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Environmental Monitoring and
Quality Assurance
Washington DC 20460

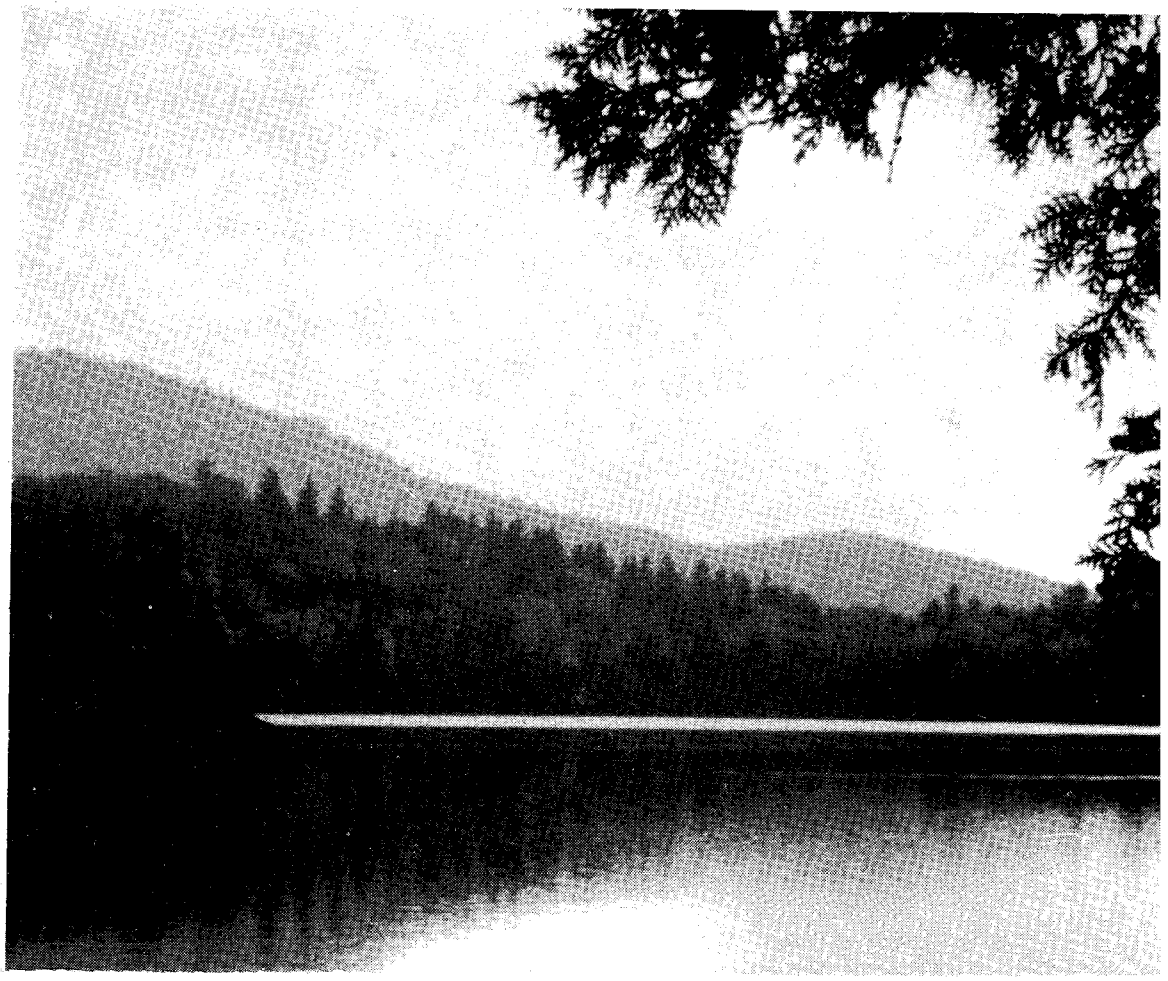
EPA/600/4-88/032
September 1988

Research and Development

EPA

Eastern Lake Survey - Phase I:

Data Base



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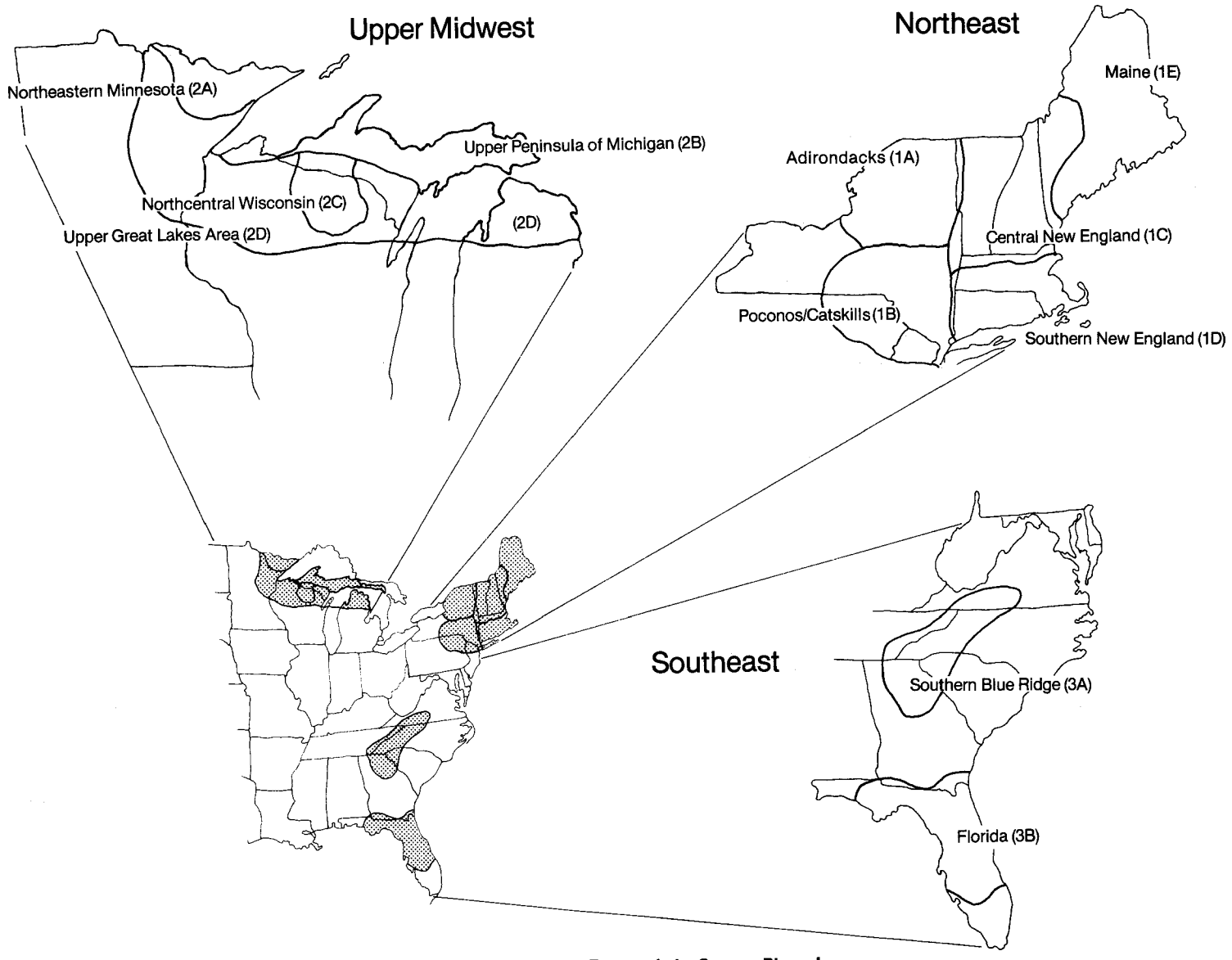

Regions and Subregions, Eastern Lake Survey-Phase I

EPA/600/4-88/032
September 1988

Eastern Lake Survey
Phase I

Data Base

A Contribution to the
National Acid Precipitation Assessment Program

U.S. Environmental Protection Agency
Office of Research and Development
Washington, DC 20460

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1.0 INTRODUCTION TO DOCUMENT AND EXPLANATION OF ITS USE

The Eastern Lake Survey-Phase I (ELS-I) is a component of the National Surface Water Survey (NSWS), a project implemented by the U.S. Environmental Protection Agency (EPA) as part of the Aquatic Effects Research Program (AERP). For information about projects within the AERP, a major component of the National Acid Precipitation Assessment Program, contact:

Dr. D. McKenzie, Acting Director
Aquatic Effects Research Program
U.S. Environmental Protection Agency
Environmental Research Laboratory
200 S.W. 35th Street
Corvallis, Oregon 97333

The AERP, which includes several integrated studies that are conducted in areas believed to be potentially sensitive to change as a result of acidic deposition, addresses four major policy questions relating to the effects of acidic deposition on aquatic ecosystems: 1) the extent and magnitude of past change, 2) the change to be expected in the future under various rates of acidic deposition, 3) the maximum rates of deposition below which further change is not expected, and 4) the rate of change or recovery of aquatic ecosystems if deposition rates are decreased.

The NSWS includes the National Stream Survey (NSS) and the National Lake Survey (NLS). Subdivided into the Eastern Lake Survey (ELS) and the Western Lake Survey (WLS), NLS is conducted in two phases. Phase I activities provide information to determine the current status of lakes and streams; Phase II activities describe seasonal variation in regional surface water chemistry.

This data base package, which covers only the first phase of ELS (ELS-I), represents one of several products produced by the AERP Technical Information Project. The project disseminates AERP information and available data to state agencies and organizations involved in acidic deposition monitoring activities. At this time, the WLS-I data base, as well as various other AERP publications, is also available. Address inquiries regarding published materials distributed through the AERP Technical Information Project to:

Mr. W. Kinney, Technical Director,
AERP Technical Information Project
EPA/Environmental Monitoring Systems Laboratory
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A computerized copy of the ELS-I data base and the documentation necessary to make use of the data are included in this package. There are three distributed ELS-I data sets: data set 3, the validated data set; data set 4, the final data set; and a subset of data set 4 distributed on IBM personal computer (PC) format disks. Data sets 3 and 4 are distributed on magnetic tape, and the PC data set is distributed on a low-density diskette.

Documentation provided in the data base package includes a description of the design and implementation of ELS-I (Section 2), information about the statistical design of the survey (Section 3), and a summary of survey results (Section 4). The data base dictionary and instructions on accessing the data are included as appendices. Questions about the information in the data base, or about reading or analyzing the data should be directed to:

Mr. J. M. Eilers, Technical Director
Eastern Lake Survey - Phase I
Northrop Services, Inc.
200 S.W. 35th Street
Corvallis, OR 97333
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2.0 SURVEY DESCRIPTION

2.1 OVERVIEW

The NSWS was initiated by EPA when it became apparent that existing data could not be used quantitatively to assess the present chemical and biological status of surface waters in the United States. The ELS-I survey design, presented in detail in Linthurst et al. (1986), Overton et al. (1986), and Kanciruk et al. (1986), is summarized in this document. The WLS-I survey design is presented in Landers et al. (1987) and Eilers et al. (1987).

Phase I of NLS is designed to provide a geographically extensive data base of sufficient quality to estimate with known confidence the number of acidic and potentially sensitive lakes (lakes that have low acid neutralizing capacity or ANC), identify their location, and describe their present chemical status from a broad-scale, regional perspective. Phase II of NLS is designed to evaluate seasonal variability in lake chemistry. Lakes sampled in Phase I and Phase II will be used to frame a long-term monitoring program that will evaluate regional-scale, long-term trends in surface water chemistry that may be attributable to the effects of acidic deposition.

ELS-I was conducted in the fall of 1984 in the northeastern, midwestern, and southeastern United States. The population of lakes to be sampled was defined as lakes located within those regions expected to contain the most lakes in the United States characterized by alkalinity <400 μeq/L (i.e., those areas where acidic deposition could potentially have the most effect). For ELS-I, the boundaries of three regions (Figure 2-1), judged to contain about 95 percent of the lakes of lower alkalinity in the eastern United States, were delineated using a national map of surface water alkalinity (Omernik and Powers, 1983). Figures 2-2, 2-3, and 2-4 show the ELS-I subregions and alkalinity map classes.

During ELS-I, one sample per lake was collected during the fall turnover period from the deepest part of the lake as an index to the essential characteristics of each lake. The fall turnover period was selected because lake water chemistry within any single lake was expected to be the most homogeneous during this season. Because not all lakes in the eastern United States could be sampled, a statistical procedure for selecting a subset of lakes for sampling was developed. The sampling plan for ELS-I employed a stratified design, in which an equal number of sample lakes was allocated to each stratum. Lakes were selected from each stratum by systematic sampling of an ordered list followed by a random start. The choice of sample size, 50 or more target lakes per stratum, was based on the judgment that this sample size would yield adequate precision for population estimates by stratum.

Data quality objectives were developed to guide the selection of sampling and analytical procedures for ELS-I. These objectives defined precision and bias goals for the procedures used in making population estimates and for the methods used in analyzing chemical variables. The data quality objectives guided the statistical design of the survey, the selection of standardized analytical methods (Hillman et al., 1986), and the design of the quality assurance program (Drousé et al., 1986). Standardized methods for sampling were also developed (Morris et al., 1986). Quality assurance results are summarized in Best et al. (1986). These documents are available through the Technical Information Project. As a complete set, the documents provide a record of ELS-I activities.

The data collected during ELS-I were used to address the key objectives of the survey--identification of the number and location of acidic and low ANC lakes, and quantification of the present chemical characteristics of the eastern lake resource. Because of the ELS-I lake selection design, the standardized protocols employed in data collection, and the quality assurance program, the ELS-I data

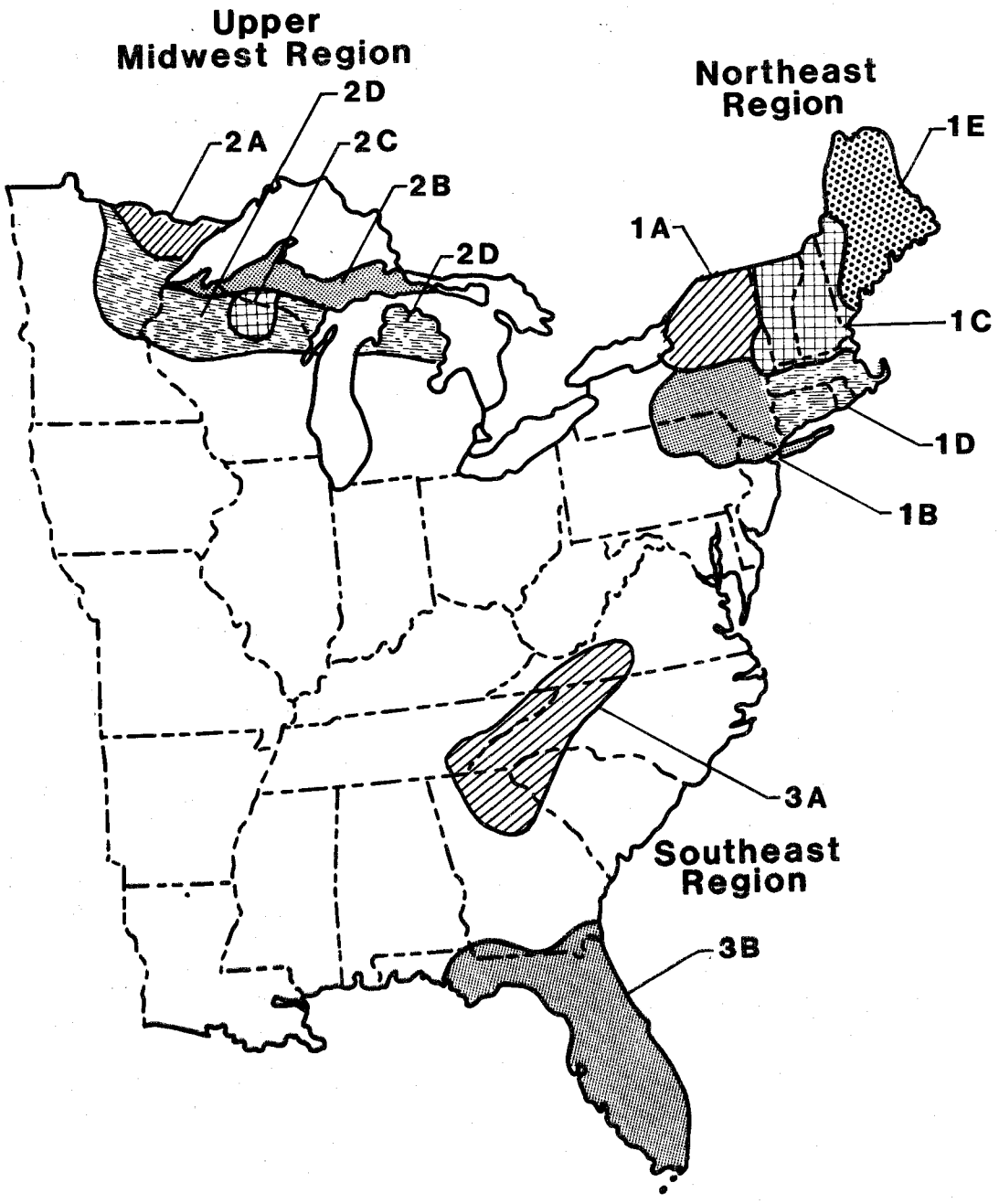

Figure 2-1. Regions and subregions for the Eastern Lake Survey-Phase I.

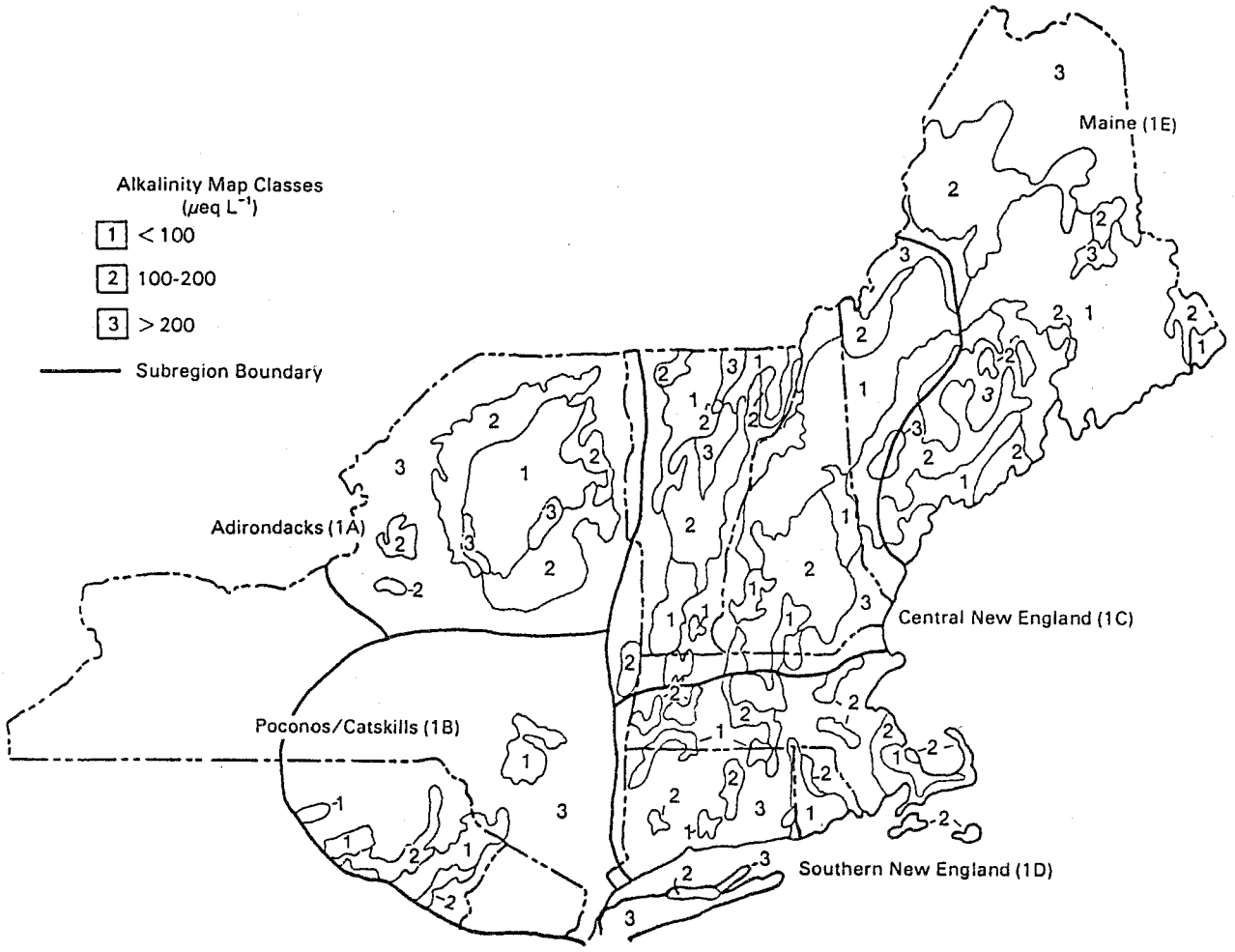

Figure 2-2. Northeastern subregions and alkalinity map classes, Eastern Lake Survey - Phase I.

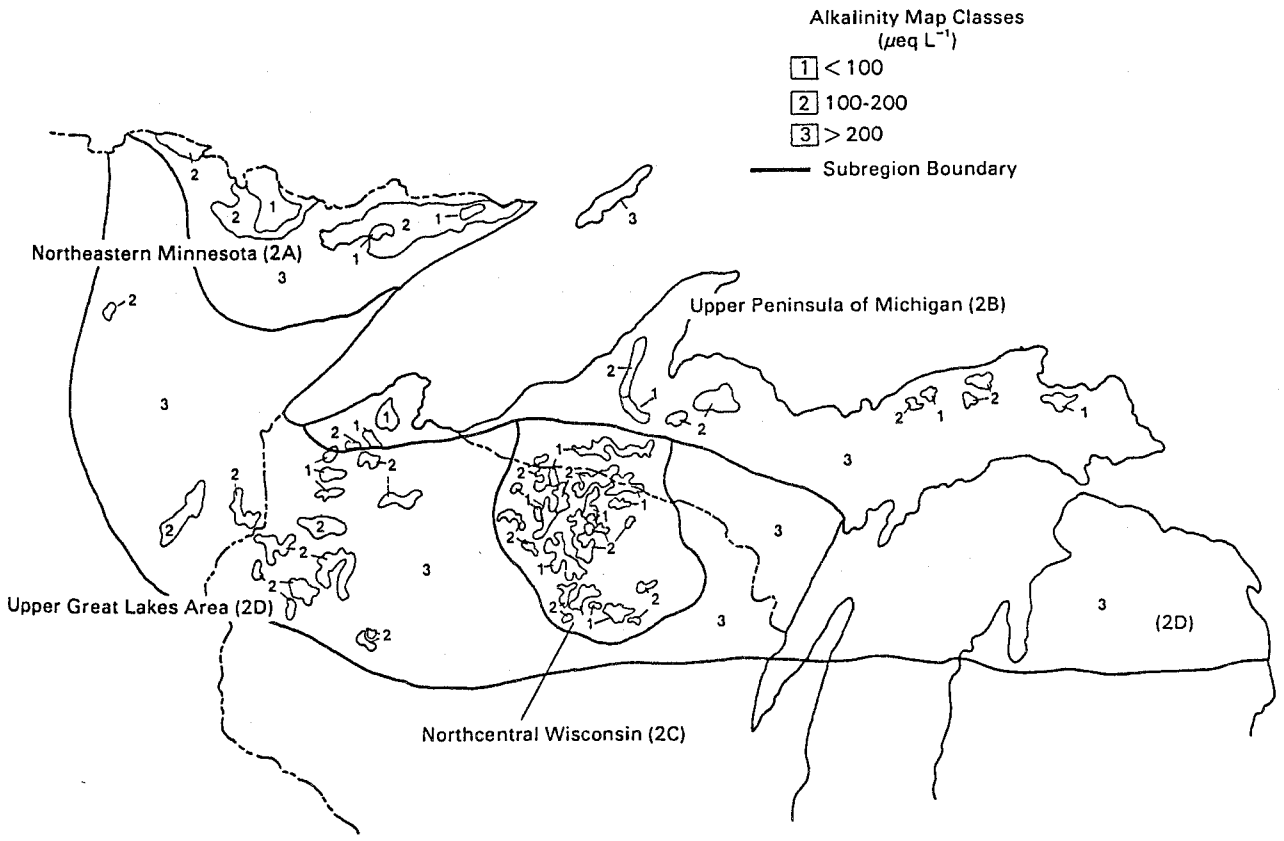

Figure 2-3. Upper midwestern subregions and alkalinity map classes, Eastern Lake Survey - Phase I.

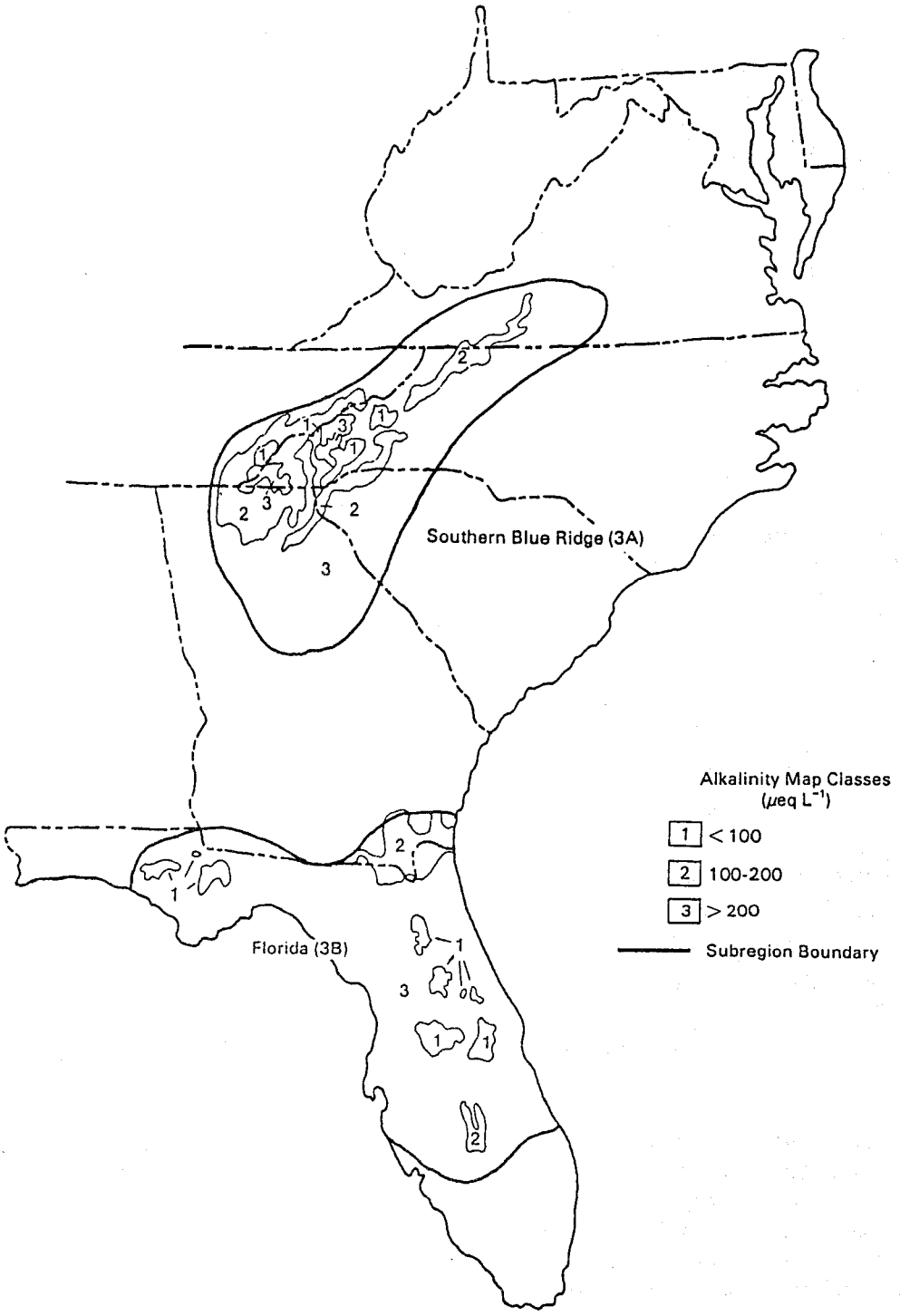

Figure 2-4. Southeastern subregions and alkalinity map classes, Eastern Lake Survey - Phase I.

base can be used to investigate correlative relationships among chemical variables on a regional basis and to estimate the chemical status of lakes within a specific region.

2.2 SURVEY DESIGN

2.2.1 Lake Selection

2.2.1.1 Probability Sample--

The stratification factors used in lake selection were region, subregion, and alkalinity map class. The Northeast was defined as NLS Region 1, the Upper Midwest as Region 2, and the Southeast as Region 3. Eleven subregions were identified (Table 2-1). Lakes representing each of the three alkalinity map classes (ANC <100, 100-199, 200-400 μeq/L, derived from Omernik and Griffith 1986; Figures 2-2, 2-3, and 2-4) were found within each of the 11 subregions; thus, 33 strata were defined in ELS-I.

Table 2-1. Assigned Numbers and Names for Regions and Subregions, Eastern Lake Survey-Phase I

Region 1: Northeast	Region 2: Upper Midwest	Region 3: Southeast
1A: Adirondacks	2A: Northeastern Minnesota	3A: Southern Blue Ridge
1B: Poconos/ Catskills	2B: Upper Peninsula of Michigan	3B: Florida
1C: Central New England	2C: Northcentral Wisconsin	
1D: Southern New England	2D: Upper Great Lakes Area	
1E: Maine		

Lakes were identified and listed using 1:250,000-scale United States Geological Survey (USGS) topographic maps. The lake type, elevation, size, and watershed size were evaluated as potential ordering factors by means of a mapping exercise to check for spatial patterns.

Strata boundaries were delineated, and all lakes on the maps were numbered in spatial order within each stratum. The final number of lakes identified in each stratum was the total number of lakes in the map population for the stratum. All population estimates for physical and chemical attributes computed in this study refer to the map population of lakes. They do not necessarily represent conditions in lakes outside the area of coverage nor conditions in lakes not depicted on the USGS topographic maps used. For example, population estimates cannot be made for lakes smaller than 4 ha.

Within each stratum, a systematic random sample of 50 lakes was drawn. Lake numbers were entered into a computer file in numerical order as labeled on the maps. In each stratum, the first lake was selected at random between lakes 1 and k (where k is the size of the map population divided by the desired sample size), and every k_{th} lake was selected thereafter. This sample is a true probability sample (i.e., within each stratum, each lake had an equal probability of inclusion).

2.2.1.2 Identification of Non-target Lakes--

Non-target lakes are those bodies of water that either could not provide data relative to the survey's objectives or could not be sampled within the constraints of a synoptic survey. Non-target lakes were identified in the probability sample by examining 1:24,000-, 1:25,000-, or 1:62,500-scale USGS topographic maps. Categories of non-target lakes identified by this method include:

(1) No lake present: lakes initially identified on 1:250,000-scale maps that did not appear on more detailed, larger-scale maps.

(2) Flowing water: sites identified as lakes on 1:250,000-scale maps that appeared as points on a stream on larger scale maps. However, if the small-scale maps were more recent than the large-scale maps and the lake in question was known to be a new reservoir, it was not eliminated.

(3) Bay/Estuary (High conductance): lakes identified on 1:250,000-scale

maps that appeared as ocean embayments or estuaries on larger scale maps.

(4) Urban/Industrial/Agricultural: lakes surrounded by or adjacent to intense urban, industrial, or agricultural land use including tailing ponds, water treatment lagoons, fish hatcheries, and cranberry bogs.

(5) Marsh/Swamp: lakes identified on 1:250,000-scale maps that appeared as swamps or marshes on larger scale maps.

(6) Too small (<4 ha): lakes identified on 1:250,000-scale maps that were less than approximately four ha. Because the resolution of most 1:250,000-scale maps was about four ha, this limit was established for consistency. Lakes less than four ha are not represented by the population descriptions.

After eliminating non-target lakes by examining maps, additional lakes were selected, when necessary, by applying the same systematic random sampling process to the remaining lakes in the initial list frame. More than the prescribed number of lakes were selected, since it was also anticipated that additional lakes would be eliminated as non-target lakes during field operations. Because the number of non-target lakes varied from stratum to stratum, the final number of lakes selected within strata varied.

The lakes that met the selection criteria after the map evaluation were provisionally designated as "target" lakes. This designation was refined as a result of information obtained during or after field sampling. The categories of non-target lakes identified by this method were defined as:

(1) No lake present: lakes visited that were found to be dry.

(2) Flowing water: sites visited and found to be streams.

(3) High conductance: lakes that, upon visitation, were found to have measured specific conductance >1500 μS/cm.

(4) Urban/Industrial/Agricultural: lakes surrounded by or adjacent to intense anthropogenic activities.

(5) Too shallow: lakes that were too shallow (generally less than 1 m) to obtain a clean (i.e., free of debris or sediment) sample.

