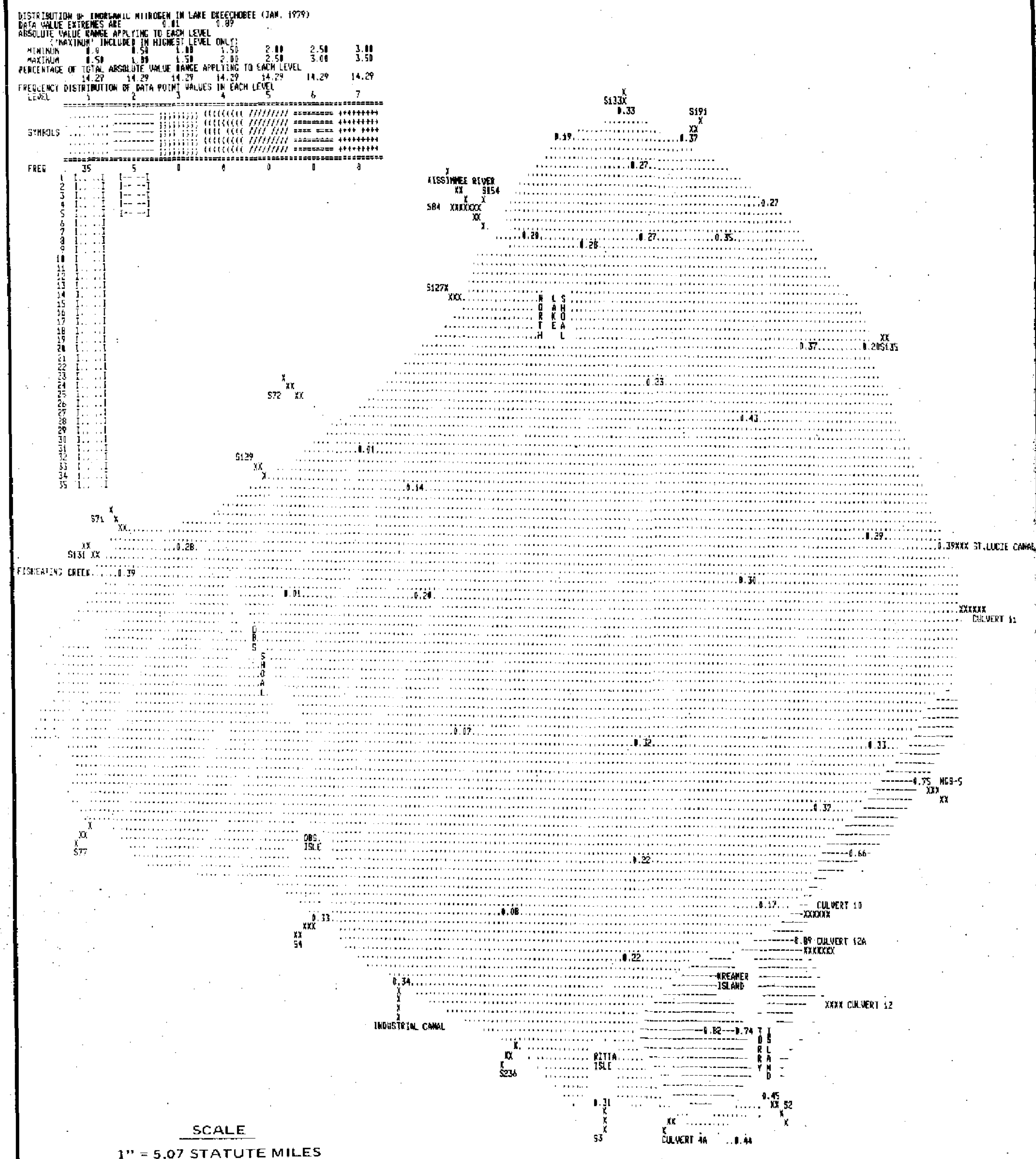


Figure 8-7 0.50 mg/L CONTOUR INTERVALS FOR INORGANIC NITROGEN (JAN. 1979)

TABLE 8-8. OPERATIONAL STATUS OF INFLOW CONVEYANCES TO LAKE OKEECHOBEE

Volume and Date of Discharge [1/]

September 1978

Inflow	4th	5th	6th*	7th*	8th*	Total	Comments
S-65E	2261	2261	2975	[2/]		7497	A
S-84	555	167	204			926	
S-154	- [2/]	-	-				E
S-133	0	476	464			940	
S-191	770	916	474			2160	
S-135	0	377	361			738	
Culvert 11	-	-	-				B
Culvert 10		-	-	-			B
Culvert 12A		-	-	-			B
Culvert 12		-	-	-			B
S-2		1805	1123	0		2928	
Culvert 4A		-	-	-			B
S-3		1075	240	843		2158	
S-236		-	-	-			D
Industrial C			-	-	-		C
S-4			460	0	0	460	
Fisheating Ck			514	401	409	1324	
S-131			0	0	129	129	
S-71			1129	1418	329	2876	
S-129			0	228	0	228	
S-72			169	0	0	169	
S-127	0	357	0			357	

Total Inflow = 22890 acre-feet

Average Lake Stage on 9/4/78 = 16.40 ft (MSL)

NOTE: [1/] Volumes are expressed in acre-feet. The time frame under consideration includes the date sampling occurred in the vicinity of the inflow conveyance plus 2 days prior to that date.

[2/] Blank means flows not applicable
- means no data available

COMMENTS:
(A) Fairly continuous discharge prior to these dates.
(B) Operated by private drainage districts. No discharge data available.
(C) This waterway not gauged at this time.
(D) Pump station under construction at this time.
(E) Volume not calculated.

* indicates actual sample dates.

TABLE 8-9. OPERATIONAL STATUS OF INFLOW CONVEYANCES TO LAKE OKEECHOBEE

Volume and Date of Discharge[1/]

January 1979

Inflow	7th	8th	9th*	10th*	11th*	Total	Comments
S-65E		356	586	697	2/	1639	A
S-84		351	577	375		1303	A
S-154		- 2/	-	-			C
S-133		563	0	0		563	
S-191		799	934	432		2165	A
S-135		369	373	0		742	
Culvert 11		-	-	-			D
Culvert 10			-	-	-		D
Culvert 12A	-	-	-				D
Culvert 12	-	-	-				D
S-2	0	0	0				A
Culvert 4A	-	-	-				D
S-3	0	0	0				
S-236	-	-	-				D
Industrial C.	-	-	-				E
S-4	387	0	0			387	A
Fisheating Ck			335	301	252	888	A
S-131			0	0	143	143	B
S-71			1422	1315	480	3217	A
S-129			264	0	244	508	B
S-72			246	0	188	434	
S-127	0	468	0			468	

Total Inflow = 12457 acre-feet

Average Lake Stage on 1/7/79 = 16.87 ft. (MSL)

NOTE: 1/ Volumes are expressed in acre-feet. The time frame under consideration includes the date sampling occurred in the vicinity of the inflow conveyance plus 2 days prior to that day.

2/ Blank means flows not applicable
- means flows not available

COMMENTS:
(A) Fairly continuous discharge prior to these dates.
(B) Small releases are made every 3 or 4 days.
(C) Structure on automatic. Discharge occurred daily. Volume not calculated.
(D) Operated by Private Drainage Districts. No discharge data available.
(E) This waterway was not gauged at this time.

*indicates actual sample dates

considerable discharge into the lake during both sampling periods; however, the total discharge during September 1978 was substantially greater than the January 1979 total. The major differences between the two periods was the much greater discharges from S-65E during September and the complete lack of discharge at S-2 and S-3 pumping stations during January 1979 compared to over 5,000 acre-feet of pumping at these two stations during the previous September.

Comparison of the four contour maps for inorganic nitrogen and total nitrogen clearly demonstrates the effect that backpumping the runoff from the Everglades Agricultural Area has on the nitrogen distribution in Lake Okeechobee.

For total nitrogen, the ambient concentration in the lake during September 1978 is represented by the Level 3 contours (2.00 to 3.00 mg/L) as indicated by Table 8-10. This contour represents approximately 57% of the total lake area.

Backpumping at S-3 resulted in Level 8 contours (7.00 to 8.00 mg/L) in the immediate vicinity of that pump station. These Level 8 contours represent a 2.0 square mile area. Level 7 contours (6.00 - 7.00 mg/L) in the same vicinity cover a 1.9 square mile area. Level 6 contours (5.00 to 6.00 mg/L) extend from S-3 to S-2 (3.7 square miles). Level 5 contours (4.00 to 5.00 mg/L) represent an 8.2 square mile area. Level 4 contours (3.00 to 4.00 mg/L) extended from the east to west sides of the South Bay area (11.4 square miles). The total area in the south end of the lake which had total nitrogen concentrations above the ambient level was equal to approximately 27 square miles or 4.4% of the lake's surface area.

TABLE 8-10 LAKE AREA WITHIN NITROGEN CONTOUR INTERVALS

Total Nitrogen					Inorganic Nitrogen				
Contour Intervals	Sept.1978		Jan.1979		Contour Intervals	Sept.1978		Jan.1979	
(mg/l)	sq.mi.	%	sq.mi	%	(mg/l)	sq.mi.	%	sq.mi.	%
<1.00	24.4	3.9			<0.50	594.5	96.6	583.8	95.2
1.00-2.00	211.6	34.3	515.0	84.0	0.50-1.00	8.5	1.4	29.2	4.8
2.00-3.00	354.3	57.4	99.0	16.1	1.00-1.50	4.8	0.8		
3.00-4.00	11.4	1.8			1.50-2.00	2.7	0.4		
4.00-5.00	8.2	1.3			2.00-2.50	1.6	0.2		
5.00-6.00	3.7	0.6			2.50-3.00	1.1	0.2		
6.00-7.00	1.9	0.3			3.00-3.50	2.3	0.4		
7.00-8.00	2.0	0.3							
>8.00									
Mean (mg/L)	2.13		1.80			0.16		0.33	
Std. Dev.	1.31		0.42			0.61		0.20	

NOTE: Total lake area for Nitrogen maps = 615 sq. miles

A dilution effect is apparent in the north end of the lake during September. Level 1 contours (0.00 to 1.00 mg/L) in this area cover 24.4 square miles. Level 2 contours (1.00 to 2.00 mg/L) cover a more extensive area (210 square miles). From Tables 8-4 and 8-8, it is apparent that this dilution effect was primarily due to releases of water from S-65E (Kissimmee River). The total area diluted below ambient levels was equal to approximately 234 square miles or 38% of the total lake area.

Contour interval widths for inorganic nitrogen were set at 0.50 mg/L. During the September 1978 time frame (Figure 8-6) inorganic nitrogen concentrations above the ambient lake concentration (Level 1; 0.00 to 1.00 mg/L) were evidenced in the south end of the lake. The pattern of the contour intervals in this area was similar to that evidenced by the total nitrogen intervals for the same area and is most likely attributable to the pumping activity during this time.

In contrast, the January 1979 map for total nitrogen (Figure 8-7) indicates a very homogeneous nitrogen distribution. Only the Level 2 (1.0 - 2.0 mg/L N) and Level 3 (2.0 - 3.0 mg/L N) contours are required for this map. The major portion of the lake (84%) had total nitrogen values of less than 2.0 mg/L N. There was a tendency for somewhat higher nitrogen values to occur along the east shore of the lake although there is no apparent reason for this pattern.

The inorganic nitrogen distribution indicated an even more homogeneous lake with all but 5% of the lake having less than 0.5 mg/L N. As with the total nitrogen,the area of higher values was along the eastern edge of the lake. Agricultural runoff discharged into the lake via private facilities could be responsible for this slight increase in the nitrogen levels in this area, but no discharge data is available for these structures to confirm this.

Phosphorus

The total phosphorus data collected during September 1979 had a high degree of variability and thus was selected as one of the phosphorus distribution cases. The data collected during August 1979 had very little variability for phosphorus and was thus chosen as comparative sampling data.

Review of the hydrologic summaries in Tables 8-6 and 8-11 for these two periods indicate that over 10 times as much discharge was occurring during the September 1979 sampling as during the previous month. Of particular significance to the phosphorus picture was the fact that both S-191 and Fisheating Creek were discharging at a high rate during September and had high concentrations of phosphorus (Table 8-4).

As can be seen from Figure 8-8, the entire lake had a total phosphorus concentration of less than 0.1 mg/L P during August 1979. In contrast, almost 25% of the lake had total phosphorus concentrations above 0.1 mg/L P the next month as shown by Figure 8-9 and Table 8-12. Total phosphorus concentrations above level 10 (>0.90 mg/L) were recorded in the vicinity of S-191; however, only 58 square miles (9.5%) of the lake were affected in this quadrant compared to 86.4 square miles (14.0%) in the western quadrant (S-4 clockwise to S-129). Since the intensive littoral zone in the western quadrant was not sampled as intensively as other areas of the lake, the phosphorus contour levels in this area could be somewhat different than described by SYMAP.

