual watershed acreage and land use.

INDIVIDUAL WATERSHED AREAS (acres)

	Lake Surface	Undeveloped	Residential	Commercial	Institutional	Park	TOTAL
Upper Horseshoe	2.2	1.4	5.5				9
Lower Horseshoe	1.0	2.3	23.9				27
Upstream Selief		250					250
Beaver Lake	14	82	33	6			135
Dark Lake	14	60	2				76
Island Lake	39	107	81	28			254
Lilly Lake	17	9	40	29			95
Potatopatch Lake	13	26	89	41	21	14	204
Mission Lake	24	123	80	37	10	10	282

INDIVIDUAL WATERSHED LAND USE (percent)

	Lake Surface	Undeveloped	Residential	Commercial	Institutional	Park	TOTAL
Upper Horseshoe	24.1	15.8	60.1				100.0
Lower Horseshoe	3.7	8.5	87.9				100.0
Upstream Selief		100.0					100.0
Beaver Lake	10.6	60.7	24.3	4.5			100.0
Dark Lake	18.9	78.9	2.3				100.0
Island Lake	15.3	41.9	31.8	11.0			100.0
Lilly Lake	17.4	9.5	42.1	30.5			100.0
Potatopatch Lake	6.2	12.6	43.6	20.4	10.3	6.9	100.0
Mission Lake	8.3	43.5	28.3	13.0	3.6	3.4	100.0

NOTE: In multi-lake systems, areas and percentages for downsteam lakes exclude all upstream lakes and their watersheds.

Table 4-1B

Kodiak Urban Lakes - Cumulative watershed acreage and land use.

CUMULATIVE WATERSHED AREAS (acres)

	Lake Surface	Undeveloped	Residential	Commercial	Institutional	Park	TOTAL
Upper Horseshoe	2.2	1.4	5.5				9
Lower Horseshoe	3.2	3.7	29				36
Upstream Selief		254	29				283
Beaver Lake	18	336	62	6			422
Dark Lake	32	396	64	6			498
Island Lake	71	503	145	34			752
							0
Lilly Lake	17	9	40	29			95
Potatopatch Lake	29	35	129	70	21	14	298
							0
Mission Lake	24	123	80	37	10	10	282

CUMULATIVE WATERSHED LAND USE (percent)

	Lake Surface	Undeveloped	Residential	Commercial	Institutional	Park	TOTAL
Upper Horseshoe	24.1	15.8	60.1				100.0
Lower Horseshoe	8.8	10.3	80.9				100.0
Upstream Selief	0.0	89.6	10.4				100.0
Beaver Lake	4.2	79.7	14.8	1.4			100.0
Dark Lake	6.4	79.5	12.8	1.2			100.0
Island Lake	9.4	66.8	19.3	4.5			100.0
Lilly Lake	17.5	9.7	42.3	30.5			100.0
Potatopatch Lake	9.8	11.7	43.2	23.6	7.1	4.7	100.0
Mission Lake	8.3	43.5	28.3	13.0	3.6	3.4	100.0

NOTE: In multi-lake systems, areas and percentages for downsteam lakes include all upstream lakes and their watersheds.

Table 4-2

FIR-HRT WR4

Lake and Watershed Characteristics

Lake	Watershed Area (acres)	Lake Area (acres)	Lake Volume (acre-ft)	Mean Lake Depth (feet)	Mean Annual Flow (cfs)	Water Detn. Time (days)
Upper Horseshoe	10	2.2	4.4	2.0	0.05	44
Lower Horseshoe	37	1.0	1.5	1.5	0.19	4
Beaver	421	14.3	57	4.0	2.37	12
Dark	495	14.4	128	8.9	2.80	23
Island	745	39.0	506	13.0	4.26	60
Lilly	95	16.5	76	4.6	0.51	75
Potatopatch	298	12.7	32	2.5	1.66	10
Mission	281	23.5	68	2.9	1.56	22
Abercrombie	200	18.7	242	13.0	1.10	111

Table 4-3
Surface Temperature, Surface Oxygen Concentration, and Secchi Clarity

TEMPERATURE (C)

	Mar 8,20	May 3	June 22	July 30	Aug 29	Oct 16	AVG.
UHshoe	0.0	10.0	13.0	14.9	15.2	7.0	10.0
LHshoe	0.0	9.5	13.0	14.7	15.4	6.0	9.8
Beaver	0.0	9.5	12.5	14.6	14.2	6.5	9.6
Dark	0.0	8.0	16.3	15.7	14.3	6.7	10.2
Island	0.0	9.5	15.5	15.7	15.1	7.0	10.5
Lilly	0.0	10.5	13.7	16.0	15.2	6.5	10.3
Ppatch	2.0	10.0	12.9	16.0	13.8	7.5	10.4
Mission	2.0	13.0	13.2	16.2	14.1	7.0	10.9
Abercrom	1.0	8.0	14.5	16.2	15.6	7.0	10.4

OXYGEN (mg/l)

	Mar 8,20	May 3	June 22	July 30	Aug 29	Oct 16	AVG.
UHshoe	4.3	11.3	10.6	10.1	9.2	12.2	9.6
LHshoe	8.2	11.4		10.1	9.8	12.5	
Beaver	10.6	11.4	10.7	10.1	10.2	12.3	10.9
Dark	9.2	11.8	9.7	9.8	10.6	12.3	10.6
Island	10.4	11.4	9.9	9.8	10.4	12.2	10.7
Lilly	8.6	11.1	10.3	9.9	10.1	12.3	10.4
Ppatch	12.2	11.3	10.6	9.9	10.2	12.0	11.0
Mission	8.4	10.5	10.5	9.9	9.9	12.2	10.2
Abercrom	9.6	11.8	10.1	9.8	10.1	12.2	10.6

SECCHI CLARITY (meters)