(6) Other: lakes that were inaccessible due to a permanent feature of the lake that prevented helicopters from landing safely (e.g., power lines).

Some other lakes were not visited because they were inaccessible or frozen. These lakes represent incompleteness in the sample and were classified as "not visited" (could not be sampled) only if the reasons for not sampling were unrelated to a permanent feature of the lake. Those lakes not visited because they were frozen, for example, did not warrant non-target classification because this is not a permanent feature of the lake. If a lake could not be visited because of a permanent feature such as shallowness, it was classified as non-target. For statistical analyses, it was assumed that lakes not visited had the same proportion of non-target lakes as those found in the visited lakes. Table 2-2 provides numbers of non-target lakes identified during map examinations and field sampling and the reasons for their exclusion from the target population. Categories and numbers of lakes classified as not visited are also shown. These definitions collectively identify the populations of lakes about which conclusions can be drawn; they further restrict the interpretation of the results, as does the identity of the map/frame population from which the probability sample was drawn.

2.2.1.3 Special Interest Lakes--

A number of lakes other than those chosen in the probability sample were sampled during ELS-I. All eastern lakes in the current

Table 2-2. Non-Target and Not Visited Lakes, Eastern Lake Survey-Phase I

A. Non-target regular lakes determined from large-scale map examination

CATEGORIES	1A	1B	1C	1D	1E	2A	2B	2C	2D	3A	3B	TOTAL
NO LAKE PRESENT	1	2	0	2	1	2	2	0	0	0	6	16
FLOWING WATER	8	2	5	5	11	3	0	0	1	3	0	37
BAY/ESTUARY	0	0	0	5	2	0	0	0	0	0	0	7
URBAN/INDUSTRIAL	0	8	1	29	0	6	0	0	1	11	19	75
MARSH/SWAMP	5	7	4	8	7	1	7	0	9	2	136	185
TOO SMALL (<4 ha)	23	20	39	47	54	26	68	10	60	44	94	485
TOTAL	37	39	49	96	75	38	77	10	71	58	255	805

B. Non-target regular lakes determined from direct examination

CATEGORIES	1A	1B	1C	1D	1E	2A	2B	2C	2D	3A	3B	TOTAL
NO LAKE PRESENT	2	6	2	4	3	0	4	0	2	9	9	41
FLOWING WATER	0	0	0	0	1	0	0	1	0	1	0	3
HIGH CONDUCTANCE	0	0	0	6	0	0	0	0	0	0	1	7
URBAN/INDUSTRIAL	2	0	0	2	0	1	0	0	0	0	0	5
TOO SHALLOW	7	4	10	12	17	9	15	6	3	1	5	89
OTHER	1	2	0	2	0	0	0	0	0	0	1	6
TOTAL	12	12	12	26	21	10	19	7	5	11	16	151

C. Reasons that regular lakes were not visited

CATEGORIES	1A	1B	1C	1D	1E	2A	2B	2C	2D	3A	3B	TOTAL
NO ACCESS PERMISSION	1	9	2	9	0	0	0	1	0	8	13	43
TIME/DISTANCE CONSTRAINTS	3	2	5	0	0	0	1	0	1	0	0	12
BAD WEATHER	0	0	0	0	0	3	2	0	5	0	0	10
WRONG LAKE	0	1	0	0	2	0	1	0	1	0	0	5
HIGH TURBIDITY	0	0	0	0	0	2	0	0	0	0	0	2
FROZEN	0	1	0	0	0	4	8	7	21	0	0	41
TOTAL	4	13	7	9	2	9	12	8	28	8	13	113

EPA Long-Term Monitoring Program, which is also part of NAPAP, were included. In all, 186 lakes were sampled as special interest lakes. Others were included on the basis of recommendations from the Acid Deposition Trends Committee of the National Research Council and from state and federal agencies. The data from these lakes were not included in the population estimates. To differentiate special interest lakes from those in the probability sample, the latter are referred to as "probability sample" lakes. Data from these lakes are presented in Kancircuk et al. (1986).

2.2.1.4 Final Lake Lists and Maps--

Lake names, identification (ID) numbers, and geographical coordinates were entered into computer files and printed for field crews. If no name was printed on the map for a given lake, the entry in the file was "no name." Each lake was assigned a unique ID number coded

for the stratum in which it occurred. For example, 1A2-034 designated the 34th lake in Subregion 1A, alkalinity map class 2. The latitude and longitude for each lake were measured with 11-point dividers to the nearest degree, minute, and second and were checked by visual examination and computer-generated overlays. Lake ID codes were printed on the topographic maps to assist field crews in locating the lakes.

2.2.2 *Variables Selected for Analysis*

A number of physical and chemical variables were measured in ELS-I, 24 of which are shown in Table 2-3. The variables were selected on the basis of their importance in chemically characterizing lakes from a regional perspective.

2.3 SURVEY IMPLEMENTATION

2.3.1 *Field Station Operations*

During the ELS-I sampling effort, 8 field stations and 11 remote base sites were established. Each field station consisted of a mobile field laboratory, an area for storage and calibration of field equipment, one helicopter, and one fixed wing aircraft. Field stations were staffed by approximately 15 people, including helicopter pilots, field sampling crews, a field laboratory crew, and personnel responsible for logistics. Generally, two helicopters were assigned to each base site. The mobile field laboratories were responsible for sample tracking, sample preservation, and sample shipping by overnight courier to analytical laboratories. Personnel at the mobile field laboratories also analyzed samples collected in airtight sealed syringes for pH and dissolved inorganic carbon, two variables that are especially prone to change.

Table 2-3. Summary of Variables Measured in the Eastern Lake Survey - Phase I[a]

Acid neutralizing capacity	Magnesium, dissolved
Aluminum, extractable	Manganese, dissolved
Aluminum, total	Nitrate, dissolved
Ammonium, dissolved	pH
Calcium, dissolved	Phosphorus, total
Carbon, dissolved inorganic	Potassium, dissolved
Carbon, dissolved organic	Secchi disk transparency
Chloride, dissolved	Silica, dissolved
Color, true	Sodium, dissolved
Conductance	Sulfate, dissolved
Fluoride, total dissolved	Temperature
Iron, dissolved	Turbidity

[a] The complete list of variables for the survey is given in Linthurst et al. (1986).

2.3.2 *Field Sampling Activities*

Five to ten lakes per day were scheduled for sampling by each helicopter sampling crew. Crews recorded watershed descriptions for each lake upon approach and conducted on-site measurements of a few key chemical variables. Samples collected at each lake included a 4-L bulk sample, to be processed through the field laboratory for delivery to the analytical laboratories, and two syringes filled with water and sealed with locking syringe valves (closed system samples). The period of field sampling was from October 7, 1984 to December 14, 1984. The field sampling and field laboratory activities are described in Morris et al. (1986) and Hillman et al. (1986), respectively.

2.3.3 *Analytical Laboratory Operations*

Because of the large number of samples and the required holding times of specific chemical variables, the use of a single laboratory for sample analysis was not possible. For this reason, detailed criteria were prepared that defined the analytical and quality assurance requirements and bids were solicited from analytical laboratories. Prospective laboratories were evaluated through the analysis of performance evaluation samples and on-site inspections. Four analytical laboratories were selected.

All analyses were conducted according to handling, analytical, and quality assurance protocols detailed in Hillman et al. (1986) and Drousé et al. (1986). The goal was to analyze all samples collected within one region at the same laboratory; however, due to logistical problems, two laboratories were needed to analyze samples from each region.

2.4 QUALITY ASSURANCE

PROGRAM

An extensive quality assurance program was designed to standardize all sampling and analytical protocols and to ensure that the quality of the data could be determined. Several types of quality assurance/quality control (QA/QC) samples were used to ensure that sampling and analytical methods were performed as specified in the QA plan. The results of QA sample analysis were used to evaluate the performance of field sampling methods and field and analytical laboratory procedures. The analysis of QC samples allowed field samplers and laboratory personnel to identify and quickly correct problems such as instrument malfunctions or reagent contamination.

2.4.1 Data Base Quality Assurance

Quality assurance of the ELS-I data base was accomplished through a series of steps designed to identify and eliminate errors and verify all questionable or unusual data. Data verification was a systematic process in which the raw data set was reviewed. The initial step involved a review of the field data forms to ensure that field QA/QC sample data were within previously established acceptance criteria. The results reported by the analytical laboratories were evaluated to ensure that the reports were complete, that laboratory QA/QC criteria were met, and that, if necessary, data were appropriately qualified.

The validation process for the ELS-I data base was designed to investigate potential errors in the chemical analyses that were not detected during verification. The data validation procedures provided a means of identifying questionable data, based on empirical evidence or statistical analyses, and a way to determine the most appropriate value for a water quality variable when it was measured in more than one way or when data substitution was necessary. Data substitution was necessary when values were missing from the data set.

2.4.2 Summary of QA/QC Results

The numerous QA/QC procedures that were implemented during ELS-I are described in detail in Drousé et al. (1986). Results of QA sample evaluation, as well as minor problems involving sample contamination that were identified and resolved through the QA program, are summarized in Best et al. (1986).

3.0 STATISTICAL DESIGN APPLICATIONS AND RESTRICTIONS

3.1 EXTRAPOLATION FROM SAMPLE TO POPULATION

For statistical analyses, the probability sample was treated as a simple random sample within each stratum. The ordering of the lakes and the systematic selection process were designed to yield greater precision than a simple random sample; therefore, statements of precision for population estimates are probably conservative.

When population estimates from combined strata are required (e.g., when making subregional or regional estimates), expansion factors or weights (W) must be used because the sampling intensity varied among strata. These weights (the stratum target population size divided by the stratum sample size) vary considerably among strata. For example, a lake sampled in one stratum may represent 3 lakes, whereas each lake sampled in another stratum may represent 36 lakes.

The flexibility of this design permits strata to be combined. The design also allows estimates to be made for specific subpopulations, or subsets of lakes; however, unless the definition of the population of interest is clearly stated, conclusions based on the ELS-I data can be misleading.

3.2 ESTIMATING THE TARGET POPULATION SIZE AND ATTRIBUTES

The first steps in the statistical analysis of the data were to determine the stratum-specific weights needed for interstratum estimation and to estimate the target population size in each stratum ($\hat{N}$, Figure 3-1). The target population size in each stratum was estimated in two units: number of lakes and lake area (Table 3-1).

The statistical frame is defined by the list of lakes identified by the map population. The map population consists of both target ano non-target populations. Within each stratum, it is possible to estimate the size of the target population by multiplying the number of sampled lakes classified as target (n^{***}) by the stratum-specific weight (W). This weight is the inverse of the inclusion probability (P) of a target lake in the final sample, which is determined according to the following equation:

$$P = 1/W = (n^*/N^*)q \qquad (1)$$

where n^* = the size of the sample drawn from the map population

N^* = the size of the map population

q = the probability that a target lake in the drawn sample is actually visited; computed by dividing the actual number of lakes visited ($n^* - n_{nb} - n_o$) by the number of lakes intended to be visited ($n^* - n_{nb}$)

where n_{nb} = the number of non-target lakes in the original sample, as determined from the maps, and

n_o = the number of lakes not visited.

Hence, P is the probability of obtaining a water sample from any target lake in the stratum map population. Note that each lake within a stratum has the same value of P and hence the same W, but that lakes from different strata can have different weights depending on the values of n^*, N^*, or q. Within a stratum, the estimated number of target lakes in the map population is:

$$\hat{N} = W(n^{***}) \qquad (2)$$

The use of equations 1 and 2 can be illustrated with the data from Stratum 1A1. A sample of 75 lakes (n^*) was selected from a map population of 711 lakes. Twelve lakes in the sample were determined to be non-target

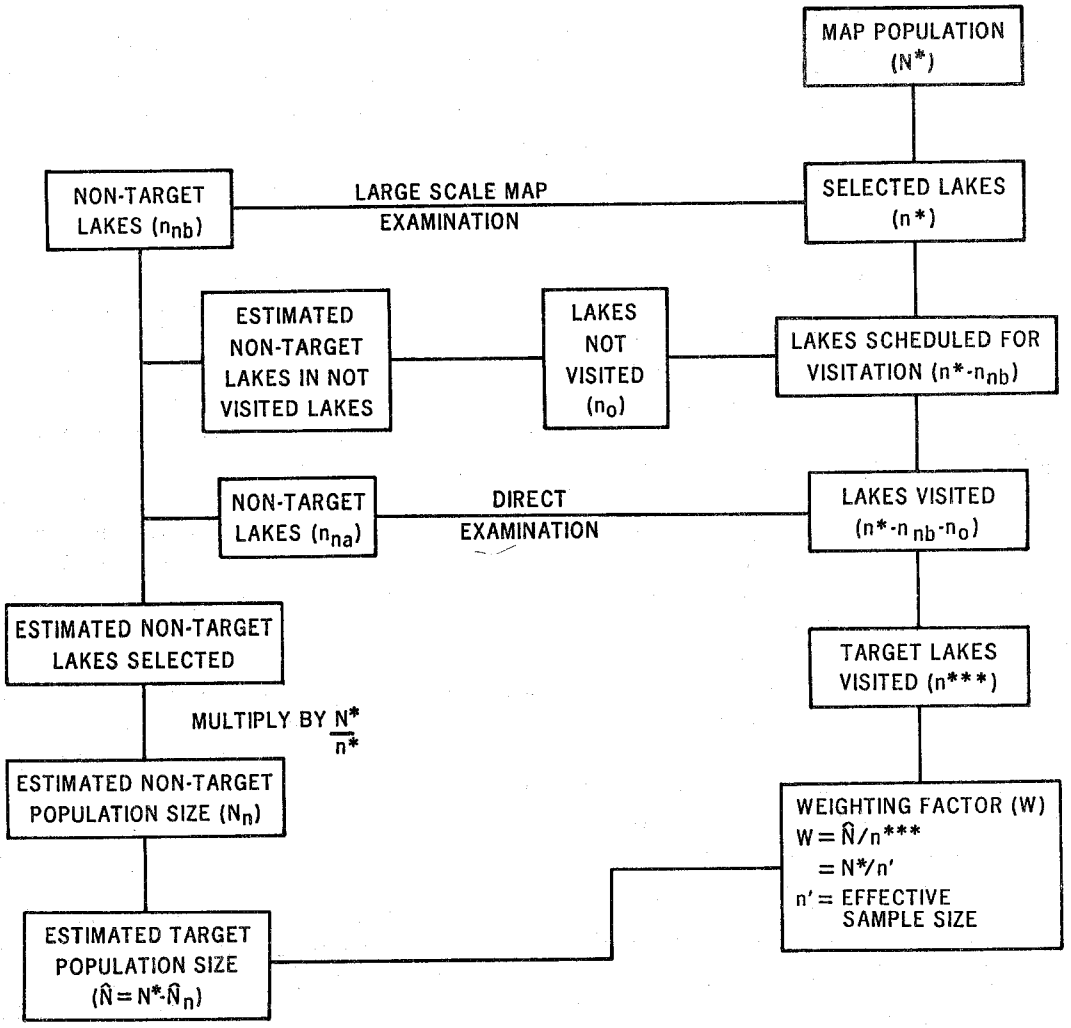

Figure 3-1. Procedures used to estimated target population size, Eastern Lake Survey - Phase I.

Table 3-1. Description of Sample and Target Population (Stratum Specific), Eastern Lake Survey - Phase I

STR	N^*	n^*	n^{***}	W	$\hat{N}$	$SE(\hat{N})$	$\hat{A}$	$SE(\hat{A})$
1A1	711	75	57	9.633	549.08	33.08	78094	20460
1A2	542	65	51	8.338	425.24	26.13	21460	5690
1A3	431	68	47	6.719	315.79	22.14	19223	6420
1B1	208	70	49	3.192	156.41	9.29	3851	544
1B2	96	70	48	1.477	70.90	3.00	2046	233
1B3	1682	68	47	27.209	1278.82	90.37	472762	443077
1C1	631	88	63	7.822	492.7	27.31	26943	9848
1C2	752	70	54	10.743	580.12	36.20	53804	27942
1C3	650	74	47	8.953	420.79	34.59	20831	4376
1D1	443	70	47	6.572	308.88	23.00	67439	54729
1D2	656	95	43	6.905	296.92	31.14	8977	1695
1D3	1568	93	37	19.426	718.76	85.22	19523	3784
1E1	1038	130	89	8.070	718.23	39.71	89853	26873
1E2	606	74	48	8.344	400.51	31.80	138490	93036
1E3	744	72	41	10.333	423.65	41.55	70292	18259
2A1	176	60	56	3.038	170.13	3.43	17419	3382
2A2	778	62	46	14.185	652.51	37.60	105222	55019
2A3	1178	85	48	14.098	676.70	61.79	1361744	1213630
2B1	118	74	41	1.878	77.00	4.89	893	90
2B2	250	100	57	2.579	147.00	9.83	2776	500
2B3	1330	80	48	17.208	825.98	71.69	30357	10842
2C1	464	60	50	8.340	417.00	17.77	8044	1472
2C2	348	60	56	6.007	336.39	7.56	10432	1382
2C3	895	60	49	15.459	757.49	41.38	237968	107910
2D1	97	90	40	1.536	61.44	3.50	1071	94
2D2	699	85	53	9.251	490.30	34.99	9027	2103
2D3	5351	70	48	82.558	3962.78	291.82	216797	58164
3A1	19	19	11	1.071	11.78	0.58	874	96
3A2	76	60	47	1.343	63.12	1.93	24432	3914
3A3	443	100	44	4.792	210.85	20.58	319159	138531
3B1	1608	140	52	13.127	682.60	69.30	21763	3917
3B2	113	113	62	1.000	62.00	0.00	18705	0
3B3	6332	181	36	38.705	1393.38	203.05	272468	232495

STR = Stratum
N^* = Frame population
n^* = Number of lakes in the probability sample
n^{***} = Number of lakes sampled
W = Expansion factor
$\hat{N}$ = Estimated target population size
$SE(\hat{N})$ = Standard error of $\hat{N}$
$\hat{A}$ = Estimated area of target population
$SE(\hat{A})$ = Standard error of $\hat{A}$

lakes based on the examination of large-scale maps (n_{nb}), and one lake was not visited (n_o). Thus, the probability that a target lake in the sample from Stratum 1A1 was actually visited (q) is 62/63 = 0.984 and the probability of obtaining a water sample from any target lake in the map population (P) is 0.984(75/711) = 0.104. The value of W to be used in combining data from Stratum 1A1 with data from any other stratum is thus 1/0.104 = 9.633. Because 57 target lakes (n^{***}) were sampled in Stratum 1A1, the estimated target population size ($\hat{N}$) for the stratum is (9.633)(57) = 549 lakes.

The estimated target lake area in a stratum ($\hat{A}$) was calculated similarly by multiplying the total area of visited target lakes (ΣA) by the stratum weight:

$$\hat{A} = W(\Sigma A) \qquad (3)$$

The variances of $\hat{N}$ and $\hat{A}$, for single strata, were estimated by:

$$\hat{V}(\hat{N}) = N^*[(N^* - n')/(n'-1)]$$

$$[n^{***}/n'][(n'-n^{***})/n'] \quad (4)$$

$$\hat{V}(\hat{A}) = N^*[(N^* - n')/(n'-1)] [1/n'][\Sigma A^2 - (\Sigma A)^2/n'] \quad (5)$$

where n', the "effective sample size," is used in place of n* because of incomplete visitation (i.e., n' = qn*). The standard errors are calculated as the square roots of the variances.

For estimates of populations covering multiple strata, estimates and variances must be computed within strata and added or else computed with equations containing weights (see below). Any explicitly defined subset of the total population of target lakes in the East is a subpopulation. Subpopulations can be defined over any combination of strata. For example, for any given variable X, there is a subpopulation of lakes having a value x less than or equal to a specified X. Subpopulation definitions also can be based on geographic boundaries such as states.

Estimates for subpopulations that are defined within single strata can be generated using formulae that are modifications of the equations given above (mathematically identical to the algorithms used in generating all the statistics for the survey). To generate single stratum subpopulation equations from 2 through 5, each n*** is replaced by by n_z and each Σ by Σ_z, where n_z is the number of sample lakes in the subpopulation z and Σ_z is the summation over the sample lakes in the subpopulation z.

For example, all 10 lakes (n_z) sampled in the Okefenokee Swamp are in Stratum 3B2, which has W = 1.000 (Table 3-1). Thus, the estimated target population size ($\hat{N}$) for the Okefenokee Swamp is (1.000)(10) = 10 lakes. The 10 lakes have a combined area of 71 ha ($\Sigma_z A$; thus, the estimated area ($\hat{A}$) of the target population in the Okefenokee Swamp is (1.000)(71 ha) = 71 ha.

A useful generalization, appropriate for any subpopulation and any combination of strata, is that,

$$\hat{N} = \Sigma W, \text{ and } \hat{A} = \Sigma WA, \quad (6)$$

where summation is over the appropriate subset of sample lakes matching the subpopulation description and where the values of W are assigned according to the stratum in which the lake belongs.

The use of equation 6 can be illustrated with the data for population estimates of acid neutralizing capacity (ANC) by state. In Florida, 140 lakes were sampled, 138 of which had surface area ≤ 2000 ha. Fifty-two of these were in Stratum 3B1 with W = 13.127, 51 in Stratum 3B2 with W = 1.000, and 35 in Stratum 3B3 with W = 38.705. The estimated target population size ($\hat{N}$) for Florida is calculated by adding the product of n_z and W for each stratum, which is the same as 52 (13.127) + 51 (1.000) + 35 (38.705) = 2,088 lakes. A subpopulation of the lakes in Florida can be defined by a particular value for ANC (in this example ANC ≤0 is used). There were 22 lakes in Stratum 3B1 with ANC ≤0, 9 lakes in Stratum 3B2, and 4 lakes in Stratum 3B3. Thus, the estimated number of lakes in Florida with ANC ≤0 is [(22 x 13.127) + (9 x 1.000) + (4 x 38.705)] = 453; the estimated proportion is 453/2088 = 0.22.

A further generalization, used in data analysis, leads to a similar formula for the estimated variance of any variable, X, over any subpopulation and combination of strata:

$$\text{Variance}(X) = \Sigma WX^2/\Sigma W - (\Sigma WX/\Sigma W)^2 \quad (7)$$

where the set of sample lakes in the summation defines the subpopulation of lakes for which the variance is estimated.

The weighting factors are extremely important. Estimating population parameters from sample data without accounting for weights can lead to erroneous calculations and incorrect interpretation. Examining relationships among variables with the expectation that these relationships are representative of the population should only be done within strata or by using weighting factors.

By a method equivalent to calculating subpopulation estimates (number of area of lakes with values less than or equal to x) and their associated upper confidence limits for all possible values of X, cumulative frequency distributions [F(x)] and cumulative areal distributions [G(x)] were calculated. At any value of x, these curves represent the estimated proportion (in total number or area of lakes) of the population having a value for that variable less than or equal to x, with the 95 percent upper confidence limit for that number. For some variables, interest is in the number of lakes with values above a particular value (e.g., sulfate > 50 μeq/L), so the inverses of the cumulative frequency distributions [1-F(x)] and of the cumulative areal distributions [1-G(x)] were generated in a similar manner.

Quintiles and medians for these cumulative frequency and areal distributions were also calculated. The quintiles (Q_1 and Q_4) reflect the estimated values of x separating the distribution into five equal parts (e.g., the 4th quintile is the 80th percentile). The median is the estimated value of x such that half the lakes in the population are characterized by concentrations of the variable equal to or less than the value of x.

3.3 RESTRICTIONS

The use and interpretation of any data set are restricted by the design, the quality of the data obtained, and the sampling protocols. The map and target populations and the period of sampling are the primary design considerations influencing the proper interpretation of the ELS-I data.

Estimates of the number of lakes within an area are strongly affected by the map scale used to define the map population. Use of larger scale maps provides greater resolution and allows smaller lakes to be identified and included in the population under consideration. The map scale used to define the map population in ELS-I was 1:250,000, which identified small lakes as approximately 4 ha. Lakes identified from 1:24,000-scale maps can be as small as 0.1 ha.

Comparisons of the results of ELS-I to those from other lake surveys in the East must be done with knowledge of the map scales used to prepare the population estimates. No direct conclusions can be drawn about the population of lakes less than 4 ha from ELS-I data. This restriction also applies to other categories of non-target lakes defined in ELS-I.

The period of sampling restricts the conclusions of ELS-I to the fall of 1984. The accuracy of extrapolating the fall index sample to other times of the year or to other years is being investigated. The degree to which short term, episodic events (e.g., spring smowmelt) affect the estimated chemical characteristics of eastern lake populations is not addressed.

3.4 DESIGN CONSIDERATIONS

3.4.1 Using Weights

The design of ELS-I requires that the results be presented as population and/or subpopulation estimates whenever conclusions on combined strata are to be drawn. Expansion factors or weights (W) must be used when making combined strata estimates of attributes for the populations of lakes (Linthurst et al., 1986). Section 3.2 defines the weights and gives the estimating equations.

All unweighted estimates must be made within strata and means or other statistics involving more than one stratum must be calculated with the appropriate stratum weights (Table 3-2). The correct way to estimate the total number of lakes in two strata below a reference value (in this example pH ≤6.0) is to determine first the total number of lakes in the sample below the reference value in each stratum (n). The next step is to determine the proportion of lakes in the sample below the reference value for each stratum (n_c/n^{**}: 2/56 = 0.0357 and 20/46 = 0.4348). Next, multiply the proportion of sample lakes below the reference value in the stratum by the estimated number of lakes in the stratum population ($\hat{N}$), which results in $\hat{N}_c$, the estimated number of lakes in the stratum

population below the reference value. Adding the $\hat{N}_c$ for each stratum (2 + 20) yields the combined stratum $\hat{N}_c$ (22). The same answer can be obtained by multiplying n_c by W for each stratum and summing the results.

The most accurate estimate for the overall proportion of lakes in the designated population below the reference value, therefore, is 289.79/822.65 = 0.3523 (Table 3-2). If the overall proportion of lakes below the reference value were computed as 22/102 = 0.216 (n_c/n^{***} for the sum of n and n^{***} for both strata), the answer would be biased. For example, there is an estimated total of 823 lakes in Strata 2A1 and 2A2. Using the correct value of 0.3523 as p_c, the estimated number of lakes with pH ≤ 6.0 would be 290. Using the incorrect p_c value of 0.216 (based on the combined n_c/n^{***}), the estimated number of lakes with pH ≤ 6.0 would be 178. Therefore, the number of lakes estimated to have pH ≤ 6.0 in both strata would be underestimated by 112 (290-178).

A less clear issue associated with the design and weighting is the examination of relationships among variables. Unweighted analyses such as regressions or correlations should not be used unless the relationships between the variables are the same across strata. Unless the relationships are independent of alkalinity map class (and any factor associated with the alkalinity map class strata), unweighted estimates can be biased, as can unweighted means or medians and total numbers.

TABLE 3-2. Use of Weights in Combined Strata Estimation, Eastern Lake Survey-Phase I

				pH ≤6.0		
Stratum	$\hat{N}$	n^{***}	W	n_c	p_c	$\hat{N}_c$
2A1	170.13	56	3.038	2	0.0357	6.07
2A2	652.52	46	14.185	20	0.4348	283.72
Combined	822.65	102		22	0.3523	289.79

$\hat{N}$ = estimated number of lakes within an alkalinity map class stratum.
n^{***} = number of lakes from which samples were obtained.
W = weighting or expansion factor.
n_c = number of lakes in the probability sample with pH ≤6.0, the reference value.
p_c = estimated proportion of lakes in the population which have a pH ≤6.0 (n_c/n^{***}).
$\hat{N}_c$ = estimated number of lakes in the population which have a pH ≤6.0, the reference value.

4.0 SURVEY RESULTS

4.1 DESCRIPTION OF TARGET POPULATION

4.1.1 Number of Lakes Sampled

A total of 2,681 probability sample lakes were selected from the map population. Of these, 805 were classified as non-target by examination of large-scale maps, 151 were classified as non-target when visited, and 113 were not visited (Table 2-2, P. 9). Data from water samples collected from 1,612 lakes were subsequently considered for use in making population estimates. Twenty of these lakes, which were larger than 2000 ha, were excluded from population estimates. The number of lakes on which population estimates are based is 1,592.

Of the 199 special interest lakes selected, 186 were sampled. Data generated from sampling special interest lakes are presented in Volumes II and III of the ELS-I Report (Overton et al., 1986 and Kanciruk et al., 1986, respectively). Because these lakes were not part of the random selection process, weighting factors do not apply, and their representativeness with respect to the chemical characteristics of the lake populations as a whole is uncertain.

4.1.2 Distribution of Lakes

During ELS-I, 763 probability sample lakes and 115 special interest lakes were sampled in the Northeast (Table 4-1). Based on the sample size of probability sample lakes, it is

Table 4-1. Number of Lakes Sampled Within Each Subregion During the Eastern Lake Survey - Phase I

Region	Subregion	Estimated Target Population Size[a]	Probability Sample Lakes[b]	Special Interest Lakes[c]
1: Northeast	1A: Adirondacks	1290 (47.6)	155	48
	1B: Poconos/Catskills	1479 (92.9)	143	12
	1C: Central New England	1483 (57.5)	163	49
	1D: Southern New England	1318 (93.7)	126	0
	1E: Maine	1526 (66.0)	176	6
		7096 (165.3)	763	115
2: Midwest	2A: Northeastern Minnesota	1457 (74.3)	147	9
	2B: Upper Peninsula of Michigan	1050 (72.5)	146	10
	2C: Northcentral Wisconsin	1480 (48.8)	153	32
	2D: Upper Great Lakes Area	4515 (293.9)	141	1
		8501 (315.5)	587	52
3: Southeast	3A: Southern Blue Ridge	258 (20.5)	94	10
	3B: Florida	2098 (212.6)	148	9
TOTAL		17,695	1,529	186

[a] Estimates are based on the number of probability sample lakes that were >4 ha and ≤2000 ha.
[b] Standard errors on target population size estimates are shown in parentheses.
[c] The number of lakes sampled that were part of the probability sample.
The number of lakes sampled that were not part of the probability sample.

estimated that the number of lakes in the Northeast characterized by ELS-I is 7,096 with a standard error of 165.3. The estimated number of lakes characterized by ELS-I in the other areas is: 8,501 in the Upper Midwest, 258 in the Southern Blue Ridge, and 2,098 in Florida. The state in which the largest number of probability sample lakes was sampled was Wisconsin (253, Table 4-2); the most special interest lakes sampled were in New York (48).

Table 4-2. Number of Lakes Sampled Within Each State During the Eastern Lake Survey - Phase I

Region	State	Probability Sample Lakes[a]	Special Interest Lakes[b]
1: Northeast	Connecticut	24	0
	Massachusetts	97	0
	Maine	225	6
	New Hampshire	69	17
	New Jersey	7	12
	New York	191	48
	Pennsylvania	106	0
	Rhode Island	15	0
	Vermont	29	32
2: Midwest	Michigan	160	11
	Minnesota	174	10
	Wisconsin	253	31
3: Southeast	Florida	138	9
	Georgia	54	1
	North Carolina	30	7
	South Carolina	12	0
	Tennessee	6	2
	Virginia	2	0

[a] The number of lakes (>4 ha and ≤2000 ha) actually sampled that were part of the probability sample.
[b] The number of lakes actually sampled that were not part of the probability sample.

4.2 ESTIMATED CHEMICAL CHARACTERISTICS

4.2.1 *Chemical Comparisons*

Six of the chemical variables measured during ELS-I were selected for detailed analysis because of their direct relevance to the effects of acidic deposition on lake chemistry. They are described below:

(1) pH: In some lakes, continuous inputs of acids can result in decreases in pH and ANC.

(2) ANC: In other lakes, ANC may decrease before substantial decreases in pH occur; therefore, losses in ANC may serve as a better indicator of acidification than decreases in pH.

(3) Sulfate: Sulfate concentrations in lake water can become elevated as a result of sulfate deposition, one of the key components of acidic deposition.

(4) Extractable Aluminum: Acidification of lakes can be accompanied by elevated concentrations of aluminum that can be toxic to aquatic organisms, particularly fish.

(5) Dissolved Organic Carbon (DOC): In "colored" lakes, DOC is composed primarily of organic acids of terrestrial origin. These compounds can serve as sources of hydrogen ions (i.e., acidity). Thus, some lakes may be acidic because of the presence of organic acids and not necessarily because of acidic deposition.

(6) Calcium: Calcium, the dominant cation in many lakes, is often equivalent in concentration to bicarbonate, a major component of ANC. In lakes with low ANC, calcium (if also low) could provide evidence that the lake is potentially sensitive to acidic deposition.

In the Northeast, an estimated 240 lakes had pH ≤5.0 and 916 had pH ≤6.0 (Table 4-3). In Florida a similar number of lakes (259) were estimated to have pH ≤5.0 and substantially fewer lakes (687) had pH ≤6.0.