TABLE 8-11. OPERATIONAL STATUS OF INFLOW CONVEYANCES TO LAKE OKEECHOBEE

Volume and Date of Discharge [1]

September 1979

Inflow	8th	9th	10th*	11th*	12th*	13th*	Total	Comments
S-65E		7539	9303	7061	[2]		23723	A
S-84		2142	3709	3749			9600	
S-154		- [2]	-	-				E
S-133		0	978	274			1252	
S-191		2844	3475	3310			9629	A
S-135		0	787	1188			1975	
Culvert 11		-	-	-				B
Culvert 10	-	-	-					B
Culvert 12A	-	-	-					B
Culvert 12	-	-	-					B
S-2	0	0	0					
Culvert 4A	-	-	-					B
S-3	0	0	833				833	
S-236	-	-	0					D
Industrial C.	-	-	-					C
S-4				0	0	391	391	
Fisheating Ck				5078	4840	4939	14857	A
S-131				0	0	220	220	
S-71				3352	3590	4661	11603	A
S-129				0	0	432	432	
S-72				662	1033	1265	2960	
S-127		0	373	0			373	

Total Inflow = 77848 acre-feet

Average Lake Stage on 9/8/79 = 14.98 ft. (MSL)

NOTE: [1] Volumes are expressed in acre-feet. The time frame under consideration includes the date sampling occurred in the vicinity of inflow conveyance plus 2 days prior to that date.

[2] Blank means flows not applicable
- means flow not available

COMMENTS:
(A) Fairly continuous discharge prior to these dates
(B) Operated by private drainage districts. No discharge data available.
(C) This waterway not gauged at this time.
(D) Pumped for 19 hours on the 8th and 9th. Volume not calculated.
(E) Structure on automatic. Discharge occurred daily. Volume not calculated.

*indicates actual sample dates.

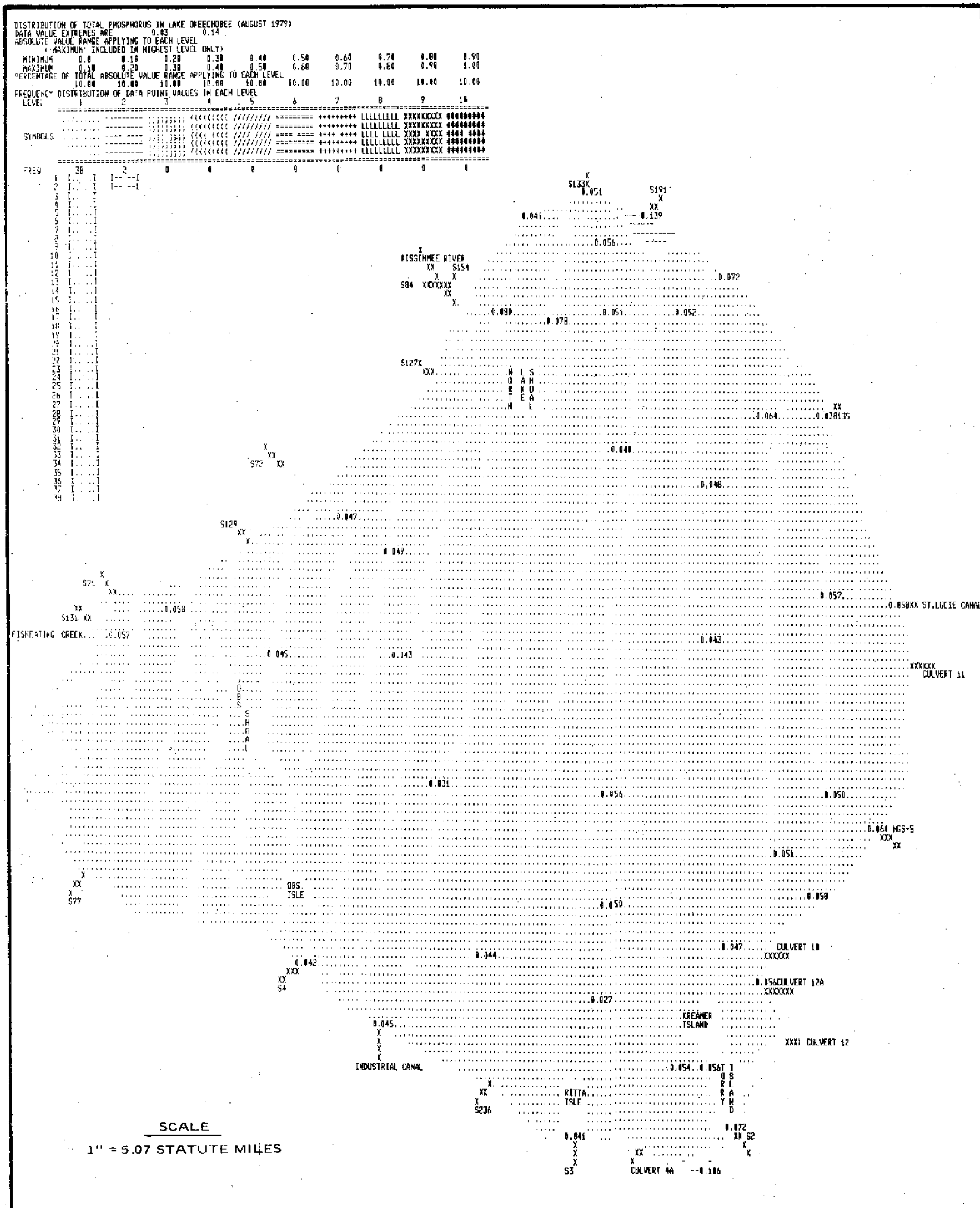


Figure 8-8 0.10 mg/L CONTOUR INTERVALS FOR TOTAL PHOSPHORUS (AUGUST 1979)

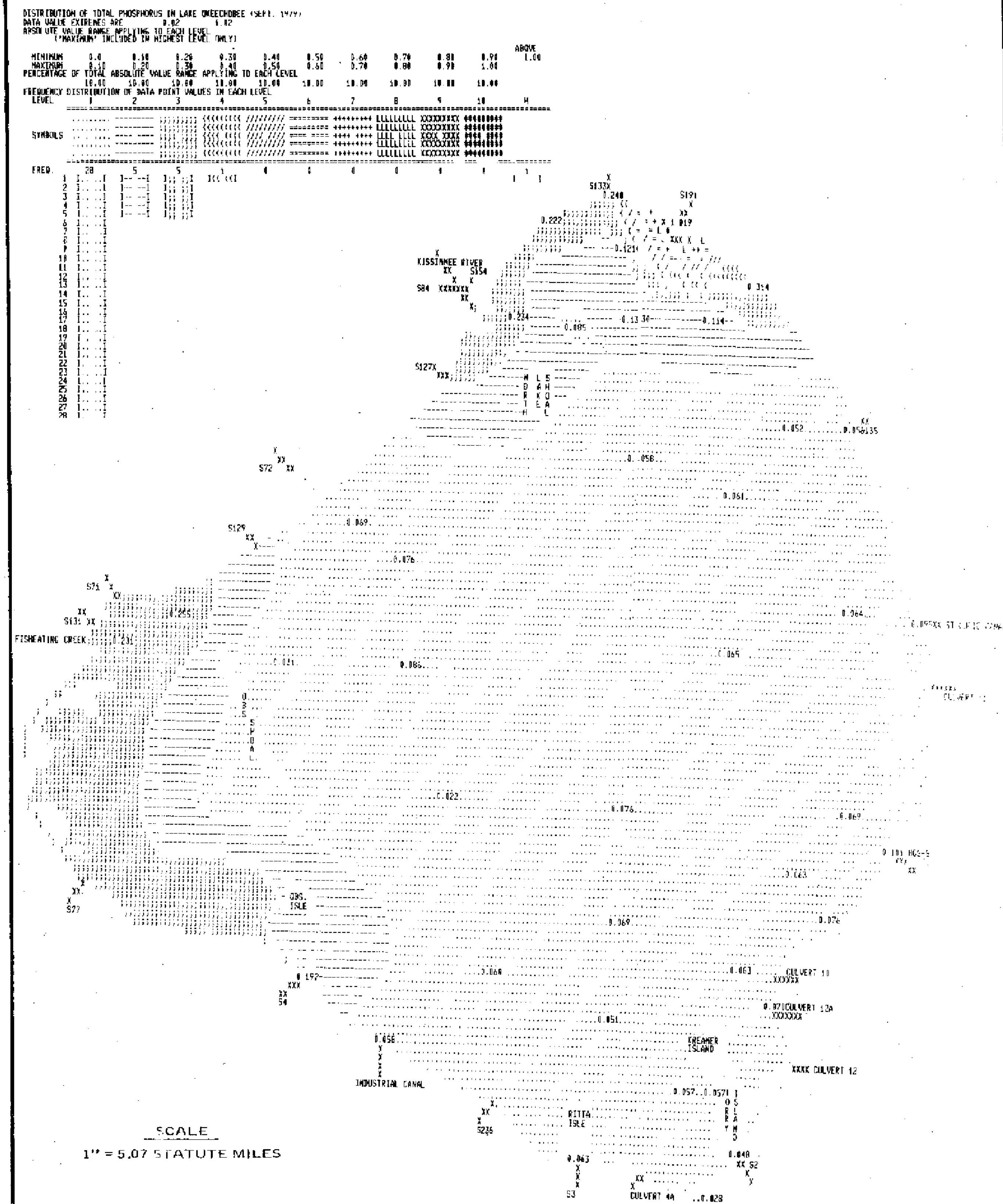


Figure 8-9 0.10 mg/L CONTOUR INTERVALS FOR TOTAL PHOSPHORUS (SEPT. 1979)

TABLE 8-12 LAKE AREA WITHIN PHOSPHORUS CONTOUR INTERVALS

Contour Intervals (mg/l)	Total Phosphorus			
	August 1979		Sept. 1979	
	sq. mi	%	sq. mi.	%
<0.10	611.3	99.7	467.7	76.3
0.10-0.20	1.7	0.3	77.5	12.6
0.20-0.30			61.5	10.0
0.30-0.40			2.5	0.4
0.40-0.50			1.2	0.2
0.50-0.60			0.7	0.1
0.60-0.70			0.4	0.1
0.70-0.80			0.5	0.1
0.80-0.90			0.3	<0.1
>0.90			0.2	<0.1
Mean (mg/L)	0.055		0.123	
Std. Dev.	0.019		0.160	

NOTE: Total lake area for phosphorus maps = 613 sq. miles

SUMMARY

During periods of heavy rainfall (August 1978), low conductivity water entering the lake from the north end had a dilution effect on the ambient water in the lake. The area of impact was approximately 116 square miles (or 19%) of the lake's surface area. Backpumped agricultural runoff from south of the lake tended to elevate the conductivity values in that portion of the lake. These elevated conductivity values encompassed a 68 square mile area (11% of the total lake area).

Nitrogen concentrations in Lake Okeechobee during September 1978 were elevated in the southern region due to the pumping of runoff from the Everglades Agricultural Area (EAA) at S-2 and S-3. Approximately 27 square miles (or 4.4%) of the lake had nitrogen concentrations which were elevated above ambient levels. The inorganic nitrogen was the fraction primarily responsible for these elevated values. Water discharged to the lake from conveyances in the northern half generally had lower nitrogen concentrations than the resident water in the lake. Due to this trend, discharges to the northern half of the lake tended to dilute the ambient nitrogen concentrations in the lake.

Water entering the northern and western regions of the lake during September 1979 tended to increase the phosphorus levels in this portion of the lake. A larger area was affected in the western region (86 square miles or 14% of total lake area) than in the northern region (58 square miles or 9% of total lake area). Phosphorus entering other areas of the lake seemed to have no effect on the ambient phosphorus concentrations in those areas. Ortho phosphorus was the fraction primarily responsible for increasing the phosphorus concentration in the lake.

CHAPTER IX
TROPHIC STATE ASSESSMENT

INTRODUCTION

The process of increasing the nutrient content and productivity of a lake is commonly called eutrophication. A leading entity in eutrophication research, the Organization for Economic Cooperation and Development, defined lake eutrophication as "...the nutrient enrichment of waters which results in an array of symptomatic changes among which are the production of algae and other aquatic plants, the deterioration of fisheries, the deterioration of water quality, and other changes which are found objectionable and interfere with water use." The trophic state of a lake can impact the biological integrity, the water quality, and the alternative water uses of the resource (Table 9-1). The major quantitative determinant of trophic state in a lake is the nutrient concentrations in the water. In turn, these concentrations depend on external nutrient loadings to the lake, internal loadings (retention in the biomass and sediments), and the rate of lake flushing. Though many nutrients are required for algal growth, phosphorus and nitrogen are the most common limiting nutrients for net primary production, and thus the standing crop biomass of algae and nuisance aquatic weeds in the lake. Although the majority of research efforts have been aimed at phosphorus management, both nutrients will be considered here.

Several researchers have applied current eutrophication modeling and trophic state assessment techniques to Lake Okeechobee (Brezonik and Federico 1975; Miller 1978; Dickson et al. 1978; Brezonik et al 1979; Kratzer and Brezonik 1980). These researchers relied, however, upon data bases that were either individually incomplete or, taken as a group,

TABLE 9-1. TROPHIC STATE CHARACTERISTICS

Nutrient Supply	OLIGOTROPHIC Under Fed	MESOTROPHIC	EUTROPHIC Well Fed	HYPERTROPHIC Overfed
Biological	Low Productivity		High Productivity	
	High Diversity		Low Diversity	
	Low Biomass			Blue-Green Trash Fish
			High Biomass	
Water Quality	Clear		Turbid	
	Well Oxygenated		Occasional Oxygen Deficiencies	Anoxic Conditions
	Low Nutrients		High Nutrients	
Water Use	Good Drinking Water	Fair Drinking Water		Poor Drinking Water Irrigation Supplies
	Good Aesthetics/ Recreation	Fair Aesthetics/ Good Recreation		Poor Aesthetics/ Recreation
	Limited Fish & Wildlife	Good Fish & Wildlife		Poor Fish & Wildlife

were inconsistent in data collection methodologies and time frames. Sampling sites, collection frequency, parametric coverage, and period of record varied considerably among the data base. Previous studies were usually just one year in duration, which necessitated the combination and extrapolation of 3 or 4 different studies in order to get an adequate data base by which to evaluate the trophic state of the lake.