	May 3	June 22	July 30	Aug 29	Oct 16	AVG.
UHshoe	0.5	1.0	1.0	1.0	1.0	0.9
LHshoe	1.0	0.3	0.3	0.3	0.2	0.4
Beaver	1.5	1.3	1.6	0.8	1.0	1.2
Dark	1.5	2.8	3.3	4.0	1.8	2.7
Island	1.5	2.7	3.0	3.0	2.0	2.4
Lilly	2.0	1.5	2.0	2.0	1.5	1.8
Ppatch	0.6	0.5	0.5	0.6	0.5	0.5
Mission	1.2	0.8	0.7	0.8	0.6	0.8
Abercrom	4.3	4.5	5.0	4.5	3.0	4.3

Table 4-4A

Upper Horseshoe Lake

TEMPERATURE (C)

	March 8	May 3	June 22	July 30	Aug 29	Oct 16
Surface	0.0	10.0	13.0	14.9	15.2	7.0
0.5 m	0.0	10.0	13.0	14.1	13.3	7.0
1.0 m		10.5	13.0	14.1	13.3	7.0
1.2 m		8.5				

OXYGEN (mg/l)

	March 8	May 3	June 22	July 30	Aug 29	Oct 16
Surface	4.3	11.3	10.6	10.1	9.2	12.2
0.5 m	0.6	11.2	10.1	10.1	8.5	12.2
1.0 m		11.2	10.0	9.7	1.7	12.2
1.2 m		5.5				

Lower Horseshoe Lake

TEMPERATURE (C)

	March 20	May 3	June 22	July 28	Aug 29	Oct 16
Surface	0.0	9.5	13.0	14.7	15.4	6.0
0.5 m	0.0	9.2	11.5	14.0	13.2	6.0
Bottom		9.2	11.5			

OXYGEN (mg/l)

	March 20	May 3		July 28	Aug 29	Oct 16
Surface	8.2	11.4		10.1	9.8	12.5
0.5 m	8.2	11.4		7.4	0.6	11.5
Bottom		10.2				

Table 4-415

Beaver Lake

TEMPERATURE (C)

	March 8	May 3	June 22	July 30	Aug 29	Oct 16
Surface	0.0	9.5	12.5	14.6	14.2	6.5
0.5 m		10.0	12.5	14.0	14.0	6.2
1.0 m	2.0	10.0	12.5	13.8	13.5	6.0
1.5 m		9.5	12.5	12.7	13.2	6.0
2.0 m	2.0	9.0	12.0	12.1	12.7	6.0
2.5 m		7.5	11.5	11.5	11.9	6.0
3.0 m	3.0					
Bottom	3.0			11.2		

OXYGEN (mg/l)

	March 8	May 3	June 22	July 30	Aug 29	Oct 16
Surface	10.6	11.4	10.7	10.1	10.2	12.3
0.5 m		11.2		10.2	10.2	12.1
1.0 m	6.6	11.2		10.2	8.9	12.0
1.5 m		10.7		10.1	8.7	12.0
2.0 m	4.5	10.6		10.0	7.2	11.9
2.5 m		8.0		8.0	3.1	11.3
3.0 m	0.4					
Bottom	0.2			4.5		

Table 4-4c

Dark Lake

TEMPERATURE (C)

	March 20	May 2	June 25	July 28	Aug 30	Oct 16
Surface	0.0	8.0	16.3	15.7	14.3	6.7
0.5 m		8.5	16.3	15.8	14.5	6.6
1.0 m	0.0	8.5	14.7	15.8	14.5	6.6
1.5 m		8.0	14.5	15.7	14.5	6.6
2.0 m	1.0	8.0	14.1	14.0	14.4	6.6
2.5 m		7.0	13.7	12.8	14.4	6.6
3.0 m	1.5	6.0	13.2	12.5	14.3	6.6
3.5 m		5.5	12.7	11.6	13.5	6.6
4.0 m	2.0	5.0	12.0	11.2	12.7	6.6
4.5 m		5.0	10.8	10.7	12.1	6.6
5.0 m	3.5		10.5			

OXYGEN (mg/l)

	March 20	May 2	June 25	July 28	Aug 30	Oct 16
Surface	9.2	11.8	9.7	9.8	10.6	12.3
0.5 m		11.8	9.6	9.8	10.2	12.3
1.0 m	9.4	11.8	9.4	9.6	10.0	12.3
1.5 m		11.6	9.6	9.6	10.0	12.3
2.0 m	9.0	11.6	9.5	9.7	9.9	12.3
2.5 m		11.4	9.2	9.4	9.7	12.3
3.0 m	6.3	11.2	9.2	9.1	10.1	12.4
3.5 m		10.8	9.2	7.3	5.6	12.3
4.0 m	3.7	10.4	9.1	5.6	3.3	12.3
4.5 m		6.2	8.2	4.1	1.4	6.0
5.0 m	0.2		8.1			

Table 4-4D

Island Lake

TEMPERATURE (C)

	March 20	May 1	June 25	July 28	Aug 30	Oct 16
Surface	0.0	9.5	15.5	15.7	15.1	7.0
0.5 m		9.0	15.5	15.8	15.0	7.0
1.0 m	2.0	9.0	15.5	15.8	14.9	7.0
1.5 m		8.5	15.5	15.7	14.8	7.0
2.0 m	2.5	8.0	15.5	15.7	14.8	7.0
2.5 m		7.5	14.0	15.7	14.7	7.0
3.0 m	2.5	7.0	13.8	14.6	14.7	7.0
3.5 m		7.0	13.3	13.8	14.6	7.0
4.0 m	2.5	6.5	12.6	13.3	14.5	7.0
4.5 m		6.5	11.9	11.1	13.0	7.0
5.0 m	2.5	6.0	11.2	10.1	12.0	7.0
6.0 m	2.0	5.5	9.3	8.7	9.5	7.0
7.0 m	2.2	5.0	8.3	7.8	8.4	7.0
8.0 m	2.5	4.5	6.9	7.3	8.5	7.0
9.0 m	3.0	4.2	6.6	7.1		7.0
9.8 m	3.0					

OXYGEN (mg/l)