By definition, lakes with ANC ≤0 μeq/L are acidic; these lake waters have limited capacity to neutralize acidic inputs. The overall results

Table 4-3. **Estimated Total Number of Lakes (>4 ha and ≤2000 ha), and Number and Percentage of Lakes with Selected Values of pH and ANC from Phase I of the Eastern Lake Survey. The 95 Percent Upper Confidence Limits (UCL) for Lake Number are Shown in Parentheses[a]. These Reference Values Provide One Mechanism by Which Chemical Characterization of Lakes Within and Among Subregions can be Accomplished [Data are from Linthurst et al. (1986), Overton et al. (1986), and Kanciruk et al. (1986)].**

Region/ Subregion	Total Number of Lakes	pH ≤5.0 Number (UCL)	pH ≤5.0 %	pH ≤6.0 Number (UCL)	pH ≤6.0 %	ANC (μeq/L) ≤0 Number (UCL)	ANC (μeq/L) ≤0 %	ANC (μeq/L) ≤200 Number (UCL)	ANC (μeq/L) ≤200 %
Northeast	7096	240(314)	3.40	916(1056)	12.9	326(422)	4.6	4258(4513)	60.0
Upper Midwest	8501	130(189)	1.5	818(1036)	9.61	48(209)	1.7	3518(3982)	41.4
Southern Blue Ridge	258	0 (-)	0	1 (2)	0.4	0 (-)	0	88 (108)	34.3
Florida	2098	259(385)	12.4	687 (878)	32.7	463(615)	22.0	1156(1413)	55.1

[a] Upper confidence limits for values of zero are undefined.

for the Northeast and Upper Midwest indicate that less than 5 percent and 2 percent, respectively, of the lakes were acidic (Table 4-3). The majority of these acidic lakes were located in a single subregion in each area; 10.7 percent of the lakes in the Adirondacks (1A) and 9.8 percent in the Upper Peninsula of Michigan (2B) were acidic. In Florida, 22 percent of the lakes were acidic, while in the Southern Blue Ridge, no acidic lakes were sampled. The Northeast had the highest number and percentage of lakes with ANC ≤200 μeq/L (4,258 and 60.0%, respectively).

An estimated 1,846 lakes of the total estimated target population (7,096) in the Northeast had high sulfate concentrations (≥150 μeq/L; Table 4-4). Of the five northeastern subregions surveyed, the highest numbers of lakes with high sulfate concentrations occurred in the Poconos/Catskills (1B) and Southern New England (1D). Fewer lakes with high sulfate were found in the Upper Midwest and these were concentrated in the Upper Great Lakes Area (2D). Only 22 lakes in the Southern Blue Ridge (3A) were estimated to have sulfate concentrations ≥150 μeq/L. In Florida (3B) 40.3 percent of the lakes in the target population were estimated to have sulfate concentrations ≥150 μeq/L.

Extractable aluminum is an operationally defined term used to describe forms of aluminum that can be toxic to fish and other aquatic organisms. Concentrations of extractable aluminum were relatively low in all areas surveyed. In the Northeast, 92 "clearwater" (true color ≤30 platinum cobalt units) lakes had high (>150 μg/L) extractable aluminum, and of these, 82 were located in the Adirondacks (1A, Table 4-4). The only other subregion where more than one percent of the lakes were estimated to have high extractable aluminum was Florida (3B) where 14 lakes representing 1.5 percent of the target population had concentrations ≥150 μg/L.

On a regional basis, a substantial percentage of lakes contained DOC concentrations ≥6 mg/L (Table 4-4). The Upper Midwest contained, by far, the largest number of high DOC lakes whereas the number in the Southern Blue Ridge (3A) was very small. Of the estimated 1,873 lakes in the Northeast with high DOC, the highest number (643) was located in Maine (1E). In the Upper Midwest, the highest percentages were

Table 4-4. Estimated Total Number of Lakes (>4 ha and ≤2000 ha), and Number and Percentage of Lakes with Selected Values of Four Key Variablesfrom Phase I of the Eastern Lake Survey. The 95 Percent Upper Confidence Limits (UCL) for Lake Number are Shown in Parentheses[a]. These Reference Values Provide One Mechanism by Which Chemical Characterization of Lakes Within and Among Subregions can be Accomplished. [Data are from Linthurst et al. (1986), Overton et al. (1986), and Kanciruk et al. (1986)].

Region/ Subregion	Total Number of Lakes	Sulfate ≥150 μeq/L			Extractable Al ≥150 μg/L[b]			Dissolved Organic Carbon ≥6 mg/L			Calcium ≤50 μeq/L		
		Number	(UCL)	%	Number	(UCL)	%	Number	(UCL)	%	Number	(UCL)	%
Northeast	7096	1846	(2082)	26.0	92	(135)	2.0	1873	(2090)	26.4	359	(442)	5.1
Upper Midwest	8502	608	(932)	7.1	2	(4)	0.0	5351	(5938)	62.9	776	(997)	9.1
Southern Blue Ridge	258	22	(36)	8.5	0	(0)	(-)	16	(28)	6.1	31	(42)	12.0
Florida	2098	846	(1088)	40.3	14	(35)	1.5	1445	(1776)	68.9	402	(551)	19.2

[a] Upper confidence limits for values of zero are undefined.
[b] Data are for "clearwater" lakes only (i.e., with true color values ≤30 platinum cobalt units).

observed in Northeastern Minnesota (2A, the subregion that contains the Boundary Waters Canoe Area) and the Upper Great Lakes Area (2D). In Florida (3B), 1,445 lakes, representing an estimated 68.9 percent of the target population, had high DOC.

On a regional basis, Florida (3B) had the highest estimated percentage (19.2%) of lakes with calcium concentrations ≤50 μeq/L (Table 4-4). The largest number of lakes with low calcium was located in the Upper Midwest; of these, 324 were located in Northcentral Wisconsin (2C), which comprised an estimated 21.9 percent of the target population. In the Northeast, the highest percentage of lakes with low calcium was observed in Southern New England (1D, 10.1%) followed by the dirondacks (1A, 8.3%).

4.3 POPULATION ESTIMATES

The ELS-I data were used to describe lakes in the eastern United States by producing cumulative frequency distributions. Figure 4-1 is an example for ANC. For any value of ANC shown on the x-axis, the corresponding percentage of lakes estimated to have ANC equal to or less than that value is shown on the y-axis. Because these distributions are estimated from sample data, the 95 percent confidence limit is also given (shown as a dashed line). For example, if the percentage of lakes estimated to have ANC ≤0 μeq/L is 22.0 and the 95 percent upper confidence limit on this estimate is 29.3, one would be 95 percent certain that the true percentage of lakes with ANC ≤0 μeq/L is no greater than 29.3.

The cumulative frequency distributions for pH and ANC were distinctly different among regions. Qualitative comparisons of the distributions of ANC in the Northeast and Upper Midwest indicate that overall the northeastern lakes were characterized by lower ANC (Figure 4-1). Very few lakes in the Southern Blue Ridge were characterized by low ANC although the percentage of Florida (3B) lakes at the low end of the ANC range was relatively high. Similar conclusions can be drawn by comparing the distributions for pH (Figure 4-2).

Although these curves serve to highlight major differences among the regional populations of lakes, they should not be used to provide quantitative estimates. Instead, the equations developed in the design can be used to generate quantitative estimates of

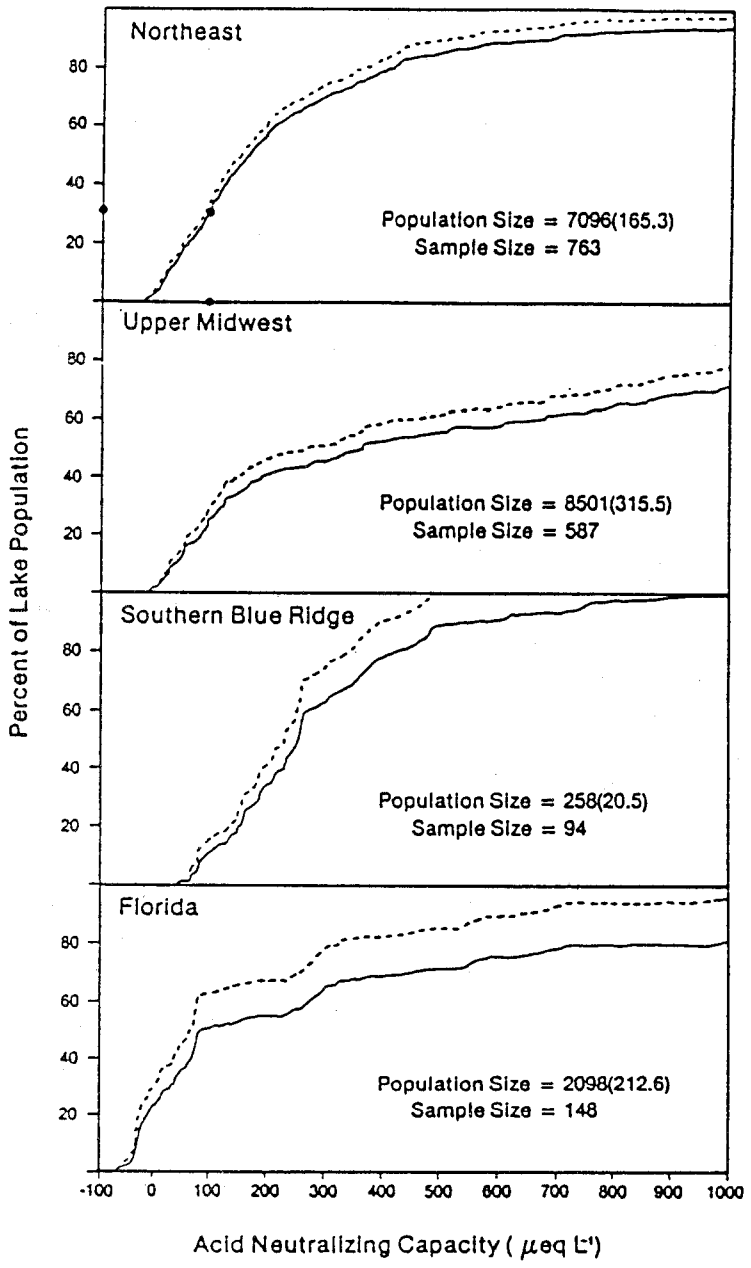

Figure 4-1. **Cumulative frequency distributions for acid neutralizing capacity for the population of lakes >4 ha and ≤2000 ha in two regions and two subregions sampled in the fall of 1984 during Phase I of the Eastern Lake Survey. The dashed line is the 95 percent upper confidence limit. Population size is estimated; standard errors of these estimates are shown in parentheses. These plots can be used to make qualitative comparisons among areas surveyed (e.g., the dots shown for the Northeast indicate that approximately 30 percent of the lakes have ANC ≤100 ueq/L). However, a complete description of the use of the data base to make quantitative comparisons among areas is contained in the data report on the survey results [Linthurst et al. (1986), Overton et al. (1986), and Kanciruk et al. (1986)].**

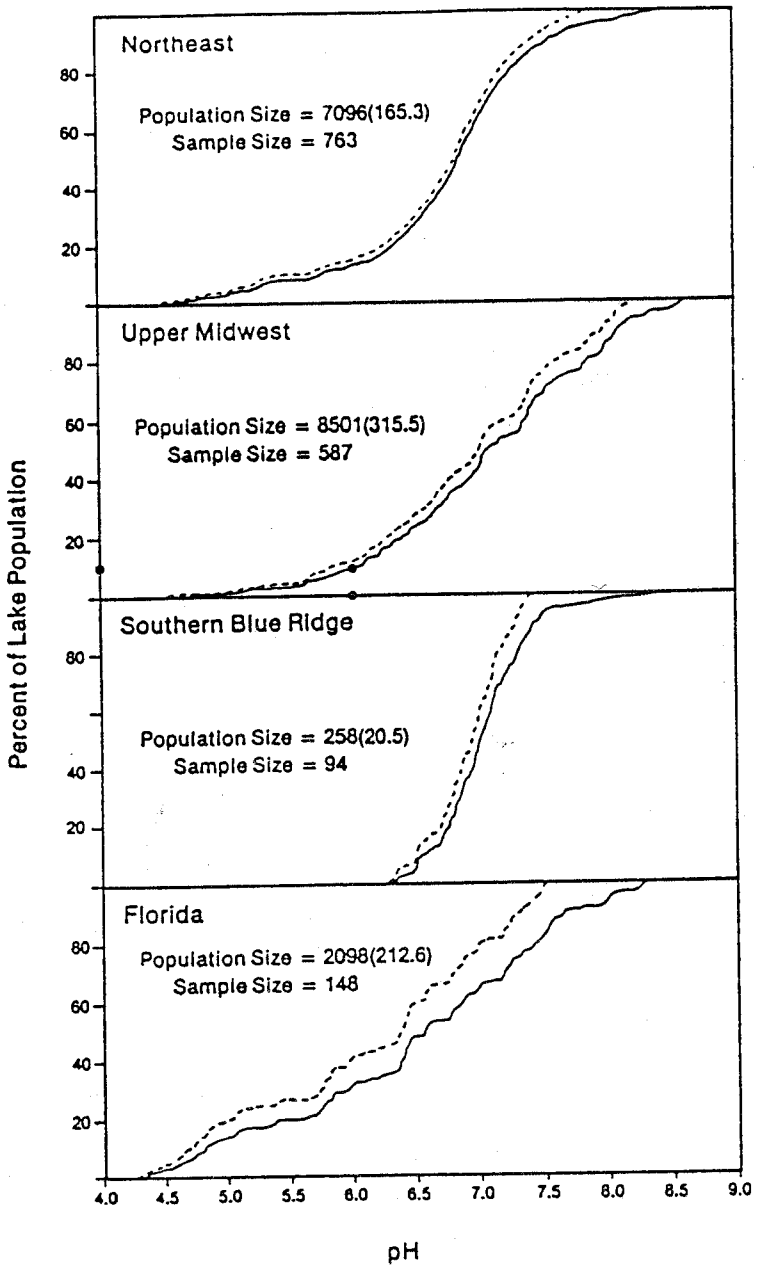

Figure 4-2. **Cumulative frequency distributions for pH for the population of lakes >4 ha and ≤2000 ha in two regions and two subregions sampled in the fall of 1984 during Phase I of the Eastern Lake Survey. The dashed line is the 95 percent upper confidence limit. Population size is estimated; standard errors of these estimates are shown in parentheses. These plots can be used to make qualitative comparisons among areas surveyed. Imprecise estimates can be obtained from the curve (e.g., the dots shown for the Upper Midwest indicate that approximately 10 percent of the lakes have pH ≤6.0). However, a complete description of the use of the data base to make quantitative comparisons among areas is contained in the data report on the survey results [Linthurst et al. (1986), Overton et al. (1986), and Kanciruk et al. (1986)].**

characteristics of target population lakes from sample data. For comparisons within and among regions, any value of a chemical or physical variable of interest can be selected. The values presented in Tables 4-3 and 4-4 were selected to quantify the number of lakes (or the percentage of lakes) in the target population that have a concentration equal to or less than, or equal to or greater than, that listed.

4.4 SUMMARY OBSERVATIONS

4.4.1 Extent and Location of Acidic Lakes

The subregions in the eastern United States that contain the largest proportion of acidic (ANC ≤0 μeq/L) and low pH (≤5.0) lakes are the Adirondacks (1A), the Upper Peninsula of Michigan (2B), and Florida (3B).

- Within the Northeast (Region 1), the Adirondacks (1A) had the largest estimated number (138) and percentage (11%) of lakes with ANC ≤0 μeq/L, followed by Southern New England (1D, 5%), and the Poconos/Catskills (1B, 5%). Maine (1E) had the lower percentage of acidic lakes (<1%). Most acidic lakes in the Adirondacks (1A) occurred in the western portion of the subregion.

- In the Upper Midwest (Region 2), 10 percent of the lakes in the Upper Peninsula of Michigan (2B) had ANC ≤0 μeq/L, and three percent in Northcentral Wisconsin (2C) were acidic. In Northeastern Minnesota (2A) and the Upper Great Lakes Area (2D) no acidic lakes were sampled.

- In the Southeast (Region 3), no acidic lakes were sampled in the Southern Blue Ridge (3A). In contrast, an estimated 22 percent of the lakes in Florida (3B) had ANC ≤0 μeq/L.

- Acidic lakes in the Northeast had higher concentrations of sulfate, calcium, and extractable aluminum than did acidic lakes in the Upper Midwest and Southeast.

4.4.2 Extent and Location of Low pH Lakes

The estimated number of lakes and lake area with low pH (pH ≤5.0) also varied substantially among and within regions.

- Within the Northeast, the Adirondacks (1A) had the largest estimated number (128) and percentage (10%) of lakes with pH ≤5.0. Subregion 1D (Southern New England) contained the second highest estimated number (66) and percentage (5%) and the largest area (2295 ha, 6%) of low pH lakes. Maine (1E) had the fewest lakes (8, <1%) and least area (95 ha) with pH ≤5.0.

- In the Upper Midwest, no lakes with pH ≤5.0 were observed in Northeastern Minnesota (2A) or the Upper Great Lakes Area (2D). The Upper Peninsula of Michigan (2B) was estimated to contain 99 lakes (9%) with pH ≤5.0.

- In the Southeast, no lakes with pH ≤5.0 were sampled in the Southern Blue Ridge (3A). Florida (3B) had the highest estimated number and percentage of lakes (259, 12%) and the largest estimated lake area with pH ≤5.0.

4.4.3 Additional Information

Results of ELS-I are presented in detail in the three-volume report entitled Characteristics of Lakes in the Eastern United States (Linthurst et al., 1986; Overton et al., 1986; and Kanciruk et al., 1986). This three-volume set is available through the Technical Information Project.

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APPENDIX A
DATA BASE DICTIONARY

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National Surface Water Survey: Eastern Lake Survey–Phase I, Data Base Dictionary

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Environmental Sciences Division

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ORNL/TM-10153

ENVIRONMENTAL SCIENCES DIVISION

NATIONAL SURFACE WATER SURVEY: EASTERN LAKE SURVEY-PHASE I, DATA BASE DICTIONARY

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*These documents fully describe the purpose, design, and results of the U.S. EPA Eastern Lake Survey-Phase I.

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ABSTRACT

Kanciruk, Paul, Merilyn Gentry, Raymond McCord, Les Hook, Joseph Eilers, and Mary D. Best. 1986. National Surface Water Survey: Eastern Lake Survey-Phase I, Data Base Dictionary. ORNL/TM-10153. Oak Ridge National Laboratory, Oak Ridge, Tennessee. 102 pp.

The Eastern Lake Survey-Phase I (ELS-I), conducted in the fall of 1984, was the first part of a long-term effort by the U.S. Environmental Protection Agency known as the National Surface Water Survey. It was designed to synoptically quantify the surface water quality of the United States in areas expected to exhibit low buffering capacity. This effort was in support of the National Acid Precipitation Assessment Program.

The survey involved a three-month field effort in which 1612 probability sample lakes and 186 special interest lakes in the northeast, southeast, and upper midwest regions of the United States were sampled. The data base supporting this effort was designed and data management was implemented by the Environmental Sciences Division of the Oak Ridge National Laboratory.

This document provides the information necessary for researchers to transfer the ELS-I data base accurately to their own computer systems. A data dictionary, this document also includes complete descriptions of the variables in the data base and of the data set formats.

Keywords: National Lake Survey; NSWS; Eastern Lake Survey; Water Quality; Acidic Deposition; Acid Rain; EPA; Research Data Management.

1. INTRODUCTION

This data dictionary describes the U.S. Environmental Protection Agency's (EPA's) Eastern Lake Survey-Phase I (ELS-I) data base. A description of the purpose, design, and results of the survey is contained in the three-volume report on the ELS-I (Linthurst et al. 1986, Overton et al. 1986, and Kanciruk et al. 1986). Table 1 summarizes the information collected during this survey.

This dictionary does not report the results of the survey, nor does it describe its purpose, design, or protocols. The function of the data base dictionary is to provide data managers and programmers with the information necessary to correctly transfer the ELS-I data to their own computer systems.

Table 1. Summary of information collected during the U.S. EPA Eastern Lake Survey-Phase I[a]

Geographic information

County	Latitude
Elevation	Longitude
Lake area	State
Lake ID	USGS map names
Lake name	Watershed area

Collected on the lake

Air temperature	Number of inlets/outlets	Watershed disturbances
Conductance	pH	Water temperature
Depth	Secchi disk transparency	

Measured in the field laboratory

Color	Dissolved inorganic carbon	pH	Turbidity

Measured in the analytical laboratory

Acid neutralizing capacity	Dissolved inorganic carbon	Mineral acidity
Air-equilibrated pH	Dissolved organic carbon	Nitrate
Ammonium	Extractable aluminum	Phosphorus
Calcium	Fluoride	Potassium
Chloride	Initial titration pH	Silica
CO_2 acidity	Iron	Sodium
CO_3 alkalinity	Magnesium	Sulfate
Conductance	Manganese	Total aluminum

Calculated or interpolated

Anion deficit	Organic anions
Biocarbonate ion	Precipitation
Calculated conductance	Runoff
Carbonate ion	Sum of anions
Conductance	Sum of base cations
Deposition (H^+, NO_3^-, SO_4^{-2})	Sum of cations
Distance from ocean	Sum of cations/sum of anions
Estimated hydraulic residence time	Watershed:lake area ratio
Lake volume	

[a]For a complete list of variables, see Sections 4 and 5. For a description of the survey purpose, design and results, see the related documents listed on p. iii of this report.

2. DATA BASE DESIGN

The ELS-I data base was developed at the Oak Ridge National Laboratory (ORNL) on tandem IBM* 3033 mainframe computers using the SAS† statistical software system. The data were entered into a series of relational (tabular) SAS files which, after error checking and validation, were merged to create the data sets distributed for public use. A complete description of data base design and implementation is presented in Kanciruk, Olson, and McCord (1986).

There were two working data sets (1 and 2) used internally to verify and validate the ELS-I data base. These are not distributed. There are three distributed ELS-I data sets (Table 2), data set 3 (the validated data set), data set 4 (the final data set), and a subset of data set 4, distributed on IBM personal computer (PC) format disks. Data sets 3 and 4 are distributed on magnetic tape in both SAS and card-image formats. Data sets 3 and 4 have similar sets of variables, but duplicate lake samples (collected for quality assurance purposes) are identified separately only in data set 3. In data set 4 and the PC data set the duplicate samples were averaged, and only the average value was reported for each lake; additionally, some missing data were substituted with estimates based upon duplicate analyses (Eilers et al. 1986). For example, if the pH meter was inoperative in the helicopter and this pH measurement was missing, the value was substituted based on the pH measurement taken at the field laboratory.

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*IBM is the registered trademark of International Business Machines Corporation, Boca Raton, Florida 33432.

†SAS is the registered trademark of SAS Institute Inc., Cary, North Carolina 27511.

Table 2. Characteristics of data sets 3 and 4 and the PC data set

Characteristic	Data set 3 (validated)	Data set 4 (final)	PC data set (final)
Format, media	SAS or card image, 9 track magtape	SAS or card image, 9 track magtape	Card image, IBM PC disks
Number of files	1	1	4
File names[a]	ELSI.SAS(DS3) (SAS format) ELSI.DS3C (Card format)	ELSI.SAS(DS4) (SAS format) ELSI.DS4C (Card format)	ELS-I.RG1 (Reg. 1) ELS-I.RG2 (Reg. 2) ELS-I.RG3 (Reg. 3) ELS-I.SPC (Special)
Approximate size in MBytes	4.9	2.6	0.6 (total)
Number of observations	1922	1798	1798
Number of variables	254	150	47
Duplicate lake samples	Retained	Averaged	Averaged
Number of observations per lake	1 or 2	1	1
Tags present	Yes	No	No
Flags present	Yes	Yes	No
Missing data	Not substituted	Substituted when possible[b]	Substituted when possible[b]
Missing value representation[c]	-999 if numeric, space if character	-999 if numeric, space if character	-999 if numeric, space if character
Unique key	LAKE_ID with SAMCOD	LAKE_ID	LAKE_ID

[a]Magnetic tape files may or may not be named. PC data files are always named.
[b]Eilers et al. (1986).
[c]Missing value representation is for card-image files only. Standard SAS notation for missing values is used in the SAS files.

Data set 4 was used for analyzing and reporting results in Linthurst et al. (1986), Overton et al. (1986), and Kanciruk et al. (1986). Data set 3 is useful when the researcher desires unaveraged, unsubstituted data. In data set 3, LAKE_ID concatenated with SAMCOD is the unique record identifier. Data set 4 or the PC data set is more appropriate for general analysis, with LAKE_ID being the unique record identifier. The PC data set (four files - one for probability sample lakes in each region and one for all special lakes) is smaller and duplicates information presented in the tables in Kanciruk et al. (1986).

3. DATA TAGS AND FLAGS

In addition to the ELS-I analytic and descriptive variables, some variables are designated as "tags" or "flags". These variables are data qualifiers that provide additional information for an individual value. Tags are one-letter codes contained in a variable that were used to qualify data as they were recorded on the field or laboratory data forms. For example, if a pH reading was not acceptable because the pH meter was slow to stabilize, or was erratic, and a second attempt was necessary, then the pH was recorded with a tag, "B", to associate this information specifically with this variable. Tag variable names have the same name as the variable they qualify, but with the suffix "T". A list of tag codes is given in Table 3. Tags are provided only in data set 3.

Flags are two-character codes (Table 4) which also qualify data. Flags were not entered by the observer taking the measurement, but were entered during the data verification and validation process. For flag variable names, an "F" was appended to the name of the variable being qualified.

Both tags and flags can contain multiple, concatenated codes. Variables which are tags or flags are included in the list of variables presented in Sect. 4. The use of tags and flags during the ELS-I is described in Kanciruk, Olson, and McCord (1986). Analytical quality assurance (QA) and validation procedures, including QA flagging, are provided in Best et al. (1986), Drouse et al. (1986), and Eilers et al. (1986).

Table 3. Tag code definitions, U.S. EPA Eastern Lake Survey-Phase I

Tag code	Definition[a]
A	Instrument unstable.
B	Redone, first reading not acceptable.
C	Instruments and sampling gear not vertical in water column.
D	Slow stabilization.
E	HYDROLAB cable too short.
F	Results outside of criteria with consent of the quality assurance manager.
J	Results not available; insufficient sample volume shipped to the analytical laboratory from the field.
K	Results not available; entire aliquot not shipped.
L	Results not available due to interference.
M	Results not available; sample lost or destroyed by analytical laboratory.
N	Not required.
R	Results from reanalysis.
S	Contamination suspected.
T	Leaking container.
U	Results not required by procedure; unnecessary.
X	User-defined on the field form (defined in variable TAG_X).
Y	User-defined on the field form (defined in variable TAG_Y).
Z	User-defined on the field form (defined in variable TAG_Z).
<	Measurements taken at <1.5 m.

[a]For a description of the analytical quality assurance verification process, see Best et al. (1986) and Drouse et al. (1986).

Note: Tags are included only in data set 3.

Table 4. Flag code definitions, U.S. EPA Eastern Lake Survey-Phase I

Flag code	Definition[a]
A0	Anion/cation percent ion balance difference was outside of criteria due to unknown cause.
A1	Anion/cation percent ion balance difference was outside of criteria due to nitrate contamination.
A2	Anion/cation percent ion balance difference was outside of criteria due to anion (other than nitrate) contamination.
A3	Anion/cation percent ion balance difference was outside of criteria due to cation contamination.
A4	Anion/cation percent ion balance difference was outside of criteria due to unmeasured organic protolytes (fits Oliver Model, Hillman et al. 1986).
A5	Anion/cation percent ion balance difference was outside of criteria due to possible analytical error; anion concentration too high.
A6	Anion/cation percent ion balance difference was outside of criteria due to possible analytical error; cation concentration too low.
A7	Anion/cation percent ion balance difference was outside of criteria due to possible analytical error; anion concentration too low.
A8	Anion/cation percent ion balance difference was outside of criteria due to possible analytical error; cation concentration too high.
B0	External (field) blank was above expected criteria. (For pH, DIC, DOC, conductance, alkalinity, and acidity determinations where the blank was above expected criteria).
B1	Internal (laboratory) blank was greater than twice the required detection limit. (This flag used for pH, DIC, DOC, conductance, alkalinity, and acidity determinations where the blank was above expected criteria).

Table 4. (continued)

Flag code	Definition[a]
B2	External (field) blank was above expected criteria and contributed more than 20% to sample values which were greater than ten times the required detection limit. (Flag not used for pH, DIC, DOC, acidity, or alkalinity determinations.)
B3	Internal (laboratory) blank was more than twice the required detection limit and contributed more than 10% to the sample concentrations which were greater than ten times the required detection limit. (Flag not used for pH, DIC, DOC, acidity, or alkalinity determinations.)
B4	Potential negative sample bias based on internal (laboratory) blank data.
B5	Potential negative sample bias based on external (field) blank data.
C0	Percent conductance difference was outside of criteria due to an unknown cause (possible analytical error; ion concentration too high).
C1	Percent conductance difference was outside of criteria due to possible analytical error; anion concentration too high.
C2	Percent conductance difference was outside of criteria due to anion contamination.
C3	Percent conductance difference was outside of criteria due to cation contamination.
C4	Percent conductance difference was outside of criteria due to unmeasured organic anions (fits Oliver Model, Hillman et al. 1986).
C5	Percent conductance difference was outside of criteria due to possible analytical error in conductivity measurement.
C6	Percent conductance difference was outside of criteria due to possible analytical error; anion concentration too low.
C7	Percent conductance difference was outside of criteria due to unmeasured protolyte anions (does not fit Oliver Model, Hillman et al. 1986).
C8	Percent conductance difference was outside of criteria due to possible analytical error; cation concentration too low.

Table 4. (continued)

Flag code	Definition[a]
C9	Percent conductance difference was outside of criteria due to possible analytical error; cation concentration too high.
D0	External (field) duplicate precision exceeded the maximum expected percent relative standard deviation, but either the routine or the duplicate concentration was greater than ten times the required detection limit.
D2	External (field) duplicate precision exceeded the maximum expected percent relative standard deviation, and both the routine and the duplicate sample concentrations were greater than ten times the required detection limit.
D3	Internal (laboratory) duplicate precision exceeded the maximum required percent relative standard deviation, and both the routine and duplicate sample concentrations were greater than ten times the required detection limit.
F0	Percent conductance difference exceeded criteria when HYDROLAB conductivity value was substituted.
F1	Protolyte analysis program indicated field pH problem when HYDROLAB pH value was substituted.
F2	Protolyte analysis program indicated unexplained field pH/DIC problem when HYDROLAB pH value was substituted.
H0	The maximum holding time criteria were not met.
N5	NO_3 data obtained from analysis of aliquot 5.
P0	Field problem; station pH.
P1	Field problem; station DIC.
P2	Field problem; unexplained (pH/DIC).
P3	Laboratory problem; initial alkalinity pH.

Table 4. (continued)

Flag code	Definition[a]
P4	Laboratory problem; initial acidity pH.
P5	Laboratory problem; unexplained, initial pH (acidity/alkalinity).
P6	Laboratory problem; initial DIC.
P7	Laboratory problem; air-equilibrated pH/DIC.
P8	Laboratory problem; unexplained, initial pH/DIC.
P9	Laboratory problem; alkalinity determination.
U0	Known error based on relationships with other variables and/or impossible values; substitutions were made in data set 4.
U1	Value is a substitution, original value was missing.
U2	Value is a substitution, original value was considered to be in error.
V0	Data value represents the average from a duplicate split and measurement of the lake sample.
V1	Data value is from the duplicate sample and is not averaged because the regular sample had "W0" flag limitations.
W0	Data value has possible measurement error, based on relationships with other variables, has QA violations, or is outside of QA windows for acceptable data.
Z0	Original value was less than zero and has been replaced with zero.
Z1	Value was less than the "system decision limit (nonparametric)."

[a]For a description of the analytical quality assurance verification process and validation methods, see Best et al. (1986), Drouse et al. (1986), and Eilers et al. (1986).

4. LIST OF VARIABLES

Table 5 lists the 254 variables in data set 3. It is alphabetized by variable name and provides variable type (numeric or character), length (in bytes, as structured in SAS), format (if any) and the SAS label. Table 6 provides this information for the 150 variables in data set 4, and Table 7 describes the 47 variables in the PC data set. Units of measure are defined in Sect. 5.

Variable labels are printed as they appear in the SAS data sets. To assure accuracy, these lists are unedited file transfers from the mainframe computer. The use of all capital letters and "UEQ/L" for "μeq/l" and "US" for "μs/cm" are some unavoidable constraints on the aesthetics of table presentation imposed by limitations of the mainframe computer character set.

To avoid confusion, it is recommended that programmers loading data into their local software systems retain original variable names and labels when possible.