This report represents the first long term comprehensive study which includes both a long period of record (seven years) and a comprehensive and consistent data collection methodology. The previous chapters have evaluated seven year trends and spacial variations in the lake's water quality and have documented the quality and volumes of water entering the lake. In this chapter the quantitative relationships between nutrient loading rates to Lake Okeechobee and the trophic state response of the lake are examined using a consistent, long term data base.

The applicability of several simple empirical and semi-theoretical predictive models to the lake is assessed by comparing observed values for total phosphorus and total nitrogen to the values predicted using nutrient loadings, and morphometric and hydrologic data. The present trophic state of the lake is examined by comparison of average values for several trophic state indicators with critical values for these indicators in the literature. In addition, the lake's trophic state is quantified, using a trophic state index based on four trophic indicators. Finally, several recent input-output models will be assessed to determine the appropriate model to be applied to Lake Okeechobee. An analysis of trophic state probability will then be applied to this model.

REVIEW OF TROPHIC STATE ASSESSMENT TECHNIQUES

1. Trophic State Indicators

Several attempts have been made to establish trophic state criteria against which to judge the trophic state of a lake. These include commonly measured water quality parameters, primarily total phosphorus, ortho phosphorus, total nitrogen, inorganic nitrogen, Secchi disk transparency, and chlorophyll a. The available critical values (above or below which eutrophic conditions can be expected in a lake) for these parameters are presented in Table 9-2. With the exception of the Kratzer (1979) values, these critical values were determined from northern temperate lake data bases. The Kratzer (1979) data base, however, consisted of 40 Florida lakes (including Lake Okeechobee) from the EPA National Eutrophication Survey. Thus, the corresponding critical values from the Kratzer study are probably more appropriate to Lake Okeechobee.

2. Trophic State Indices

Trophic state indices (TSI) are useful in quantifying trophic conditions in a lake. The recent demand for quantitative indices or semi-quantitative trophic state rankings by water managers and regulatory agencies has resulted in the development of several trophic state indices. Several investigators have developed ranking schemes for a closed data set based on the average rankings of several trophic indicators (Lueschow et al., 1970; Michalski and Conroy, 1972; EPA, 1974). For example, the EPA developed a water quality index to rank the lakes of the NES based on six parameters; however, since such an index simply provides a relative trophic ranking, its interpretation is totally dependent upon the nature of the data base. These indices would probably not provide a useful assessment of Lake Okeechobee's trophic state.

TABLE 9-2. CRITICAL VALUES[1/] FOR TROPHIC STATE PARAMETERS

Parameter[2/]	Kratzer 1979	NES 1975	Sawyer 1947 [3/]	Vollenweider 1968	Chapra & Tarapchak 1976	NAS + NAE[4/] 1973	Bennedorf 1979	Carlson 1977
Secchi Disk	-	<2.0	-	-	-	-	-	-
Chlorophyll a	>10.0	>10.0	-	-	>8.8	>10.0	-	>6.0
Total Phosphate	>0.040	>0.020	-	>0.020	-	-	-	-
Ortho phosphate	-	-	>0.010	>0.010	-	-	>0.010	-
Total Nitrogen	>0.90	-	-	-	-	-	-	
Inorganic Nitrogen	-	-	>0.30	>0.30	-	-	-	-

1/ Critical value = value above (or below) which eutrophic conditions can be expected in a lake.

2/ Secchi disk in m; chlorophyll a in μg/L; nutrient concentrations in mg N or P/L

3/ In Vollenweider (1968); p. 66.

4/ National Academy of Sciences and National Academy of Engineering, in Chapra and Tarapchak (1976), p. 1261.

Several absolute, quantitative or semi-quantitative trophic state indices have been proposed recently (Bortleson et al. 1974; Wisconsin Dept. of Natural Resources 1975; Uttormark and Wall 1975; Carlson 1977; Shannon and Brezonik 1972). Bortleson et al.(1974), Uttormark and Wall (1975), and the Wisconsin DNR (1975), based their indices on semi-quantitative ratings of several trophic state indicators. For example, Uttormark and Wall (1975) developed a lake condition index based on somewhat subjective numerical ratings in four categories (1) dissolved oxygen; (2) transparency; (3) fish kills; and (4) use impairment. Despite its simplicity and readily attainable data requirements, the index relies on subjective and nonquantitative parameters which limit its applicability for water quality management.

In their study of 55 lakes in north central Florida, Shannon and Brezonik (1972) used principal component analysis to develop a multivariate TSI. The resulting equation requires the following variables: Secchi disk transparency, specific conductivity, total organic nitrogen, total phosphorus, primary productivity, chlorophyll a, and Pearsall's cation ratio ((Na+K)/(Ca+Mg)). The advantage of this multivariate approach is that an erroneous measurement of a single variable may not lead to misclassification as with a univariate approach. However, although the Shannon and Brezonik data base was entirely Florida lakes, Lake Okeechobee was not included. Also, the specific conductivity for Lake Okeechobee is outside the range of values found in the Shannon and Brezonik data base; therefore, the Shannon and Brezonik TSI should not be applied to Lake Okeechobee.

Carlson (1977) based his TSI on a simple transformation of the Secchi disk transparency such that a transparency of 64 m has a TSI value of 0 and a transparency of 6.2 cm has a TSI value of 100. The index was developed so that a doubling, or halving, of the transparency results in a 10 unit change in the TSI value. Carlson then used regression analysis to relate transparency to total phosphorus concentration, and to chlorophyll _a_ concentration. A similar TSI based on total nitrogen concentration was developed by Kratzer (1979) from the primarily nitrogen limited Florida NES data base. The lesser of TSI (TP) and TSI (TN) should represent the limiting nutrient for any given lake and was averaged with the corresponding TSI (SD) and TSI (CHA) values to compute a TSI (AVG). This allows one to combine the physical response (SD), the biological response (CHA), and the limiting nutrient (either TP or TN). TSI (AVG) has several advantages for use on Lake Okeechobee, including its simplicity, small data requirements, objectivity, reliance on common and well understood trophic indicators, and its proven classification ability with the Florida NES lakes (Kratzer, 1979). Therefore, TSI (AVG) will be the trophic state index used to classify Lake Okeechobee along with the trophic state indicators and input-output models.

3. Nutrient Prediction Equations

The development of quantitative guidelines (management criteria) with regard to the eutrophication of lakes is dependent upon being able to adequately predict the nutrient concentrations in the lake from the nutrient loading rates and the lake's mean depth and water residence time. The nutrient concentrations in the lake are then related to the algal biomass in the lake (as measured by chlorophyll _a_), which is further related to water clarity (as measured by Secchi disk transparency). The equations used to predict nutrient concentrations are derived from the nutrient mass balance equations.

a. Phosphorus Equations

In its most general form the phosphorus mass balance can be expressed as (Reckhow 1978):

$$dP/dt = J - L_{out} - \sigma_p \ (J, L_{out}, (\overline{P})_1, \text{Ca, Fe, Al, pH, } O_2, \tau_\omega, \overline{z}, V, \text{ biological uptake,....}) \qquad (1)$$

where, dP/dt = change in P storage in lake, g P/yr

P = mass of phosphorus, g

J = P flux into lake, g P/yr

L_{out} = rate of P export from lake, g P/yr ($=\rho_\omega P$)

σ_p = P sedimentation rate coefficient, yr^{-1}

τ_ω = water residence time, yr ($=V/Q_{surface\ out}$)

ρ_ω = water renewal rate, yr^{-1} ($=1/\tau_\omega$)

Thus, the removal of phosphorus from a lake occurs through two pathways: (1) the outflow (L_{out}); and (2) sedimentation ($\sigma_p \ (J, L_{out}, (\overline{P})_1, \ldots.)$). The phosphorus sedimentation rate coefficient is actually a "catch-all" that accounts for all phosphorus losses other than those through the lake outlet, and changes in the total phosphorus content of the water. It is dependent on the influx and efflux of phosphorus, lake geomorphology and hydrology, the dissolved oxygen concentration and pH at the sediment-water interface, major cations that combine with phosphorus and transport it to or hold it in the sediments, and net macrophyte and fish uptake of phosphorus.

Vollenweider (1969) expressed the phosphorus mass balance in the following simplified form:

$$dP/dt = J - L_{out} - S \qquad (2)$$

where, S = rate of P sedimentation, g P/yr ($=\sigma_p$ P)

Thus, the rate of phosphorus deposition to the sediments is assumed to be proportional to the total mass of phosphorus in the lake. The mass balance model is thus a highly simplified and aggregated representation of the phosphorus balance for a lake. It treats the lake as a completely mixed reactor, and the basic time unit of the model is a year, thus eliminating complications arising from seasonal variations. The model lumps all external sources of phosphorus in one term, J (g P/yr), and it accounts for all phosphorus losses in two terms representing sedimentation and hydraulic loss via the outflow. Thus, the model describes the change in total phosphorus concentration in a lake (expressed as an annual average) as the difference between the source term and the two loss (sink) terms. It should be noted that the Vollenweider model considers only net sedimentation (i.e., the release of P from the sediments is not considered as an independent process).

Under steady-state conditions (time-invarying rates for all source and sink terms) the solution to Vollenweider's (1969) mass balance is:

$$dP/dt = 0 = J - L_{out} - S = J - \rho_\omega P - \sigma_p P$$

$$J = P(\rho_\omega + \sigma_p), \text{ so } P = J/(\rho_\omega + \sigma_p), \text{ or}$$

$$(\overline{P})_l = J/V(\rho_\omega + \sigma_p) = L_p/\bar{z}(\rho_\omega + \sigma_p) \qquad (3)$$

where $(\overline{P})_l$ = average total phosphorus concentration in lake, mg P/L

L_p = areal total phosphorus loading rate, g P/m^2-yr

V = lake volume, m^3

$\bar{z}$ = lake mean depth, m

Several equations have been proposed recently for predicting total phosphorus concentrations based on (3) using different estimates for σ_p (Vollenweider 1975, 1976; Dillon and Kirchner 1975; Chapra 1975; Jones and Bachmann 1976). Using equation (3) to define σ_p, Vollenweider (1975) found that σ_p could be estimated by,

$$\sigma_p = \ln 5.5 = 0.85 \ln \bar{z} \quad (r = 0.79), \text{ or } \sigma_p \cong 10/\bar{z}$$

Substituting the above value for σ_p into (3) produces Vollenweider's (1975) total phosphorus predictive equation:

$$TP = L_p / \bar{z} \, (\rho_\omega + 10/\bar{z}) = L_p/(10 + q_s) \qquad (4).$$

In more recent work, Vollenweider (1976) proposed a new estimate for σ_p, $\sigma_p = \sqrt{\tau_\omega} / \tau_\omega$, which, upon substitution into (3) produced the following predictive equation:

$$TP = L_p/q_s \, (1 + \sqrt{\tau_\omega}) \qquad (5).$$

Because of the difficulties in directly measuring σ_p (and the fact that it really represents a composite sink coefficient), Dillon and Rigler (1975) proposed a model using a new variable, R_{exp}, the phosphorus retention coefficient. R_{exp} is the fraction of influent phosphorus retained in the lake on an annual basis and can be expressed as:

$$R_{exp} = (P_{in} - P_{out}0 / P_{in} \qquad (6)$$

where, $P_{out} = Q_{out} (\bar{P})_o$

$(\bar{P})_o$ = average outflow phosphorus concentration, mg P/L

Q_{out} = surface outflow rate, m^3/sec

Since $P_{in} = L_pA$ and $Q_{out}/A \sim q_s$ (assuming $Q_{out} = Q_{in}$),

$$R_{exp} = (L_p A - Q_{out} (\bar{P})_o) / L_p A, \text{ and}$$

$$R_{exp} = (L_p - q_s (\bar{P})_o) / L_p = ((L_p/q_s) - (\bar{P})_o) / L_p/q_s) .$$

It was assumed that $(\bar{P})_o = (\bar{P})_1$. Reckhow (1979) has shown this assumption to be strongly supported by available data. Thus, the Dillon and Rigler (1975) total phosphorus predictive equation becomes:

$$R_{exp} L_p/q_s = L_p / q_s - (\bar{P})_1, \text{ or} \tag{7}$$

$$TP = (\bar{P})_1 = L_p (1 - R_{exp}) / q_s$$

In its original form this equation was proposed to be used with a predictive equation for R_{exp} based on a double regression of R_{exp} versus q_s derived by Kirchner and Dillon (1975). However, predictive equations for R_{exp} were found to be unsuccessful for Florida lakes (Hand 1975, Kratzer 1979).