	March 20	May 1	June 25	July 28	Aug 30	Oct 16
Surface	10.4	11.4	9.9	9.8	10.4	12.2
0.5 m		11.0	9.9	9.7	10.2	12.2
1.0 m	9.0	11.0	9.8	9.8	10.1	12.1
1.5 m		11.0	9.7	9.7	9.8	12.1
2.0 m	9.0	11.2	9.7	9.7	9.9	12.1
2.5 m		11.2	9.6	9.4	9.6	12.1
3.0 m	8.4	11.0	9.7	9.8	9.5	12.0
3.5 m		11.0	9.7	9.8	9.6	12.0
4.0 m	7.5	10.9	9.8	9.5	9.0	12.0
4.5 m		10.8	9.7	8.0	6.9	12.0
5.0 m	5.7	10.4	9.7	6.7	4.6	11.7
6.0 m	4.9	9.8	9.7	4.3	1.0	11.5
7.0 m	4.0	9.5	6.0	1.7	0.2	2.0
8.0 m	3.2	8.4	2.0	0.5	0.2	2.0
9.0 m	2.4	2.5	0.1	0.2		2.0
9.8 m	0.4					

Table 4-4E

Lilly Lake

TEMPERATURE (C)

	March 20	May 4	June 23	Aug 1	Aug 29	Oct 17
Surface	0.0	10.5	13.7	16.0	15.2	6.5
0.5 m		11.0	13.7	16.2	15.2	6.5
1.0 m	3.0	11.0	13.7	16.2	15.0	5.5
1.5m		11.0	13.6	16.2	14.9	6.5
2.0m	5.0	11.0	13.5	16.0	14.9	6.5
Bottom	5.0	11.0	13.5	15.8		

OXYGEN (mg/l)

	March 20	May 4	June 23	Aug 1	Aug 29	Oct 17
Surface	8.6	11.1	10.3	9.9	10.1	12.3
0.5 m		11.0	10.3	9.8	9.8	12.3
1.0 m	5.2	11.0	10.1	9.2	9.5	12.3
1.5 m		10.8	10.1	9.2	9.4	12.2
2.0m	0.8	10.8	10.0	7.5	9.5	11.9
Bottom	0.2	6.8	8.2	<1		9.0

Potatopatch Lake

TEMPERATURE (C)

	March 8	May 4	June 23	Aug 1	Aug 29	Oct 17
Surface	2.0	10.0	12.9	16.0	13.8	7.5
0.5 m	6.0	10.0	12.7	16.0	13.8	6.5
1.0 m		10.0	12.5	16.0	13.6	6.5
1.2m						6.5

OXYGEN (mg/l)

	March 8	May 4	June 23	Aug 1	Aug 29	Oct 17
Surface	12.2	11.3	10.6	9.9	10.2	12.0
0.5 m	11.0	11.3	10.3	9.6	10.2	11.8
1.0 m		11.0	10.2	9.3	9.8	11.5
1.2m						9.8

Table 4-4F

Mission Lake

TEMPERATURE (C)

	March 8	May 4	June 23	Aug 1	Aug 29	Oct 17
Surface	2.0	13.0	13.2	16.2	14.1	7.0
0.5 m		13.0	13.1	16.2	14.1	7.0
1.0 m	6.0	13.0	13.0	16.2	14.1	9.0
1.2m	5.8	12.2	13.0		14.2	

OXYGEN (mg/l)

	March 8	May 4	June 23	Aug 1	Aug 29	Oct 17
Surface	8.4	10.5	10.5	9.9	9.9	12.2
0.5 m		10.5	10.4	9.2	9.6	12.0
1.0 m	5.8	10.5	10.5	8.5	9.2	3.0
1.2m	0.3	5.0	10.4		8.8	

Take 4-4G

Gertrude Lake
(at Abercrombie Park)

TEMPERATURE (C)

	March 30	May 5	June 26	July 30	Aug 30	Oct 17
Surface	1.0	8.0	14.5	16.2	15.6	7.0
0.5 m		8.0	14.6	16.1	15.4	7.0
1.0 m	2.0	8.0	14.6	15.9	15.1	7.0
1.5 m		8.0	14.5	15.5	14.9	7.0
2.0 m	3.0	8.0	14.5	15.5	14.8	7.0
2.5 m		8.0	14.1	15.4	14.7	7.0
3.0 m	3.0	8.0	13.7	15.2	14.6	7.0
3.5 m		8.0	13.3	14.8	14.6	7.0
4.0 m	3.0	8.0	13.1	13.8	14.3	7.0
4.5 m		7.5	12.7	13.2	14.3	7.0
5.0 m	3.0	7.5	12.1	12.0	13.1	7.0
6.0 m	3.0	6.0	10.8	11.0	11.8	7.0
7.0 m	3.0	5.3	10.4	10.4	10.9	7.0

OXYGEN (mg/l)

	March 30	May 4	June 23	Aug 1	Aug 29	Oct 17
Surface	9.6	11.8	10.1	9.8	10.1	12.2
0.5 m		11.8	9.9	9.8	9.9	12.2
1.0 m	9.6	11.8	9.8	9.6	10.2	12.2
1.5 m		11.8	9.7	9.6	9.9	12.2
2.0 m	9.0	11.8	9.7	9.7	9.9	12.2
2.5 m		11.8	9.6	9.5	10.0	12.2
3.0 m	9.0	11.6	9.8	9.7	9.7	12.2
3.5 m		11.6	9.4	9.9	9.7	12.2
4.0 m	7.3	11.4	9.5	9.0	9.6	12.2
4.5 m		11.2	9.5	8.6	9.2	12.2
5.0 m	5.2	11.0	9.7	6.8	5.3	12.2
6.0 m	3.6	10.6	8.7	4.3	0.6	12.2
7.0 m	0.6	9.2	6.4	2.2	0.3	12.2