Table 5. List of variables, data set 3, U.S. EPA Eastern Lake Survey-Phase I

Variable	Type	Length	SAS label[a]
ACCO11	NUMERIC	8	ACIDITY-CO2 (UEQ/L)
ACCO11F	CHARACTER	12	FLAG FOR ACCO11
ACCO11T	CHARACTER	6	TAG FOR ACCO11
ACM11	NUMERIC	8	ACIDITY-MINERAL (UEQ/L)
ACM11T	CHARACTER	6	TAG FOR ACM11
AIRTMP	NUMERIC	8	AIR TEMP (DEG C)
ALEX11	NUMERIC	8	EXT. ALUMINUM (UG/L)
ALEX11F	CHARACTER	12	FLAG FOR ALEX11
ALKA11	NUMERIC	8	ALKALINITY (UEQ/L)
ALKA11F	CHARACTER	12	FLAG FOR ALKA11
ALKA11T	CHARACTER	6	TAG FOR ALKA11
ALKC11	NUMERIC	8	ALKALINITY-CO3 (UEQ/L)
ALKC11T	CHARACTER	6	TAG FOR ALKC11
ALTL11	NUMERIC	8	TOTAL ALUMINUM (UG/L)
ALTL11F	CHARACTER	12	FLAG FOR ALTL11
ALTL11T	CHARACTER	6	TAG FOR ALTL11
ANCAT	NUMERIC	8	CATSUM/ANSUM
ANDEF	NUMERIC	8	CATSUM - ANSUM (UEQ/L)
ANSUM	NUMERIC	8	SUM OF ANIONS (UEQ/L)
ANSUMF	CHARACTER	12	FLAG FOR ANSUM
BAT_ID	CHARACTER	6	BATCH ID
BAT_IDT	CHARACTER	6	TAG FOR BAT_ID
BNSTAR	NUMERIC	8	POPULATION SIZE BY STRATA
CATSUM	NUMERIC	8	SUM OF CATIONS (UEQ/L)
CATSUMF	CHARACTER	12	FLAG FOR CATSUM
CA11	NUMERIC	8	CALCIUM (MG/L)
CA11F	CHARACTER	12	FLAG FOR CA11
CA11T	CHARACTER	6	TAG FOR CA11
CA16	NUMERIC	8	CALCIUM (UEQ/L)
CL11	NUMERIC	8	CHLORIDE (MG/L)
CL11F	CHARACTER	12	FLAG FOR CL11
CL11T	CHARACTER	6	TAG FOR CL11
CL16	NUMERIC	8	CHLORIDE (UEQ/L)
COLVAL	NUMERIC	8	COLOR (PCU)
COLVALF	CHARACTER	6	FLAG FOR COLVAL
COLVALT	CHARACTER	6	TAG FOR COLVAL
COMMNT	CHARACTER	150	COMMENT FROM FORM 2
COM01	CHARACTER	120	COMMENT FORM 01
CON_B	NUMERIC	8	CONDUCTIVITY AT BOTTOM-1.5M (US)
CON_BT	CHARACTER	6	TAG FOR CON_B
CON_1	NUMERIC	8	CONDUCTIVITY AT 4 OR 5 M (US)
CON_10	NUMERIC	8	CONDUCTIVITY AT 50 M (US)
CON_2	NUMERIC	8	CONDUCTIVITY AT 6 OR 10 M (US)

Table 5. (continued)

Variable	Type	Length	SAS label[a]
CON_3	NUMERIC	8	CONDUCTIVITY AT 8 OR 15 M (US)
CON_4	NUMERIC	8	CONDUCTIVITY AT 10 OR 20 M (US)
CON_5	NUMERIC	8	CONDUCTIVITY AT 12 OR 25 M (US)
CON_6	NUMERIC	8	CONDUCTIVITY AT 14 OR 30 M (US)
CON_60	NUMERIC	8	CONDUCTIVITY AT .6*DEPTH (US)
CON_60T	CHARACTER	6	TAG FOR CON_60
CON_7	NUMERIC	8	CONDUCTIVITY AT 16 OR 35 M (US)
CON_8	NUMERIC	8	CONDUCTIVITY AT 18 OR 40 M (US)
CON_9	NUMERIC	8	CONDUCTIVITY AT 20 OR 45 M (US)
CONCAL	NUMERIC	8	CALC. SP. COND. (US)
CONCALF	CHARACTER	20	FLAG FOR CONCAL
COND11	NUMERIC	8	CONDUCTIVITY-ANAL LAB (US)
COND11F	CHARACTER	12	FLAG FOR COND11
COND11T	CHARACTER	6	TAG FOR COND11
CONFI	NUMERIC	8	CONDUCTIVITY FINAL CALIB (US)
CONFIT	CHARACTER	6	TAG FOR CONFI
CONIN	NUMERIC	8	CONDUCTIVITY INITIAL CALIB (US)
CONTOP	NUMERIC	8	CONDUCTIVITY AT SURFACE (1.5M) (US)
CONTOPF	CHARACTER	6	FLAG FOR CONTOP
CONTOPT	CHARACTER	6	TAG FOR CONTOP
COUNTY	CHARACTER	5	FIPS CODE(ST,COUNTY)
CO316	NUMERIC	8	CARBONATE ALKALINITY (UEQ/L)
CO316F	CHARACTER	12	FLAG FOR CO316
CRW_ID	CHARACTER	6	CREW ID FORM 1
DATADD	NUMERIC	8	DATE ADDED TO RAW DATASET
DATENT	NUMERIC	8	DATE ENTERED FORM 1
DATRE	NUMERIC	8	DATE REENTERED FORM 1
DATREC	NUMERIC	8	DATE RECEIVED BY ORNL FORM 1
DATSHP	NUMERIC	8	DATE SHIPPED FORM 2
DATSMP	NUMERIC	8	DATE SAMPLED FORM 1
DICE11	NUMERIC	8	EQUIL DIC-ANAL LAB (MG/L)
DICE11F	CHARACTER	12	FLAG FOR DICE11
DICE11T	CHARACTER	6	TAG FOR DICE11
DICI11	NUMERIC	8	INITIAL DIC-ANAL LAB (MG/L)
DICI11F	CHARACTER	12	FLAG FOR DICI11
DICI11T	CHARACTER	6	TAG FOR DICI11
DICQCS	NUMERIC	8	DIC QCCS - FIELD LAB (MG/L)
DICQCST	CHARACTER	6	TAG FOR DICQCS
DICVAL	NUMERIC	8	DIC - FIELD LAB (MG/L)
DICVALF	CHARACTER	6	FLAG FOR DICVAL
DICVALT	CHARACTER	6	TAG FOR DICVAL
DISM	NUMERIC	8	DISTANCE FROM COAST (KM)

Table 5. (continued)

Variable	Type	Length	SAS label[a]
DOC11	NUMERIC	8	DOC-ANAL LAB (MG/L)
DOC11F	CHARACTER	12	FLAG FOR DOC11
DOC11T	CHARACTER	6	TAG FOR DOC11
DP_B	NUMERIC	8	DEPTH AT BOTTOM-1.5M (M)
DP_BT	CHARACTER	6	TAG FOR DP_B
DP_CAT	NUMERIC	8	DEPTH CATEGORY 4=<20M 5=>20M
DP_TOP	NUMERIC	8	DEPTH AT SURFACE (1.5M) (M)
DP_TOPT	CHARACTER	6	TAG FOR DP_TOP
DP_60	NUMERIC	8	DEPTH .6*BOTTOM (M)
DP_60T	CHARACTER	6	TAG FOR DP_60
ELEV	NUMERIC	8	LAKE ELEVATION (M)
FE11	NUMERIC	8	IRON (UG/L)
FE11F	CHARACTER	12	FLAG FOR FE11
FE11T	CHARACTER	6	TAG FOR FE11
FTL11	NUMERIC	8	FLUORIDE (MG/L)
FTL11F	CHARACTER	12	FLAG FOR FTL11
FTL16	NUMERIC	8	FLUORIDE (UEQ/L)
HCO316	NUMERIC	8	HCO3 (UEQ/L)
HCO316F	CHARACTER	12	FLAG FOR HCO316
HDEP	NUMERIC	8	HYDROGEN ION DEPOSITION (G/M**2/YR)
HYD_ID	CHARACTER	2	HYDROLAB ID FORM 1
HYDROTYP	CHARACTER	9	HYDROLOGIC TYPE
H16	NUMERIC	8	HYDRONIUM FROM PHAC (UEQ/L)
H16F	CHARACTER	12	FLAG FOR H16
IN_OUT	CHARACTER	6	PRESENCE/ABSENCE OF INLETS/OUTLETS
INLETS	NUMERIC	8	INLETS (#)
INLETST	CHARACTER	6	TAG FOR INLETS
K11	NUMERIC	8	POTASSIUM (MG/L)
K11F	CHARACTER	12	FLAG FOR K11
K11T	CHARACTER	6	TAG FOR K11
K16	NUMERIC	8	POTASSIUM (UEQ/L)
LABNAM	CHARACTER	30	LABORATORY FOR ANALYSIS
LAKE_ID	CHARACTER	7	LAKE ID
LAKE_SIZ	NUMERIC	4	LAKE SURFACE AREA (HA)
LAKE_VOL	NUMERIC	8	CALC LAKE VOL (10**6 CU M)
LAKEID1	CHARACTER	7	ERLD-UMD ID/ALSC WSHED-POND ID
LAKEID1T	CHARACTER	4	TAG FOR LAKEID1
LAKENAME	CHARACTER	30	LAKE NAME
LAT	CHARACTER	10	LATITUDE
LAT_DD	NUMERIC	4	LATITUDE (DECIMAL DEGREES)
LONG	CHARACTER	11	LONGITUDE
LONG_DD	NUMERIC	4	LONGITUDE (DECIMAL DEGREES)

Table 5. (continued)

Variable	Type	Length	SAS label[a]
MAP_BIG	CHARACTER	25	MAP SHEET NAME (1:250,000 SCALE)
MAP_SML	CHARACTER	40	MAP SHEET NAME, 15 OR 7.5 QUAD
MG11	NUMERIC	8	MAGNESIUM (MG/L)
MG11F	CHARACTER	12	FLAG FOR MG11
MG11T	CHARACTER	6	TAG FOR MG11
MG16	NUMERIC	8	MAGNESIUM (UEQ/L)
MN11	NUMERIC	8	MANGANESE (UG/L)
MN11F	CHARACTER	12	FLAG FOR MN11
MN11T	CHARACTER	6	TAG FOR MN11
NA11	NUMERIC	8	SODIUM (MG/L)
NA11F	CHARACTER	12	FLAG FOR NA11
NA11T	CHARACTER	6	TAG FOR NA11
NA16	NUMERIC	8	SODIUM (UEQ/L)
NH411	NUMERIC	8	AMMONIUM (MG/L)
NH411F	CHARACTER	12	FLAG FOR NH411
NH416	NUMERIC	8	AMMONIUM (UEQ/L)
NO3DEP	NUMERIC	8	NITRATE DEPOSITION (G/M**2/YR)
NO311	NUMERIC	8	NITRATE (MG/L)
NO311F	CHARACTER	12	FLAG FOR NO311
NO311T	CHARACTER	6	TAG FOR NO311
NO316	NUMERIC	8	NITRATE (UEQ/L)
NUSAM	NUMERIC	8	NUMBER OF SAMPLES IN THE BATCH
ORGION	NUMERIC	8	ORGANIC ANION (UEQ/L)
ORGIONF	CHARACTER	12	FLAG FOR ORGION
OUTLET	NUMERIC	8	OUTLETS (#)
PH_B	NUMERIC	8	PH AT BOTTOM-1.5M
PH_BT	CHARACTER	6	TAG FOR PH_B
PH_TOP	NUMERIC	8	PH AT SURFACE (1.5M)
PH_TOPF	CHARACTER	6	FLAG FOR PH_TOP
PH_TOPT	CHARACTER	6	TAG FOR PH_TOP
PH_60	NUMERIC	8	PH AT .6*DEPTH
PH_60T	CHARACTER	6	TAG FOR PH_60
PHAC11	NUMERIC	8	PH-ACIDITY INITIAL
PHAC11F	CHARACTER	12	FLAG FOR PHAC11
PHAC11T	CHARACTER	6	TAG FOR PHAC11
PHAL11	NUMERIC	8	PH-ALKALINITY INITIAL
PHAL11F	CHARACTER	12	FLAG FOR PHAL11
PHAL11T	CHARACTER	6	TAG FOR PHAL11
PHEQ11	NUMERIC	8	PH-AIR EQUILIBRATED
PHEQ11F	CHARACTER	12	FLAG FOR PHEQ11
PHFIO1	NUMERIC	8	PH FINAL CALIB
PHFIO1T	CHARACTER	6	TAG FOR PHFIO1

Table 5. (continued)

Variable	Type	Length	SAS label[a]
PHINO1	NUMERIC	8	PH INITIAL CALIB
PHINO1T	CHARACTER	6	TAG FOR PHINO1
PHSTQC	NUMERIC	8	PH QCCS - FIELD LAB
PHSTVL	NUMERIC	8	PH - FIELD LAB
PHSTVLF	CHARACTER	6	FLAG FOR PHSTVL
PHSTVLT	CHARACTER	6	TAG FOR PHSTVL
PHTAZ1	CHARACTER	3	AZIMUTH OF 1ST PHOTO (DEG)
PHTAZ2	CHARACTER	3	AZIMUTH OF 2ND PHOTO (DEG)
PHTLAP	CHARACTER	2	FRAME NUMBER FOR LAPCARD
PHTNU1	CHARACTER	2	FRAME NUMBER OF PHOTO 1
PHTNU2	CHARACTER	2	FRAME NUMBER OF PHOTO 2
PRECIP	NUMERIC	8	PRECIPITATION (M/YR)
PTL11	NUMERIC	8	TOTAL PHOSPHORUS (UG/L)
PTL11F	CHARACTER	12	FLAG FOR PTL11
PTL11T	CHARACTER	6	TAG FOR PTL11
REG_SPC	CHARACTER	16	REG SPEC LTM NRC DEW DER SAMPLE CLASS
REGION	CHARACTER	1	NSWS REGION
RT	NUMERIC	8	RESIDENCE TIME (YR)
RUNIN	NUMERIC	8	ANNUAL RUNOFF INCHES FROM DIGIT MAP
RUNOFF	NUMERIC	8	SURFACE WATER RUNOFF (M/YR)
SAM_ID	CHARACTER	6	SAMPLE ID
SAM_IDF	CHARACTER	12	FLAG FOR SAM_ID
SAM_IDT	CHARACTER	6	TAG FOR SAM_ID
SAMCOD	CHARACTER	8	SAMPLE CODE
SECDIS	NUMERIC	8	SECCHI DISAPPEAR DEPTH (M)
SECDISF	CHARACTER	6	FLAG FOR SECDIS
SECDIST	CHARACTER	6	TAG FOR SECDIS
SECMEAN	NUMERIC	8	SECCHI,MEAN DEPTH (M)
SECREA	NUMERIC	8	SECCHI REAPPEAR DEPTH (M)
SECREAF	CHARACTER	6	FLAG FOR SECREA
SECREAT	CHARACTER	6	TAG FOR SECREA
SIO211	NUMERIC	8	SILICA (MG/L)
SIO211F	CHARACTER	12	FLAG FOR SIO211
SIO211T	CHARACTER	6	TAG FOR SIO211
SITDPF	NUMERIC	8	SITE DEPTH (FT)
SITDPM	NUMERIC	8	SITE DEPTH (M)
SITDPMT	CHARACTER	6	TAG FOR SITDPM
SOBC	NUMERIC	8	SUM OF BASE CATIONS (UEQ/L)
SOBCF	CHARACTER	12	FLAG FOR SOBC
SO4DEP	NUMERIC	8	SULFATE DEPOSITION (G/M**2/YR)
SO411	NUMERIC	8	SULFATE (MG/L)
SO411F	CHARACTER	12	FLAG FOR SO411

Table 5. (continued)

Variable	Type	Length	SAS label[a]
SO411T	CHARACTER	6	TAG FOR SO411
SO416	NUMERIC	8	SULFATE (UEQ/L)
SPLCOD	CHARACTER	4	SPLIT CODES
ST	CHARACTER	2	STATE (TWO-LETTER ABBREV)
STA_ID	CHARACTER	6	STATION ID FORM 2
STRAT	CHARACTER	6	STRATIFICATION(NONE,WEAK,STRONG)
STRATA	CHARACTER	3	NSWS STRATA
SUB_RGN	CHARACTER	1	NSWS SUBREGION
TAG_X	CHARACTER	40	MEANING OF TAG X FORM 1
TAG_Y	CHARACTER	20	MEANING FOR TAG Y FORM 1
TAG_Z	CHARACTER	20	MEANING FOR TAG Z FORM 1
TIMSMP	NUMERIC	8	TIME SAMPLED (24 H) HH:MM
TMP_B	NUMERIC	8	TEMPERATURE AT BOTTOM-1.5M (DEG C)
TMP_BT	CHARACTER	6	TAG FOR TMP_B
TMP_1	NUMERIC	8	TEMPERATURE AT 4 OR 5 M (DEG C)
TMP_10	NUMERIC	8	TEMPERATURE AT 50 M (DEG C)
TMP_2	NUMERIC	8	TEMPERATURE AT 6 OR 10 M (DEG C)
TMP_3	NUMERIC	8	TEMPERATURE AT 8 OR 15 M (DEG C)
TMP_4	NUMERIC	8	TEMPERATURE AT 10 OR 20 M (DEG C)
TMP_5	NUMERIC	8	TEMPERATURE AT 12 OR 25 M (DEG C)
TMP_6	NUMERIC	8	TEMPERATURE AT 14 OR 30 M (DEG C)
TMP_60	NUMERIC	8	TEMPERATURE AT .6*DEPTH (DEG C)
TMP_60T	CHARACTER	6	TAG FOR TMP_60
TMP_7	NUMERIC	8	TEMPERATURE AT 16 OR 35 M (DEG C)
TMP_8	NUMERIC	8	TEMPERATURE AT 18 OR 40 M (DEG C)
TMP_9	NUMERIC	8	TEMPERATURE AT 20 OR 45 M (DEG C)
TMPDF1	NUMERIC	8	TEMP DIF TOP-BOTTOM (DEG C)
TMPDF1T	CHARACTER	6	TAG FOR TMPDF1
TMPDF2	NUMERIC	8	TEMP DIF TOP-.6*DEPTH (DEG C)
TMPDF2T	CHARACTER	6	TAG FOR TMPDF2
TMPTOP	NUMERIC	8	TEMPERATURE AT SURFACE (1.5M) (DEG C)
TMPTOPT	CHARACTER	6	TAG FOR TMPTOP
TURQCS	NUMERIC	8	TURBIDITY QCCS - FIELD LAB (NTU)
TURVAL	NUMERIC	8	TURBIDITY - FIELD LAB (NTU)
TURVALF	CHARACTER	6	FLAG FOR TURVAL
TURVALT	CHARACTER	6	TAG FOR TURVAL
WALA	NUMERIC	8	WATERSHED AREA/LAKE AREA
WEIGHT1	NUMERIC	8	POP. EXTRAPOLATION FACTOR
WS_DIS	CHARACTER	8	D)WELL I)ND L)OG M)INE R)OAD S)TOCK
WS_OTH	CHARACTER	25	DISTURB W/I 100M - OTHER
WSHED	NUMERIC	8	WATERSHED AREA (HA)

[a]Labels are provided only in the SAS-formatted version of data set 3.

Table 6. List of variables, data set 4, U.S. EPA Eastern Lake Survey-Phase I

Variable	Type	Length	SAS label[a]
AIRTMP	NUMERIC	8	AIR TEMP (DEG C)
ALEX11	NUMERIC	8	EXT. ALUMINUM (UG/L)
ALEX11F	CHARACTER	12	FLAG FOR ALEX11
ALKA11	NUMERIC	8	ALKALINITY (UEQ/L)
ALKA11F	CHARACTER	12	FLAG FOR ALKA11
ALTL11	NUMERIC	8	TOTAL ALUMINUM (UG/L)
ALTL11F	CHARACTER	12	FLAG FOR ALTL11
ANCAT	NUMERIC	8	CATSUM/ANSUM
ANDEF	NUMERIC	8	CATSUM - ANSUM (UEQ/L)
ANSUM	NUMERIC	8	SUM OF ANIONS (UEQ/L)
ANSUMF	CHARACTER	18	FLAG FOR ANSUM
BAT_ID	CHARACTER	6	BATCH ID
BAT_IDF	CHARACTER	6	FLAG FOR BAT_ID
BNSTAR	NUMERIC	8	POPULATION SIZE BY STRATA
CATSUM	NUMERIC	8	SUM OF CATIONS (UEQ/L)
CATSUMF	CHARACTER	18	FLAG FOR CATSUM
CA11	NUMERIC	8	CALCIUM (MG/L)
CA11F	CHARACTER	12	FLAG FOR CA11
CA16	NUMERIC	8	CALCIUM (UEQ/L)
CL11	NUMERIC	8	CHLORIDE (MG/L)
CL11F	CHARACTER	12	FLAG FOR CL11
CL16	NUMERIC	8	CHLORIDE (UEQ/L)
COLVAL	NUMERIC	8	COLOR (PCU)
COLVALF	CHARACTER	6	FLAG FOR COLVAL
CON_B	NUMERIC	8	SP. COND.(LOWER HYDROLAB SAMPLE),(US)
CON_60	NUMERIC	8	CONDUCTIVITY AT .6*DEPTH (US)
CONCAL	NUMERIC	8	CALC. SP. COND. (US)
CONCALF	CHARACTER	18	FLAG FOR CONCAL
COND11	NUMERIC	8	CONDUCTIVITY-ANAL LAB (US)
COND11F	CHARACTER	12	FLAG FOR COND11
CONTOP	NUMERIC	8	SP. COND.(UPPER HYDROLAB SAMPLE),(US)
CONTOPF	CHARACTER	6	FLAG FOR CONTOP
COUNTY	CHARACTER	5	FIPS CODE(ST,COUNTY)
CO316	NUMERIC	8	CARBONATE ALKALINITY (UEQ/L)
CO316F	CHARACTER	12	FLAG FOR CO316
DATSMP	NUMERIC	8	DATE SAMPLED FORM 1
DICE11	NUMERIC	8	EQUIL DIC-ANAL LAB (MG/L)
DICE11F	CHARACTER	12	FLAG FOR DICE11
DICI11	NUMERIC	8	INITIAL DIC-ANAL LAB (MG/L)
DICI11F	CHARACTER	12	FLAG FOR DICI11
DICVAL	NUMERIC	8	DIC - FIELD LAB (MG/L)
DICVALF	CHARACTER	6	FLAG FOR DICVAL
DISM	NUMERIC	8	DISTANCE FROM COAST (KM)

Table 6. (continued)

Variable	Type	Length	SAS label[a]
DOC11	NUMERIC	8	DOC-ANAL LAB (MG/L)
DOC11F	CHARACTER	12	FLAG FOR DOC11
DP_B	NUMERIC	8	DEPTH AT BOTTOM-1.5M (M)
DP_TOP	NUMERIC	8	DEPTH AT SURFACE (1.5M) (M)
DP_60	NUMERIC	8	DEPTH .6*BOTTOM (M)
ELEV	NUMERIC	8	LAKE ELEVATION (M)
FE11	NUMERIC	8	IRON (UG/L)
FE11F	CHARACTER	12	FLAG FOR FE11
FTL11	NUMERIC	8	FLUORIDE (MG/L)
FTL11F	CHARACTER	12	FLAG FOR FTL11
FTL16	NUMERIC	8	FLUORIDE (UEQ/L)
HCO316	NUMERIC	8	HCO3 (UEQ/L)
HCO316F	CHARACTER	12	FLAG FOR HCO316
HDEP	NUMERIC	8	HYDROGEN ION DEPOSITION (G/M**2/YR)
HYD_ID	CHARACTER	2	HYDROLAB ID FORM 1
HYDROTYP	CHARACTER	9	HYDROLOGIC TYPE
H16	NUMERIC	8	HYDROGEN (UEQ/L) FROM PHAC
H16F	CHARACTER	12	FLAG FOR H16
IN_OUT	CHARACTER	6	PRESENCE/ABSENCE OF INLETS/OUTLETS
INLETS	NUMERIC	8	INLETS (#)
K11	NUMERIC	8	POTASSIUM (MG/L)
K11F	CHARACTER	12	FLAG FOR K11
K16	NUMERIC	8	POTASSIUM (UEQ/L)
LABNAM	CHARACTER	30	LABORATORY FOR ANALYSIS
LAKE_ID	CHARACTER	7	LAKE ID
LAKE_SIZ	NUMERIC	4	LAKE SURFACE AREA (HA)
LAKE_VOL	NUMERIC	8	CALC LAKE VOL (10**6 CU M)
LAKEID1	CHARACTER	7	ERLD-UMD ID/ALSC WSHED-POND ID
LAKEID1T	CHARACTER	4	TAG FOR LAKEID1
LAKENAME	CHARACTER	30	LAKE NAME
LAT	CHARACTER	10	LATITUDE
LAT_DD	NUMERIC	4	LATITUDE (DECIMAL DEGREES)
LONG	CHARACTER	11	LONGITUDE
LONG_DD	NUMERIC	4	LONGITUDE (DECIMAL DEGREES)
MAP_BIG	CHARACTER	25	MAP SHEET NAME (1:250,000 SCALE)
MAP_SML	CHARACTER	40	MAP SHEET NAME, 15 OR 7.5 QUAD
MG11	NUMERIC	8	MAGNESIUM (MG/L)
MG11F	CHARACTER	12	FLAG FOR MG11
MG16	NUMERIC	8	MAGNESIUM (UEQ/L)
MN11	NUMERIC	8	MANGANESE (UG/L)
MN11F	CHARACTER	12	FLAG FOR MN11
NA11	NUMERIC	8	SODIUM (MG/L)

Table 6. (continued)

Variable	Type	Length	SAS label[a]
NA11F	CHARACTER	12	FLAG FOR NA11
NA16	NUMERIC	8	SODIUM (UEQ/L)
NH411	NUMERIC	8	AMMONIUM (MG/L)
NH411F	CHARACTER	12	FLAG FOR NH411
NH416	NUMERIC	8	AMMONIUM (UEQ/L)
NO3DEP	NUMERIC	8	NITRATE DEPOSITION (G/M**2/YR)
NO311	NUMERIC	8	NITRATE (MG/L)
NO311F	CHARACTER	14	FLAG FOR NO311
NO316	NUMERIC	8	NITRATE (UEQ/L)
ORGION	NUMERIC	8	ORGANIC ANION (UEQ/L)
ORGIONF	CHARACTER	18	FLAG FOR ORGION
OUTLET	NUMERIC	8	OUTLETS (#)
PH_B	NUMERIC	8	PH AT BOTTOM-1.5M
PH_TOP	NUMERIC	8	PH AT SURFACE (1.5M)
PH_TOPF	CHARACTER	6	FLAG FOR PH_TOP
PH_60	NUMERIC	8	PH AT .6*DEPTH
PHAC11	NUMERIC	8	PH-ACIDITY INITIAL
PHAC11F	CHARACTER	12	FLAG FOR PHAC11
PHAL11	NUMERIC	8	PH-ALKALINITY INITIAL
PHAL11F	CHARACTER	12	FLAG FOR PHAL11
PHEQ11	NUMERIC	8	PH-AIR EQUILIBRATED
PHEQ11F	CHARACTER	12	FLAG FOR PHEQ11
PHSTVL	NUMERIC	8	PH - FIELD LAB
PHSTVLF	CHARACTER	6	FLAG FOR PHSTVL
PRECIP	NUMERIC	8	PRECIPITATION (M/YR)
PTL11	NUMERIC	8	TOTAL PHOSPHORUS (UG/L)
PTL11F	CHARACTER	12	FLAG FOR PTL11
REG_SPC	CHARACTER	16	REG SPEC LTM NRC DEW DER SAMPLE CLASS
REGION	CHARACTER	1	NSWS REGION
RT	NUMERIC	8	RESIDENCE TIME (YR)
RUNIN	NUMERIC	8	ANNUAL RUNOFF INCHES FROM DIGIT MAP
RUNOFF	NUMERIC	8	SURFACE WATER RUNOFF (M/YR)
SAM_ID	CHARACTER	6	SAMPLE ID
SAM_IDF	CHARACTER	6	FLAG FOR SAM_ID
SECDIS	NUMERIC	8	SECCHI DISAPPEAR DEPTH (M)
SECMEAN	NUMERIC	8	SECCHI,MEAN DEPTH (M)
SECREA	NUMERIC	8	SECCHI REAPPEAR DEPTH (M)
SIO211	NUMERIC	8	SILICA (MG/L)
SIO211F	CHARACTER	12	FLAG FOR SIO211
SITDPM	NUMERIC	8	SITE DEPTH (M)
SOBC	NUMERIC	8	SUM OF BASE CATIONS (UEQ/L)
SOBCF	CHARACTER	18	FLAG FOR SOBC

Table 6. (continued)

Variable	Type	Length	SAS label[a]
SO4DEP	NUMERIC	8	SULFATE DEPOSITION (G/M**2/YR)
SO411	NUMERIC	8	SULFATE (MG/L)
SO411F	CHARACTER	12	FLAG FOR SO411
SO416	NUMERIC	8	SULFATE (UEQ/L)
ST	CHARACTER	2	STATE (TWO-LETTER ABBREV)
STA_ID	CHARACTER	6	STATION ID FORM 2
STRAT	CHARACTER	6	STRATIFICATION(NONE,WEAK,STRONG)
STRATA	CHARACTER	3	NSWS STRATA
SUB_RGN	CHARACTER	1	NSWS SUBREGION
TIMSMP	NUMERIC	8	TIME SAMPLED (24 H) HH:MM
TMP_B	NUMERIC	8	TEMPERATURE AT BOTTOM-1.5M (DEG C)
TMP_60	NUMERIC	8	TEMPERATURE AT .6*DEPTH (DEG C)
TMPDF1	NUMERIC	8	TEMP DIF TOP-BOTTOM (DEG C)
TMPDF2	NUMERIC	8	TEMP DIF TOP-.6*DEPTH (DEG C)
TMPTOP	NUMERIC	8	TEMPERATURE AT SURFACE (1.5M) (DEG C)
TURVAL	NUMERIC	8	TURBIDITY - FIELD LAB (NTU)
TURVALF	CHARACTER	6	FLAG FOR TURVAL
WALA	NUMERIC	8	WATERSHED AREA/LAKE AREA
WEIGHT1	NUMERIC	8	POP. EXTRAPOLATION FACTOR
WS_DIS	CHARACTER	8	D)WELL I)ND L)OG M)INE R)OAD S)TOCK
WS_OTH	CHARACTER	25	DISTURB W/I 100M - OTHER
WSHED	NUMERIC	8	WATERSHED AREA (HA)

[a]Labels are provided only in the SAS-formatted version of data set 4.

Table 7. List of variables, PC data set (all files), U.S. EPA Eastern Lake Survey-Phase I

Variable	Type	Width[a]	Label[b]
ALEX11	NUMERIC	5.1	EXT. ALUMINUM (UG/L)
ALKA11	NUMERIC	6.1	ALKALINITY (UEQ/L)
ALTL11	NUMERIC	6.1	TOTAL ALUMINUM (UG/L)
ANCAT	NUMERIC	4.2	CATSUM/ANSUM
ANSUM	NUMERIC	6.1	SUM OF ANIONS (UEQ/L)
BNSTAR	NUMERIC	4.0	POPULATION SIZE BY STRATA
CATSUM	NUMERIC	6.1	SUM OF CATIONS (UEQ/L)
CA16	NUMERIC	6.1	CALCIUM (UEQ/L)
CL16	NUMERIC	6.1	CHLORIDE (UEQ/L)
COLVAL	NUMERIC	4.0	COLOR (PCU)
CONCAL	NUMERIC	5.1	CALC. SP. COND. (US)
COND11	NUMERIC	5.1	CONDUCTIVITY-ANAL LAB (US)
DATSMP	CHARACTER	7	DATE SAMPLED FORM 1
DICE11	NUMERIC	5.2	EQUIL DIC_ANAL LAB (MG/L)
DICVAL	NUMERIC	5.2	DIC - FIELD LAB (MG/L)
DOC11	NUMERIC	5.2	DOC-ANAL LAB (MG/L)
ELEV	NUMERIC	4.0	LAKE ELEVATION (M)
FE11	NUMERIC	6.1	IRON (UG/L)
FTL16	NUMERIC	4.1	FLUORIDE (UEQ/L)
HCO316	NUMERIC	6.1	HCO3 (UEQ/L)
HYDROTYP	CHARACTER	9	DRAINAGE, SEEPAGE, CLOSED, RESERVOIR
K16	NUMERIC	5.1	POTASSIUM (UEQ/L)
LAKE_ID	CHARACTER	7	LAKE ID
LAKENAME	CHARACTER	26	LAKE NAME
LAKE_SIZ	NUMERIC	6.0	LAKE SURFACE AREA (HA)
LAT	CHARACTER	10	LATITUDE
LONG	CHARACTER	10	LONGITUDE
MG16	NUMERIC	6.1	MAGNESIUM (MG/L)
MN11	NUMERIC	6.1	MANGANESE (UG/L)
NA16	NUMERIC	6.1	SODIUM (UEQ/L)
NH416	NUMERIC	4.1	AMMONIUM (UEQ/L)
NO316	NUMERIC	5.1	NITRATE (UEQ/L)
PHEQ11	NUMERIC	4.2	PH-AIR EQUILIBRATED
PHSTVL	NUMERIC	4.2	PH - FIELD LAB
PTL11	NUMERIC	5.1	TOTAL PHOSPHORUS (UG/L)
REG_SPC	CHARACTER	16	REG SPEC LTM NRC DEW DER SAMPLE CLASS
SECMEAN	NUMERIC	4.1	SECCHI, MEAN DEPTH (M)
SIO211	NUMERIC	5.2	SILICA (MG/L)

Table 7. (continued)

Variable	Type	Width[a]	Label[b]
SITDMP	NUMERIC	5.1	SITE DEPTH (M)
SO416	NUMERIC	6.1	SULFATE (UEQ/L)
ST	CHARACTER	2	STATE (TWO_LETTER ABBREV)
STRAT	CHARACTER	6	STRATIFICATION (NONE, WEAK, STRONG)
TMPTOP	NUMERIC	4.1	TEMPERATURE AT SURFACE
TURVAL	NUMERIC	5.1	TURBIDITY - FIELD LAB (NTU)
WALA	NUMERIC	7.1	WATERSHED AREA/LAKE AREA
WEIGHT1	NUMERIC	6.3	POPULATION EXTRAPOLATION FACTOR
WSHED	NUMERIC	6.0	WATERSHED AREA (HA)

[a]Width for character fields is the integer field width. The width for numeric fields is in W.D format, where W = the total field width (decimal point included) and D = the number of decimal places. For example, 34.78 is in 5.2 format.