The Vollenweider (1975, 1976) and the Dillon and Rigler (1975) predictive equations were modified to better fit the Florida NES data base by Kratzer (1979). The Florida NES data base represents the best available nutrient budgets for a large group of Florida lakes. All of the predictive equations were normalized by log transformations of both $(\bar{P})_1$ and the original prediction parameters (i.e., L_p, q_s, R_{exp}). The original equations were then modified by least squares regression of the original model and the Florida NES $(\bar{P})_1$ data in order to improve the predictive ability of the equations as measured by the r^2 value and the coefficient of variation (C.V.).
The degree to which these models can be modified to better fit Florida lakes is partially a function of the accuracy of the nutrient budgets. Figure 9-1 presents a prediction of the acceptability of the NES phosphorus budgets. Twenty-two of the 29 Florida NES lakes fell

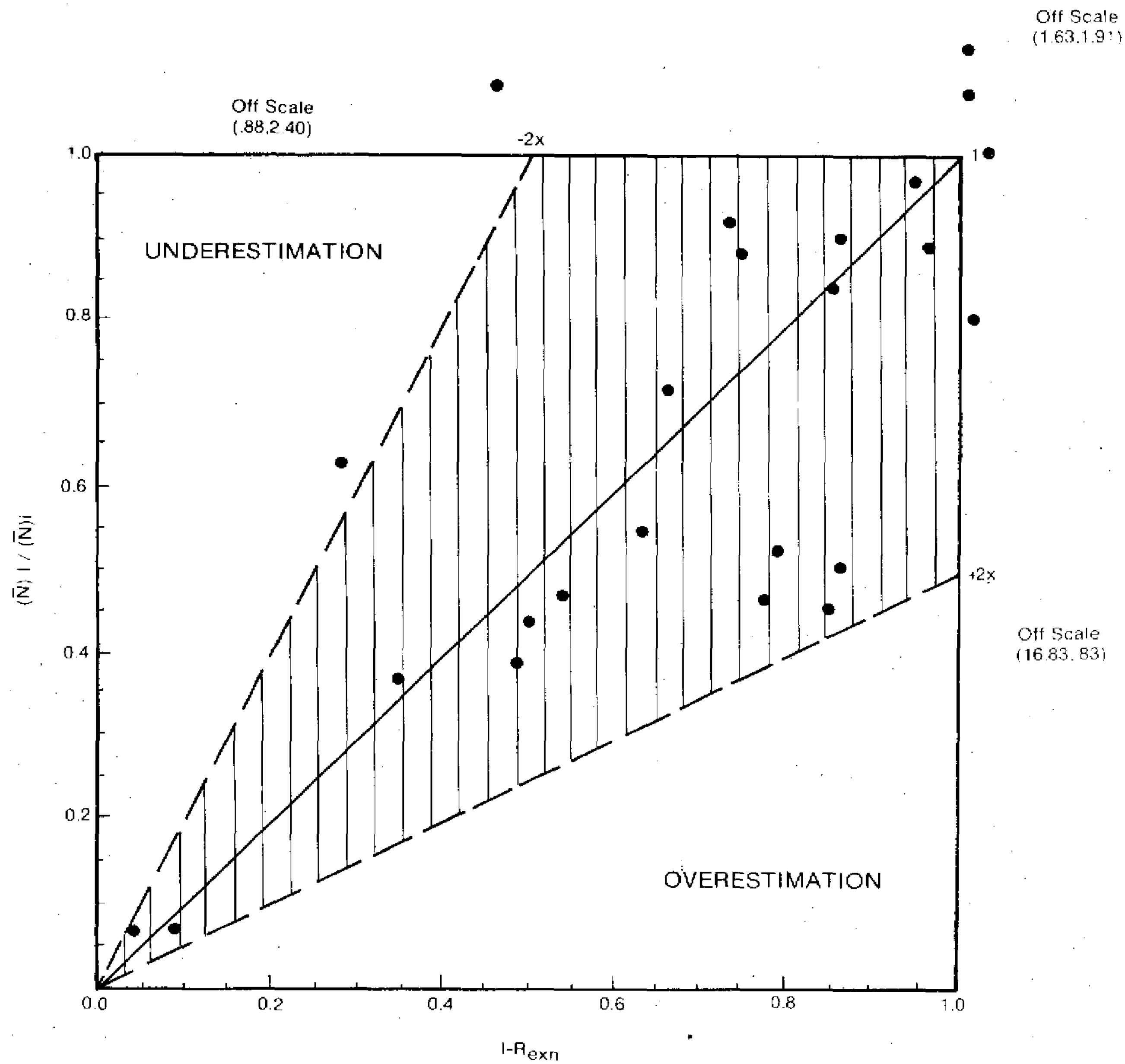


Figure 9-1 PREDICTION OF NITROGEN BUDGET ACCEPTABILITY. DATA POINTS REPRESENT FLORIDA NES LAKES FROM KRATZER (1979)

within the acceptable limits as described by Rast and Lee (1971), indicating that as a group, the NES phosphorus loading estimates appear to be of a reasonable nature. Table 9-3 presents the modified predictive equations along with the corresponding r^2 value and the coefficient of variation. The r^2 value for the three modified phosphorus predictive equations were all high, ranging from 0.79 to 0.91. The resulting modified equations for the Vollenweider (1975, 1976) and the Dillon and Rigler (1975) equations respectively are:

$$TP - 0.843 \left(L_p / \left(10 + q_s\right) \right)^{0.795} \qquad (8)$$

$$TP = 0.682 \left(L_p / \left(q_s \left(1 + \sqrt{\tau_\omega}\right) \right) \right)^{0.934}, \text{ and} \qquad (9)$$

$$TP = 0.748 \left(L_p \left(1 - R_{exp}\right) / q_s \right)^{0.862} \qquad (10)$$

b. Nitrogen Equations

The nitrogen mass balance in a lake can be expressed by the following equation:

$$dN/dt = N_{in} - N_{out} + N_{fix} - N_{sed} - N_{den} \qquad (11)$$

where, dN/dt = change in N storage in lake, g N/yr

N = mass of nitrogen, g

N_{in} = N flux into lake, g N/yr

N_{out} = N efflux through outflow, g N/yr ($=\rho_\omega N$)

N_{fix} = rate of N fixation, g N/yr

N_{sed} = rate of sedimentation, g N/yr

N_{den} = rate of denitrification, g N/yr

In general, N_{fix} and N_{den} are not determined, and thus they are considered as part of a composite net loss coefficient, σ_N. The

TABLE 9-3. TOTAL PHOSPHORUS AND TOTAL NITROGEN PREDICTIVE EQUATIONS

Predictive Equation	Original Equation: Investigator	Original Equation: Eqn. No. in text.	Modified Equation: n 3/	Modified Equation: r^2	Modified Equation: c.v.
Phosphorus: 1/					
$TP = 0.843\ [L_p/(10 + q_s)\ ]^{0.795}$	Vollenweider (1975)	4	28	0.84	24.0
$TP = 0.748\ [L_p(1 - R_{exp})/q_s]^{0.862}$	Dillon and Rigler (1975)	7	25	0.91	14.8
$TP = 0.682\ [L_p/(q_s\ (1 + \sqrt{\tau_\omega})\ )\ ]^{0.934}$	Vollenweider (1976)	5	29	0.79	31.3
Nitrogen: 2/	Original Basis for Equation		n	r^2	c.v.
$TN = 2.85\ [L_N/(10 + q_s)]^{0.216}$	Vollenweider (1975)		27	0.30	
$TN = 0.899\ [L_N\ (1 - R_{exn})/q_s)^{0.976}$	Dillon and Rigler (1975)		24	0.77	47.6
$TN = 1.29\ [L_N/q_s\ (1 + \sqrt{\tau_\omega})\ )\ ]^{0.858}$	Vollenweider (1976)		27	0.55	67.9

1/ For each predictive phosphorus equation, TP = a [original equation]^b where a and b are constants determined by the regression.

2/ For each nitrogen predictive equation the original equation was a total phosphorus predictive equation with L_p and R_{exp} replaced by L_N and R_{exn}. Thus, TN = a [transformed original equation]^b where a and b are constants determined by regression.

3/ N is the number of NES Florida lakes included in the regression. (From Kratzer 1979) loss term also includes sedimentation and will be considered as a function of the total mass of nitrogen in the lake, $_{N}N$. Thus, analogous to the mass balance for phosphorus, the mass balance for nitrogen can be simplified to:

$$dN/dt = N_{in} - \rho_{\omega} N - \sigma_N N \qquad (12)$$

which, at steady-state is:

$$dN/dt = 0 = N_{in} - N(\rho_{\omega} + \sigma_N)$$

$$\text{or, } N_{in} = N(\rho_{\omega} + \sigma_N), \quad N = N_{in}/(\rho_{\omega} + \sigma_N)$$

$$\text{or, } (\overline{N})_l = N_{in}/V(\rho_{\omega} + \sigma_N) = L_N/\bar{z}(\rho_{\omega} + \sigma_N) \qquad (13)$$

where, $(\overline{N})_l$ = average total nitrogen concentration in lake, mg N/L

L_N = areal total nitrogen loading rate, g N/m^2-yr

Similar to σ_p, σ_N represents the portions of the nitrogen budget which are not measured. However, no suitable estimates of σ_N were found by Kratzer (1979).

The equations used to predict the total nitrogen concentration in this chapter were based on the Vollenweider (1975, 1976) and the Dillon and Rigler (1975) phosphorus equations (Kratzer 1979). The equations take the form of the original phosphorus equations with L_N and R_{exn} substituted for L_p and R_{exp}, and were modified to better fit the Florida NES data, based in the same way as the phosphorus equations were. The acceptability of the NES nitrogen budgets is displayed in Figure 9-2. As was the case of the NES phosphorus loading, the nitrogen loadings also appear to be reasonable (23 out of 27 lakes fell within the acceptable limits). The resulting modified Vollenweider (1975, 1976) and Dillon and Rigler (1975) nitrogen equations are, respectively:

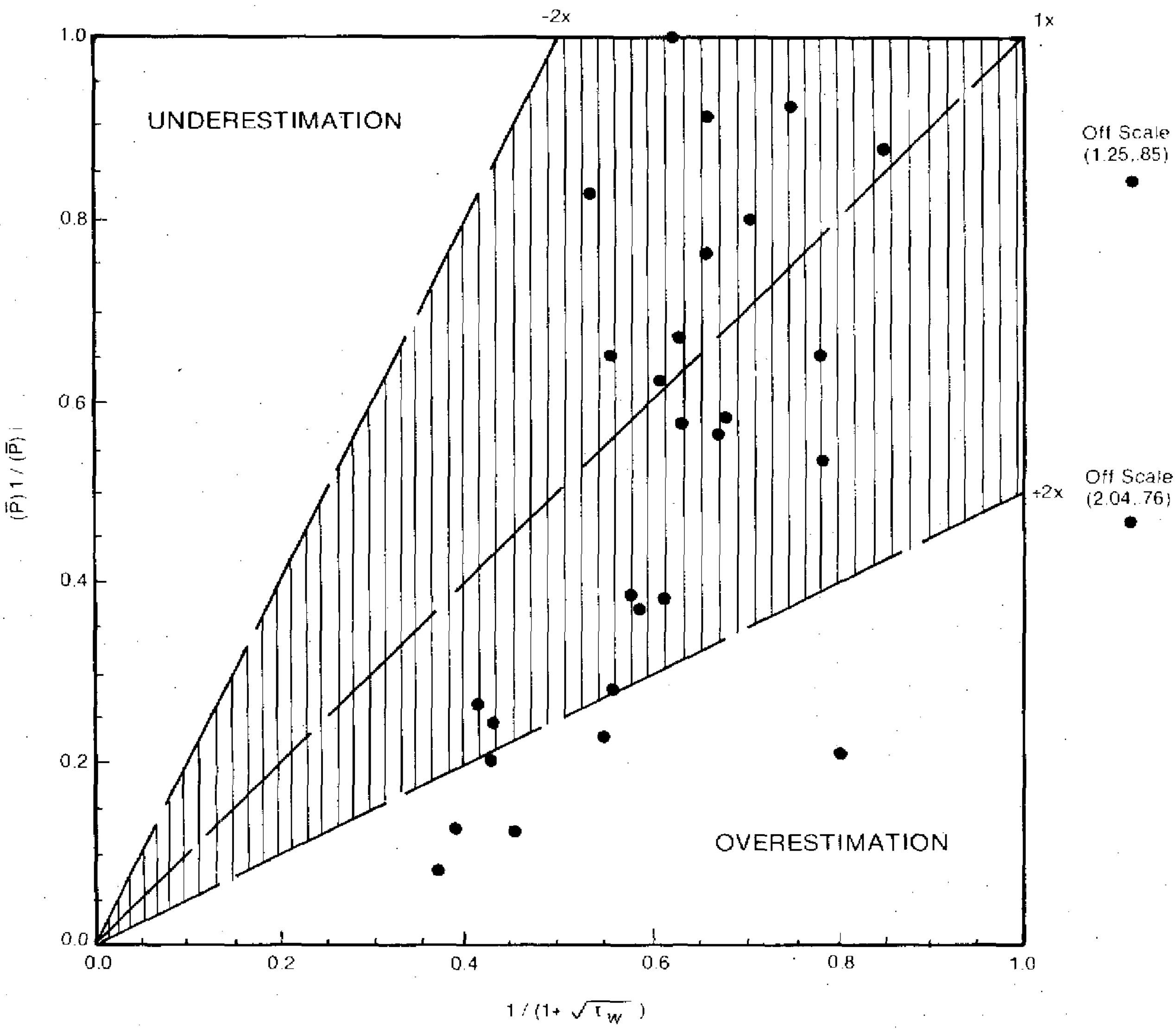


Figure 9-2 PREDICTION OF PHOSPHORUS BUDGET ACCEPTABILITY FROM RAST AND LEE (1978). DATA POINTS REPRESENT FLORIDA NES LAKES FROM KRATZER (1979)

$$TN = 2.85 \ (L_N / (10 + q_s))^{0.216} \qquad (14)$$

$$TN = 1.29 \ (L_N / (q_s (L + \sqrt{\tau_\omega})))^{0.858} \qquad (15)$$

$$TN = 0.899 \ (L_N (1 - R_{exn}) / q_s)^{0.976} \qquad (16)$$

The r^2 values for the nitrogen predictive equations were lower than for the phosphorus predictive equations, ranging between 0.30 and 0.77 (Table 9-3).