Table 4-5A

Limnological Water Quality Summary

Lake	Specific conductance (umhos/cm)	pH (Units)	Alkalinity (mg/L)	Turbidity (NTU)	Color (Pt units)	Calcium (mg/L)	Iron (ug/L)
Upper Horseshoe	150	6.76	37	7.3	24.8	14.5	2673
Lower Horseshoe	199	6.94	45	48.4	41.8	17.4	4462
Beaver	113	6.82	24	5.2	17.4	9.0	811
Dark	111	6.73	22	3.2	15.3	8.1	576
Island	135	6.81	25	3.9	11.3	10.7	431
Lilly	186	6.98	28	3.8	11.6	10.3	454
Potatopatch	530	7.44	40	15.3	16.2	16.4	1170
Mission	1406	8.34	45	8.2	18.0	21.9	731
Abercrombie	194	6.93	22	1.4	15.9	8.0	193

Table 4-5B

Limnological Water Quality Summary

Lake	Total-P (ug/L P)	Total Kjel-dahl nitrogen (ug/L N)	Ammonia (ug/L N)	Nitrate+ nitrite (ug/L N)	Organic carbon (ug/L)	Chloro-phyll a (ug/L)	Phaeo-phytin a (ug/L)	Zooplnktn biomass (mg/m^2)	Hydraulic Detention Time (days)
Upper Horseshoe	16	441	36	22	871	1.8	1.1	216	44
Lower Horseshoe	55	475	60	113	1291	1.1	0.8	7	4
Beaver	10	233	13	75	300	1.0	0.5	15	12
Dark	9	212	16	86	187	0.6	0.3	190	23
Island	11	208	13	99	211	0.9	0.4	427	60
Lilly	11	313	20	56	322	2.0	0.7	13	75
Potatopatch	43	487	25	68	659	4.7	1.9	1	10
Mission	33	437	4	8	659	4.5	1.3	1	22
Abercrombie	10	237	6	6	233	0.8	0.3	884	111

Table 4-6, Limnology Sample Elemental Analyses (page 1 of 2)

	Limit of Detection (ug/liter)	EPA aquatic life criterion (ug/liter)	Upper Horseshoe	Lower Horseshoe	Beaver	Dark	Island	Lilly	Potato-patch	Mission	Gertrude	
Lithium	1		9	37	25	27	33	44				Lithium
Boron	1	300	2	15	4	8	1	9	50	41	14	Boron
Sodium			12000	16000	11000	12000	15000	22000	50000	78000	22000	Sodium
Magnesium			2500	5600	2500	2800	4100	4300	6200	9600	3100	Magnesium
Aluminum			51	400	98	85	79	53	200	140	24	Aluminum
Silicon			640	2720	3070	3270	2700	1300	2240	3030	2970	Silicon
Phosphorus	50		110			60	70	120	70			Phosphorus
Potassium			850	3200	1200	1500	2500	3100	3500	4800	1300	Potassium
Calcium			16000	38000	13000	13000	21000	24000	16000	17000	7200	Calcium
Scandium	0.2		0.6	1.9	1.1	1.4	1.9	2.1	0.4	0.3		Scandium
Titanium			2.6	8.6	2.9	4.4	3.9	4.2	2.5	3	1.4	Titanium
Vanadium	0.2		0.5	1.3	0.4	0.5	0.8		0.5		0.3	Vanadium
Chromium	0.2	11/120	0.4	1.8	0.7	0.5	0.7	1	0.6	0.6		Chromium
Manganese			140	730	280	210	300	700	260	130	24	Manganese
Iron		1000	2200	6200	1000	690	620	710	960	580	150	Iron
Cobalt	0.07		0.9	3	0.99	0.56	0.62	0.6	0.88	0.52		Cobalt
Nickel	0.5	56	1.7	7	3.4	2.9	3.8	5.2	2.8	1.1		Nickel
Copper	0.5	6.5	0.5	6	1.5	1.6	2.7	4.8	1			Copper
Zinc	1	47		37	14	1.6	7	13	20	5		Zinc
Gallium	0.1			0.2	0.1			0.1				Gallium
Germanium	0.1			0.4		0.2	0.3	0.2				Germanium
Arsenic	1	50	1	3		1			1	2		Arsenic
Bromine			120	290	79	88	130	260	240	320	63	Bromine
Selenium	1	10/760		11	6	6	15	15	1			Selenium
Rubidium			0.6	1.8	0.7	0.8	1.3	1.7	1.3	1.5	0.6	Rubidium
Strontium			92	210	81	83	130	140	110	120	55	Strontium
Yttrium	0.05		0.08	0.33	0.11	0.11	0.13	0.06	0.05	0.06		Yttrium

Table 4-6, Limnology Sample Elemental Analyses (page 2 of 2)

	Limit of Detection (ug/liter)	EPA aquatic life criterion (ug/liter)	Upper Horseshoe	Lower Horseshoe	Beaver	Dark	Island	Lilly	Potato-patch	Mission	Gertrude	
Molybdenum	0.1			0.4	0.1		0.2	0.1	0.2	0.2		Molybdenum
Silver	0.05	0.12		0.06				0.11				Silver
Palladium	0.05			0.05				0.06				Palladium
Cadmium	0.1	0.66		0.1	0.1	0.1		0.2				Cadmium
Tin	0.1			0.2				0.1	0.1	0.2	0.1	Tin
Tellurium	0.2			0.2	0.3			0.4				Tellurium
Iodine			70	220	42	40	80	240	98	110	16	Iodine
Cesium	0.05		0.07	0.23	0.09	0.11	0.18	0.24	0.17	0.13		Cesium
Barium		1000	13	37	13	13	16	9.1	9.3	5.4	6.4	Barium
Lanthanum	0.05			0.11		0.05	0.05		0.1			Lanthanum
Cerium	0.05		0.11	0.28	0.08	0.09	0.08		0 07	0.09		Cerium
Praseodymium	0.05			0.05								Praseodymium
Neodymium	0.1							0.1				Neodymium
Samarium	0.05			0.07								Samarium
Gadolinium	0.05							0.05				Gadolinium
Dysprosium	0.05			0.05	0.05							Dysprosium
Erbium	0.05			0.05			0.05					Erbium
Ytterbium	0.05			0.05				0.07				Ytterbium
Mercury	0.1	0.012		0.3		0.3	0.4	0.2				Mercury
Lead		1.3	0.44	1.8	0.98	0.33	0.42	1.1	1.1	0.57	0.35	Lead
Uranium	0.02			0.02					0.03	0.03		Uranium