[b]Labels are not provided in the PC data sets but are given here for completeness.

5. DEFINITION OF VARIABLES

Table 8 provides units of measure and extended definitions for variables contained in data sets 3 and 4 and the PC data set. Variable tags and flags are not included because their definitions would invariably be just "tag (or flag) for variable X." A full description of data collected and ELS-I protocol is provided in Linthurst et al. (1986). In situ measurements are outlined in Hillman et al. (1986) and Morris et al. (1986). EPA methods are from U.S. EPA (1983), and U.S. Geological Survey (USGS) methods are from Skougstad et al. (1979).

Conventions used in the computer-coded equations are as follows:

* represents multiplication

** represents exponentiation, and

/ represents division.

Table 8. Definition of variables, U.S. EPA Eastern Lake Survey-Phase I

Name	Units	Definition
ACCO11	µeq/L	Carbon dioxide acidity (or base neutralizing capacity) is the measured acidity in a sample due to dissolved CO_2, hydronium, and hydroxide. Determined in the analytical laboratory using base titration and Gran analysis. Used in conjunction with alkalinity to refine alkalinity and acidity calculations.
ACM11	µeq/L	Mineral acidity (negative alkalinity), calculated in the analytical laboratory using the first Gran function iteration on a data pair (NaOH volume, calculated pH) for which the calculated pH was less than 5.
AIRTMP	°C	Air temperature measured from the helicopter with a thermometer.
ALEX11	µg/L	Extractable aluminum is an estimate of monomeric aluminum complexes (Al^{+3}). Aluminum in an unacidified, filtered sample was complexed with 8-hydroxyquinoline and extracted with methyl-isobutyl ketone (MIBK) in the field laboratory. The extract was analyzed in the analytical laboratory using the method described in Hillman et al. (1986).
ALKA11	µeq/L	Acid neutralizing capacity is a measure of the amount of acid necessary to neutralize the bicarbonate, carbonate, alumino-hydroxy complexes, and other bases in a sample. Determined in the analytical laboratory in an unfiltered, unacidified aliquot, using acidimetric titration and modified Gran analysis (Hillman et al. 1986; Kramer 1984).
ALKC11	µeq/L	Carbonate alkalinity, corresponds to the point in an acidimetric titration curve where hydroxyl (OH^-) and carbonate ($CO_3^=$) were neutralized (V2), but before the point where the bicarbonate (HCO_3^-) was neutralized (V1).

Table 8. (continued)

Name	Units	Definition
ALTL11	µg/L	Total aluminum, measured in the analytical laboratory in an unfiltered, acidified (HNO_3) aliquot, using EPA method 202.2 (AAS, atomic absorption spectroscopy, graphite furnace).
ANCAT		Ratio of measured cations to measured anions: ANCAT = CATSUM/ANSUM.
ANDEF	µeq/L	Anion deficit is the measured cations minus the measured anions: ANDEF = CATSUM - ANSUM.
ANSUM	µeq/L	Sum of major anion concentrations: ANSUM = CL16 + FTL16 + NO316 + HCO316 + CO316 + SO416.
BAT_ID		Batch identification number, lake and quality assurance samples processed and analyzed together on the same day and in the same field laboratory were given common batch numbers.
BNSTAR		Number of lakes identified in a stratum (see STRATA) from the USGS 1:250,000 scale maps. Lakes to be sampled were randomly selected to represent this frame population.
CA11	mg/L	Dissolved calcium, measured in the analytical laboratory in filtered, acidified (HNO_3) aliquot (EPA method 215.1, AAS, flame).
CA16	µeq/L	Dissolved calcium: CA16 = CA11*49.90 µeq/mg.
CATSUM	µeq/L	Summation of major cation concentrations: CATSUM = CA16 + MG16 + NA16 + K16 + NH416 + H16.
CL11	mg/L	Chloride ion, measured in the analytical laboratory in a filtered, unacidified aliquot (ASTM 1984; O'Dell et al. 1984; ion chromatographic method).
CL16	µeq/L	Chloride ion: CL16 = CL11*28.21 µeq/mg.

Table 8. (continued)

Name	Units	Definition
CO316	µeq/L	Carbonate, an estimate (Butler 1982) of: $CO_3^{-2} = \frac{4.996 \times [DIC\ mg/L] \times K_1K_2}{[H^+]^2 + [H^+]K_1 + K_1K_2}$ which is coded as: CO316 = 60009*(DICI11/12011)*ALPHA2*33.33; where: ALPHA2 = K1*K2/ ((10**(-PHAC11))**2 + (10**-PHAC11)*K1 + K1*K2). where: K1 = 4.3*10**-7, and K2 = 5.61*10**-11.
COLVAL	PCU	True color measured in the field laboratory by first centrifuging the sample to remove particles, then using an HACH Model CO-1 Comparator (EPA method 110.2, modified).
COMMNT		Comment from field laboratory.
COMO1		Comment from lake sampling crew.
	Field specific conductance	
		The following measurements of conductance were made with the HYDROLAB probe from the helicopter (CONTOP thru CONFI). These are not in alphabetical order, but ordered as usually measured. Measurements paralleled field temperature measurements.
CONTOP	µS/cm	Conductance at surface (usually 1.5 m below the surface).
CON_B	µS/cm	Conductance at SITDPM - 1.5 m.

Table 8. (continued)

Name	Units	Definition
CON_60	µS/cm	Conductance at 0.6*SITDPM. Measurement taken when TMPDF1 ≥ 4°C.
	Profile measurements	
		Specific conductance profile measurements were taken when TMPDF2 ≥ 4° C. Profile measurement depths were determined by maximum lake depth measured (SITDPM). If SITDPM ≤ 20 m, profile measurements were taken at 4 m, and at 2 m increments to the bottom. If SITDPM > 20 m, the profile was taken at 5 m, and at 5 m increments to the bottom.
CON_1	µS/cm	Conductance at 4 m (SITDPM ≤20) or 5 m (SITDPM >20).
CON_2	µS/cm	Conductance at 6 m (SITDPM ≤20) or 10 m (SITDPM >20).
CON_3	µS/cm	Conductance at 8 m (SITDPM ≤20) or 15 m (SITDPM >20).
CON_4	µS/cm	Conductance at 10 m (SITDPM ≤20) or 20 m (SITDPM >20).
CON_5	µS/cm	Conductance at 12 m (SITDPM ≤20) or 25 m (SITDPM >20).
CON_6	µS/cm	Conductance at 14 m (SITDPM ≤20) or 30 m (SITDPM >20).
CON_7	µS/cm	Conductance at 16 m (SITDPM ≤20) or 35 m (SITDPM >20).
CON_8	µS/cm	Conductance at 18 m (SITDPM ≤20) or 40 m (SITDPM >20).
CON_9	µS/cm	Conductance at 20 m (SITDPM ≤20) or 45 m (SITDPM >20).
CON_10	µS/cm	Conductance at 50 m.

Table 8. (continued)

Name	Units	Definition
CONIN	µS/cm	Initial conductance values, obtained from initial analysis of a 50 µS/cm QC check sample used to verify HYDROLAB calibration.
CONFI	µS/cm	Final conductance values, obtained from final analysis of a 50 µS/cm QC check sample used to verify HYDROLAB calibration (see CONIN).
CONCAL	µS/cm	Calculated conductance, sum of the products of ion concentration times equivalent conductance. The cations summed were Ca^{+2}, Mg^{+2}, Na^{+}, K^{+}, NH_4^{+}, and H^{+}. The anions summed were SO_4^{-2}, HCO_3^{-2}, Cl^{-}, NO_3^{-}, F^{-}, CO_3^{-2}, and OH^{-}. coded as: CONCAL = [(CA16*59.47) + (MG16*53.0) + (K16*73.48) + (NA16*50.08) + (NH416*73.5) + (H16*349.65) + (SO416*80.0) + (HCO316*44.5) + (CL16*76.31) + (NO316*71.42) + (F16*55.4) + (CO316*69.3) + (OH*198)]/1000. This calculation converts µeq/L to µS/cm.
COND11	µS/cm	Specific conductance, measured in the analytical laboratory using a conductivity cell (EPA method 120.1).
COUNTY		Federal Information Processing Standard (FIPS 1979) state and county code.
CRW_ID		Lake sampling crew ID number.
DATADD		Date of completion of data management quality assurance procedures and the observation was added to data set 1 (the raw data set). DDMMMYY format.
DATENT		Date of first entry of lake sampling field data into data set 1 (the raw data set). DDMMMYY format.
DATRE		Date of second entry of lake sampling field data (all data were double entered) into data set 1 (the raw data set). DDMMMYY format.

Table 8. (continued)

Name	Units	Definition
DATREC		Date lake sampling field data were received by ORNL. DDMMMYY format.
DATSHP		Date samples were shipped from field laboratories to the analytical laboratories. DDMMMYY format.
DATSMP		Date lake was sampled. DDMMMYY format.
DICE11	mg/L	Air-equilibrated dissolved inorganic carbon, measured in the analytical laboratory in an unfiltered, unacidified aliquot bubbled with 300 ppm CO_2, drawn into a syringe, filtered, and analyzed without exposure to the atmosphere (EPA method 415.2 modified, infrared spectrophotometric detector).
DICI11	mg/L	Dissolved inorganic carbon, measured in the analytical laboratory in an unfiltered, unacidified aliquot. The sample was drawn into a syringe, filtered, and analyzed without exposure to the atmosphere, (EPA method 415.2 modified, infrared spectrophotometric detector).
DICQCS	mg/L	Dissolved inorganic carbon (DIC) QC check sample (field laboratory). DIC was measured in the field laboratory on a 2.0 mg/L sodium carbonate solution using a flame ionization detector. The check sample was measured before the first sample measurement and after every eight samples.
DICVAL	µg/L	Dissolved inorganic carbon, measured in the field laboratory on a sample drawn directly into a syringe from the Van Dorn water sampler, filtered, and analyzed without exposure to the atmosphere, using a DOHRMANN DC-80 carbon analyzer with infrared spectrophotometric detector (EPA method 415.2, modified).
DISM	km	Distance of the lake from the Atlantic Ocean. A calculated variable for lakes within 150 km from the coast line (otherwise this value is missing).

Table 8. (continued)

Name	Units	Definition
DOC11	mg/L	Dissolved organic carbon, measured in the analytical laboratory in a filtered, acidified (H_2SO_4) aliquot (EPA method 415.2, infrared spectrophotometric detector).
DP_B	m	Depth at which bottom temperature and conductance were measured: DP_B = SITDPM - 1.5.
DP_CAT		Lake depth category, 4 (if SITDPM $\leq$ 20 m) or 5 (if SITDPM > 20 m).
DP_TOP	m	Depth of surface water sample, usually 1.5 m.
DP_60	m	Sixty percent of site depth: DP_60 = 0.6*SITDPM.
ELEV	m	Lake elevation, taken from USGS topographic maps.
FE11	µg/L	Dissolved iron, measured in the analytical laboratory in a filtered, acidified (HNO_3) aliquot (EPA method 236.1, AAS, flame).
FTL11	mg/L	Total dissolved fluoride, measured in the analytical laboratory in a filtered, unacidified aliquot, analyzed using an ion-selective electrode (ISE, EPA method 340.2, modified).
FTL16	µeq/L	Total dissolved fluoride: FTL16 = FTL11*52.64 µeq/mg.
H16	µeq/L	Hydrogen ion concentration: H16 = 10**(-PHAC11)*10**6.
HCO316	µeq/L	Bicarbonate, an estimate (Butler 1982) of: $$HCO_3^- = \frac{5.080 \times [\text{DIC mg/L}] \times [H^+]K_1}{[H^+]^2 + [H^+]K_1 + K_1K_2}$$ which is coded as: HCO316 = 61017*(DICI11/12011)* ALPHA1*16.39; where ALPHA1 = ((10**(-PHAC11))*K1)/ ((10**(-PHAC11))**2 + (10**-PHAC11)*K1 + K1*K2); where K1 = 4.3*10**-7, and K2 = 5.61*10**-11

Table 8. (continued)

Name	Units	Definition
HDEP	g/m^2	Average annual wet hydrogen ion deposition, derived from 1980-1982 Acid Deposition System data (Watson and Olsen 1984). Deposition values for lakes were assigned by contouring both the hydrogen ion concentrations measured in precipitation and the precipitation volumes (see PRECIP), interpolating values for 3.75 minute latitude/longitude cells, and multiplying these paired cell values.
HYD_ID		Identification number for the HYDROLAB meter used for field measurements.
HYDROTYP		Hydrologic type, defined from geographic data. Classes are: CLOSED DRAINAGE RESERVOIR SEEPAGE
INLETS		Number of lake inlets as observed from the helicopter.
IN_OUT		Presence and/or absence of inlets and outlets, as determined from topographic maps: I/O = both; NI/O = outlets only; I/NO = inlets only; NI/NO = neither; RES = Reservoir.
K11	mg/L	Dissolved potassium, measured in the analytical laboratory in a filtered, acidified (HNO_3) aliquot (EPA method 258.1, AAS, flame).
K16	µeq/L	Dissolved potassium: K16 = K11*25.57 µeq/mg.
LABNAM		Name of the analytical laboratory which performed the analytical analyses. The four laboratories were Global Geochemistry Corporation (GLOBAL); U.S. Geological Survey (USGS); Versar, Inc. (VERSAR); Environmental Monitoring Services, Inc. (EMSI).

Table 8. (continued)

Name	Units	Definition
LAKE_ID		Seven-character unique identification code assigned to each lake. The first character represents the region (1, 2, or 3); the second character, the subregion; the third character, the alkalinity map class; a dash; and the last three digits the assigned lake number. The first three characters also designate the stratum (see STRATA). LAKE_ID is unique for every record in data set 4 and the PC data set, but is repeated in data set 3 for those lakes which were sampled twice for quality assurance purposes.
LAKE_SIZ	ha	Lake surface area, measured using an electronic planimeter on USGS topographic maps.
LAKE_VOL	$10^6 m^3$	Estimated lake volume: LAKE_VOL = ((LAKE_SIZ*10**4)*SITDPM*0.464)/10**6.
LAKEID1		ELS-I LAKE_ID cross reference with EPA Environmental Research Laboratory, Duluth, University of Minnesota, Duluth study lakes identification code or the Adirondack Lake Survey Corporation (ALSC) ponds identification code. Either the ERLD_UMD or ALSC ID number is in this field (else missing).
LAKENAME		Lake name taken from USGS topographic maps. When a number of small lakes were identified by only one name on the map, another qualifier was added to the name, such as "southern," to identify the lake. Where no name was listed, "(NO NAME)" was entered into the data base as the lake name.
LAT	deg	Latitude taken from the USGS topographic maps in DD-MM-SS (degrees-minutes-seconds) format.
LAT_DD	deg	Latitude expressed as degrees and decimal degrees in DD.DDDD format.
LONG	deg	Longitude as read from the USGS topographic maps in DDD-MM-SS format.
LONG_DD	deg	Longitude expressed as degrees and decimal degrees in DDD.DDDD format.
MAP_BIG		Name of the 1:250,000 scale USGS topographic map on which the lake is located.

Table 8. (continued)

Name	Units	Definition
MAP_SML		Name of the 15 minute or 7.5 minute scale USGS topographic map on which the lake is located.
MG11	mg/L	Dissolved magnesium, measured in the analytical laboratory in a filtered, acidified (HNO_3) aliquot (EPA method 242.1, AAS, flame).
MG16	µeq/L	Dissolved magnesium: MG16 = MG11*82.26 µeq/mg.
MN11	µg/L	Dissolved manganese, measured in the analytical laboratory in a filtered, acidified (HNO_3) aliquot (EPA method 243.1, AAS, flame).
NA11	mg/L	Dissolved sodium, measured in the analytical laboratory in a filtered, acidified (HNO_3) aliquot (EPA method 273.1, AAS, flame).
NA16	µeq/L	Dissolved sodium: NA16 = NA11*43.50 µeq/mg.
NH411	mg/L	Ammonium ion, measured in the analytical laboratory in a sample from the filtered, acidified (H_2SO_4) aliquot (EPA method 350.1, colorimetric, automated).
NH416	µeq/L	Ammonium ion: NH416 = NH411*55.44 µeq/mg.
NO3DEP	g/m^2	Average annual nitrate ion deposition, derived from 1980-1982 Acid Deposition System data (Watson and Olsen 1984). Lake deposition values were assigned by contouring both the nitrate ion concentrations measured in precipitation and the precipitation volumes (see PRECIP), interpolating values for 3.75 minute latitude/longitude cells, and multiplying these paired cell values.
NO311	mg/L	Nitrate ion, measured in the analytical laboratory in a filtered, unacidified aliquot (ASTM 1984; O'Dell et al. 1984; ion chromatography).
NO316	µeq/L	Nitrate ion: NO316 = NO311*16.13 µeq/mg.
NUSAM		Number of samples in a batch and processed by the field laboratory during a sampling day (see BAT_ID).

Table 8. (continued)

Name	Units	Definition
ORGION	µeq/L	Estimate of the organic anion concentration: ORGION = K*CT/(K + (10**(-PHAC11))); where: K = 10**(-PK); CT = DOC11*10; and PK = 0.96 + 0.9*PHAC11 - 0.039*PHAC11**2.
OUTLET		Number of lake outlets as observed from the helicopter.
	Field pH measurements	
		The following measurements were made from the helicopter with the HYDROLAB probe (PH_TOP through PHFI01). They are listed in the usual order of sampling. Measurements of pH paralleled field temperature measurements.
PH_TOP	pH	pH measurement at surface (usually 1.5 m below the surface)
PH_B	pH	pH at SITDPM - 1.5 M
PH_60	pH	pH at 0.6*SITDPM
PHIN01	pH	Initial measurement of a pH 3.91 QC check sample, used to calibrate the HYDROLAB.
PHFI01	pH	Final measurement of a pH 3.91 QC check sample, used to calibrate the HYDROLAB.
	Laboratory pH measurements	
PHAC11	pH	Initial pH from the acidity titration, measured in the analytical laboratory. A sample from an unfiltered, unacidified aliquot was placed into a CO_2 free titration vessel and stirred. The pH was measured with an electrode (without exposure to the atmosphere) before addition of base titrant.
PHAL11	pH	Initial pH from the alkalinity titration, measured in the analytical laboratory. A sample from the unfiltered, unacidified aliquot was placed into a titration vessel (not CO_2 free) and stirred. The pH was measured with an electrode before the first addition of acid titrant.

Table 8. (continued)

Name	Units	Definition
PHEQ11	pH	Air-equilibrated pH, measured in the analytical laboratory in an unfiltered, unacidified aliquot bubbled with 300 ppm CO_2. (EPA method 150.1, electrode).
PHSTQC	pH	Measurement of a pH 4.0 QC check sample, used by the field laboratory to calibrate closed system pH measurements.
PHSTVL	pH	Closed system pH, measured in the field laboratory using an ORION Model 611 meter and an ORION ROSS combination pH electrode on a syringe sample unexposed to the atmosphere (EPA method 150.1).
PHTAZ1	deg	Azimuth of first photo taken of the lake by field crew.
PHTAZ2	deg	Azimuth of second photo taken of the lake by field crew.
PHTLAP		Frame number for lapcard photo identification with lake ID.
PHTNU1		Frame number of first photo.
PHTNU2		Frame number of second photo.
PRECIP	m	Annual precipitation. For Region 1, derived from 30-year precipitation norm values (1951-1980) for 500 stations (National Climate Center, NOAA). For Regions 2 and 3, derived from the 1980-1982 Acid Deposition System data (Watson and Olsen 1984) for 162 stations. Values were assigned for each lake by contouring the precipitation volume data and interpolating values for 3.75 minute latitude/longitude cells. Precipitation cell values were used to weight the H^+, SO_4^{-2}, and NO_3^- concentrations in precipitation samples.

Table 8. (continued)

Name	Units	Definition
PTL11	µg/L	Total phosphorous, measured in the analytical laboratory in an unfiltered, acidified (H_2SO_4) aliquot, using either of two automated, colorimetric phosphomolybdate methods: for normal phosphorus levels, using a 15mm absorption cell; for low levels, a preliminary method using 50mm absorption cell was employed (USGS method I-4600-78).
REGION		Region is a major area of the conterminous United States where a substantial number of lakes with alkalinity <400 µeq/L can be found. For the ELS-I there are three regions, 1 (Northeast), 2 (Upper Midwest), and 3 (Southeast).
REG_SPC		Reason for lake being sampled: REGULAR: part of the probability sample. REG/SPC/XXX: part of the probability sample, but also identified as being of special interest. SPC/XXX: of special interest only. The 'XXX' gives the reason for the special interest: XXX codes: LTM = an EPA long-term monitoring lake NRC = suggested by the National Research Council DEW = suggested by the state of New Jersey DER = suggested by the state of Florida
RT	yr	Estimated hydraulic residence time, defined as years required to replace the volume of the lake. Calculated only for drainage lakes and reservoirs (see HYDROTYP). $RT = \frac{LA \times \text{site depth}}{\text{runoff} \times (\text{watershed area} - LA) + (\text{precip} \times LA)}$ where LA = lake area. coded as: RT = ((LAKE_SIZ*10**4)*(SITDPM*0.464))/ (((RUNIN*2.54*10**-2)*((WSHED*10**4) - (LAKE_SIZ*10**4))) + ((LAKE_SIZ*10**4)*(PRECIP))).
RUNIN	in/yr	Surface water runoff interpolated from USGS map (Busby 1966).

Table 8. (continued)

Name	Units	Definition
RUNOFF	m/yr	Surface water runoff interpolated from USGS map (Busby 1966). RUNOFF = RUNIN*0.025 m/in.
SAM_ID		Identifies individual samples within a batch (see BAT_ID). In combination BAT_ID and SAM_ID are the unique sample identifiers.
SAMCOD		Sample code indicating the type of sample: R = routine sample D = duplicate sample
SECDIS	m	Secchi disk disappearance depth.
SECMEAN	m	Mean of Secchi disk disappearance and reappearance depths. SECMEAN is the lake depth if the disk was visible on the lake bottom.
SECREA	m	Secchi disk reappearance depth.
SIO211	mg/L	Silica, measured in the analytical lab in an unfiltered aliquot (USGS method I-2700-78, colorimetric, molybdate blue, automated method).
SITDPF	ft	Sampling site depth, measured using a depth sounder or weighted line. Not necessarily maximum lake depth.
SITDPM	m	Sampling site depth, measured using a depth sounder or weighted line. Not necessarily maximum lake depth.
SO4DEP	g/m^2	Average annual sulfate ion deposition, derived from 1980-1982 Acid Deposition System data (Watson and Olsen 1984). Lake deposition values were assigned by contouring both the sulfate ion concentrations measured in precipitation and the precipitation volumes (see PRECIP), interpolating values for 3.75 minute latitude/longitude cells, and multiplying these paired cell values.
SO411	mg/L	Sulfate ion, measured in the analytical laboratory in a filtered, unacidified aliquot (ASTM 1984; O'Dell et al. 1984; ion chromatographic methods).
SO416	µeq/L	Sulfate ion: SO416 = SO411*20.82 µeq/mg.

Table 8. (continued)

Name	Units	Definition
SOBC	µeq/L	Sum of base cations: SOBC = NA16 + K16 + CA16 + MG16.
SPLCOD		Split code, indicates that duplicate sample aliquots were sent to cooperating analytical laboratories, where: E = U.S. EPA Environmental Research Laboratory at Corvallis, C = Canada, and N = Norway.
ST		State: standard two character postal abbreviation.
STA_ID		Station ID of the field laboratory where lake samples were processed. STA_ID codes: 1 = Bangor, ME; 2 = Lake Placid, NY; 3 = Lexington, MA; 4 = Pocono, PA; 5 = Rhinelander, WI; 6 = Duluth, MI; 7 = Asheville, NC; 8 = Gainesville, FL
STRAT		Thermal stratification status: MIXED = Lakes where the difference between top temperature and bottom temperature (TMPDF1) was <4°C. WEAK = Lakes where the temperature difference between top and bottom (TMPDF1) was ≥4°C and the difference between top and the 60% depth temperature (TMPDF2) was <4°C. STRONG = Lakes with a temperature difference ≥4°C between the top temperature (TMPTOP) and the temperature at 60% of lake depth (TMP_60).
STRATA		Strata, a subpopulation of lakes within a geographic area defined before sampling by the expected alkalinity of surface waters within a subregion and within a region.

Table 8. (continued)

Name	Units	Definition
SUB_RGN		Subregions are areas within each region that are similar in water quality, physiography, vegetation, climate, and soil. The ELS-I used a letter A-E concatenated with the region number as subregion identifier. The 11 subregions in the ELS-I were: Region 1 Northeast 1A: Adirondacks 1B: Poconos/ Catskills 1C: Central New England 1D: Southern New England 1E: Maine Region 2 Upper Midwest 2A: Northeastern Minnesota 2B: Upper Peninsula of Michigan 2C: Northcentral Wisconsin 2D: Upper Great Lakes Region 3 Southeast 3A: Southern Blue Ridge 3B: Florida
TAG_X		Meaning of the user-defined tag 'X' reported on the field form.
TAG_Y		Meaning of the user-defined tag 'Y' reported on the field form.
TAG_Z		Meaning of the user-defined tag 'Z' reported on the field form.
TIMSMP		Time lake was sampled in HH:MM format (24 H).
	Field temperature measurement:	
		The following temperature measurements (TMPTOP to TMP_10) were made from the helicopter with the HYDROLAB probe. They are not in alphabetical order, but ordered as usually measured. Comparisons of top and bottom temperatures determined the need to take profile measurements.

Table 8. (continued)

Name	Units	Definition
TMPTOP	°C	Lake water temperature at surface (1.5 m).
TMP_B	°C	Temperature at SITDPM - 1.5 m.
TMPDF1	°C	Difference between top and bottom temperatures: TMPDF1 = TMPTOP - TMP_B.
TMP_60	°C	Temperature at 0.6*SITDPM. Measurement taken if TMPDF1 ≥4°C.
TMPDF2	°C	Difference between temperature at top and temperature at 0.6*SITDPM: TMPDF2 = TMPTOP - TMP_60.
	Profile measurements	
		Temperature profile measurements were taken when TMPDF2 ≥ 4°C. Profile measurement depths were determined by maximum lake depth measured (SITDPM). If SITDPM ≤ 20 m, profile measurements were taken at 4 m and at 2 m increments to the bottom. If SITDPM > 20 m, the profile was taken at 5 m and at 5 m increments to a maximum depth of 50 m.
TMP_1	°C	Temperature at 4 m (SITDPM ≤20) or at 5 m (SITDPM >20).
TMP_2	°C	Temperature at 6 m (SITDPM ≤20) or at 10 m (SITDPM >20).
TMP_3	°C	Temperature at 8 m (SITDPM ≤20) or at 15 m (SITDPM >20).
TMP_4	°C	Temperature at 10 m (SITDPM ≤20) or at 20 m (SITDPM >20).
TMP_5	°C	Temperature at 12 m (SITDPM ≤20) or at 25 m (SITDPM >20).
TMP_6	°C	Temperature at 14 m (SITDPM ≤20) or at 30 m (SITDPM >20).
TMP_7	°C	Temperature at 16 m (SITDPM ≤20) or at 35 m (SITDPM >20).

Table 8. (continued)

Name	Units	Definition
TMP_8	°C	Temperature at 18 m (SITDPM ≤20) or at 40 m (SITDPM >20).
TMP_9	°C	Temperature at 20 m (SITDPM ≤20) or at 45 m (SITDPM >20).
TMP_10	°C	Temperature at 50 m.
TURQCS	NTU	Turbidity, measured by the field laboratory on a 5.0 NTU QC check sample used to verify nephelometer calibration. Values for the check sample were recorded before and after eight sample measurements.
TURVAL	NTU	Turbidity, measured in the unfiltered sample in the field laboratory using a MONITEK model 21 nephelometer, reported in nephelometric turbidity units (EPA method 180.1).
WALA		Ratio of watershed area to lake area. Watershed area includes lake area.
WEIGHT1		Stratum specific population expansion factor, equal to the inverse of a sample lake's inclusion probability.
WSHED	ha	Watershed area, the geographic area from which surface water drains into a particular lake, as determined using an electronic planimeter on USGS topographic maps. Lake area was included in watershed area.
WS_DIS		Disturbances of the natural environment in a watershed within 100 m of the shore as noted by field crew, where: D = dwellings L = logging R = roads I = industry M = mining S = livestock
WS_OTH		Other disturbances of the natural environment in a watershed within 100 m of the shore as noted by field crew. The "other" disturbances were specified in WS_OTH.

6. CARD-IMAGE FORMAT DEFINITION

ELS-I data sets 3 and 4 are provided as both SAS-formatted files and as card-image files. The PC data set is provided in card-image format only. The formats for the card-image files for all data sets are presented in Tables 9, 10, and 11. Table 11 provides the card-image format used for all PC data set files. There are four PC data set files - ELS-I.RG1, ELS-I.RG2, ELS-I.RG3, and ELS-I.SPC. They provide information for Regions 1, 2, 3, and the special interest lakes, respectively.

Most numeric variables were transferred to the card-image files for data sets 3 and 4 in 9.4 format (total length 9, including decimal point, with 4 decimals), regardless of their original formats (however, WSHED is in 9.2; LAKE_SIZ, WALA, ANDEF, and ALKC11 are all in 9.3 format). The column "Dec" in Tables 9 and 10 indicates the original number of digits to the right of the decimal point in the SAS data sets. This value should be used as a part of the input format to prevent the generation of overly significant data on other computer systems.

Dates are in DDMMMYY format, and times are in HH:MM format (24-h clock) for all data sets.

The two comment variables in data set 3 (COMMNT and COMO1) were split into two parts each because of their respective lengths (COMMNT1, COMMNT2, and COMO11, COMO12). Therefore, the card-image form of data set 3 has 256 (not 254) variables.

Note that missing numeric variables are represented as -999. These values must be removed before analysis.