4. Nutrient Loading Models

Since the first nutrient loading model was published by Vollenweider (1968) more than a decade ago, numerous workers have modified the basic model or developed new models in order to derive nutrient loading rate criteria for water quality management purposes (Vollenweider 1975, 1976; Shannon and Brezonik 1972; Dillon 1975). Also, many statistical and empirical models have been developed from limited data bases (geographically and lake types). For the purposes of this report, only the theoretical and semi-theoretical models mentioned above will be considered, along with the corresponding modifications for Florida lakes (Kratzer 1979).

There are two critical levels (excessive and permissible) associated with nutrient loading models. The excessive level represents the loading rate above which a lake has a high probability of proceeding to a eutrophic/hypereutrophic (high nutrient-high productivity) state. The permissible level represents the loading rate below which a lake has a high probability of maintaining an oligotrophic (low nutrient-low productivity) state.

a. Phosphorus Models

The initial Vollenweider (1968) model was derived from well-documented inverse relationships between mean depth and various measures of water quality. Based on available data and his subjective judgment on lake quality, Vollenweider estimated critical phosphorus loading levels as a function of mean depth using the following equation:

$$L_c\ (P)_{excessive} = 0.05\ \bar{z}^{\,0.6} \qquad (17)$$

The graphical representation of the Vollenweider (1968) model is shown in Figure 9-3.

Shannon and Brezonik (1972) developed a model identical in form to the Vollenweider (1968) model, except with different phosphorus critical loading levels (Figure 9-4). Regression analysis between nutrient loading levels and the Shannon and Brezonik (1972) TSI was used to determine the critical phosphorus loads. The excessive volumetric phosphorus loading rate for the model is:

$$L_c\ (P)_{excessive} = 0.22\ g/m^3 - yr \qquad (18)$$

Although these early models provided useful information and insight into the relationship between nutrient loading rates and trophic state, it was later discovered that a lake's response to loadings also depended on the water residence time and hydraulic loading rate of a lake (Vollenweider 1975, 1976; Dillon 1975). Vollenweider (1975) hypothesized there is to be two basic hydraulic zones of response to phosphorus loading: (1) for low hydraulic loading rates (q_s) the critical volumetric phosphorus loading rate is proportional to the phosphorus sedimentation rate coefficient (σ_p) only ($L_c(P) \sim$ constant), and (2) for high

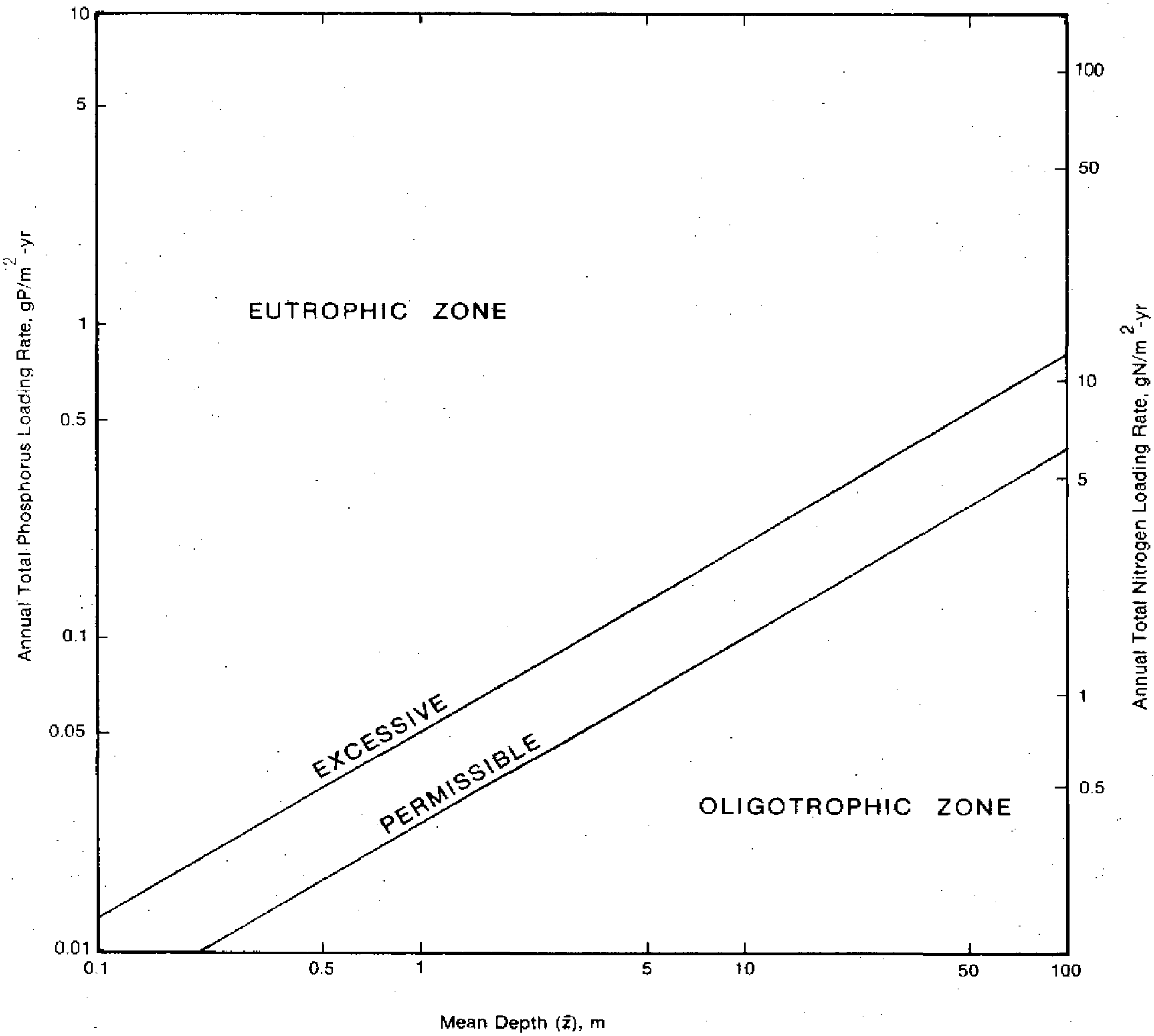


Figure 9-3 VOLLENWEIDER'S PHOSPHORUS AND NITROGEN LOADING CRITERION (1968), L VERSUS $\bar{z}$

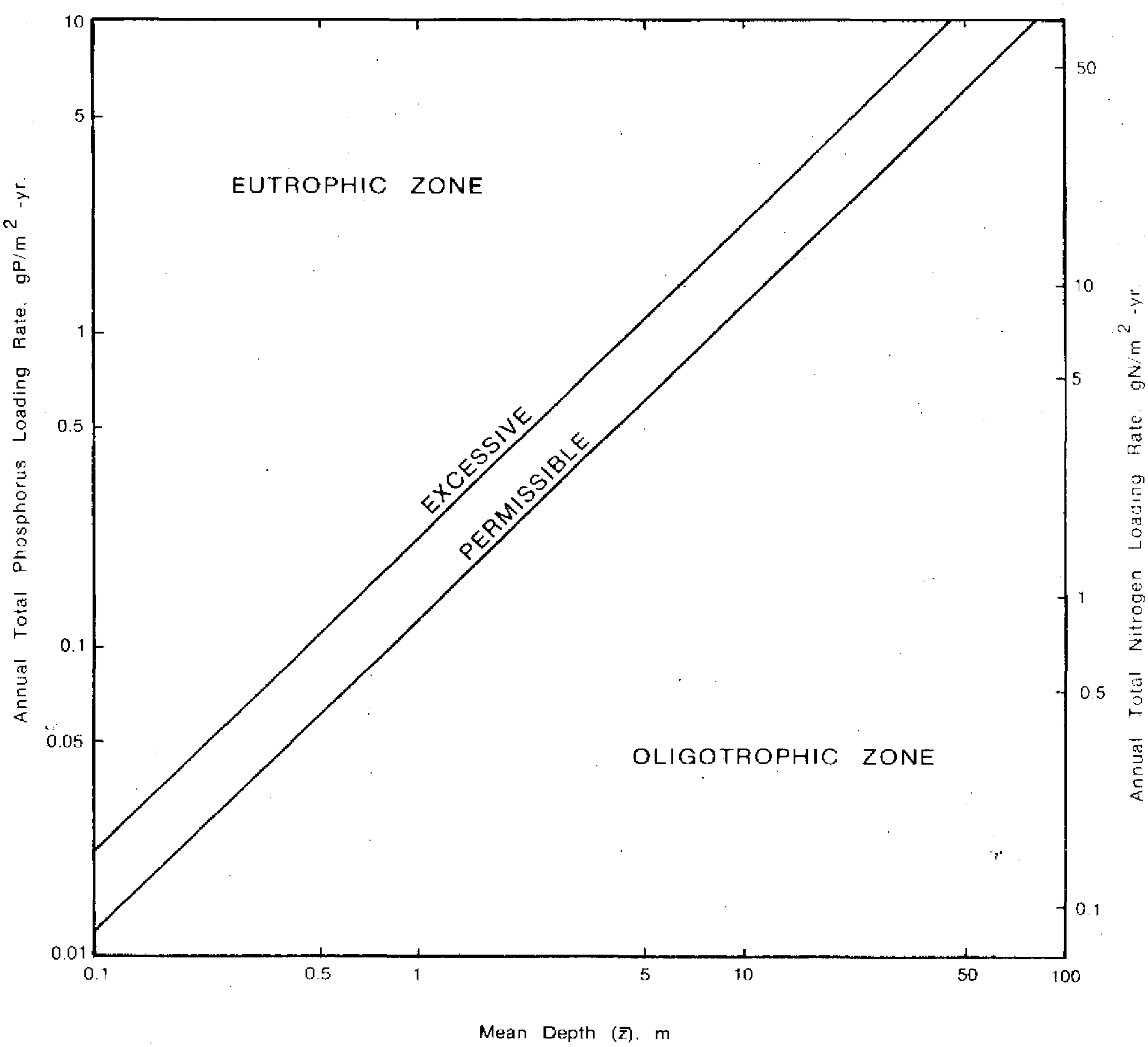


FIGURE 4. SHANNON AND BREZONIK'S PHOSPHORUS AND NITROGEN VOLUMETRIC LOADING CRITERIA (1972), L VERSUS $\bar{z}$

hydraulic loading rates the critical volumetric phosphorus loading rate is proportional to the hydraulic flushing rate (ρ_{ω}) only ($L_c(P) \sim$ constant . q_s). This reasoning produced Vollenweider's (1975) phosphorus predictive equation (4), which is the basis of his critical phosphorus loading rates (Figure 9-5) using a critical total phosphorus concentration of 0.020 mg P/L (Table 9-2). Thus, the equation for Vollenweider's (1975) model is:

$$L_c(P) \text{ excessive} = 0.20 + 0.020\, q_s \qquad (19)$$

Dillon (1975) also recognized the importance of the hydraulic loading rate by proposing a phosphorus loading model based on Dillon and Rigler's (1975) phosphorus predictive equation (7). Although Dillon proposed the use of Kirchner and Dillon's (1975) R_p predictive equation in his model, the measured R_{exp} will be used in this study due to poor predictions for R_p from Florida data bases. Dillon's model of L_p $(1-R_p)$ versus $\bar{z}$ delineates trophic state according to a line representing a critical predicted total phosphorus concentration of 0.020 mg P/L (Figure 9-6) according to the following equation:

$$L_c\,(P)_{excessive} = 0.020\, q_s \,/\, (1-R_{exp}) \qquad (20)$$

In Vollenweider's (1976) most recent model (Figure 9-7) he considers the effects of both water residence time and the hydraulic loading rate on trophic state determination. His resulting critical phosphorus loading criteria consider a critical total phosphorus value of 0.020 mg P/L in his predictive equation (5). This produces the following equation describing the excessive loading rate:

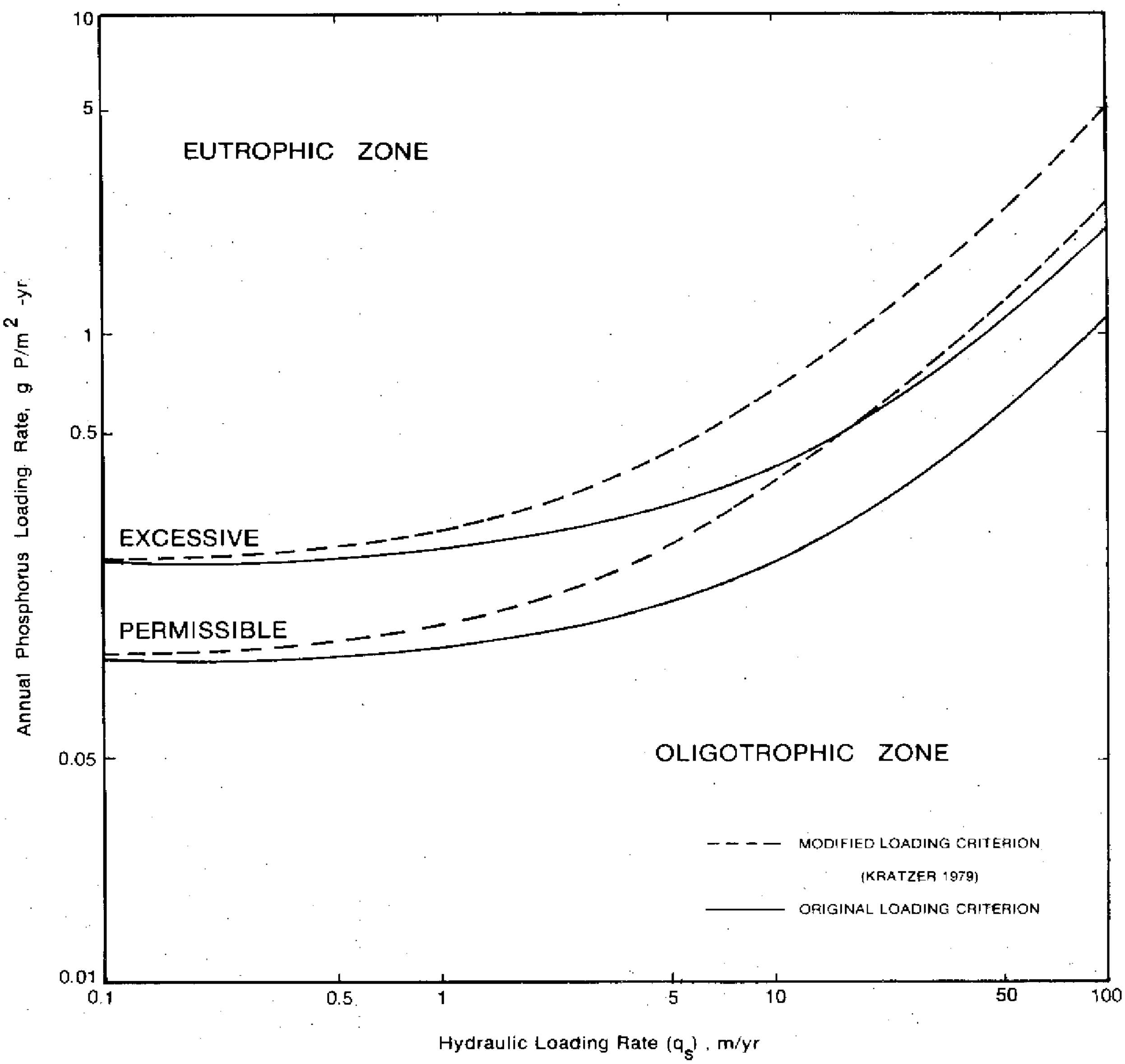
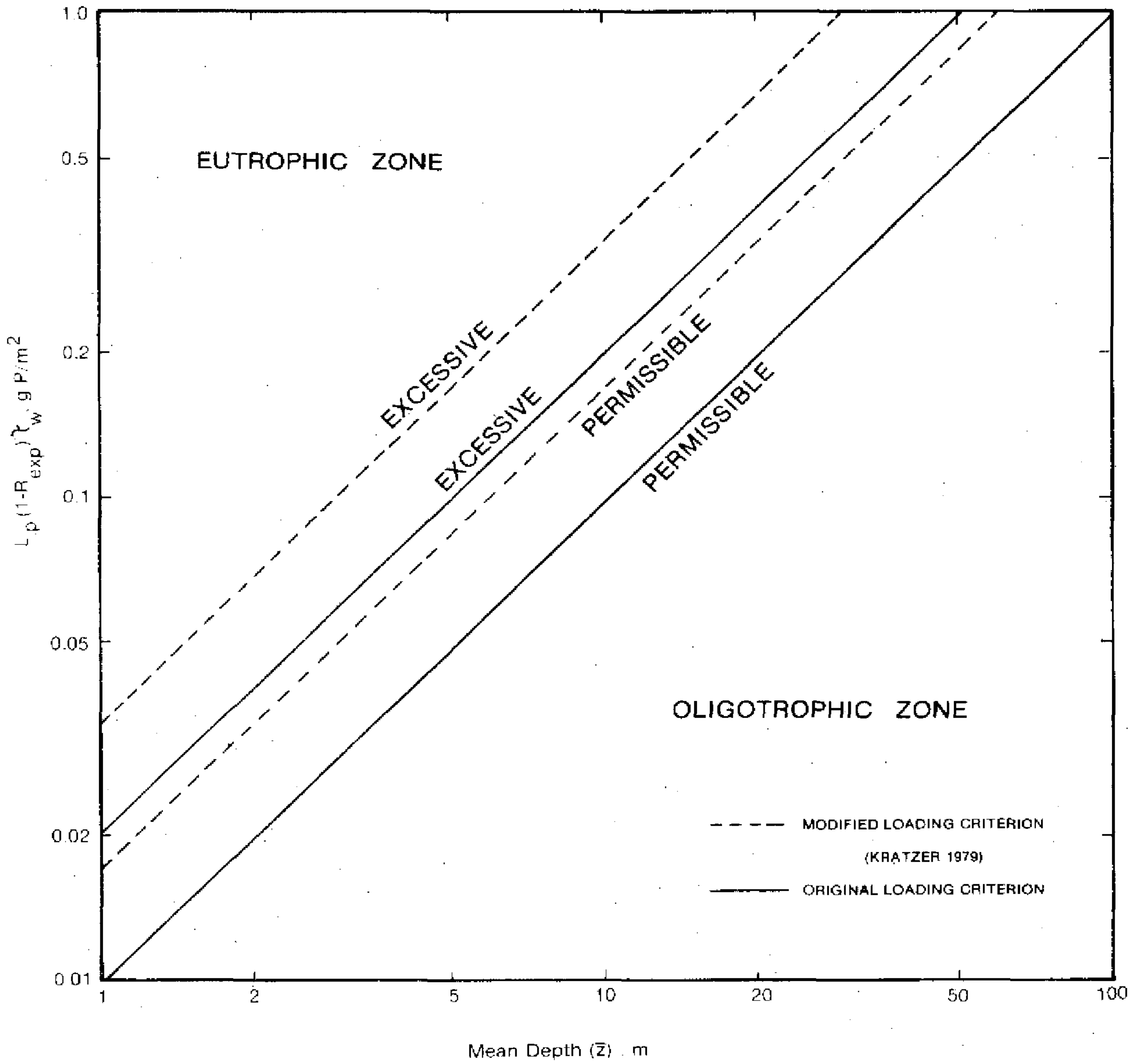
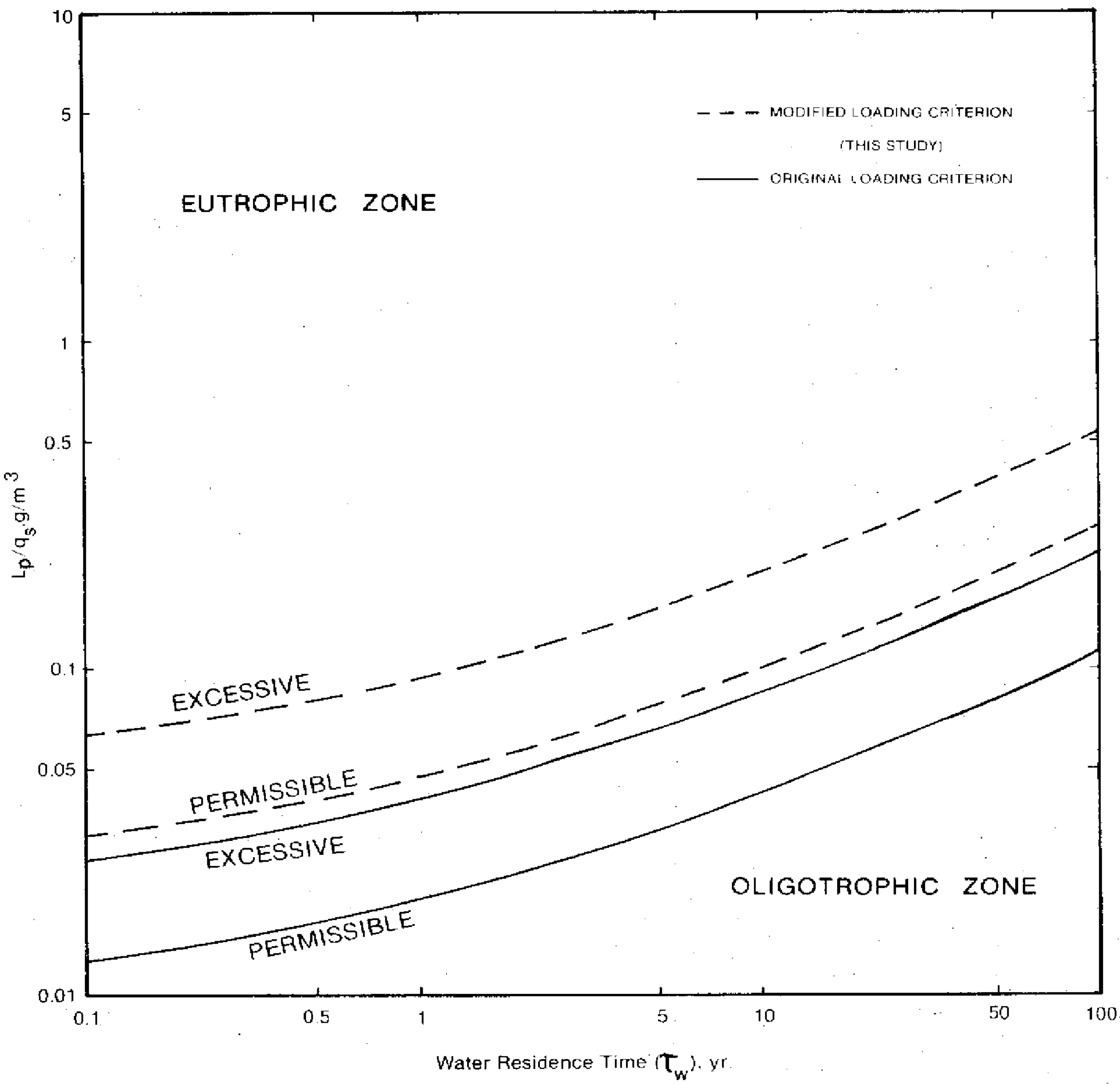


Figure 9-5 CRITICAL LOADING PLOT FOR PHOSPHORUS INPUT TO LAKES ACCORDING TO VOLLENWEIDER (1975)



DILLON (1975) TROPHIC STATE PREDICTIVE MODEL.



CRITICAL LOADING PLOT FOR PHOSPHORUS INPUT TO LAKES ACCORDING TO VOLLENWEIDER (1976).

$$L_c(P)_{excessive} = 0.020\ q_s\ (1 + \sqrt{\tau_\omega}\ ) \quad (21)$$

The Vollenweider (1975) and Dillon (1975) models were modified to better fit the Florida NES data base (Kratzer 1979) because Florida lakes appear to be able to withstand higher total phosphorus concentrations (and correspondingly higher P loading rates) before reaching the same level of algal biomass as would be found in north temperate lakes. This phenomena is illustrated in Figure 9-8. The increased allowable loadings for the Vollenweider (1975) and Dillon (1975) models are based on regressions of $(\overline{P})_1$ and Chl-a predictive equati ns versus critical values 0.040 mg P/L and 10 g/L, respectively. This procedure was also followed in this study to produce a modified loading criteria for the Vollenweider (1976) model. The resulting modified loading criteria for the Vollenweider (1975), Dillon (1975), and Vollenweider (1976) models (see Figures 9-5, 9-6, and 9-7, respectively) are:

$$L_c\ (P)_{excessive} = 0.20 + 0.050\ q_s \quad (22)$$

$$L_c\ (P)_{excessive} = 0.034\ q_s/\ (1-R_{exp}) \quad (23)$$

$$L_c\ (P)_{excessive} = 0.048\ q_s\ (1 + \sqrt{\tau_\omega} \quad (24)$$

For all the models discussed above, except the Shannon and Brezonik (1972) model, the permissible loading rate (delineating oligotrophic/mesotrophic states) is half of the excessive criteria. For Shannon and Brezonik the permissible and excessive loads were based on TSI values. The critical phosphorus loading