Notes:
1) All concentrations are given in units of ug / liter (equivalent to parts per billion).
2) All samples were collected during the late July 1995 sampling event.
3) The EPA aquatic life criteria for Chromium are 11 ug/l for the hexavalent state and 120 ug/l for the trivalent state.
4) The EPA aquatic life criteria for Selenium are 10 ug/l for the Selenite ion and 760 ug/l for the Selenate ion.
5) Many of the aquatic life criteria are hardness dependent. Values corresponding to 50 mg/l hardness as $CaCO_3$ are used above
6) Blank detection limits are given where all samples were above detection limits. Blank EPA aquatic life criteria are given where there is none. Blank sample concentrations are given where the element was present at a concentration below detection limits.

Table 4-7. Releases of coho salmon and rainbow trout fry during 1990-1996 into lakes evaluated under the Clean Lakes for Kodiak project.

Lake	Fish Species	Year 1990	1991	1992	1993	1994	1995	1996
Lower Horseshoe	rainbow	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Dark Lake	coho	7,500	7,500	7,500	8,000	18,000[a]	12,571[b]	0
Island Lake	coho	8,500	22,500	22,500	16,000	47,400[a]	23,523[b]	14,000[c]
Potatopatch Lake	coho	0	9,500	7,500	0	20,000[a]	4,857[b]	0
Mission Lake	coho	10,000	12,700	7,500	8,000	30,200[a]	20,285[b]	14,000[c]
Lilly (Big Lake)	rainbow	3,600	3,600	1,800	3,600	7,950	4,000	7,000
Gertrude Lake (Abercrombie)	rainbow	3,700	3,700	3,200	3,700	8,350	6,300	4,000

[a] Coho fry stocked at 0.50 grams on June 17, 1994.
[b] Coho fry stocked at 2.1 grams on August 3, 1995.
[c] Coho fry stocked at 0.4 grams on June 6, 1996.

Table 4-8. Lakes and streams sampled for fish in 1995, number of traps used, and catch in numbers by species from Kodiak city area.

Lake/Creek	Date	Traps	Coho	Rain-bow	Dolly Varden	Stickle-back	Sculpin
U. Horseshoe Lake	26 Apr	3	3	0	0	0	0
	4 May	6	11	0	0	0	0
	17 Oct	5	42	n/a	n/a	n/a	0
L. Horseshoe Lake	26 Apr	8	12	0	3	3	0
	4 May	6	79	0	18	0	1
	17 Oct	3	14	n/a	n/a	n/a	0
Selief Ditch	4 May	2	18	0	8	0	0
	17 Oct	1	29	n/a	n/a	n/a	0
Reservoir Creek	26 Apr	2	0	0	0	8	0
	17 Oct	1	18	n/a	n/a	n/a	0
Beaver Lake	26 Apr	10	4	0	0	7	0
	4 May	8	38	0	4	32	0
	17 Oct	7	183	0	15	68	0
Dark Lake	28 Apr	8	0	0	1	1	0
	18 May	6	26	0	5	0	0
	8 Nov	6	46	0	1	47	0
Island Lake	28 Apr	8	3	0	0	0	0
	18 May	10	89	0	54	1	0
	8 Nov	6	67	0	11	4	0
Potatopatch Lake	27 Apr	8	3	0	0	656	0
	19 May	10	63	0	0	240	1
	19 Oct	6	127	0	0	69	0
Mission Lake	27 Apr	8	0	0	0	293	0
	19 May	10	3	0	0	157	0
	19 Oct	7	41	0	0	178	0
Lilly Lake	27 Apr	5	0	0	0	384	0
	23 May	7	0	0	0	1158	0
	19 Oct	6	0	25	0	212	0
Gertrude Lake (Abercrombie)	28 Apr	10	0	0	0	19	0
	23 May	9	0	48	1	22	0
	9 Nov	6	0	10	0	0	0
Totals		198	919	83	121	3559	2

Table 4-9. Catch and size information on juvenile coho salmon, rainbow trout, and Dolly Varden captured in Kodiak Lakes in 1995.

Lake	Date	Number of fish Caught	Number of traps fished	Catch per trap	Length (mm)	Average Weight (g)	Condition Factor
Coho							
Upper Horseshoe	26 Apr	3	3	1.0	94.7	9.8	1.15
	4 May	11	6	1.8	99.5	11.0	1.08
	17 Oct	42	5	8.4	73.9	4.9	1.20
Lower Horseshoe	26 Apr	12	8	1.5	81.3	5.3	0.92
	4 May	79	6	13.2	84.9	6.5	0.91
	17 Oct	14	3	4.7	73.1	4.8	1.20
Selief Ditch	4 May	18	2	9.0	92.2	8.4	0.96
	17 Oct	29	1	29.0	77.2	5.7	1.17
Beaver Lake	26 Apr	4	10	0.4	91.3	8.3	1.00
	4 May	38	8	4.8	93.7	9.8	1.09
	17 Oct	183	7	26.1	79.1	6.4	1.17
Dark Lake	18 May	26	6	4.3	103.2	10.2	0.84
	8 Nov	46	6	7.7	69.0	4.0	1.21
Island Lake	28 Apr	3	8	0.4	89.0	7.6	1.04
	18 May	89	10	8.9	90.9	8.1	0.98
	8 Nov	67	6	11.2	75.3	6.1	1.13
Potatopatch Lake	27 Apr	3	8	0.4	82.0	5.6	0.87
	19 May	63	10	6.3	115.6	16.3	1.03
	19 Oct	127	6	21.2	98.2	10.7	1.10
Mission Lake	27 Apr	1	8	0.1	69.0	2.7	0.82
	19 May	3	10	0.3	96.7	12.7	1.05
	19 Oct	41	7	5.9	90.6	8.3	1.10
Reservoir Creek	17 Oct	18	1	18.0	79.7	5.9	1.15

- Continued -

Table 4-9. Catch and size information on juvenile coho salmon, rainbow trout, and Dolly Varden captured in Kodiak Lakes in 1995, continued.