Table 9. Card-image format definition, data set 3, U.S. EPA Eastern Lake Survey-Phase I

Card No.[a]	Variable	Label	Variable type	Variable width[b]	Dec[c]	Column start	Column end	Card No.
1	CONCALF	FLAG FOR CONCAL	CHAR	20		1	20	1
1	LAKEID	LAKE ID	CHAR	7		22	28	1
1	DATREC	DATE RECEIVED BY ORNL FORM 1	CHAR	7		30	36	1
1	DATENT	DATE ENTERED FORM 1	CHAR	7		38	44	1
1	DATADD	DATE ADDED TO RAW DATASET	CHAR	7		46	52	1
1	DATRE	DATE REENTERED FORM 1	CHAR	7		54	60	1
1	DATSMP	DATE SAMPLED FORM 1	CHAR	7		62	68	1
1	TIMSMP	TIME SAMPLED (24 H) HH:MM	CHAR	5		70	74	1
2	HYDID	HYDROLAB ID FORM 1	CHAR	2		1	2	2
2	PHINO1	PH INITIAL CALIB	NUM	9.4	2	4	12	2
2	PHINO1T	TAG FOR PHINO1	CHAR	6		14	19	2
2	PHFIO1	PH FINAL CALIB	NUM	9.4	2	21	29	2
2	PHFIO1T	TAG FOR PHFIO1	CHAR	6		31	36	2
2	CONIN	CONDUCTIVITY INITIAL CALIB (US)	NUM	9.4	0	38	46	2
2	CONFI	CONDUCTIVITY FINAL CALIB (US)	NUM	9.4	0	48	56	2
2	CONFIT	TAG FOR CONFI	CHAR	6		58	63	2
2	PHTLAP	FRAME NUMBER FOR LAPCARD	CHAR	2		65	66	2
2	PHTNU1	FRAME NUMBER OF PHOTO 1	CHAR	2		68	69	2
2	PHTNU2	FRAME NUMBER OF PHOTO 2	CHAR	2		71	72	2
3	PHTAZ1	AZIMUTH OF 1ST PHOTO (DEG)	CHAR	3		1	3	3
3	PHTAZ2	AZIMUTH OF 2ND PHOTO (DEG)	CHAR	3		5	7	3
3	SITDPM	SITE DEPTH (M)	NUM	9.4	2	9	17	3
3	SITDPMT	TAG FOR SITDPM	CHAR	6		19	24	3
3	AIRTMP	AIR TEMP (DEG C)	NUM	9.4	1	26	34	3
3	SITDPF	SITE DEPTH (FT)	NUM	9.4	1	36	44	3
3	SECDIS	SECCHI DISAPPEAR DEPTH (M)	NUM	9.4	1	46	54	3
3	SECDISF	FLAG FOR SECDIS	CHAR	6		56	61	3
3	SECDIST	TAG FOR SECDIS	CHAR	6		63	68	3
4	SECREA	SECCHI REAPPEAR DEPTH (M)	NUM	9.4	1	1	9	4
4	SECREAF	FLAG FOR SECREA	CHAR	6		11	16	4
4	SECREAT	TAG FOR SECREA	CHAR	6		18	23	4
4	DPTOP	DEPTH AT SURFACE (1.5M) (M)	NUM	9.4	1	25	33	4
4	DPTOPT	TAG FOR DPTOP	CHAR	6		35	40	4
4	DPB	DEPTH AT BOTTOM-1.5M (M)	NUM	9.4	1	42	50	4
4	DPBT	TAG FOR DPB	CHAR	6		52	57	4
4	TMPTOP	TEMPERATURE AT SURFACE (1.5M) (DEG C)	NUM	9.4	1	59	67	4
4	TMPTOPT	TAG FOR TMPTOP	CHAR	6		69	74	4
5	TMPB	TEMPERATURE AT BOTTOM-1.5M (DEG C)	NUM	9.4	1	1	9	5
5	TMPBT	TAG FOR TMPB	CHAR	6		11	16	5
5	CONTOP	CONDUCTIVITY AT SURFACE (1.5M) (US)	NUM	9.4	0	18	26	5
5	CONTOPF	FLAG FOR CONTOP	CHAR	6		28	33	5
5	CONTOPT	TAG FOR CONTOP	CHAR	6		35	40	5
5	CONB	CONDUCTIVITY AT BOTTOM-1.5M (US)	NUM	9.4	0	42	50	5
5	CONBT	TAG FOR CONB	CHAR	6		52	57	5
5	PHTOP	PH AT SURFACE (1.5M)	NUM	9.4	2	59	67	5
5	PHTOPF	FLAG FOR PHTOP	CHAR	6		69	74	5

Table 9. (continued)

Card No.[a]	Variable	Label	Variable type	Variable width[b]	Dec[c]	Column start	Column end	Card No.
6	PHTOPT	TAG FOR PHTOP	CHAR	6		1	6	6
6	PHB	PH AT BOTTOM-1.5M	NUM	9.4	2	8	16	6
6	PHBT	TAG FOR PHB	CHAR	6		18	23	6
6	TMPDF1	TEMP DIF TOP-BOTTOM (DEG C)	NUM	9.4	1	25	33	6
6	TMPDF1T	TAG FOR TMPDF1	CHAR	6		35	40	6
6	DP60	DEPTH .6*BOTTOM (M)	NUM	9.4	1	42	50	6
6	DP60T	TAG FOR DP60	CHAR	6		52	57	6
6	TMP60	TEMPERATURE AT .6*DEPTH (DEG C)	NUM	9.4	1	59	67	6
6	TMP60T	TAG FOR TMP60	CHAR	6		69	74	6
7	CON60	CONDUCTIVITY AT .6*DEPTH (US)	NUM	9.4	0	1	9	7
7	CON60T	TAG FOR CON60	CHAR	6		11	16	7
7	PH60	PH AT .6*DEPTH	NUM	9.4	2	18	26	7
7	PH60T	TAG FOR PH60	CHAR	6		28	33	7
7	TMPDF2	TEMP DIF TOP-.6*DEPTH (DEG C)	NUM	9.4	1	35	43	7
7	TMPDF2T	TAG FOR TMPDF2	CHAR	6		45	50	7
7	OUTLET	OUTLETS (#)	NUM	9.4	0	52	60	7
7	INLETS	INLETS (#)	NUM	9.4	0	62	70	7
8	INLETST	TAG FOR INLETS	CHAR	6		1	6	8
8	DPCAT	DEPTH CATEGORY 4=<20M 5=>20M	NUM	9.4	0	8	16	8
8	TMP1	TEMPERATURE AT 4 OR 5 M (DEG C)	NUM	9.4	1	18	26	8
8	TMP2	TEMPERATURE AT 6 OR 10 M (DEG C)	NUM	9.4	1	28	36	8
8	TMP3	TEMPERATURE AT 8 OR 15 M (DEG C)	NUM	9.4	1	38	46	8
8	TMP4	TEMPERATURE AT 10 OR 20 M (DEG C)	NUM	9.4	1	48	56	8
8	TMP5	TEMPERATURE AT 12 OR 25 M (DEG C)	NUM	9.4	1	58	66	8
9	TMP6	TEMPERATURE AT 14 OR 30 M (DEG C)	NUM	9.4	1	1	9	9
9	TMP7	TEMPERATURE AT 16 OR 35 M (DEG C)	NUM	9.4	1	11	19	9
9	TMP8	TEMPERATURE AT 18 OR 40 M (DEG C)	NUM	9.4	1	21	29	9
9	TMP9	TEMPERATURE AT 20 OR 45 M (DEG C)	NUM	9.4	1	31	39	9
9	TMP10	TEMPERATURE AT 50 M (DEG C)	NUM	9.4	1	41	49	9
9	CON1	CONDUCTIVITY AT 4 OR 5 M (US)	NUM	9.4	0	51	59	9
9	CON2	CONDUCTIVITY AT 6 OR 10 M (US)	NUM	9.4	0	61	69	9
10	CON3	CONDUCTIVITY AT 8 OR 15 M (US)	NUM	9.4	0	1	9	10
10	CON4	CONDUCTIVITY AT 10 OR 20 M (US)	NUM	9.4	0	11	19	10
10	CON5	CONDUCTIVITY AT 12 OR 25 M (US)	NUM	9.4	0	21	29	10
10	CON6	CONDUCTIVITY AT 14 OR 30 M (US)	NUM	9.4	0	31	39	10
10	CON7	CONDUCTIVITY AT 16 OR 35 M (US)	NUM	9.4	0	41	49	10
10	CON8	CONDUCTIVITY AT 18 OR 40 M (US)	NUM	9.4	0	51	59	10
10	CON9	CONDUCTIVITY AT 20 OR 45 M (US)	NUM	9.4	0	61	69	10
11	CON10	CONDUCTIVITY AT 50 M (US)	NUM	9.4	0	1	9	11
11	TAGX	MEANING OF TAG X FORM 1	CHAR	40		11	50	11
11	TAGY	MEANING FOR TAG Y FORM 1	CHAR	20		52	71	11

Table 9. (continued)

Card No.[a]	Variable	Label	Variable type	Variable width[b]	Dec[c]	Column start	Column end	Card No.
12	TAGZ	MEANING FOR TAG Z FORM 1	CHAR	20		1	20	12
12	BATID	BATCH ID	CHAR	6		29	34	12
12	SAMID	SAMPLE ID	CHAR	6		36	41	12
12	CRWID	CREW ID FORM 1	CHAR	6		43	48	12
12	ANCAT	CATIONS/ANIONS	NUM	9.4	4	50	58	12
12	HYDROTYP	HYDROLOGIC TYPE	CHAR	9		60	68	12
13	LAKENAME	LAKE NAME	CHAR	30		1	30	13
13	ST	STATE (TWO-LETTER ABBREV)	CHAR	2		32	33	13
13	WSHED	WATERSHED AREA (SQ. KM)	NUM	9.2	2	35	43	13
13	ELEV	LAKE ELEVATION (M)	NUM	9.4	1	45	53	13
13	LAKESIZ	LAKE SURFACE AREA (HA)	NUM	9.3	2	55	63	13
13	INOUT	PRESENCE/ABSENCE OF INLETS/OUTLETS	CHAR	6		65	70	13
14	LATDD	LATITUDE (DECIMAL DEGREES)	NUM	9.4	5	12	20	14
14	LONGDD	LONGITUDE (DECIMAL DEGREES)	NUM	9.4	5	22	30	14
14	REGION	NSWS REGION	CHAR	1		32	32	14
14	SUBRGN	NSWS SUBREGION	CHAR	1		34	34	14
14	MAPBIG	MAP SHEET NAME (1:250,000 SCALE)	CHAR	25		36	60	14
15	MAPSML	MAP SHEET NAME, 15 OR 7.5 QUAD	CHAR	40		1	40	15
15	LAT	LATITUDE	CHAR	10		42	51	15
15	LONG	LONGITUDE	CHAR	11		53	63	15
15	STRATA	NSWS STRATA	CHAR	3		65	67	15
15	COUNTY	FIPS CODE(ST,COUNTY)	CHAR	5		69	73	15
16	LAKEID1	ERLD-UMD ID/ALSC WSHED-POND ID	CHAR	7		1	7	16
16	LAKEID1T	TAG FOR LAKEID1	CHAR	4		9	12	16
16	DISM	DISTANCE FROM COAST (KM)	NUM	9.4	0	14	22	16
16	HDEP	HYDROGEN ION DEPOSITION (G/M**2/YR)	NUM	9.4	3	24	32	16
16	NO3DEP	NITRATE DEPOSITION (G/M**2/YR)	NUM	9.4	2	34	42	16
16	SO4DEP	SULFATE DEPOSITION (G/M**2/YR)	NUM	9.4	2	44	52	16
16	PRECIP	PRECIPITATION (M/YR)	NUM	9.4	3	54	62	16
16	WALA	WATERSHED AREA/LAKE AREA	NUM	9.3	2	64	72	16
17	REGSPC	REG SPEC LTM NRC DEW DER SAMPLE CLASS	CHAR	16		1	16	17
17	WSOTH	DISTURB W/I 100M - OTHER	CHAR	25		18	42	17
17	RUNIN	ANNUAL RUNOFF INCHES FROM DIGIT MAP	NUM	9.4	0	44	52	17
17	WEIGHT1	POP. EXTRAPOLATION FACTOR	NUM	9.4	4	54	62	17
17	RT	RESIDENCE TIME (YR)	NUM	9.4	3	64	72	17
18	RUNOFF	SURFACE WATER RUNOFF (M/YR)	NUM	9.4	4	1	9	18
18	LAKEVOL	CALC LAKE VOL (10**6 CU M)	NUM	9.4	3	11	19	18
18	SECMEAN	SECCHI,MEAN DEPTH (M)	NUM	9.4	2	21	29	18
18	STRAT	STRATIFICATION(NONE,WEAK,STRONG)	CHAR	6		31	36	18
18	WSDIS	D)WELL I)ND L)OG M)INE R)OAD S)TOCK	CHAR	8		38	45	18
18	BNSTAR	POPULATION SIZE BY STRATA	NUM	9.4	0	47	55	18
18	BATIDT	TAG FOR BATID	CHAR	6		57	62	18

Table 9. (continued)

Card No.[a]	Variable	Label	Variable type	Variable width[b]	Dec[c]	Column start	Column end	Card No.
19	LABNAM	LABORATORY FOR ANALYSIS	CHAR	30		1	30	19
19	NUSAM	NUMBER OF SAMPLES IN THE BATCH	NUM	9.4	0	32	40	19
19	DATSHP	DATE SHIPPED FORM 2	NUM	7		42	48	19
19	STAID	STATION ID FORM 2	CHAR	6		50	55	19
19	SAMIDT	TAG FOR SAMID	CHAR	6		57	62	19
19	SAMCOD	SAMPLE CODE	CHAR	8		64	71	19
20	DICVAL	DIC - FIELD LAB (MG/L)	NUM	9.4	3	1	9	20
20	DICVALF	FLAG FOR DICVAL	CHAR	6		11	16	20
20	DICVALT	TAG FOR DICVAL	CHAR	6		18	23	20
20	DICQCS	DIC QCCS - FIELD LAB (MG/L)	NUM	9.4	3	25	33	20
20	DICQCST	TAG FOR DICQCS	CHAR	6		35	40	20
20	PHSTVL	PH - FIELD LAB	NUM	9.4	2	42	50	20
20	PHSTVLF	FLAG FOR PHSTVL	CHAR	6		52	57	20
20	PHSTVLT	TAG FOR PHSTVL	CHAR	6		59	64	20
20	PHSTQC	PH QCCS - FIELD LAB	NUM	9.4	2	66	74	20
21	TURVAL	TURBIDITY - FIELD LAB (NTU)	NUM	9.4	2	1	9	21
21	TURVALF	FLAG FOR TURVAL	CHAR	6		11	16	21
21	TURVALT	TAG FOR TURVAL	CHAR	6		18	23	21
21	TURQCS	TURBIDITY QCCS - FIELD LAB (NTU)	NUM	9.4	1	25	33	21
21	COLVAL	COLOR (PCU)	NUM	9.4	0	35	43	21
21	COLVALF	FLAG FOR COLVAL	CHAR	6		45	50	21
21	COLVALT	TAG FOR COLVAL	CHAR	6		52	57	21
21	SPLCOD	SPLIT CODES	CHAR	4		59	62	21
21	ANSUMF	FLAG FOR ANSUM	CHAR	12		64	75	21
22	CATSUMF	FLAG FOR CATSUM	CHAR	12		1	12	22
22	SOBCF	FLAG FOR SOBC	CHAR	12		14	25	22
22	ORGIONF	FLAG FOR ORGION	CHAR	12		27	38	22
22	ANSUM	SUM OF ANIONS (UEQ/L)	NUM	9.4	3	40	48	22
22	CATSUM	SUM OF CATIONS (UEQ/L)	NUM	9.4	3	50	58	22
22	SOBC	SUM OF BASE CATIONS (UEQ/L)	NUM	9.4	3	60	68	22
23	ORGION	ORGANIC ANION (UEQ/L)	NUM	9.4	3	1	9	23
23	ANDEF	CATSUM - ANSUM (UEQ/L)	NUM	9.3	3	11	19	23
23	HCO316	HCO3 (UEQ/L)	NUM	9.4	3	21	29	23
23	HCO316F	FLAG FOR HCO316	CHAR	12		31	42	23
23	CA16	CALCIUM (UEQ/L)	NUM	9.4	3	44	52	23
23	CO316	CARBONATE ALKALINITY (UEQ/L)	NUM	9.4	3	54	62	23
23	CO316F	FLAG FOR CO316	CHAR	12		64	75	23
24	CL16	CHLORIDE (UEQ/L)	NUM	9.4	3	1	9	24
24	MG16	MAGNESIUM (UEQ/L)	NUM	9.4	3	11	19	24
24	NO316	NITRATE (UEQ/L)	NUM	9.4	3	21	29	24
24	K16	POTASSIUM (UEQ/L)	NUM	9.4	3	31	39	24
24	NA16	SODIUM (UEQ/L)	NUM	9.4	3	41	49	24
24	SO416	SULFATE (UEQ/L)	NUM	9.4	3	51	59	24
24	FTL16	FLUORIDE (UEQ/L)	NUM	9.4	3	61	69	24

Table 9. (continued)

Card No.[a]	Variable	Label	Variable type	Variable width[b]	Dec[c]	Column start	Column end	Card No.
25	NH416	AMMONIUM (UEQ/L)	NUM	9.4	3	1	9	25
25	H16	HYDRONIUM FROM PHAC (UEQ/L)	NUM	9.4	3	11	19	25
25	H16F	FLAG FOR H16	CHAR	12		21	32	25
25	SAMIDF	FLAG FOR SAMID	CHAR	12		34	45	25
25	CA11	CALCIUM (MG/L)	NUM	9.4	3	47	55	25
25	CA11F	FLAG FOR CA11	CHAR	12		57	68	25
25	CA11T	TAG FOR CA11	CHAR	6		70	75	25
26	MG11	MAGNESIUM (MG/L)	NUM	9.4	3	1	9	26
26	MG11F	FLAG FOR MG11	CHAR	12		11	22	26
26	MG11T	TAG FOR MG11	CHAR	6		24	29	26
26	K11	POTASSIUM (MG/L)	NUM	9.4	3	31	39	26
26	K11F	FLAG FOR K11	CHAR	12		41	52	26
26	K11T	TAG FOR K11	CHAR	6		54	59	26
26	NA11	SODIUM (MG/L)	NUM	9.4	3	61	69	26
27	NA11F	FLAG FOR NA11	CHAR	12		1	12	27
27	NA11T	TAG FOR NA11	CHAR	6		14	19	27
27	MN11	MANGANESE (UG/L)	NUM	9.4	0	21	29	27
27	MN11F	FLAG FOR MN11	CHAR	12		31	42	27
27	MN11T	TAG FOR MN11	CHAR	6		44	49	27
27	FE11	IRON (UG/L)	NUM	9.4	0	51	59	27
27	FE11F	FLAG FOR FE11	CHAR	12		61	72	27
28	FE11T	TAG FOR FE11	CHAR	6		1	6	28
28	ALEX11	EXT. ALUMINUM (UG/L)	NUM	9.4	0	8	16	28
28	ALEX11F	FLAG FOR ALEX11	CHAR	12		18	29	28
28	CL11	CHLORIDE (MG/L)	NUM	9.4	3	31	39	28
28	CL11F	FLAG FOR CL11	CHAR	12		41	52	28
28	CL11T	TAG FOR CL11	CHAR	6		54	59	28
28	SO411	SULFATE (MG/L)	NUM	9.4	3	61	69	28
29	SO411F	FLAG FOR SO411	CHAR	12		1	12	29
29	SO411T	TAG FOR SO411	CHAR	6		14	19	29
29	NO311	NITRATE (MG/L)	NUM	9.4	3	21	29	29
29	NO311F	FLAG FOR NO311	CHAR	12		31	42	29
29	NO311T	TAG FOR NO311	CHAR	6		44	49	29
29	SIO211	SILICA (MG/L)	NUM	9.4	3	51	59	29
29	SIO211F	FLAG FOR SIO211	CHAR	12		61	72	29
30	SIO211T	TAG FOR SIO211	CHAR	6		1	6	30
30	FTL11	FLUORIDE (MG/L)	NUM	9.4	4	8	16	30
30	FTL11F	FLAG FOR FTL11	CHAR	12		18	29	30
30	DOC11	DOC-ANAL LAB (MG/L)	NUM	9.4	3	31	39	30
30	DOC11F	FLAG FOR DOC11	CHAR	12		41	52	30
30	DOC11T	TAG FOR DOC11	CHAR	6		54	59	30
30	NH411	AMMONIUM (MG/L)	NUM	9.4	3	61	69	30

Table 9. (continued)

Card No.[a]	Variable	Label	Variable type	Variable width[b]	Dec[c]	Column start	Column end	Card No.
31	NH411F	FLAG FOR NH411	CHAR	12		1	12	31
31	PHEQ11	PH-AIR EQUILIBRATED	NUM	9.4	2	14	22	31
31	PHEQ11F	FLAG FOR PHEQ11	CHAR	12		24	35	31
31	PHAL11	PH-ALKALINITY INITIAL	NUM	9.4	2	37	45	31
31	PHAL11F	FLAG FOR PHAL11	CHAR	12		47	58	31
31	PHAL11T	TAG FOR PHAL11	CHAR	6		60	65	31
31	PHAC11	PH-ACIDITY INITIAL	NUM	9.4	2	67	75	31
32	PHAC11F	FLAG FOR PHAC11	CHAR	12		1	12	32
32	PHAC11T	TAG FOR PHAC11	CHAR	6		14	19	32
32	ACCO11	ACIDITY-CO2 (UEQ/L)	NUM	9.4	2	21	29	32
32	ACCO11F	FLAG FOR ACCO11	CHAR	12		31	42	32
32	ACCO11T	TAG FOR ACCO11	CHAR	6		44	49	32
32	ACM11	ACIDITY-MINERAL (UEQ/L)	NUM	9.4	2	51	59	32
32	ACM11T	TAG FOR ACM11	CHAR	6		61	66	32
33	ALKA11	ALKALINITY (UEQ/L)	NUM	9.4	1	1	9	33
33	ALKA11F	FLAG FOR ALKA11	CHAR	12		11	22	33
33	ALKA11T	TAG FOR ALKA11	CHAR	6		24	29	33
33	ALKC11	ALKALINITY-CO3 (UEQ/L)	NUM	9.3	1	31	39	33
33	ALKC11T	TAG FOR ALKC11	CHAR	6		41	46	33
33	COND11	CONDUCTIVITY-ANAL LAB (US)	NUM	9.4	1	48	56	33
33	COND11F	FLAG FOR COND11	CHAR	12		58	69	33
34	COND11T	TAG FOR COND11	CHAR	6		1	6	34
34	DICE11	EQUIL DIC-ANAL LAB (MG/L)	NUM	9.4	3	8	16	34
34	DICE11F	FLAG FOR DICE11	CHAR	12		18	29	34
34	DICE11T	TAG FOR DICE11	CHAR	6		31	36	34
34	DICI11	INITIAL DIC-ANAL LAB (MG/L)	NUM	9.4	3	38	46	34
34	DICI11F	FLAG FOR DICI11	CHAR	12		48	59	34
34	DICI11T	TAG FOR DICI11	CHAR	6		61	66	34
35	PTL11	TOTAL PHOSPHORUS (UG/L)	NUM	9.4	1	1	9	35
35	PTL11F	FLAG FOR PTL11	CHAR	12		11	22	35
35	PTL11T	TAG FOR PTL11	CHAR	6		24	29	35
35	ALTL11	TOTAL ALUMINUM (UG/L)	NUM	9.4	1	31	39	35
35	ALTL11F	FLAG FOR ALTL11	CHAR	12		41	52	35
35	ALTL11T	TAG FOR ALTL11	CHAR	6		54	59	35
35	CONCAL	CALC. SP. COND. (US)	NUM	9.4	3	61	69	35
36	COM011	COMMENT FORM 01 PT 1	CHAR	75		1	75	36
37	COM012	COMMENT FORM 01 PT 2	CHAR	45		1	45	37
38	COMMNT1	COMMENT FROM FORM 02 PT 1	CHAR	75		1	75	38
39	COMMNT2	COMMENT FROM FORM 02 PT 2	CHAR	75		1	75	39

[a]Card No. is a variable on each record in columns 79-80.
[b]Width for CHAR (character) fields is the integer field width. The width for NUM (numeric) fields is in W.D format, where W = the total field width (decimal point included) and D = the number of decimal places. For example, 34.78 is in 5.2 format.
[c]Dec is the number of decimal places with which the original data were reported.

Table 10. Card-image format definition, data set 4, U.S. EPA Eastern Lake Survey-Phase I

Card No.[a]	Variable	Label	Variable type	Variable width[b]	Dec[c]	Column start	Column end	Card No.
1	LAKEID	LAKE ID	CHAR	7		1	7	1
1	DATSMP	DATE SAMPLED FORM 1	CHAR	7		9	15	1
1	TIMSMP	TIME SAMPLED (24 H) HH:MM	CHAR	5		17	21	1
1	HYDID	HYDROLAB ID FORM 1	CHAR	2		23	24	1
1	WSOTH	DISTURB W/I 100M - OTHER	CHAR	25		26	50	1
1	SITDPM	SITE DEPTH (M)	NUM	9.4	2	52	60	1
1	AIRTMP	AIR TEMP (DEG C)	NUM	9.4	1	62	70	1
2	SECDIS	SECCHI DISAPPEAR DEPTH (M)	NUM	9.4	1	1	9	2
2	SECREA	SECCHI REAPPEAR DEPTH (M)	NUM	9.4	1	11	19	2
2	DPTOP	DEPTH AT SURFACE (1.5M) (M)	NUM	9.4	1	21	29	2
2	DPB	DEPTH AT BOTTOM-1.5M (M)	NUM	9.4	1	31	39	2
2	TMPTOP	TEMPERATURE AT SURFACE (1.5M) (DEG C)	NUM	9.4	1	41	49	2
2	TMPB	TEMPERATURE AT BOTTOM-1.5M (DEG C)	NUM	9.4	1	51	59	2
2	CONTOP	SP. COND.(UPPER HYDROLAB SAMPLE),(US)	NUM	9.4	0	61	69	2
3	CONTOPF	FLAG FOR CONTOP	CHAR	6		1	6	3
3	CONB	SP. COND.(LOWER HYDROLAB SAMPLE),(US)	NUM	9.4	0	8	16	3
3	PHTOP	PH AT SURFACE (1.5M)	NUM	9.4	2	18	26	3
3	PHTOPF	FLAG FOR PHTOP	CHAR	6		28	33	3
3	PHB	PH AT BOTTOM-1.5M	NUM	9.4	2	35	43	3
3	TMPDF1	TEMP DIF TOP-BOTTOM (DEG C)	NUM	9.4	1	45	53	3
3	DP60	DEPTH .6*BOTTOM (M)	NUM	9.4	1	55	63	3
3	TMP60	TEMPERATURE AT .6*DEPTH (DEG C)	NUM	9.4	1	65	73	3
4	CON60	CONDUCTIVITY AT .6*DEPTH (US)	NUM	9.4	0	1	9	4
4	PH60	PH AT .6*DEPTH	NUM	9.4	2	11	19	4
4	TMPDF2	TEMP DIF TOP-.6*DEPTH (DEG C)	NUM	9.4	1	21	29	4
4	OUTLET	OUTLETS (#)	NUM	9.4	0	31	39	4
4	INLETS	INLETS (#)	NUM	9.4	0	41	49	4
4	BATID	BATCH ID	CHAR	6		51	56	4
4	SAMID	SAMPLE ID	CHAR	6		58	63	4
4	BATIDF	FLAG FOR BATID	CHAR	6		65	70	4
5	STAID	STATION ID FORM 2	CHAR	6		1	6	5
5	SAMIDF	FLAG FOR SAMID	CHAR	6		8	13	5
5	DICVAL	DIC - FIELD LAB (MG/L)	NUM	9.4	4	15	23	5
5	DICVALF	FLAG FOR DICVAL	CHAR	6		25	30	5
5	PHSTVL	PH - FIELD LAB	NUM	9.4	3	32	40	5
5	PHSTVLF	FLAG FOR PHSTVL	CHAR	6		42	47	5
5	TURVAL	TURBIDITY - FIELD LAB (NTU)	NUM	9.4	3	49	57	5
5	TURVALF	FLAG FOR TURVAL	CHAR	6		59	64	5
5	COLVAL	COLOR (PCU)	NUM	9.4	1	66	74	5
6	COLVALF	FLAG FOR COLVAL	CHAR	6		1	6	6
6	ANSUMF	FLAG FOR ANSUM	CHAR	18		8	25	6
6	CATSUMF	FLAG FOR CATSUM	CHAR	18		27	44	6
6	CONCALF	FLAG FOR CONCAL	CHAR	18		46	63	6
7	SOBCF	FLAG FOR SOBC	CHAR	18		1	18	7
7	ORGIONF	FLAG FOR ORGION	CHAR	18		20	37	7
7	ANSUM	SUM OF ANIONS (UEQ/L)	NUM	9.4	3	39	47	7
7	CATSUM	SUM OF CATIONS (UEQ/L)	NUM	9.4	3	49	57	7
7	SOBC	SUM OF BASE CATIONS (UEQ/L)	NUM	9.4	4	59	67	7

Table 10. (continued)

Card No.[a]	Variable	Label	Variable type	Variable width[b]	Dec[c]	Column start	Column end	Card No.
8	ORGION	ORGANIC ANION (UEQ/L)	NUM	9.4	4	1	9	8
8	ANDEF	CATSUM - ANSUM (UEQ/L)	NUM	9.3	4	11	19	8
8	HCO316	HCO3 (UEQ/L)	NUM	9.4	4	21	29	8
8	HCO316F	FLAG FOR HCO316	CHAR	12		31	42	8
8	CA16	CALCIUM (UEQ/L)	NUM	9.4	4	44	52	8
8	CO316	CARBONATE ALKALINITY (UEQ/L)	NUM	9.4	4	54	62	8
8	CO316F	FLAG FOR CO316	CHAR	12		64	75	8
9	CL16	CHLORIDE (UEQ/L)	NUM	9.4	4	1	9	9
9	MG16	MAGNESIUM (UEQ/L)	NUM	9.4	4	11	19	9
9	NO316	NITRATE (UEQ/L)	NUM	9.4	4	21	29	9
9	K16	POTASSIUM (UEQ/L)	NUM	9.4	4	31	39	9
9	NA16	SODIUM (UEQ/L)	NUM	9.4	4	41	49	9
9	SO416	SULFATE (UEQ/L)	NUM	9.4	4	51	59	9
9	FTL16	FLUORIDE (UEQ/L)	NUM	9.4	4	61	69	9
10	NH416	AMMONIUM (UEQ/L)	NUM	9.4	4	1	9	10
10	H16	HYDROGEN (UEQ/L) FROM PHAC	NUM	9.4	4	11	19	10
10	H16F	FLAG FOR H16	CHAR	12		21	32	10
10	NO311F	FLAG FOR NO311	CHAR	14		34	47	10
11	LABNAM	LABORATORY FOR ANALYSIS	CHAR	30		1	30	11
11	CA11	CALCIUM (MG/L)	NUM	9.4	4	32	40	11
11	CA11F	FLAG FOR CA11	CHAR	12		42	53	11
11	MG11	MAGNESIUM (MG/L)	NUM	9.4	4	55	63	11
12	MG11F	FLAG FOR MG11	CHAR	12		1	12	12
12	K11	POTASSIUM (MG/L)	NUM	9.4	4	14	22	12
12	K11F	FLAG FOR K11	CHAR	12		24	35	12
12	NA11	SODIUM (MG/L)	NUM	9.4	4	37	45	12
12	NA11F	FLAG FOR NA11	CHAR	12		47	58	12
12	MN11	MANGANESE (UG/L)	NUM	9.4	1	60	68	12
13	MN11F	FLAG FOR MN11	CHAR	12		1	12	13
13	FE11	IRON (UG/L)	NUM	9.4	1	14	22	13
13	FE11F	FLAG FOR FE11	CHAR	12		24	35	13
13	ALEX11	EXT. ALUMINUM (UG/L)	NUM	9.4	2	37	45	13
13	ALEX11F	FLAG FOR ALEX11	CHAR	12		47	58	13
13	CL11	CHLORIDE (MG/L)	NUM	9.4	4	60	68	13
14	CL11F	FLAG FOR CL11	CHAR	12		1	12	14
14	SO411	SULFATE (MG/L)	NUM	9.4	4	14	22	14
14	SO411F	FLAG FOR SO411	CHAR	12		24	35	14
14	NO311	NITRATE (MG/L)	NUM	9.4	4	37	45	14
14	SIO211	SILICA (MG/L)	NUM	9.4	4	47	55	14
14	SIO211F	FLAG FOR SIO211	CHAR	12		57	68	14
15	FTL11	FLUORIDE (MG/L)	NUM	9.4	4	1	9	15
15	FTL11F	FLAG FOR FTL11	CHAR	12		11	22	15
15	DOC11	DOC-ANAL LAB (MG/L)	NUM	9.4	4	24	32	15
15	DOC11F	FLAG FOR DOC11	CHAR	12		34	45	15
15	NH411	AMMONIUM (MG/L)	NUM	9.4	4	47	55	15
15	NH411F	FLAG FOR NH411	CHAR	12		57	68	15

Table 10. (continued)

Card No.[a]	Variable	Label	Variable type	Variable width[b]	Dec[c]	Column start	Column end	Card No.
16	PHEQ11	PH-AIR EQUILIBRATED	NUM	9.4	3	1	9	16
16	PHEQ11F	FLAG FOR PHEQ11	CHAR	12		11	22	16
16	PHAL11	PH-ALKALINITY INITIAL	NUM	9.4	3	24	32	16
16	PHAL11F	FLAG FOR PHAL11	CHAR	12		34	45	16
16	PHAC11	PH-ACIDITY INITIAL	NUM	9.4	3	47	55	16
16	PHAC11F	FLAG FOR PHAC11	CHAR	12		57	68	16
17	ALKA11	ALKALINITY (UEQ/L)	NUM	9.4	3	1	9	17
17	ALKA11F	FLAG FOR ALKA11	CHAR	12		11	22	17
17	COND11	CONDUCTIVITY-ANAL LAB (US)	NUM	9.4	2	24	32	17
17	COND11F	FLAG FOR COND11	CHAR	12		34	45	17
17	DICE11	EQUIL DIC-ANAL LAB (MG/L)	NUM	9.4	4	47	55	17
17	DICE11F	FLAG FOR DICE11	CHAR	12		57	68	17
18	DICI11	INITIAL DIC-ANAL LAB (MG/L)	NUM	9.4	4	1	9	18
18	DICI11F	FLAG FOR DICI11	CHAR	12		11	22	18
18	PTL11	TOTAL PHOSPHORUS (UG/L)	NUM	9.4	2	24	32	18
18	PTL11F	FLAG FOR PTL11	CHAR	12		34	45	18
18	ALTL11	TOTAL ALUMINUM (UG/L)	NUM	9.4	2	47	55	18
18	ALTL11F	FLAG FOR ALTL11	CHAR	12		57	68	18
19	CONCAL	CALC. SP. COND. (US)	NUM	9.4	3	1	9	19
19	COUNTY	FIPS CODE(ST,COUNTY)	CHAR	5		11	15	19
19	LAKEID1	ERLD-UMD ID/ALSC WSHED-POND ID	CHAR	7		17	23	19
19	LAKEID1T	TAG FOR LAKEID1	CHAR	4		25	28	19
19	DISM	DISTANCE FROM COAST (KM)	NUM	9.4	0	30	38	19
19	LAKENAME	LAKE NAME	CHAR	30		40	69	19
19	ST	STATE (TWO-LETTER ABBREV)	CHAR	2		71	72	19
20	WSHED	WATERSHED AREA (HA)	NUM	9.2	2	1	9	20
20	ELEV	LAKE ELEVATION (M)	NUM	9.4	1	11	19	20
20	LAKESIZ	LAKE SURFACE AREA (HA)	NUM	9.3	3	21	29	20
20	INOUT	PRESENCE/ABSENCE OF INLETS/OUTLETS	CHAR	6		31	36	20
20	LATDD	LATITUDE (DECIMAL DEGREES)	NUM	9.4	4	49	57	20
20	LONGDD	LONGITUDE (DECIMAL DEGREES)	NUM	9.4	4	59	67	20
20	SUBRGN	NSWS SUBREGION	CHAR	1		69	69	20
21	MAPBIG	MAP SHEET NAME (1:250,000 SCALE)	CHAR	25		1	25	21
21	MAPSML	MAP SHEET NAME, 15 OR 7.5 QUAD	CHAR	40		27	66	21
22	LAT	LATITUDE	CHAR	10		1	10	22
22	LONG	LONGITUDE	CHAR	11		12	22	22
22	STRATA	NSWS STRATA	CHAR	3		24	26	22
22	HDEP	HYDROGEN ION DEPOSITION (G/M**2/YR)	NUM	9.4	3	28	36	22
22	NO3DEP	NITRATE DEPOSITION (G/M**2/YR)	NUM	9.4	2	38	46	22
22	SO4DEP	SULFATE DEPOSITION (G/M**2/YR)	NUM	9.4	2	48	56	22
22	PRECIP	PRECIPITATION (M/YR)	NUM	9.4	3	58	66	22

Table 10. (continued)

Card No.[a]	Variable	Label	Variable type	Variable width[b]	Dec[c]	Column start	Column end	Card No.
23	RUNIN	ANNUAL RUNOFF INCHES FROM DIGIT MAP	NUM	9.4	0	1	9	23
23	WEIGHT1	POP. EXTRAPOLATION FACTOR	NUM	9.4	4	11	19	23
23	RT	RESIDENCE TIME (YR)	NUM	9.4	3	21	29	23
23	RUNOFF	SURFACE WATER RUNOFF (M/YR)	NUM	9.4	3	31	39	23
23	LAKEVOL	CALC LAKE VOL (10**6 CU M)	NUM	9.4	3	41	49	23
23	WALA	WATERSHED AREA/LAKE AREA	NUM	9.3	3	51	59	23
23	SECMEAN	SECCHI,MEAN DEPTH (M)	NUM	9.4	2	61	69	23
24	STRAT	STRATIFICATION(NONE,WEAK,STRONG)	CHAR	6		1	6	24
24	WSDIS	D)WELL I)ND L)OG M)INE R)OAD S)TOCK	CHAR	8		8	15	24
24	REGSPC	REG SPEC LTM NRC DEW DER SAMPLE CLASS	CHAR	16		17	32	24
24	REGION	NSWS REGION	CHAR	1		34	34	24
24	BNSTAR	POPULATION SIZE BY STRATA	NUM	9.4	0	36	44	24
24	ANCAT	CATIONS/ANIONS	NUM	9.4	4	46	54	24
24	HYDROTYP	HYDROLOGIC TYPE	CHAR	9		56	64	24

[a]Card No. is a variable on each record in columns 79-80.
[b]Width for CHAR (character) fields is the integer field width. The width for NUM (numeric) fields is in W.D format, where W = the total field width (decimal point included) and D = the number of decimal places. For example, 34.78 is in 5.2 format.
[c]Dec is the number of decimal places with which the original data were reported.