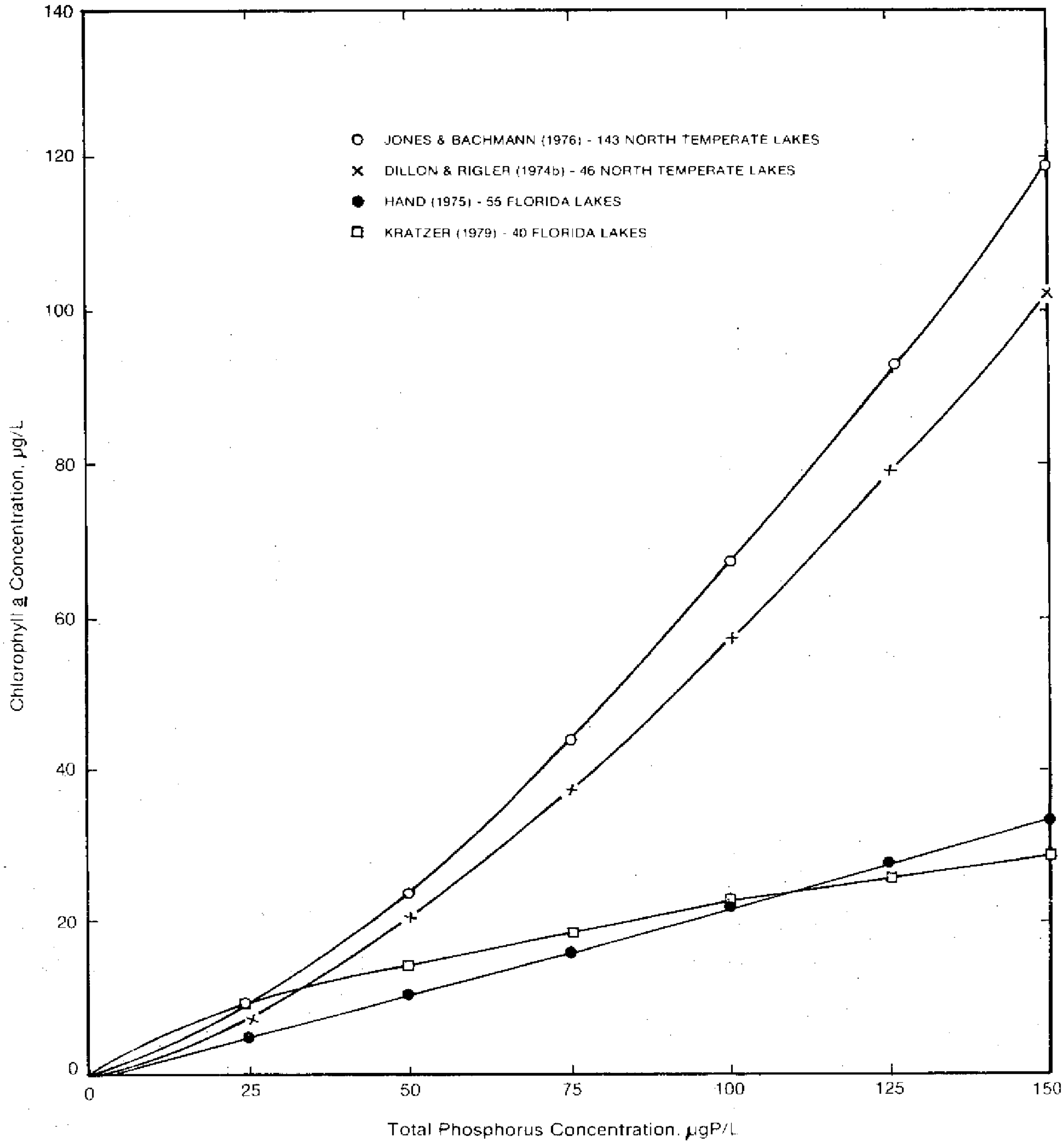


Figure 9-8 **COMPARISON OF CHLOROPHYLL A CONCENTRATIONS AS A FUNCTION OF TOTAL PHOSPHORUS CONCENTRATION BETWEEN NORTH TEMPERATE LAKES AND FLORIDA LAKES**

equations are summarized in Table 9-4.

b. Nitrogen Models

The nitrogen version of the Vollenweider (1968) model is derived from the phosphorus criteria using an assumed total N/ total P ratio of 15 by weight. Thus, the critical nitrogen loading equation for the model represented in Figure 9-3 is:

$$L_c\ (N)_{excessive} = 0.750\ \bar{z}^{0.6} \qquad (25)$$

Similarly, Shannon and Brezonik (1972) assumed a 15:1 molar ratio (~7.2:1 by weight) for total N/total P to devise their critical nitrogen loading criteria (Figure 9-5):

$$L_c\ (N)_{excessive} = 1.5\ g/m^3\text{-}yr \qquad (26)$$

Nitrogen predictive equations were developed from the Vollenweider (1975), Dillon (1975), and Vollenweider (1976) phosphorus models by substituting L_N and R_{exn} for L_p and R_{exp} in the phosphorus predictive equations, and regressing these equations versus the total nitrogen concentrations for the Florida NES data base (equations 14 - 16). The critical loading rates for the modified Dillon (1975) and Vollenweider (1976) nitrogen models are based directly on these predictive equations with a critical nitrogen concentration of 0.90 mg N/L. For the modified Vollenweider (1975) nitrogen model, the critical loading rate is based on a regression of L_N/q_s versus Chl-a for the Florida NES lakes, considering a critical Chl-a value of 10 μg/L. The resulting loading criteria for the modified Vollenweider (1975), Dillon (1975), and Vollenweider (1976) nitrogen models (Figures 9-9, 9-10 and 9-11, respectively) are:

TABLE 9-4. CRITICAL EQUATIONS FOR NUTRIENT LOADING MODELS

Model	Phosphorus Equations	Nitrogen Equations
1. Vollenweider (1968)	$L_c(P)_{exc.} = 0.050\ \bar{z}^{0.6}$	$L_c(N)_{exc.} = 0.750\ \bar{z}^{0.6}$
	$L_c(P)_{perm.} = 0.025\ \bar{z}^{0.6}$	$L_c(N)_{perm.} = 0.375\ \bar{z}^{0.6}$
2. Shannon & Brezonik (1972)	$Lc(P)_{exc.} = 0.22$ g/m^3-yr	$L_c(N)_{exc.} = 1.5$ g/m^3-yr
	$L_c(P)_{perm.} = 0.12$ g/m^3-yr	$L_c(N)_{perm.} = 0.86$ g/m^3-yr
3. Vollenweider (1975)	$L_c(P)_{exc.} = 0.20 + 0.020\ q_s$	
	$L_c(P)_{perm.} = 0.10 + 0.010\ q_s$	
4. Modified Vollenweider (1975) (Kratzer 1979)	$L_c(P)_{exc.} = 0.20 + 0.050\ q_s$	$L_c(N)_{exc.} = 3.0 + 1.10\ q_s$
	$L_c(P)_{perm.} = 0.10 + 0.025\ q_s$	$L_c(N)_{perm.} = 1.5 + 0.55\ q_s$
5. Dillon (1975)	$L_c(P)_{exc.} = 0.020\ q_s/(1-R_p)$	
	$L_c(P)_{perm.} = 0.010\ q_s/(L-R_p)$	
6. Modified Dillon 1975) (Kratzer 1979)	$L_c(P)_{exc.} = 0.034\ q_s/(1-R_p)$	$L_c(N)_{exc.} = q_s/(1-R_N)$
	$L_c(P)_{perm.} = 0.017\ q_s/(1-R_p)$	$L_c(N)_{perm.} = 0.5\ q_s/(1-R_N)$
7. Vollenweider (1976)	$L_c(P)_{exc.} = 0.020\ q_s(1 + \sqrt{\tau_\omega})$	
	$L_c(P)_{perm.} = 0.010\ q_s\ (1 + \sqrt{\tau_\omega})$	
8. Modified Vollenweider (1976)	$L_c(P)_{exc.} = 0.048\ q_s(1 + \sqrt{\tau_\omega})$	$L_c(N)_{exc.} = 0.66\ q_s(1 + \sqrt{\tau_\omega})$
	$L_c(P)_{perm.} = 0.024\ q_s\ (1+ \sqrt{\tau_\omega})$	$L_c(N)_{perm.} = 0.33\ q_s\ (1 + \sqrt{\tau_\omega})$

NOTE: exc. = excessive
perm. = permissible

Vollenweider (1975) model classified the lake correctly six of the seven years based upon phosphorus; however, it classified the lake correctly for only one year based upon nitrogen. The Shannon and Brezonik model (1972) correctly classified the lake for each year based upon nitrogen; however, it did not correctly classify the lake for any of the years based upon phosphorus. The modified Dillon (1975) model correctly classified the lake 50 percent of the time based upon both phosphorus and nitrogen. The Vollenweider (1968) and Vollenweider (1976) models were the least accurate in classifying the lake. Therefore, based upon the trophic state classifications, the modified Vollenweider (1976) model appears to be the most applicable model for Lake Okeechobee.

The second criterion in evaluating the applicability of the eight models to Lake Okeechobee involves the data base on which the models were developed. Table 9-10 presents the eight models, along with the general geographic region in which the model development lakes were located. The Vollenweider (1968), Vollenweider (1975), Dillon (1975), and Vollenweider (1976) models were developed for temperate lakes and, therefore, are probably the least applicable to Lake Okeechobee. The Shannon and Brezonik (1972) model was developed using a data base consisting of lakes located in Florida; however, Lake Okeechobee was not included among the lakes. The modified models of Vollenweider (1975), Dillon (1975), and Vollenweider (1976) were developed from a data base of Florida lakes which included Lake Okeechobee. Based upon the most pertinent data base, it would appear that one of the latter three models (modified Dillon 1975 or modified Vollenweider 1975, 1976) would be the most applicable to Lake Okeechobee