Lake	Date	Number of fish Caught	Number of traps fished	Catch per trap	Length (mm)	Average Weight (g)	Condition Factor
Rainbow							
Lilly Lake (Big Lake)	19 Oct	25	6	4.2	81.0	5.8	1.04
Gertrude Lake (Abercrombie)	23 May	48	9	5.3	92.2	8.3	1.03
	8 Nov	10	6	1.7	70.6	4.3	1.18
Dolly Varden							
L. Horseshoe Lake	26 Apr	3	11	0.3	78.7	4.9	0.88
	4 May	16	8	2.0	96.1	9.6	0.93
Selief Ditch	4 May	10	2	5.0	107.8	11.8	0.72
Beaver Lake	4 May	4	8	0.5	118.0	15.4	0.86
	17 Oct	15	7	2.1	106.3	12.7	0.99
Dark Lake	28 Apr	1	8	0.1	82.0	5.1	0.92
	18 May	5	6	0.8	111.2	10.7	0.75
	8 Nov	1	6	0.2	128.0	19.3	0.92
Island Lake	18 May	54	10	5.4	93.3	9.4	0.91
	8 Nov	11	6	1.8	132.3	26.0	1.01
Gertrude Lake (Abercrombie)	23 May	1	9	0.1	102.0	9.9	0.93

Table 4-10. Juvenile coho size and age (from scale analysis), Kodiak Urban Lakes, 1995.

Lake	Date	Age	Length (mm)	Weight (g)
Upper Horseshoe Lake				
	04/27/95	1	59	1.7
	04/27/95	1	83	5.0
	05/04/95	1	80	5.4
	05/04/95	1	92	9.3
	05/04/95	1	101	10.9
	05/04/95	1	106	13.6
	05/04/95	1	107	13.9
	05/04/95	1	110	14.0
	05/04/95	1	111	16.0
	10/17/95	1	79	6.3
Lower HorseshoeLake				
	05/04/95	1	66	2.6
	05/04/95	1	72	4.0
	05/04/95	1	78	5.0
	05/04/95	1	80	6.0
	05/04/95	1	80	5.4
	05/04/95	1	85	7.2
	05/04/95	1	93	7.6
	05/04/95	1	104	10.2
	05/04/95	1	104	7.5
	05/04/95	1	112	7.9
	10/17/95	1	73	4.8
	10/17/95	1	78	5.4
	10/17/95	1	80	6.3
	10/17/95	1	94	9.7
Dark Lake				
	05/18/95	1	97	7.7
	05/18/95	1	111	8.2
	05/18/95	2	129	18.4
	05/18/95	2	158	

- Continued -

Table 4-10. Juvenile coho size and age (from scale analysis), Kodiak Urban Lakes, 1995, continued.

Lake	Date	Age	Length (mm)	Weight (g)
Beaver Lake				
	04/26/95	1	65	2.8
	04/26/95	1	96	8.1
	04/26/95	1	101	9.6
	04/26/95	1	103	12.6
	05/04/95	1	99	10.5
	05/04/95	1	100	10.2
	05/04/95	2	120	16.7
	05/04/95	2	131	24.9
	10/17/95	1	86	6.3
	10/17/95	2	122	20.8
	10/17/95	2	137	30.6
Island Lake				
	05/18/95	1	75	
	05/18/95	1	80	5.9
	05/18/95	1	84	5.2
	05/18/95	1	85	5.9
	05/18/95	1	90	7.1
	05/18/95	1	90	8.5
	05/18/95	1	92	6.6
	05/18/95	1	92	6.3
	05/18/95	1	95	8.0
	05/18/95	1	100	9.7
	05/18/95	1	108	10.1
	05/18/95	2	115	16.1
	05/18/95	2	130	22.0
	05/18/95	2	130	22.9
	11/08/95	2	104	12.8
	11/08/95	2	117	18.1
	11/08/95	2	123	22.2
	11/08/95	2	127	24.5
	11/08/95	2	130	24.4
	11/08/95	2	132	25.7

- Continued -

Table 4-10. Juvenile coho size and age (from scale analysis), Kodiak Urban Lakes, 1995, continued.

Lake	Date	Age	Length (mm)	Weight (g)
Potatopatch Lake				
	05/19/95	1	85	6.3
	05/19/95	1	86	7.1
	05/19/95	1	96	10.8
	05/19/95	1	110	13.8
	05/19/95	1	111	14.0
	05/19/95	1	115	17.3
	05/19/95	1	116	15.1
	05/19/95	2	122	19.8
	05/19/95	2	122	19.2
	05/19/95	2	125	20.3
	05/19/95	2	128	20.0
	10/19/95	1	91	8.5
	10/19/95	1	95	9.4
	10/19/95	1	95	9.3
	10/19/95	1	97	10.1
	10/19/95	1	98	10.1
	10/19/95	1	100	10.9
	10/19/95	1	102	10.9
	10/19/95	1	119	17.5
	10/19/95	1	123	21.3
Mission Lake				
	05/19/95	1	75	4.3
	05/19/95	1	75	4.3

Species List for Macrophytes

Table 4-11

	Common name
Equisetum fluviatile	Horsetail
Isoëtes muricata	Quillwort
Juncus sp	Rush
Nuphar polysepalum	Yellow Pond Lilly
Potamogeton Berchtoldi	Pondweeds
P. epihydrus	
P. gramineus	
P. pectinatus	
P. perfoliatus	
P. praelongus	
Ruppia spiralis (formerly maritima)	Ditch grass
Sparganium angustifolium	Burr Reed
Utricularia vulgaris	Bladderwort