Table 11. Card-image format definition, PC data set, U.S. EPA Eastern Lake Survey-Phase I

Card No.[a]	Variable	Label	Variable type	Variable width[b]	Column start	Column end	Card No.
1	LAKE_ID	LAKE ID	CHAR	7	1	7	1
1	LAKENAME	LAKE NAME	CHAR	26	9	34	1
1	LAT	LATITUDE	CHAR	10	36	45	1
1	LONG	LONGITUDE	CHAR	10	46	56	1
1	ST	STATE (TWO LETTER ABBREV)	CHAR	2	58	59	1
1	ELEV	LAKE ELEVATION (M)	NUM	4.0	61	64	1
1	LAKE_SIZ	LAKE SURFACE AREA (HA)	NUM	6.0	66	71	1
1	WSHED	WATERSHED AREA (HA)	NUM	6.0	73	78	1
2	WALA	WATERSHED AREA/LAKE AREA	NUM	7.1	1	7	2
2	HYDROTYP	DRAINAGE, SEEPAGE, CLOSED, RESERVOIR	CHAR	9	9	17	2
2	TMPTOP	TEMPERATURE AT SURFACE	NUM	6.1	19	24	2
2	STRAT	STRATIFICATION (NONE, WEAK, STRONG)	CHAR	6	26	31	2
2	SITDMP	SITE DEPTH (M)	NUM	5.1	33	37	2
2	SECMEAN	SECCHI, MEAN DEPTH (M)	NUM	6.1	39	44	2
2	TURVAL	TURBIDITY - FIELD LAB (NTU)	NUM	5.1	46	50	2
2	COLVAL	COLOR (PCU)	NUM	4.0	52	55	2
2	FE11	IRON (UG/L)	NUM	6.1	57	62	2
2	ANSUM	SUM OF ANIONS (UEQ/L)	NUM	6.1	64	69	2
2	CATSUM	SUM OF CATIONS (UEQ/L)	NUM	6.1	71	76	2
3	ANCAT	CATSUM/ANSUM	NUM	4.2	1	4	3
3	PHEQ11	PH-AIR EQUILIBRATED	NUM	4.2	6	9	3
3	PHSTVL	PH - FIELD LAB	NUM	4.2	11	14	3
3	ALKA11	ALKALINITY (UEQ/L)	NUM	6.1	16	21	3
3	COND11	CONDUCTIVITY-ANAL LAB (US)	NUM	5.1	23	27	3
3	CONCAL	CALC. SP. COND. (US)	NUM	5.1	29	33	3
3	DICE11	EQUIL DIC ANAL LAB (MG/L)	NUM	5.2	35	39	3
3	DICVAL	DIC - FIELD LAB (MG/L)	NUM	5.2	41	45	3
3	DOC11	DOC-ANAL LAB (MG/L)	NUM	5.2	47	51	3
3	ALEX11	EXT. ALUMINUM (UG/L)	NUM	5.1	53	57	3
3	ALTL11	TOTAL ALUMINUM (UG/L)	NUM	6.1	59	64	3
3	CA16	CALCIUM (UEQ/L)	NUM	6.1	66	71	3
3	MG16	MAGNESIUM (MG/L)	NUM	6.1	73	78	3
4	NA16	SODIUM (UEQ/L)	NUM	6.1	1	6	4
4	K16	POTASSIUM (UEQ/L)	NUM	5.1	8	12	4
4	NH416	AMMONIUM (UEQ/L)	NUM	4.1	14	17	4
4	SO416	SULFATE (UEQ/L)	NUM	6.1	19	24	4
4	HCO316	HCO3 (UEQ/L)	NUM	6.1	26	31	4
4	CL16	CHLORIDE (UEQ/L)	NUM	6.1	33	38	4
4	NO316	NITRATE (UEQ/L)	NUM	5.1	40	44	4
4	FTL16	FLUORIDE (UEQ/L)	NUM	4.1	46	49	4
4	PTL11	TOTAL PHOSPHORUS (UG/L)	NUM	5.1	51	55	4
4	SIO211	SILICA (MG/L)	NUM	5.2	57	61	4
4	REG_SPC	REG SPEC LTM NRC DEW DER SAMPLE CLASS	CHAR	16	63	78	4
5	MN11	MANGANESE (UG/L)	NUM	6.1	1	6	5
5	DATSMP	DATE SAMPLED FORM 1	CHAR	7	8	14	5
5	WEIGHT1	POPULATION EXTRAPOLATION FACTOR	NUM	6.3	16	21	5
5	BNSTAR	POPULATION SIZE BY STRATA	NUM	4.0	23	26	5

[a]Note: Card number is a variable on each 80 column record. For cards 1-4, it is in column 80, and in column 28 for card 5.

[b]Format for CHAR (character) fields is the integer field width. The width for NUM (numeric) fields is in W.D format, where W = the total field width and D = the number of decimal places. For example, 34.78 is in 5.2 format. Numeric values are reported to their original accuracy and therefore a "Dec" value (as in Tables 9 and 10) is not reported here.

7. DATA TRANSPORT VERIFICATION

The ELS-I data sets can be read as fully formatted SAS data sets or as card-image files (Sect. 6). Regardless, users should verify that the data have been correctly transported to their systems by generating some or all of the statistics presented in Tables 12, 13 or 14-17. These statistics were generated in SAS (PROC MEANS), but can be duplicated in other statistical packages or languages. If the statistics generated by the user differ from those presented here, the data sets may have been corrupted in transport. Note that missing values in the card-image data sets are represented as -999. These values must be removed before generating the summary statistics to check data transport.

Tables 18-20 are card image printouts of the first five lakes in data sets 3 and 4 and the PC data set (file ELS-I.RG1). They can be used to check data formats for those using the card-image versions.

These statistics are presented only as a tool to ensure proper reading of the data sets. They are not to be construed as summarizing the ELS-I results.

Table 12. Characteristics of numeric variables, data set 3, U.S. EPA Eastern Lake Survey-Phase I

Variable	N	Mean	Standard deviation	Min	Max
ACCO11	1912	41.47062	73.52104	-743.00000	1605.000
ACM11	334	90.34781	278.50100	0.00000	2068.950
AIRTMP	1919	9.21496	6.98776	-10.00000	27.000
ALEX11	1920	16.86948	35.12652	-9.40000	446.000
ALKA11	1922	269.22739	453.86112	-209.12000	4046.600
ALKC11	704	-35.89423	145.14583	-2850.45000	659.400
ALTL11	1921	80.21609	149.10288	-2.00000	5100.000
ANCAT	1920	1.17503	0.32886	0.03240	5.409
ANDEF	1920	35.77778	133.91637	-3880.40013	1738.560
ANSUM	1920	486.25823	619.03406	24.17000	5329.890
BNSTAR	1922	907.33611	1205.98069	19.00000	6332.000
CA11	1922	4.89993	6.62840	0.18700	60.940
CA16	1922	244.50655	330.75733	9.33100	3040.906
CATSUM	1920	522.03607	609.37942	53.80000	5396.040
CL11	1922	4.19715	8.33956	0.00600	94.700
CL16	1922	118.40152	235.25899	0.16900	2671.487
CO316	1920	1.45003	5.87867	0.00000	93.421
COLVAL	1919	38.99635	37.81260	0.00000	345.000
CONCAL	1920	59.88313	70.75693	7.23299	666.886
COND11	1922	58.97764	103.56276	7.80000	3613.300
CONFI	1695	49.91976	6.40529	33.00000	76.000
CONIN	1720	52.30465	5.30272	38.00000	72.000
CONTOP	1921	58.74128	61.05095	0.00000	486.000
CON_1	48	41.64583	41.85410	13.00000	272.000
CON_10	2	26.00000	8.48528	20.00000	32.000
CON_2	48	41.68750	42.43802	13.00000	275.000
CON_3	48	43.31250	43.82953	17.00000	282.000
CON_4	41	39.75610	29.27096	16.00000	148.000
CON_5	32	35.09375	22.22228	17.00000	132.000
CON_6	21	38.42857	26.74616	13.00000	134.000
CON_60	114	46.09649	46.66601	8.00000	286.000
CON_7	10	27.90000	15.09562	13.00000	67.000
CON_8	5	24.40000	4.61519	20.00000	31.000
CON_9	4	24.25000	5.31507	20.00000	31.000
CON_B	1188	55.38889	62.08917	0.00000	623.000
DICE11	1922	3.01296	5.09113	-0.15000	46.908
DICI11	1922	3.41214	5.18873	0.14800	49.834
DICQCS	472	2.07942	0.07944	1.82900	2.322
DICVAL	1919	3.51185	5.18560	0.15800	48.990
DISM	648	36.27623	24.37521	1.00000	121.000
DOC11	1922	5.95128	4.74350	0.00000	48.220

Table 12. (continued)

Variable	N	Mean	Standard deviation	Min	Max
DP_60	115	12.39913	9.78350	4.00000	78.000
DP_B	1191	7.95827	7.33872	1.50000	58.500
DP_CAT	51	4.56863	0.50020	4.00000	5.000
DP_TOP	1922	1.35021	0.35169	0.00000	2.000
ELEV	1922	352.97086	212.00840	1.50000	1582.000
FE11	1922	109.11134	188.54109	-34.00000	2638.000
FTL11	1922	0.04922	0.04862	0.00100	0.590
FTL16	1922	2.59093	2.55929	0.05300	31.068
H16	1920	2.26214	9.24127	0.00000	154.880
HCO316	1920	240.52848	420.84902	0.05200	4051.282
HDEP	1922	0.03330	0.01674	0.00700	0.088
INLETS	1418	1.42666	5.33883	0.00000	168.000
K11	1922	0.86590	1.55452	0.00400	24.980
K16	1922	22.14093	39.74911	0.10200	638.739
LAKE_SIZ	1921	191.20969	2265.97715	0.90000	89357.750
LAKE_VOL	1921	22.28651	286.38913	0.00500	8458.247
LAT_DD	1922	42.76948	5.30628	27.20833	48.575
LONG_DD	1922	80.24077	8.35985	67.17276	94.067
MG11	1922	1.54992	2.39174	0.10200	29.750
MG16	1922	127.49657	196.74490	8.39100	2447.235
MN11	1922	27.05307	76.29103	-20.00000	2030.000
NA11	1922	2.86096	4.68958	0.06000	53.990
NA16	1922	124.45172	203.99664	2.61000	2348.565
NH411	1922	0.05092	0.09733	-0.06000	1.630
NH416	1922	2.82280	5.39616	-3.32600	90.367
NO311	1922	0.20088	1.02687	-0.10600	30.600
NO316	1922	3.24028	16.56341	-1.71000	493.578
NO3DEP	1922	1.14727	0.29448	0.62000	2.070
NUSAM	1922	20.61915	4.02085	6.00000	30.000
ORGION	1920	55.55495	40.27825	0.00000	261.967
OUTLET	1475	0.73085	0.55139	0.00000	5.000
PHAC11	1920	6.63927	0.81980	3.81000	8.820
PHAL11	1922	6.59499	0.81339	3.80000	8.780
PHEQ11	1922	7.07354	0.97158	3.82000	8.930
PHFIO1	1690	3.92820	0.17577	3.18000	5.900
PHINO1	1720	3.92978	0.06564	3.63000	4.190
PHSTQC	562	4.02747	0.02385	3.95000	4.100
PHSTVL	1921	6.62114	0.82653	3.81000	9.360
PH_60	113	6.16159	0.65213	4.62000	8.110
PH_B	1183	6.38929	0.77132	3.99000	8.840

Table 12. (continued)

Variable	N	Mean	Standard deviation	Min	Max
PH_TOP	1916	6.49296	0.86117	3.6000	10.460
PRECIP	1922	0.98665	0.20240	0.65400	1.959
PTL11	1921	15.06132	30.60416	-6.10000	833.000
RT	1286	1.18998	3.19160	0.00000	45.109
RUNIN	1922	16.14880	7.21895	2.00000	40.000
RUNOFF	1922	0.41018	0.18336	0.05080	1.016
SECDIS	1915	2.68366	1.68140	0.10000	11.500
SECMEAN	1916	2.60151	1.65151	0.05000	11.450
SECREA	1592	2.56231	1.63344	0.00000	11.400
SIO211	1922	2.66141	3.20768	-1.14000	22.600
SITDPF	1912	22.11145	25.32269	2.00000	391.000
SITDPM	1922	6.73852	7.71806	0.50000	119.000
SO411	1922	5.77956	8.90770	0.10000	119.000
SO416	1922	120.33034	185.45823	2.08200	2477.580
SO4DEP	1922	1.88979	0.50270	0.68000	4.170
SOBC	1922	518.59590	614.10378	33.95471	5377.569
TMPDF1	1172	1.13063	1.76898	0.00000	8.700
TMPDF2	114	3.40526	2.17251	0.00000	7.500
TMPTOP	1921	10.23550	3.96171	0.70000	21.900
TMP_1	48	11.58750	1.67873	8.50000	16.700
TMP_10	2	10.75000	6.43467	6.20000	15.300
TMP_2	48	10.51250	2.49080	5.20000	16.700
TMP_3	48	7.97292	3.06752	4.30000	16.700
TMP_4	41	7.20244	3.04043	4.10000	16.700
TMP_5	32	6.71250	3.01745	4.00000	16.700
TMP_6	21	6.54762	3.29509	3.90000	16.600
TMP_60	114	8.89737	2.66855	4.00000	15.300
TMP_7	10	7.60000	4.32563	3.90000	16.300
TMP_8	5	9.58000	5.04450	5.60000	16.000
TMP_9	4	10.30000	5.32353	5.30000	15.800
TMP_B	1188	9.50480	3.83471	1.40000	21.100
TURQCS	467	4.77880	0.10864	4.50000	5.200
TURVAL	1921	1.57565	6.98437	0.00000	290.000
WALA	1898	61.54920	461.01922	1.73000	16843.710
WEIGHT1	1723	11.26258	14.37614	1.00000	82.558
WSHED	1899	5362.90868	32430.68105	5.00000	551300.000

Table 13. Characteristics of numeric variables, data set 4, U.S. EPA Eastern Lake Survey-Phase I

Variable	N	Mean	Standard deviation	Min	Max
AIRTMP	1795	9.28273	6.97854	-10.00000	27.000
ALEX11	1798	17.16146	35.71280	0.00000	446.000
ALKA11	1798	267.59825	453.05996	-209.12000	4046.600
ALTL11	1798	78.81065	100.46459	0.00000	1357.400
ANCAT	1798	1.70948	0.30213	0.30780	5.078
ANDEF	1798	37.89717	67.35770	-576.70200	510.042
ANSUM	1798	488.25553	629.58124	24.17000	5986.790
BNSTAR	1798	907.95050	1206.72927	19.00000	6332.000
CA11	1798	4.89983	6.70668	0.18700	60.940
CA16	1798	244.50140	334.66356	9.33100	3040.906
CATSUM	1798	526.15266	630.20668	54.35000	5410.090
CL11	1798	4.25988	8.53221	0.04000	94.700
CL16	1798	120.17119	240.69367	1.12800	2671.487
CO316	1798	1.45091	5.95657	0.00000	93.421
COLVAL	1798	39.09399	37.99092	0.00000	345.000
CONCAL	1798	60.32693	72.95000	7.25900	667.128
COND11	1798	56.99743	64.68002	7.80000	543.000
CONTOP	1798	57.06062	58.90198	0.00000	486.000
CON_60	106	45.94340	47.64608	8.00000	286.000
CON_B	1111	54.98380	61.87565	0.00000	623.000
DICE11	1798	2.98671	5.05909	0.00000	46.908
DICI11	1798	3.38392	5.14487	0.14800	49.834
DICVAL	1798	3.45045	5.11455	0.15800	48.990
DISM	610	36.16066	24.07413	1.00000	121.000
DOC11	1798	5.93411	4.75487	0.00000	48.220
DP_60	107	12.50935	10.02531	4.00000	78.000
DP_B	1114	8.00350	7.42429	1.50000	58.500
DP_TOP	1798	1.34978	0.35176	0.00000	2.000
ELEV	1798	353.29066	213.47442	1.50000	1582.000
FE11	1798	109.91935	190.76451	0.00000	2638.000
FTL11	1798	0.04901	0.04718	0.00100	0.587
FTL16	1798	2.57994	2.48342	0.05300	30.884
H16	1798	2.35312	9.51457	0.00150	154.882
HCO316	1798	239.49123	422.02708	0.05200	4051.282
HDEP	1798	0.03333	0.01673	0.00700	0.088
INLETS	1328	1.45934	5.50630	0.00000	168.000
K11	1798	0.87249	1.58637	0.00400	24.980
K16	1798	22.30959	40.56350	0.10200	638.739
LAKE_SIZ	1797	199.47747	2342.07629	0.90000	89357.750
LAKE_VOL	1797	23.62236	296.05535	0.00500	8458.247
LAT_DD	1798	42.73941	5.32249	27.20833	48.575
LONG_DD	1798	80.22093	8.34963	67.17276	94.067

Table 13. (continued)

Variable	N	Mean	Standard deviation	Min	Max
MG11	1798	1.57107	2.53376	0.10200	32.533
MG16	1798	129.23654	208.42700	8.39100	2676.165
MN11	1798	27.42158	76.89641	0.00000	2030.000
NA11	1798	2.86874	4.79774	0.06000	58.549
NA16	1798	124.79015	208.70151	2.61000	2546.881
NH411	1798	0.05342	0.09833	0.00000	1.630
NH416	1798	2.96167	5.45127	0.00000	90.367
NO311	1798	0.20519	1.05574	0.00000	30.600
NO316	1798	3.30977	17.02911	0.00000	493.578
NO3DEP	1798	1.14669	0.29350	0.62000	2.070
ORGION	1798	55.24876	39.99638	0.00000	261.967
OUTLET	1381	0.73135	0.54860	0.00000	5.000
PHAC11	1798	6.63092	0.82550	3.81000	8.820
PHAL11	1798	6.58711	0.81743	3.80000	8.780
PHEQ11	1798	7.06590	0.97586	3.82000	8.930
PHSTVL	1798	6.61476	0.83263	3.81000	9.360
PH_60	105	6.14790	0.65917	4.62000	8.110
PH_B	1106	6.38069	0.76725	3.99000	8.840
PH_TOP	1798	6.48352	0.86234	3.60000	9.280
PRECIP	1798	0.98723	0.20298	0.65400	1.959
PTL11	1798	15.25968	31.45457	0.00000	833.000
RT	1209	1.19708	3.23114	0.00000	45.109
RUNIN	1798	16.17519	7.24359	2.00000	40.000
RUNOFF	1798	0.41085	0.18399	0.05080	1.016
SECDIS	1792	2.68214	1.68856	0.10000	11.500
SECMEAN	1793	2.59967	1.65794	0.05000	11.450
SECREA	1491	2.55641	1.63550	0.00000	11.400
SIO211	1798	2.66738	3.21926	0.00000	22.600
SITDPM	1798	6.77216	7.83774	0.50000	119.000
SO411	1798	5.82384	9.12651	0.10000	119.000
SO416	1798	121.25242	190.01401	2.08200	2477.580
SO4DEP	1798	1.89078	0.50291	0.68000	4.170
SOBC	1798	520.83780	630.33173	33.95500	5408.420
TMPDF1	1095	1.13123	1.75375	0.00000	8.700
TMPDF2	106	3.28585	2.14531	0.00000	7.500
TMPTOP	1797	10.23422	3.97149	0.70000	21.900
TMP_60	106	9.00377	2.68895	4.00000	15.300
TMP_B	1111	9.49523	3.82036	1.40000	21.100
TURVAL	1798	1.58125	7.17877	0.00000	290.000
WALA	1775	59.58885	457.98664	1.73000	16843.710
WEIGHT1	1612	11.26263	14.40741	1.00000	82.558
WSHED	1776	5461.02381	33195.60583	5.00000	551300.000

Table 14. Characteristics of numeric variables, PC data set, file ELS-I.RG1, U.S. EPA Eastern Lake Survey-Phase I

Variable	N	Mean	Standard deviation	Min	Max
ALEX11	768	16.43132	36.35289	0.00000	324.50000
ALKA11	768	246.43729	395.25058	-45.60000	4046.60000
ALTL11	768	82.37370	91.11827	0.00000	796.80000
ANCAT	768	1.09544	0.19626	0.67592	3.68011
ANSUM	768	518.56986	577.51590	58.10000	4945.94000
CA16	768	252.80748	310.58216	19.26100	3028.43100
CATSUM	768	544.37003	575.20750	69.38000	4809.44000
CL16	768	168.70019	298.79375	4.24600	2501.32400
COLVAL	768	32.15820	27.97935	0.00000	250.00000
CONCAL	768	63.77247	66.35044	10.80478	519.10627
COND11	768	60.70167	60.82066	11.00000	453.50000
DICE11	768	2.67787	4.32100	0.04900	46.90800
DICVAL	768	3.18445	4.56360	0.20400	48.99000
DOC11	768	4.89102	2.88793	0.14000	26.38000
ELEV	768	327.07311	222.06455	1.52000	1582.00000
FE11	768	87.91081	122.56009	0.00000	1082.00000
FTL16	768	3.00737	2.78388	0.15800	30.88400
HCO316	768	219.34374	367.15718	0.30200	4051.28200
K16	768	16.26754	15.66557	0.15300	149.84000
LAKE_SIZ	768	118.99640	827.83248	3.70000	16604.29688
MG16	768	97.83916	131.05954	10.28300	1711.00800
MN11	768	33.64518	75.41905	0.00000	1191.00000
NA16	768	173.12857	260.51477	3.87200	2154.99000
NH416	768	2.88856	5.24475	0.00000	54.88600
NO316	768	2.10560	5.62028	0.00000	75.52100
PHEQ11	768	7.11684	0.83784	4.34000	8.90000
PHSTVL	768	6.68322	0.74451	4.32000	9.36000
PTL11	768	13.41374	21.50178	0.00000	376.40000
RT	678	0.47060	0.77263	0.00017	7.82332
SECMEAN	765	2.82170	1.84087	0.25000	11.45000
SIO211	768	2.27329	2.10464	0.00000	13.01900
SITDPM	768	5.81698	6.08889	0.50000	88.40000
SO416	768	124.23265	72.36926	29.08600	879.87400
TMPTOP	768	10.99831	2.32969	1.50000	20.40000
TURVAL	768	1.10473	1.46060	0.00000	17.40000
WALA	768	80.92600	647.16726	1.90000	16843.71000
WSHED	768	4086.33641	19195.40300	13.00000	229433.00000

Table 15. Characteristics of numeric variables, PC data set, file ELS-I.RG2, U.S. EPA Eastern Lake Survey-Phase I

Variable	N	Mean	Standard deviation	Min	Max
ALEX11	592	14.85726	24.06341	0.00000	213.00000
ALKA11	592	337.83703	536.37445	-48.60000	4002.00000
ALTL11	592	55.08429	71.24538	0.00000	805.00000
ANCAT	592	1.32298	0.39460	0.30782	5.07775
ANSUM	592	397.92899	573.55282	24.17000	5986.79000
CA16	592	250.10206	341.95743	12.97400	2769.99900
CATSUM	592	455.17480	573.02890	54.35000	5410.09000
CL16	592	26.36550	67.20984	1.12800	1006.70200
COLVAL	592	47.52956	40.07031	4.00000	345.00000
CONCAL	592	47.48514	60.55767	7.25949	667.12761
COND11	592	45.08243	53.06983	7.80000	494.00000
DICE11	592	3.70076	5.97319	0.00000	43.47000
DICVAL	592	4.16900	5.94529	0.21700	44.23000
DOC11	592	7.56780	4.31016	0.00000	28.80000
ELEV	592	417.96933	93.19639	184.40624	594.36723
FE11	592	152.76182	233.69000	0.00000	2290.00000
FTL16	592	1.95386	1.79584	0.47400	24.42500
HCO316	592	298.91267	499.35963	0.21300	3700.45800
K16	592	15.37094	12.53058	2.30100	165.18200
LAKE_SIZ	592	228.80470	3687.82072	3.80000	89357.75000
MG16	592	143.00523	210.65423	11.51600	2676.16500
MN11	592	13.28547	30.34586	0.00000	470.00000
NA16	592	42.29103	56.55044	2.61000	876.96000
NH416	592	2.88165	4.51240	0.00000	46.01500
NO316	592	1.69885	4.06693	0.00000	81.45600
PHEQ11	592	7.20709	0.96156	4.44000	8.93000
PHSTVL	592	6.66905	0.81658	4.43000	8.69000
PTL11	592	16.37500	13.02489	0.00000	146.00000
RT	271	1.33389	2.10697	0.00231	14.65093
SECMEAN	591	2.18672	1.27330	0.35000	9.05000
SIO211	592	2.60069	3.53472	0.00000	22.60000
SITDPM	592	6.63514	5.63415	0.90000	36.90000
SO416	592	66.87173	83.15468	2.08200	1917.52200
TMPTOP	591	7.50085	3.54530	0.70000	16.00000
TURVAL	592	1.22373	1.52824	0.10000	24.00000
WALA	591	27.03393	111.64595	1.73000	1687.34000
WSHED	591	1783.52453	10555.14335	10.00000	169319.00000

Table 16. Characteristics of numeric variables, PC data set, file ELS-I.RG3, U.S. EPA Eastern Lake Survey-Phase I

Variable	N	Mean	Standard deviation	Min	Max
ALEX11	252	15.04286	37.61724	0.00000	446.00000
ALKA11	252	300.00282	513.99854	-209.12000	3639.76000
ALTL11	252	102.87659	147.01061	8.00000	1357.40000
ANCAT	252	1.10402	0.21191	0.77165	2.06647
ANSUM	252	795.15516	921.42669	53.83000	5263.49000
CA16	252	303.48070	456.72497	9.33100	3040.90600
CATSUM	252	840.54794	925.75947	69.33000	5396.04000
CL16	252	240.83323	276.01491	15.51500	2671.48700
COLVAL	252	49.95040	56.21904	5.00000	300.00000
CONCAL	252	101.74301	113.06640	8.01816	666.88582
COND11	252	93.67996	96.78401	7.80000	543.00000
DICE11	252	3.70177	5.98719	0.11600	42.59000
DICVAL	252	4.10723	5.80983	0.15800	39.63000
DOC11	252	6.53758	8.52618	0.28700	48.22000
ELEV	252	198.44944	264.90799	7.00000	1103.40000
FE11	252	107.60714	263.79158	0.00000	2638.00000
FTL16	252	2.92582	2.96358	0.05300	16.16000
HCO316	252	281.83960	484.62304	0.05200	3270.17500
K16	252	65.27744	91.87338	0.10200	638.73900
LAKE_SIZ	252	448.46504	2230.58687	2.80000	21091.00000
MG16	252	245.99266	361.16737	14.88900	2447.23500
MN11	252	44.73810	146.28747	0.00000	2030.00000
NA16	252	215.43385	234.53684	16.09500	2546.88100
NH416	252	3.91381	8.30921	0.00000	90.36700
NO316	252	11.59388	42.97750	0.00000	493.57800
PHEQ11	252	6.99524	1.22004	3.82000	8.66000
PHSTVL	252	6.58583	1.02353	3.81000	8.96000
PTL11	252	22.97222	71.32378	0.00000	833.00000
RT	131	0.42241	0.58274	0.00041	3.25555
SECMEAN	251	2.28745	1.40724	0.05000	8.45000
SIO211	252	4.32829	4.75184	0.00800	19.92000
SITDPM	252	9.22460	14.14498	0.90000	119.00000
SO416	252	256.31047	444.62537	3.01900	2477.58000
TMPTOP	252	14.29325	4.81251	0.90000	21.90000
TURVAL	252	4.43194	18.62202	0.10000	290.00000
WALA	231	101.77597	423.29760	1.91000	5301.14000
WSHED	231	22079.30303	81102.78478	16.00000	551300.00000

Table 17. Characteristics of numeric variables, PC data set, file ELS-I.SPC, U.S. EPA Eastern Lake Survey-Phase I

Variable	N	Mean	Standard deviation	Min	Max
ALEX11	186	30.38038	54.21199	0.00000	291.10000
ALKA11	186	87.51387	130.11197	-63.20000	990.60000
ALTL11	186	107.00941	120.98585	0.00000	685.00000
ANCAT	186	1.08956	0.24132	0.66471	2.79296
ANSUM	186	234.77613	204.32662	46.32000	1366.95000
CA16	186	112.47215	93.59672	14.47100	632.73200
CATSUM	186	250.88575	214.45812	67.19000	1430.51000
CL16	186	54.88017	112.91371	5.07800	1063.88400
COLVAL	186	26.17473	24.50996	0.00000	150.00000
CONCAL	186	30.86082	24.36839	7.34817	180.17453
COND11	186	29.92661	22.64624	7.80000	169.00000
DICE11	186	1.02046	1.40585	0.00000	10.32000
DICVAL	186	1.37198	1.46852	0.20100	11.79000
DOC11	186	4.22379	3.24976	0.09000	21.30000
ELEV	186	465.47063	231.73038	13.40000	1213.00000
FE11	186	67.56720	112.44073	0.00000	1050.00000
FTL16	186	2.33915	1.82291	0.31600	11.61800
HCO316	186	76.17933	116.86902	0.62300	926.29100
K16	186	11.12719	8.08205	2.09700	91.79600
LAKE_SIZ	185	100.57507	300.57163	0.90000	2861.89990
MG16	186	56.86865	59.05333	8.39100	422.81600
MN11	186	23.25538	25.52832	0.00000	134.50000
NA16	186	64.96949	102.91122	3.65400	1038.78000
NH416	186	2.22826	3.75044	0.00000	40.63800
NO316	186	2.18545	4.23507	0.00000	34.76000
PHEQ11	186	6.50191	0.98254	4.19000	8.39000
PHSTVL	186	6.19844	0.82480	4.18000	7.74000
PTL11	186	8.88253	10.47581	0.00000	95.00000
RT	129	0.64988	0.99895	0.00825	7.33698
SECMEAN	186	3.41989	1.79639	0.65000	10.75000
SIO211	186	2.25655	2.67706	0.00000	18.50000
SITDPM	186	7.83226	7.54631	0.60000	60.00000
SO416	186	99.04769	62.00120	4.58000	699.55200
TMPTOP	186	10.26505	3.22150	2.90000	21.20000
TURVAL	186	0.82446	0.88564	0.10000	7.50000
WALA	185	22.33373	59.47057	1.79000	702.00000
WSHED	186	2183.27914	10270.65206	5.00000	120474.00000