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Table 4-12: Intensive Sampling for Fecal Coliforms and Turbidity

Island Lake Watershed - 13 September 1996

Sample Location	Sample Number	Fecal Coliforms (cfus/100ml)	Turbidity (NTUs)
Outlet Upper Horseshoe	1	170	98
Selief Lane into Lower Hshoe	2	2490	107
Pillar Mtn Creek	21	180	5
Combined flow @ L13 Selief	4	800	12
Lynden Wy flow into Slf ditch	22	2100	143
Combined flow @ L11 Selief	5	550	23
Combined flow @ L6 Selief	6	490	28
Mozart Crcl flow into Slf ditch	23	1200	N/A
Combined flow inlet Beaver Lk	7	1460	36
Inlet Dark Lake	8	840	9
Smokey's dump, toe of fill	9	<10	110
Joycrafts' creek	10	<10	83
Creek nr MH, N end Shahafka	11	10	73
Behind Safeway	12	60	7
Entry 24" culvert under BEI	13	210	9
24" culvert under Cove Drive	14	210	56
Near Is Lk Rd & Balika	15	220	72
Confluence (#11 + #15 +...)	17	200	59
Side drainage frm ArctTrn/Ptar	16	1310	174
Creek at Is Lk park (#17 + #16)	18	330	116
In Island Lake @ "swim beach"	19	360	109

Table 4-13: Water testing results and ADEC Water Quality Criteria.

All concentrations are in mg/liter (ppm) unless otherwise stated.

		ADEC WATER QUALITY CRITERIA:					Sample conc. / WQ Criteria:	
Contaminant	**Baranof Park Sample**	Aquatic life fresh water	Aquatic life seawater	Drinking water	Contact Recreation	Secondary Recreation	Percent of Drinking Water	Percent of freshwater aquatic life
Toluene	0.0065	NR	NR	1	1	No	0.65	
Ethylbenzene	0.0014	32	0.43	0.7	0.7	Hazard	0.20	
P&M Xylene	0.0045	NR	NR	10 total	10 total	Allowed	0.05	
O Xylene	0.0021	NR	NR	10 total	10 total	for	0.02	
1,2,4-Trimethylbenzene	0.00099	NR	NR	NR	NR	Incidental		
Napthalene	0.002	NR	NR	NR	NR	Contact		
Diesel Range Organics	0.149	NR	NR	NR	NR	No Hazard		
Arsenic	ND	0.05	0.036	0.05	0.05	Allowed		
Selenium	ND	0.01	0.054	0.05	0.05	for		
Silver	ND	0.00012	0.0023	0.1	0.1	Incidental		
Cadmium	0.000744	0.0011	0.0093	0.005	0.005	Contact	15	68
Chromium	ND			0.1	0.1			
Lead	0.014	0.0032	0.0085	0.015	0.015		93	438
Mercury	ND	0.000012	0.000025	0.002	0.002			
Barium	0.0326	1	n	2	2		2	1
Iron	15.9	1	n	(0.3)			5300	1590
TDS	141	NR	NR	500		No	28	
Chloride	29.6	NR	NR	200		Hazard	15	
Sulphate	11.3	NR	NR	200		Allowed	5	
Ammonia-N	2.59	2.2*				for	6	
TOC	7.5					Incidental		
TKN	3.62					Contact		
Total N		10	NR	10				
TP	0.062							
	P'patch Lake Samples							
Turbidity (mo.avg) in NTUs	15.9	NR		1				
Turbidity (2d.avg) in NTUs	22	natural+5		5	natural+5	natural+10		
Fecals, 5x avg (cfu/100ml)	160	NR	NR	0	100	200		
Fecals, Max (cfu/100ml)	470	NR	NR		200	400		
Diss. Oxygen	>9	7	6	4	4	4		
pH	6.5-9.5	6.5-9.0	6.5-8.5	6.0-8.5	5.0-9.0	5.0-9.0		
Color (Pt units)		<max(50,natl)		<max(natl,15)	max(natl,15)			

* Total ammonia criterion is a function of temperature and pH. Higher pH, such as occurs in Potatopatch Lake during summer, decreases the allowable total ammonia concentration.

ND = not detected
NR = not regulated

Glossary

Note: This glossary was provided by ADF&G Habitat Division, and is reproduced here without editorial change.

ALKALINITY - Also known as acid-neutralizing capacity, it is the measure of the amount of inorganic carbon present in water as carbon dioxide, bicarbonate, and carbonate ions.

BASELINE DATA - The collection of data at a point in time that describes the physical, biological, and chemical attributes of watersheds and water bodies that can and will change over time. The results of future data collection can be compared against the baseline data to analyze differences and make determinations about changes in the water bodies. Baseline data can be used to develop a more intensive approach to acquire more specific information.

BIOMASS - Also known as standing crop, it is the amount of organic matter (mass) of a particular plant, animal, or trophic level (e.g., herbivores) within a known area or volume.

CHANNEL FLOW - The flow of water in open channels. Channel flow varies according to gradient, topography, landscape, and time.

CONDITION FACTOR - A combined measure of length and weight that provides a relative measure of a fish's well being. A long, skinny fish has a low condition factor as opposed to a short, fat one.

CHLOROPHYLL - The most important photosynthetic pigment found in phytoplankton. Chlorophyll concentration is often used as an index of algal biomass and as an indicator of trophic condition.

COLOR - Color in water can result from the presence of dissolved metals (e.g., iron), organic materials (humus), plankton, and certain industrial wastes. Color is measured in platinum-cobalt (Pt) units. High levels (i.e. greater than 15 Pt units) of color or organic stain act to decrease light penetration and lower primary productivity.

CONDUCTIVITY - Conductivity is the measure of the ability of a solution to conduct an electric current. It is an index of the overall quantity of dissolved substances. Conductivity is the reciprocal of resistivity and the unit of measurement is umhos/cm (micro-mhos per centimeter). Distilled water has a conductivity of nearly zero, whereas seawater has a conductivity of about 45,000.

DISCHARGE - The volume of water flowing in a given stream at a given place and within a given time period (e.g., 100 cubic feet per second).

DISSOLVED OXYGEN - One to the most significant gases dissolved in lakes and streams. It is essential for aerobic respiration, but it also influences all biochemical activities within an aquatic community. Oxygen levels vary with the amount of mixing, turbulence, altitude, temperature, level of photosynthetic activity, and bacterial activity level. Also frequently referred to as DO.

DISSOLVED SOLIDS - The amount of dissolved (non-volatile) matter in water.

DRAINAGE NETWORK - The pattern of tributaries of a river or stream system. When viewed from above, the stream courses often appear to form leaf vein-like patterns.

EUTROPHIC - See definition under Trophic Status, below.

EUTROPHICATION - The natural or artificial addition (loading) of nutrients and particulate matter to lakes and reservoirs at rates sufficient to increase the potential for biological production and act to decrease lake volume.

FECAL COLIFORM BACTERIA - A group of bacteria found in mammalian intestines and soils. They are a useful indicator of fecal pollution in water.

FLUSHING - We suggest deleting this term in favor of hydraulic residence time as listed below. Flushing rate is not synonymous with residence time.

GROUNDWATER - Water that any given point in time that is flowing beneath the soil surface. Water often moves between the surface and the subsurface depending on local conditions.

HABITAT - The locality or environment in which a plant or animal lives.

HYDRAULIC RESIDENCE or **WATER RETENTION TIME** - The length of time for the total volume of water within a lake to be replaced.

HYDROLOGY - The scientific study of the properties, distribution, and effects of water on the earth's surface, in the soil and underlying rocks, and in the atmosphere.

INORGANIC - Commonly referred to as mineral it includes all matter that is not animal or plant.

IRON - Iron is an essential nutrient for phytoplankton and it is tied closely with the phosphorus cycle. In natural waters having little turbidity or color, iron concentrations generally are less than 200 micrograms per liter (or parts per billion). However, some groundwater and acid surface drainages may contain higher concentrations.

LIMNOLOGY - The study of the geologic, physical, chemical, and biological characteristics and events occurring in lakes and reservoirs.

MACROPHYTES - Refers to all of the large aquatic plants visible to the naked eye including macroalgae (e.g., stoneworts), and flowering vascular plants. Macrophytes are often abundant in shallow lakes.

MESOTROPHIC - See definition under Trophic Status, below.

MORPHOMETRY or **MORPHOMETRIC PARAMETERS** - Methods used to analyze the shapes and sizes of lakes. Common morphometric parameters include surface area, mean (average) depth, maximum depth, and volume.

NON-POINT SOURCE - A source of pollution other than a point source (see point source definition, below).

OLIGOTROPHIC - See definition under Trophic Status, below.

ORGANIC - Organic matter includes both natural and man-made molecules and compounds containing carbon and hydrogen. All living matter in water is made up of organic molecules.

pH - The negative log of the hydrogen-ion concentration. A solution with a pH lower than 7 is acidic, a pH of 7 is considered neutral, and a pH higher than 7 is alkaline. Seawater is alkaline and has a pH around 8.4, whereas normal rainwater has a pH around 5.8. Fish die when the pH drops to about 4.5. Seemingly small changes in pH may in fact be very large because the pH scale is logarithmic. Thus, an increase in acidity from 5.0 to 4.0 pH is actually a 10-fold increase. Put another way, a doubling of acidity or alkalinity levels is represented by a change in the pH level of 0.3.

PHOSPHORUS - Phosphorus is often the primary nutrient controlling lake productivity. Phosphorus is present in a variety of forms: dissolved, colloidal, and particulate (inorganic and organic). Total phosphorus is the combined amount of all phosphorus forms.

PHOTOSYNTHESIS - The utilization of sunlight as an energy source by green plants to manufacture organic material from carbon dioxide, water, and nutrients.

PHYTOPLANKTON - Microscopic floating (planktonic) plants (algae) in the form of individual cells, colonies, and filaments. Photosynthetic phytoplankton are responsible for the majority of primary productivity in non-shallow lakes.

POINT SOURCE - A discernible, confined, and discreet conveyance, including a pipe, ditch, tunnel, conduit, well, container, rolling stock, or vessel or floating craft from which pollutants are or could be discharged.

POLLUTION - The contamination or altering of waters, land, or subsurface land in a manner which creates a nuisance or makes waters, land, or subsurface land unclean, or noxious, or impure, or unfit so that they are actually or potentially harmful or detrimental or injurious to public health, safety, or welfare, to domestic, commercial, industrial, or recreational use, or to livestock, wild animals, bird, fish, or other aquatic life.

RIPARIAN ZONE - Terrestrial areas adjacent to streams or other bodies of water where the plant community and microclimate conditions are products of the combined presence and influence of perennial and/or intermittent water, the associated high water tables, and soils which exhibit some wetness characteristics. The riparian zone is identified by soil characteristics and distinctive vegetation. It includes wetlands, and those portions of the floodplain and the valley bottom that support vegetative growth which is tolerant of, or more dependent upon water during some portion of the growing season, than are plants further upslope.

SECCHI DISK TRANSPARENCY - An index of water clarity. A weighted 20-centimeter diameter black and white disk (the Secchi) is lowered into the water and the depth at which it disappears from view is recorded as the Secchi depth.

STEWARDSHIP - The management of property entrusted to others; caring for the land and waters for both short and long term needs within the capacity of the environment to provide those needs.

SURFACE FLOW - Also referred to as run-off. It is the flow of water overland into and within a stream channel or lake.

TEMPERATURE - Water temperature is one of the most important physical aspects affecting chemical reactions, nutrient cycles, and productivity of an aquatic system. In many temperate lakes, summer water temperatures decrease rapidly with increasing depth resulting in thermal stratification. The warm upper layer (epilimnion) is separated from the colder deep layers (hypolimnion) by a transition zone referred to as the metalimnian or thermocline.

TOTAL SOLIDS - Total solids include both dissolved and suspended solids.