Table 18. Card-image listing (first five lakes), data set 3, U.S. EPA Eastern Lake Survey-Phase I

```
BOHON5                  1E3-018 21NOV84 26NOV84 05DEC84 29NOV84 15OCT84 13:42    1
DD    3.9000              4.0200          58.0000   49.0000        14 15 16     2
190 090    1.8000            18.0000    6.0000    1.2000                         3
   1.0000                    1.5000        -999.0000          10.4000           4
-999.0000            53.0000                -999.0000           7.0700           5
       -999.0000          -999.0000         -999.0000         -999.0000         6
-999.0000          -999.0000          -999.0000            1.0000    2.0000      7
       -999.0000 -999.0000 -999.0000 -999.0000 -999.0000 -999.0000               8
-999.0000 -999.0000 -999.0000 -999.0000 -999.0000 -999.0000 -999.0000             9
-999.0000 -999.0000 -999.0000 -999.0000 -999.0000 -999.0000 -999.0000            10
-999.0000                                                                        11
                      1      100    01     1          1.2026 DRAINAGE            12
MOUNTAIN POND                      ME    442.00  368.8000    29.200 I/O         13
POND          46.5583   69.0111 1 E PRESQUE ISLE                                14
15' MUSQUACOOK LAKES                          46-33'30"N 69-00'40"W  1E3 23021   15
             -999.0000    0.0300    0.8200    1.8000    1.0660    15.140         16
REG/                                          20.0000   10.3330    0.1160        17
   0.5080    0.2440    1.1000 MIXED            744.0000                         18
EMSI                            19.0000 16OCT84 1              R                 19
   2.9040                    1.9090            7.4200                 4.0500    20
   1.2000                    4.7000   40.0000                E    BOHON5         21
BO                          BO            330.2900  397.2000  393.9852          22
  69.7796    66.903  244.1280 BO            279.1900    0.5220 BO               23
   9.2530   72.8820    0.8710    5.2420   36.6700   74.4730    1.0480            24
   3.1600    0.0500 BO                            5.5950                         25
   0.8860                          0.2050                         0.8430         26
                      -4.0000                          68.0000                   27
         19.9000                   0.3280                         3.5770         28
                       0.0540 HON5                      2.8530                   29
          0.0199                   7.0800                         0.0570         30
               7.6400                    7.0800                          7.2800  31
BO                    16.5000                     -999.0000 U                   32
 278.7000                          94.500          39.7000                       33
          3.0590                          3.2930                                34
   3.8000 B5                      69.2000                         40.6216        35
CT/9C                                                                            36
                                                                                 37
                                                                SUSPECT, DU      38
PLICATE MEASUREMENT NOT MADE.                                                    39
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Table 18. (continued)

```
BOHON5                1E3-060 21NOV84 26NOV84 05DEC84 29NOV84 15OCT84 14:45    1
DD    3.9000            4.0200          58.0000   49.0000        23 24 25      2
090 045   10.7000           18.0000   35.0000    2.2000                         3
   2.0000                  1.5000           9.2000          11.3000            4
  10.4000          52.0000                  47.0000           7.1000            5
          7.0600           0.9000        -999.0000        -999.0000            6
-999.0000        -999.0000        -999.0000            1.0000    2.0000         7
       -999.0000 -999.0000 -999.0000 -999.0000 -999.0000 -999.0000              8
-999.0000 -999.0000 -999.0000 -999.0000 -999.0000 -999.0000 -999.0000           9
-999.0000 -999.0000 -999.0000 -999.0000 -999.0000 -999.0000 -999.0000          10
-999.0000                                                                      11
                     1      100    02     1         1.2210 DRAINAGE            12
MILLINOCKET LAKE               ME  17521.00  230.1000   873.800 I/O            13
LAKE         46.3028   68.8750 1 E PRESQUE ISLE                                14
15' MILLINOCKET LAKE                     46-18'10"N 68-52'30"W  1E3 23021      15
             -999.0000    0.0290    0.8000    1.6700    1.0440    20.050       16
REG/                                        20.0000   10.3330    0.5130        17
   0.5080   43.3820    2.1000 MIXED            744.0000                        18
EMSI                            19.0000 16OCT84 1              R               19
   2.5870                -999.0000           7.4200              -999.0000    20
   0.5000                -999.0000   45.0000               E    BOHON5         21
B0                         B0            331.6100  404.9100  402.5401         22
  66.3937    73.301  232.3610 B0            277.5440    0.6550 B0             23
   9.3380   88.4290    1.0480    5.4210   31.1460   87.0900    1.1160          24
   2.3280    0.0400 B0                            5.5620                        25
   1.0750                         0.2120                         0.7160         26
                     4.0000                         89.0000                     27
          8.9000                  0.3310                         4.1830         28
                     0.0650 HON5                     1.9040                     29
          0.0212                  6.7200                         0.0420         30
                7.6400                   7.2600                          7.4000 31
B0                    12.2000                      -999.0000 U                 32
 264.3000                         79.300          40.7000                      33
          2.8620                          3.0530                               34
   6.2000 B5                    26.9000                        41.5374          35
CT/9C                                                                          36
                                                                               37
                                                                SUSPECT, DU    38
PLICATE MEASUREMENT NOT MADE.                                                  39
```

Table 18. (continued)

```
BOHON5                  1E3-007 21NOV84 26NOV84 05DEC84 29NOV84 15OCT84 12:47    1
JJ    3.8500              3.9500          48.0000   42.0000        07 08 09     2
065 330    5.2000            15.0000   17.0000    5.3000                         3
   5.0000                    1.5000            3.7000            9.6000          4
   9.4000            49.0000                   48.0000            7.6000          5
          7.5700             0.2000          -999.0000         -999.0000         6
-999.0000          -999.0000          -999.0000            2.0000    1.0000      7
       -999.0000 -999.0000 -999.0000 -999.0000 -999.0000 -999.0000               8
-999.0000 -999.0000 -999.0000 -999.0000 -999.0000 -999.0000 -999.0000             9
-999.0000 -999.0000 -999.0000 -999.0000 -999.0000 -999.0000 -999.0000            10
-999.0000                                                                        11
                      1      100    04     1          1.0894 DRAINAGE            12
WHEELOCK LAKE                     ME    629.00  243.5000    52.000 I/O          13
LAKE          47.2000   68.7167 1 E EDMUNDSTON                                  14
15' EAGLE LAKE                              47-12'00"N 68-43'00"W  1E3 23003    15
            -999.0000    0.0310    0.8600    1.7700    1.1000    12.100         16
REG/                                         15.0000   10.3330    0.5700         17
   0.3810    1.2550    5.1500 MIXED            744.0000                         18
EMSI                            19.0000 16OCT84 1              R                 19
   4.0870                -999.0000            7.5800                -999.0000   20
   0.5000                -999.0000   20.0000                E    BOHON5          21
BO                         BO            442.4200  481.9600  479.9240          22
  31.9413    39.535  365.2790 BO            356.7850    1.1550 BO               23
   9.1960   67.7820    0.1610    4.6790   50.6770   65.2710    1.3580            24
   1.9960    0.0400 BO                            7.1500                         25
   0.8240                          0.1830                          1.1650        26
                     -5.0000                          36.0000                    27
          9.3000                   0.3260                          3.1350        28
                      0.0100 HON5                      2.8770                    29
          0.0258                   3.2300                          0.0360        30
                5.8100 U0                7.4100                          7.4500 31
BO                   36.5000                     -999.0000 U                    32
 398.6000                      -999.000 U        48.5000                         33
          4.5610 P7                        4.7560                               34
   2.7000 B5                     45.2000                          50.1980        35
CT/9C                                                                            36
                                                                                 37
                                                                SUSPECT, DU      38
PLICATE MEASUREMENT NOT MADE.                                                    39
```

Table 18. (continued)

```
BOHON5WO              1E3-006 21NOV84 26NOV84 05DEC84 29NOV84 15OCT84 11:15
JJ    3.8500            3.9500          48.0000   42.0000        01 02 03
090 140   36.9000            14.0000  121.0000    4.2000
                             1.5000          35.4000          11.7000
   3.9000                                    57.0000           7.3500
   5.1000            80.0000                 22.1000           6.3000
          6.9000             6.6000
  56.0000            6.9500          5.4000            1.0000    4.0000
          5.0000   11.4000   11.4000   11.3000   10.6000    5.8000
   5.3000 -999.0000 -999.0000 -999.0000 -999.0000   77.0000   75.0000
  73.0000   69.0000   55.0000   55.0000 -999.0000 -999.0000 -999.0000
-999.0000
                    1      100    05     1          1.1640 DRAINAGE
                                ME 133706.00  170.4000   281.600 I/O
GLAZIER LAKE
LAKE          47.2278   69.0000 1 E EDMUNDSTON
                                          47-13'40"N 69-00'00"W  1E3 23003
15' ALLAGASH/ST FRANCIS
             -999.0000    0.0340    0.9700    1.8300    1.1450   474.810
                                             15.0000   10.3330    0.0950
REG/
   0.3810   48.2140    4.0500 STRONG LR        744.0000
                                19.0000 16OCT84 1                R
EMSI                                   7.5300                  -999.0000
   0.4600 P1U0   Y      -999.0000                   E    BOHON5WO
   0.5000               -999.0000   50.0000
                         B0            704.1200  819.5900  817.1291
BO                                     659.1790    2.8900 B0
  59.7194   115.471  563.5460 B0
  36.1650   86.4550    6.5000    8.8980   62.5960   93.5650    1.4530
                                             13.2100
   2.4390    0.0200 B0                                          1.4390
   1.0510                        0.3480
                        3.0000                   94.0000
                                                                4.4940
          17.8000               1.2820
                        0.4030 HON5WO             3.3490
                                                                0.0440
           0.0276               6.0200
                 8.0500                 7.5500                          7.6600
                        25.9000                  -999.0000 U
BO
 632.1000                     -999.000 U         77.9000
                                          7.1300
          6.9510                                                83.8261
   0.4000 B5                   39.9000
CT/9C

X=UNSTABLE READING - LARGE ACTIVE ZOOPLANKTON IN SAMPLE; Y=DATA SUSPECT, DU
PLICATE MEASUREMENT NOT MADE.
```

Table 18. (continued)

```
BOHON5                  1E3-006 21NOV84 26NOV84 05DEC84 29NOV84 15OCT84 11:15    1
JJ    3.8500              3.9500          48.0000   42.0000        01 02 03     2
090 140   36.9000              14.0000  121.0000    4.2000                      3
   3.9000                      1.5000          35.4000          11.7000          4
   5.1000            80.0000                    57.0000           7.3500          5
          6.9000                6.6000          22.1000           6.3000          6
  56.0000                6.9500            5.4000            1.0000    4.0000     7
          5.0000   11.4000   11.4000   11.3000   10.6000    5.8000                8
   5.3000 -999.0000 -999.0000 -999.0000 -999.0000   77.0000   75.0000            9
  73.0000   69.0000   55.0000   55.0000 -999.0000 -999.0000 -999.0000            10
-999.0000                                                                         11
                     1      100    06     1          1.1659 DRAINAGE             12
GLAZIER LAKE                     ME 133706.00  170.4000   281.600 I/O           13
LAKE          47.2278   69.0000 1 E EDMUNDSTON                                  14
15' ALLAGASH/ST FRANCIS                   47-13'40"N 69-00'00"W  1E3 23003      15
             -999.0000    0.0340    0.9700    1.8300    1.1450   474.810        16
REG/                                         15.0000   10.3330    0.0950         17
   0.3810   48.2140    4.0500 STRONG LR        744.0000                          18
EMSI                            19.0000 16OCT84 1              D                 19
   7.0450                1.8950            7.5600                 4.0600        20
   0.4000              -999.0000   50.0000              E    BOHON5             21
BO                      BO            698.5100  814.4200  813.0120             22
  61.6538   115.908  558.1470 BO            655.1870    2.4930 BO               23
  36.2220   86.9490    6.5000    8.1060   62.7700   93.7320    1.4210           24
   1.3860    0.0300 BO                          13.1300                          25
   1.0570                         0.3170                     1.4430             26
                     2.0000                        92.0000                      27
         14.6000                 1.2840                     4.5020             28
                     0.4030 HON5                   3.3810                       29
          0.0270                 6.2200                     0.0250             30
                8.0500                   7.5800                      7.6000     31
BO                    27.6000                   -999.0000 U                     32
 632.1000                     -999.000 U        76.0000                         33
          7.0080                     7.1100                                     34
  -5.4000 B5                     42.7000                   83.2397              35
CT/9C                                                                             36
                                                                                  37
PLICATE MEASUREMENT NOT MADE.                                SUSPECT, DU         38
                                                                                  39
```

Table 19. Card-image listing (first five lakes), data set 4, U.S. EPA Eastern Lake Survey-Phase I

```
1A1-003 25OCT84 10:51 B                                  7.3000    8.0000      1
   5.6000    5.4000    1.5000    7.2000   11.5000   11.3000   23.0000        2
         22.0000    4.5000          4.5500    0.2000 -999.0000 -999.0000      3
-999.0000 -999.0000 -999.0000    1.0000 -999.0000 210    14                  4
2                0.4360           4.8000          0.4000          10.0000     5
       HON5Z1                                  HON5Z1                         6
                                          154.0100  120.7700   99.3970        7
  11.3305   -33.235    0.8820 Z1              59.2810    0.0000 Z1            8
   8.0400   16.2870    9.7750    6.3410   17.4870  132.4570    2.8530         9
   5.1560   16.2181              HON5                                        10
EMSI                             1.1880                 0.1980               11
                0.2480                0.4020                33.0000           12
               13.0000 B5Z1          208.3000                 0.2850          13
                6.3620                0.6060    0.8360                        14
   0.0542                1.5700                0.0930                        15
   4.7900                4.7300                4.7900                        16
  -9.9000               23.7000 B5             0.1290 Z1                     17
   0.4100 Z1            0.0000 Z0            386.6000                        18
  23.8860 36043 04-504       -999.0000 HAWK POND                      NY     19
    96.00  645.3000    12.800 NI/O   POND         43.9569   74.9583 A        20
UTICA                   15' BIG MOOSE                                       21
43-57'25"N 74-57'30"W  1A1    0.0430    1.2500    2.1000    0.9090            22
  30.0000    9.6330    0.6830    0.7620    0.4340     7.500    5.5000         23
MIXED           REG/             1  711.0000   0.7842  DRAINAGE              24
```

Table 19. (continued)

```
1A1-004 25OCT84 10:32 B                                          7.3000     5.0000        1
   6.5000     6.0000     1.5000     8.2000    12.2000    12.1000    26.0000              2
         20.0000     4.4600            4.4400     0.1000 -999.0000 -999.0000             3
-999.0000 -999.0000 -999.0000 -999.0000 -999.0000 210     11                             4
2                 0.4280            4.6700            0.2000            5.0000            5
       HON5Z1              Z1                   HON5Z1                                     6
                                          125.9900  104.5500   82.3830                   7
   7.3903    -21.441     0.6330 HOZ1            45.0100     0.0000 HOZ1                 8
   7.5040    16.5340     8.7750     7.4410    13.3980  106.7860     2.2950               9
   1.2750    20.8930                HON5                                                  10
EMSI                               0.9020                    0.2010                       11
                0.2910                 0.3080                    52.0000                  12
               30.0000 B5            163.3000                     0.2660                  13
                5.1290                 0.5440     0.3630                                  14
   0.0436                  1.0600                 0.0230 Z1                               15
   4.6900                  4.7100                 4.6800                                  16
 -11.3000                 22.7000 B5              0.1280 Z1                               17
   0.3770 HOZ1             0.0000 Z0            273.1000                                  18
  22.0660 36043 04-500        -999.0000 EVERGREEN LAKE                          NY        19
    73.00  612.7000     19.500 NI/NO  LAKE          43.9167    75.0167 A                 20
UTICA                      15' NUMBER FOUR                                                21
43-55'00"N 75-01'00"W  1A1     0.0440     1.2800     2.1400     0.9060                   22
  30.0000     9.6330 -999.0000     0.7620     0.6610     3.740     6.2500                 23
MIXED            REG/              1  711.0000    0.8298  SEEPAGE                         24
```

Table 19. (continued)

```
1A1-008 15OCT84 11:43 P  DAM AT NORTH END OF LAKE     1.5000   18.0000        1
   1.6000 -999.0000    1.5000 -999.0000   12.3000 -999.0000   32.0000         2
       -999.0000   6.3500        -999.0000 -999.0000 -999.0000 -999.0000       3
-999.0000 -999.0000 -999.0000    1.0000    1.0000 205    03                   4
2                 1.1390          6.5400          1.1000          30.0000       5
      HON5Z1              Z1                  HON5Z1                            6
                   D2                  200.5300  217.3200  215.6880             7
  38.4854    16.788   65.3980              126.9460    0.0300                  8
  11.3400   49.4380    1.8870    6.4180   32.8860  119.5070    2.3690          9
   1.3860    0.2455              HON5Z1                                        10
EMSI                              2.5440                 0.6010                11
                0.2510                0.7560                20.0000             12
               87.0000 B5            17.3000                 0.4020             13
                5.7400                0.1170    5.5580                          14
   0.0450                 4.0000 D2              0.0250 Z1                     15
   7.0200                 6.4800                 6.6100                        16
  71.8000                26.0000                 0.7680                        17
   1.2340                 6.3000 B5Z1          205.5000                        18
  26.0820 36041 05-667       -999.0000 CEDAR RIVER FLOW                 NY     19
 11914.00  640.1000   264.600 I/O    UNKNOWN      43.7083   74.4750 A          20
UTICA                    15' INDIAN LAKE                                       21
43-42'30"N 74-28'30"W  1A1    0.0430    1.2300    2.0800    0.9090              22
  25.0000    9.6330    0.0250    0.6350    1.8420    45.030    1.6000           23
MIXED  DR       REG/             1  711.0000   1.0837  DRAINAGE                24
```

Table 19. (continued)

```
1A1-009 30OCT84 13:49 B                                                  1.5000    12.0000
   1.5000 -999.0000    0.5000 -999.0000   10.6000 -999.0000   28.0000
      -999.0000    4.3300        -999.0000 -999.0000 -999.0000 -999.0000
-999.0000 -999.0000 -999.0000    1.0000    2.0000 212    09
2                0.4680            4.5400            0.6000            25.0000
      HON5Z1                                  HON5Z1
                                     150.2400  101.5500   68.1510
  27.3742   -48.688    0.6230                25.2990    0.0000
   7.7860   21.2230    1.9840    1.6620   19.9660  137.9120    1.9320
   2.4950   30.9030              HON5Z1
EMSI                             0.5070                    0.2580
               0.0650                0.4590                35.0000
             122.0000 B5           324.5000                 0.2760
               6.6240                0.1230    1.9720
   0.0367                 4.1600                0.0450
   4.5100                 4.4800                4.5100
 -23.1000                28.2000 B5             0.1660 Z1
   0.5450                 5.8000 Z1            638.3000
  26.6430 36041 07-934       -999.0000 TWIN LAKES (EASTERN)            NY
   129.00  812.0000     7.400 NI/O   LAKE         43.6208   74.6208 A
UTICA                     15' WEST CANADA LAKES
43-37'15"N 74-37'15"W  1A1    0.0450    1.3000    2.1800    0.9000
  30.0000    9.6330    0.0560    0.7620    0.0520    17.430    1.5000
MIXED           REG/            1  711.0000   0.6759  DRAINAGE
```

Table 19. (continued)

```
                                                                  0.9000   20.0000        1
1A1-010 16OCT84 12:04 B                                                                   2
   1.0000 -999.0000    0.5000 -999.0000   13.2000 -999.0000   34.0000                  3
       -999.0000    4.3000        -999.0000 -999.0000 -999.0000 -999.0000               4
-999.0000 -999.0000 -999.0000 -999.0000 -999.0000 206    04                              5
2                0.6770           4.3600           0.4000          40.0000               6
       D2HON5Z1           D2                  D2HON5Z1                                    7
                   BOD2                146.8100  124.1500   79.7480                      8
  33.6899   -22.660    0.4840 D2             45.8580    0.0000 D2                       9
  11.1150   15.2180    1.5650    2.8380   15.8340  131.8950    1.7480                   10
   3.6590   40.7380 D2          HON5Z1                                                   11
EMSI                            0.9190                  0.1850                            12
                0.1110               0.3640                 23.0000                      13
              249.0000 B2B5         282.7000                  0.3940                      14
                6.3350               0.0970    2.6760                                    15
   0.0332                 5.3500 BO              0.0660                                   16
   4.4200                 4.3700                 4.3900 D2                                17
  -34.2000               33.7000 D2WO            0.2340 Z1                                18
   0.5560                 0.1000 B5Z1          527.5000                                  19
  30.6790 36041 04-1011       -999.0000 SNYDER LAKE                          NY          20
   145.00  734.6000      7.300 I/O    LAKE         43.5708   74.8208 A                   21
UTICA                     15' OLD FORGE                                                  22
43-34'15"N 74-49'15"W  1A1    0.0470    1.3900    2.3300    0.8900                       23
  30.0000    9.6330    0.0290    0.7620    0.0300    19.860    1.0000                   24
MIXED           REG/             1  711.0000   0.8457  DRAINAGE
```

Table 20. Card-image listing (first five lakes), PC data set, file ELS-I.RG1, U.S. EPA Eastern Lake Survey-Phase I

```
1A1-003 HAWK POND                          43-57'25"N 74-57'30"W NY  645      13      96 1
    7.5 DRAINAGE   0.58 11.5 MIXED    7.3  5.5   0.4   10   13.0  154.0  120.8 2
0.78 4.79 4.80   -9.9  23.7  23.9  0.13  0.44  1.57 208.0  386.6   59.3   16.3 3
  17.5   6.3  5.2  132.5    0.9    8.0   9.8  2.9   0.0  0.84 REGULAR          4
  33.0 25OCT84  9.633  711 5
1A1-004 EVERGREEN LAKE                     43-55'00"N 75-01'00"W NY  613      20      73 1
    3.7 SEEPAGE     .   12.2 MIXED    7.3  6.3   0.2    5   30.0  126.0  104.5 2
0.83 4.69 4.67  -11.3  22.7  22.1  0.13  0.43  1.06 163.0  273.1   45.0   16.5 3
  13.4   7.4  1.3  106.8    0.6    7.5   8.8  2.3   0.0  0.36 REGULAR          4
  52.0 25OCT84  9.633  711 5
1A1-008 CEDAR RIVER FLOW                   43-42'30"N 74-28'30"W NY  640     265   11914 1
   45.0 DRAINAGE   0.02 12.3 MIXED    1.5  1.6   1.1   30   87.0  200.5  217.3 2
1.08 7.02 6.54   71.8  26.0  26.1  0.77  1.14  4.00  17.0  205.5  126.9   49.4 3
  32.9   6.4  1.4  119.5   65.4   11.3   1.9  2.4   6.3  5.56 REGULAR          4
  20.0 15OCT84  9.633  711 5
1A1-009 TWIN LAKES (EASTERN)               43-37'15"N 74-37'15"W NY  812       7     129 1
   17.4 DRAINAGE   0.05 10.6 MIXED    1.5  1.5   0.6   25  122.0  150.2  101.5 2
0.68 4.51 4.54  -23.1  28.2  26.6  0.17  0.47  4.16 324.0  638.3   25.3   21.2 3
  20.0   1.7  2.5  137.9    0.6    7.8   2.0  1.9   5.8  1.97 REGULAR          4
  35.0 30OCT84  9.633  711 5
1A1-010 SNYDER LAKE                        43-34'15"N 74-49'15"W NY  735       7     145 1
   19.9 DRAINAGE   0.03 13.2 MIXED    0.9  1.0   0.4   40  249.0  146.8  124.1 2
0.85 4.42 4.36  -34.2  33.7  30.7  0.23  0.68  5.35 282.0  527.5   45.9   15.2 3
  15.8   2.8  3.7  131.9    0.5   11.1   1.6  1.7   0.1  2.68 REGULAR          4
  23.0 16OCT84  9.633  711 5
```

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APPENDIX B

DATA BASE FORMAT DOCUMENTATION

Table B-1. File Documentation

Description	Filename	Number of Lakes	Number of Records	Size (bytes)
Regular[a] lakes - Northeast	ELS-I.RG1	768	3840	274945
Regular lakes - Upper Midwest	ELS-I.RG2	592	2960	211937
Regular lakes - Southeast	ELS-I.RG3	252	1260	90217
Special lakes - all regions	ELS-I.SPC	186	930	66589
Format-- This file	ELS-I.FRM	---	----	------

[a] Probability Sample Lakes.

Format Documentation for U.S. EPA NSWS ELS Data on PC Disk

The U.S. EPA NSWS ELS-I data, as reported in EPA report number EPA-600/4-86-007C, have been formatted into fixed records with a maximum length of 80 columns. The data in this format may be stored on two double-sided/double density 5 1/4" diskettes (360KB) or on one high capacity PC-AT disk. The disk was produced with PC-DOS 3.1. The data and format are reported in the files as described in Table B-1. All of the data files have the same format as described in Table B-2.

Table B-2. Parameter and Format Documentation

Parameter	Units	Format Attributes: Type	Width[a]	Record Number	Start - End Column
ID	(none)	char	7	1	1 - 7
Name	(none)	char	26	1	9 - 34
Latitude	(dd-mm'ss"N)	char	10	1	36 - 45
Longitude	(dd-mm'ss"W)	char	10	1	46 - 56
State	(none)	char	2	1	58 - 59
Elevation	(m)	num	4.0	1	61 - 64
Lake Area	(ha)	num	6.0	1	66 - 71
Watershed Area	(ha)	num	6.0	1	73 - 78
Record Number	(none)	num	1.0	1	80 - 80
WA/LA	(none)	num	7.1	2	1 - 7
Hydrologic Type	(none)	char	9	2	9 - 17
Surface Temp.	(deg C)	num	6.1	2	19 - 24
Stratified	(none)	char	6	2	26 - 31
Site Depth	(m)	num	5.1	2	33 - 37
Secchi Depth	(m)	num	6.1	2	39 - 44
Turbidity	(NTU)	num	5.1	2	46 - 50
Color	(PCU)	num	4.0	2	52 - 55
Fe	(µG/L)	num	6.1	2	57 - 62
Sum Anions	(µeq/L)	num	6.1	2	64 - 69
Sum Cations	(µeq/L)	num	6.1	2	71 - 76
Record Number	(none)	num	1.0	2	80 - 80
Cations/Anions	(none)	num	4.2	3	1 - 4
Equilibrated pH	(pH)	num	4.2	3	6 - 9
Closed pH	(pH)	num	4.2	3	11 - 14
ANC	(µeq/L)	num	6.1	3	16 - 21
Meas. Conductivity	(µS/cm)	num	5.1	3	23 - 27
Cal. conductivity	(µS/cm)	num	5.1	3	29 - 33
Equilibrated DIC	(mg/L)	num	5.2	3	35 - 39
Closed DIC	(mg/L)	num	5.2	3	41 - 45
DOC	(mg/L)	num	5.2	3	47 - 51
Extractable Al	(µg/L)	num	5.1	3	53 - 57
Total Al	(µg/L)	num	6.1	3	59 - 64
Ca	(µeq/L)	num	6.1	3	66 - 71
Mg	(µeq/L)	num	6.1	3	73 - 78
Record Number	(none)	num	1.0	3	80 - 80
Na	(µeq/L)	num	6.1	4	1 - 6
K	(µeq/L)	num	5.1	4	8 - 12
NH_4	(µeq/L)	num	4.1	4	14 - 17
SO_4	(µeq/L)	num	6.1	4	19 - 24
HCO_3	(µeq/L)	num	6.1	4	26 - 31
Cl	(µeq/L)	num	6.1	4	33 - 38
NO_3	(µeq/L)	num	5.1	4	40 - 44
F	(µeq/L)	num	4.1	4	46 - 49
Total P	(µeq/L)	num	5.1	4	51 - 55
SiO_2	(mg/L)	num	5.2	4	57 - 61
Sample Type	(none)	char	16	4	63 - 78
Record Number	(none)	num	1.0	4	80 - 80
Mn	(µg/L)	num	6.1	5	1 - 6
Date	(ddmmmyy)	char	7	5	8 - 14
Population Factor	(none)	num	6.3	5	16 - 21
Strata Population	(N)	num	4.0	5	23 - 26
Record Number	(none)	num	1.0	5	28 - 28

[a] A foot note will go here.....

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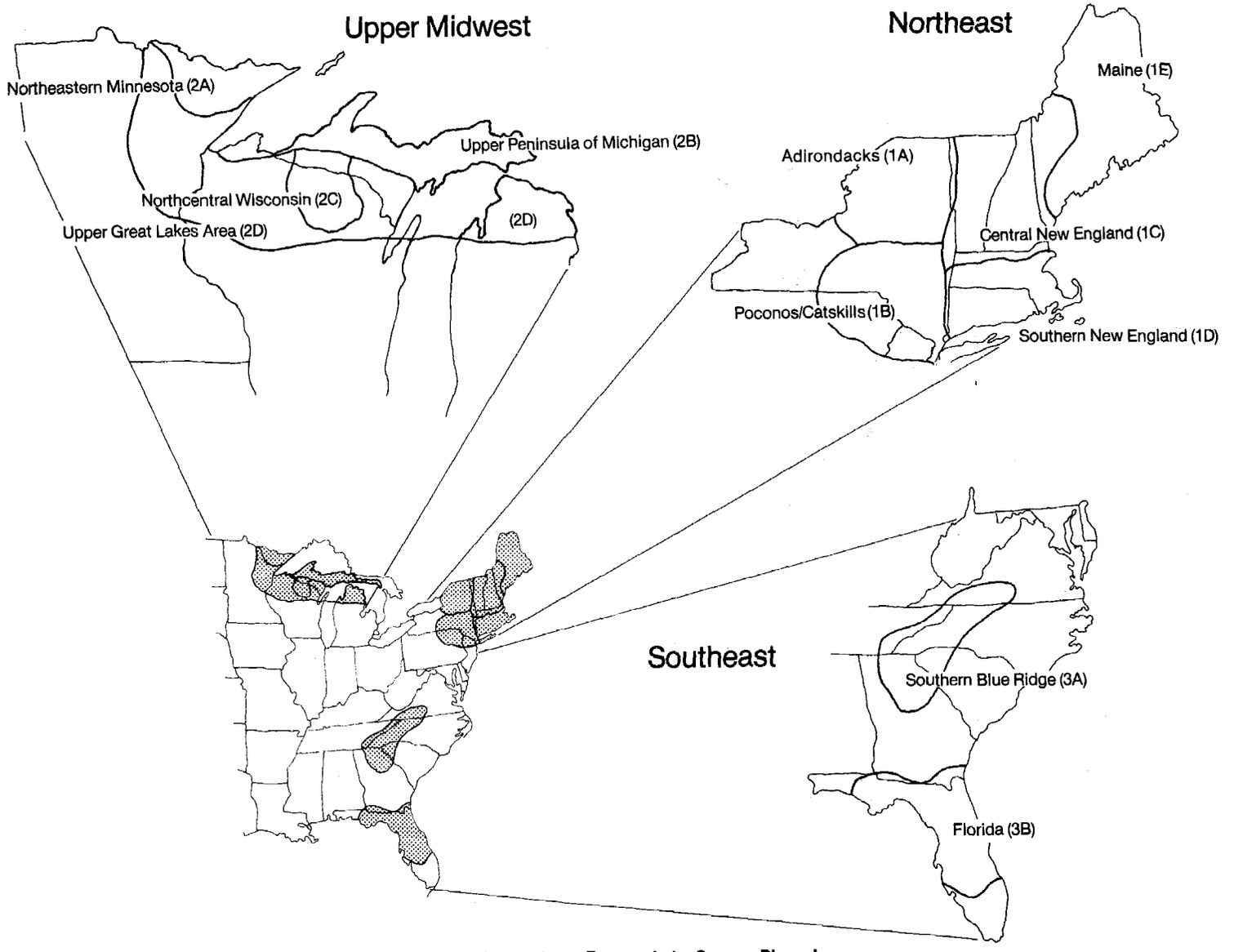

Regions and Subregions, Eastern Lake Survey-Phase I

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