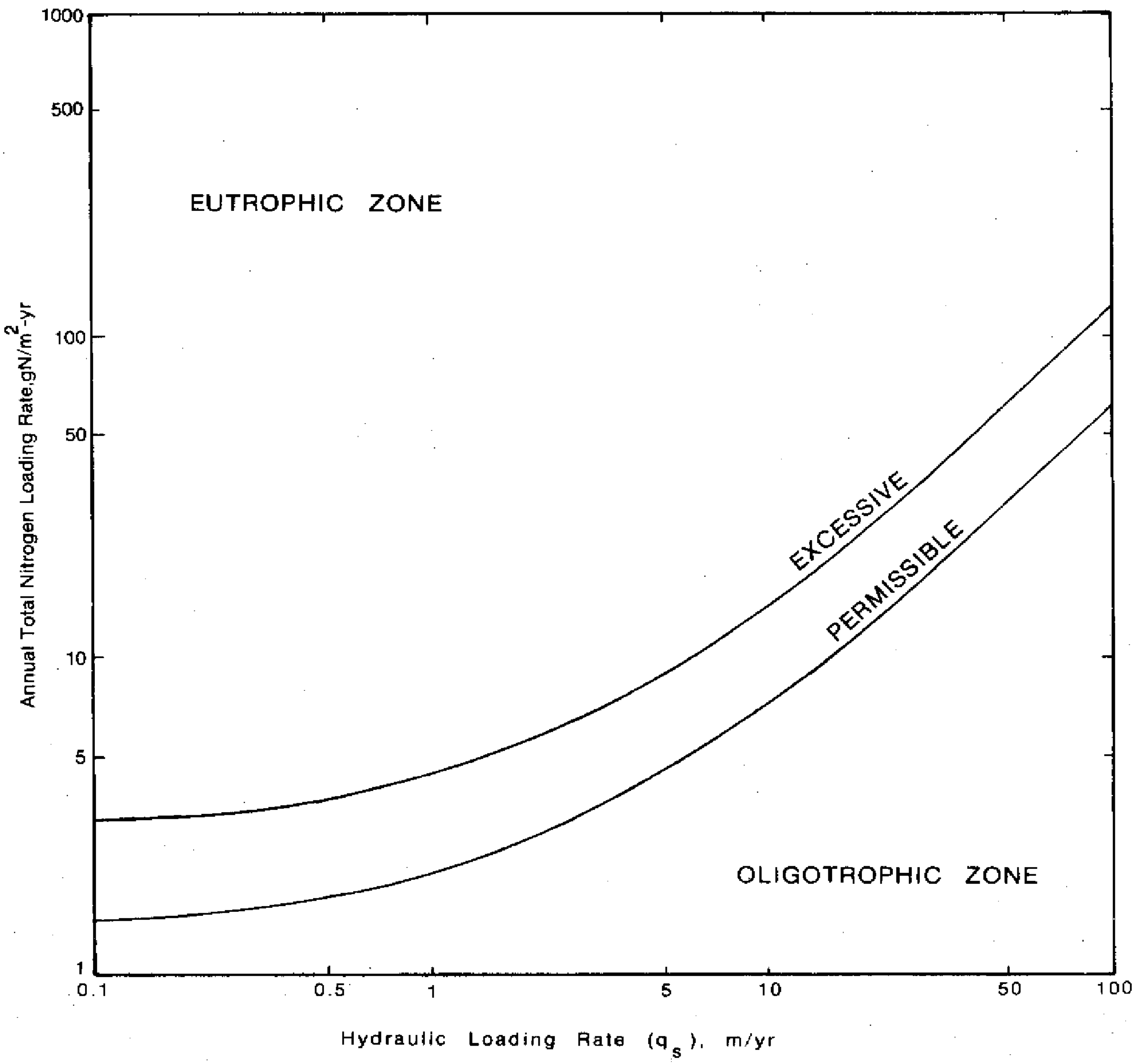
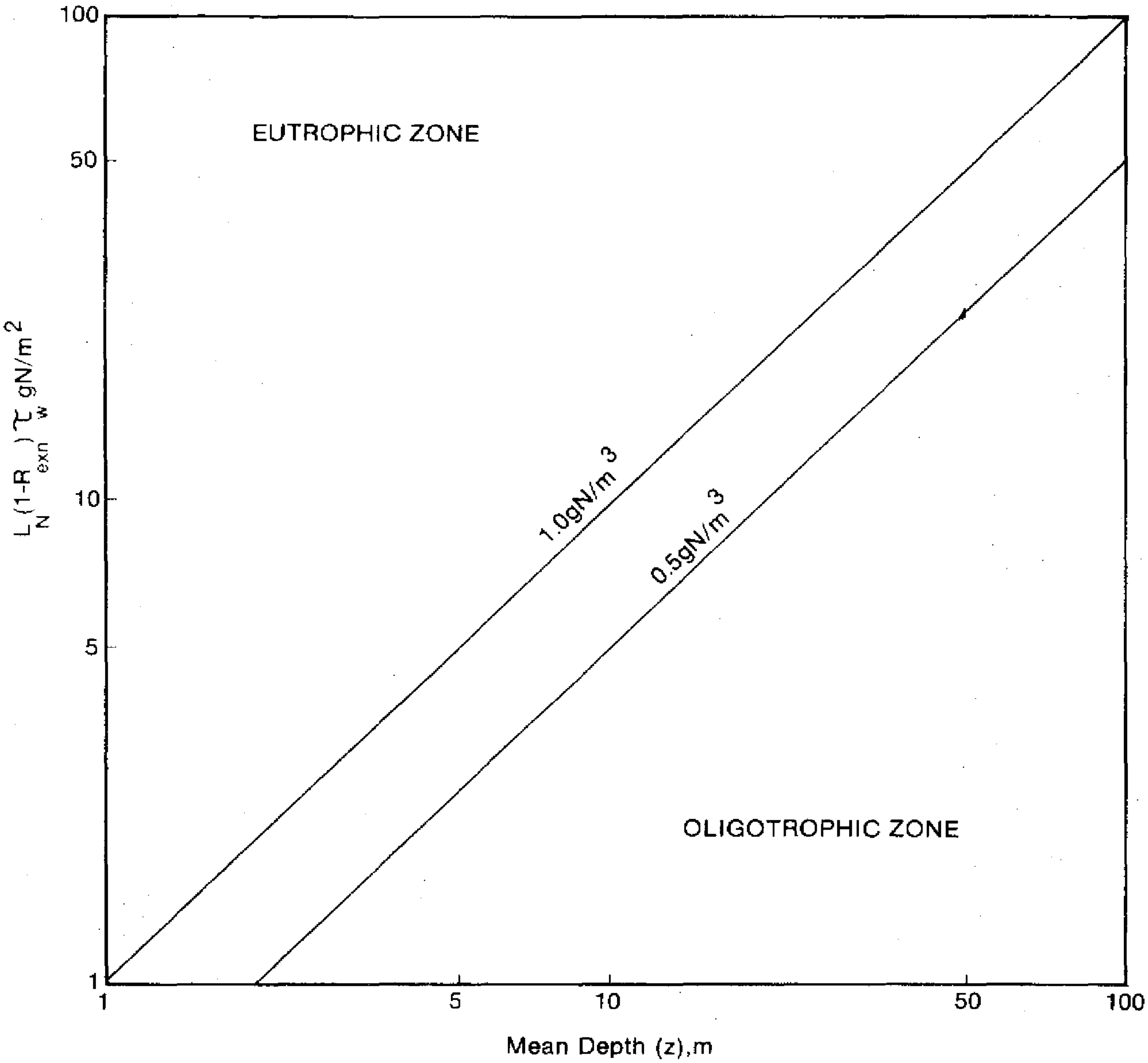
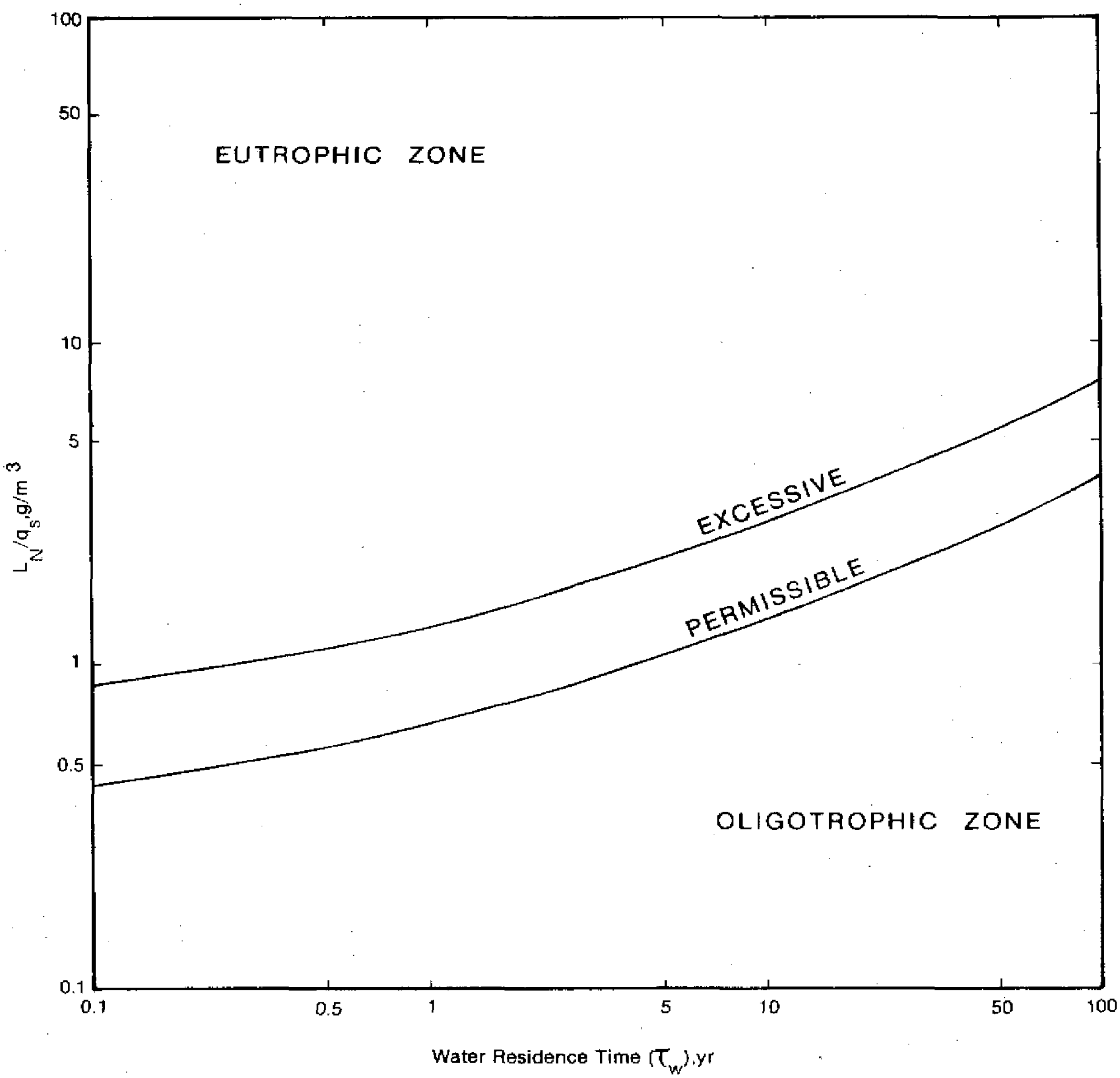


Figure 9-9 CRITICAL LOADING PLOT FOR NITROGEN ACCORDING TO THE MODIFIED VOLLENWEIDER (1975) MODEL.



CRITICAL LOADING PLOT FOR NITROGEN ACCORDING TO THE MODIFIED DILLON (1975) MODEL.



CRITICAL LOADING PLOT FOR NITROGEN ACCORDING TO THE MODIFIED VOLLENWEIDER (1976) MODEL.

$$L_c\ (N)_{excessive} = 3.0 + 1.10\ q_s \tag{27}$$

$$L_c\ (N)_{excessive} = q_s / (1-R_{exn}) \tag{28}$$

$$L_c\ (N)_{excessive} = 0.66\ q_s\ (1 + \sqrt{\tau_\omega}) \tag{29}$$

As with the phosphorus models, all the above nitrogen models (except Shannon and Brezonik) consider the permissible loading rate to be half the excessive rate. For the Shannon and Brezonik model, the excessive and permissible rates are based on TSI values. The critical nitrogen loading equations are summarized in Table 9-4.

5. Trophic State Probability Analysis

Uncertainty is present in all the trophic state predictive equations, and the loading models based on the equations. In fact, uncertainty is present in most water quality assessments, simply because sampling is not continuous through time and space. All models are by definition simplifications of reality and are, therefore, imprecise. The uncertainty associated with model predictions can be used to weigh the value of the predictions. This uncertainty can be expressed in terms of probability. Reckhow (1978) combined the uncertainty in nutrient loading with the uncertainty in a model to estimate the total prediction uncertainty, expressed as the probability that a lake will fall in each of the three trophic states.

The information required to apply probability analysis to trophic state models includes: model standard error, loading uncertainty, measured nutrient concentrations, trophic state delineation values, and predicted nutrient values. The total prediction uncertainty is related to the model standard error and the loading uncertainty by:

$$S_T^2 = S_m^2 + S_L^2 \tag{30}$$

where,

S_T = total prediction uncertainty

S_m = model standard error

S_L = uncertainty in loading (=kL)

The model standard error is calculated by the following equation:

$$S_m = \sqrt{\frac{\sum_{i=1}^{n} (P_{ob} - P_e)^2}{n - 2}} \quad \text{or} \quad \sqrt{\frac{\sum_{i=1}^{n} (N_{ob} - N_e)^2}{n - 2}} \tag{31}$$

where, P_{ob}, N_{ob} = measured total P or N concentration in lake

P_e, N_e = estimated (predicted) values, i.e., TP, TN

n = number of lakes in data base used to develop predictive equations

For a data base with measured nutrient budgets (i.e., measured flows and concentrations for inputs and outputs) the level of uncertainty in the terms (L_p, L_n, q_s, τ_ω, R_{exp}, R_{exn}) is approximately the same as the average uncertainty in these terms in the model development data set. Thus, the loading uncertainty is incorporated in the model standard error, and the trophic state probabilities can be estimated using an S_L of 0 (Reckhow 1978). If the nutrient budgets are based on estimated values, however, (e.g., nutrient export coefficients from various land uses) the loading uncertainty is a proportion of the loading term (i.e., S_L = kL). The probability curves used in the Reckhow analysis assume that the prediction errors are normally distributed. This is done by converting the predicted values to values of the standard normal deviate:

$$Z_n = \frac{P_{t.s.} - P_e}{S_T} \quad \text{or} \quad \frac{N_{t.s.} - N_e}{S_T} \tag{32}$$

where Z_n = standard normal deviate

$P_{t.s.}$, $N_{t.s.}$ = trophic state delineation values (i.e., critical values for P and N)

It should be noted here that the trophic state probabilities are estimated by assuming that the model error is associated with P_e (or N_e), not $P_{t.s.}$ (or $N_{t.s.}$) (i.e., the transition lines are "true" values, with no uncertainty, while the estimated lake concentration has model and loading uncertainty associated with it).

In summary, three comments need to be made on the restrictions of this probability analysis:

1. The application lake should have characteristics similar to those of the model development data set.
2. The probability analysis should only use the P and N values predicted from the TP and TN predictive equations, respectively. This is because the models assume that the probability assigned to a trophic state is a function of the error in the prediction. Using the measured $(\overline{P})_1$ and $(\overline{N})_1$ values would negate the purpose of the analysis.
3. The assumptions inherent in this analysis should be considered before applying the analysis. Also, the accuracy of the prediction equations for a given lake should be considered before application. Thus, the best proven predictive model for a given lake should be used in order to give a valid trophic state probability assessment.

ASSESSMENT OF LAKE OKEECHOBEE'S TROPHIC STATUS

1. Trophic State Indicators

The average annual water chemistry values from 1973 to 1979 for Lake Okeechobee are shown in Table 9-5. These values can be compared to the critical values for Secchi disk, chlorophyll a, total and ortho phosphorus, and total and inorganic nitrogen to give a subjective evaluation of the lake's trophic state. Although these critical values lack the simplicity of a numerical index, they are the ultimate criteria for the development of several indices and models.

All the annual average Secchi disk transparencies, chlorophyll a concentrations, and total phosphorus concentrations in Lake Okeechobee during the study period are well above (or below, for Secchi disk) all the critical values for these parameters. With the exception of the 1973 study year, all the ortho phosphorus values are above the reported literature critical values. The total nitrogen concentrations in Lake Okeechobee are considerably above the critical value reported by Kratzer (1979). Inorganic nitrogen concentrations in Lake Okeechobee are all less than the critical values reported by Sawyer (1947) and Vollenweider (1968). It should be noted, however, that these criteria were based on spring maximum concentrations in temperate lakes. Indeed, Figure 7-7 indicates that wintertime inorganic nitrogen concentrations are sufficiently high to support a phytoplankton standing crop characteristic of a eutrophic lake (based on the 0.3 mg/L criterion). In general, based on the foregoing discussion, Lake Okeechobee can be subjectively classified as eutrophic.

2. Trophic State Indices

The trophic states associated with values of TSI and each trophic state parameter are shown in Table 9-6. The delineations are based

TABLE 9-5

AVERAGE ANNUAL WATER CHEMISTRY VALUES FOR LAKE OKEECHOBEE
AND CRITICAL VALUES FOR TROPHIC STATE EVALUATION

Year	OPO_4 (mg/L)	TPO_4 (mg/L)	Inorg-N (mg/L)	Total N (mg/L)	Secchi Disk (m)	Chl-a (μg/L)
1973	0.005	0.049	0.08	1.63	0.58	-
1974	0.014	0.049	0.16	1.45	0.56	24.0
1975	0.013	0.058	0.16	1.60	0.48	27.0
1976	0.016	0.055	0.22	2.01	0.58	26.1
1977	0.013	0.063	0.13	1.64	0.65	-
1978	0.019	0.067	0.13	1.77	-	-
1979	0.045	0.097	0.26	2.02	-	-
Average 1973-79	0.018	0.063	0.16	1.73	0.57	25.7

Critical Values[1]

	OPO_4 (mg/L)	TPO_4 (mg/L)	Inorg-N (mg/L)	Total N (mg/L)	Secchi Disk (m)	Chl-a (μg/L)
NES 1975		>0.020			<2.0	>10.0
Kratzer 1979		>0.040		>0.90		>10.0
Sawyer 1947	>0.010		>0.30			
Vollenweider 1968	>0.010	>0.020	>0.30			
Chapra and Tarapchak 1976						>8.8
NAS & NAE 1973						>10.0
Bennedorf 1979	>0.010					
Carlson 1977						>6.0

[1]Critical value = value above (or below) which eutrophic conditions can be expected in a lake.

TABLE 9-6. TROPHIC STATES ASSOCIATED WITH CARLSON'S TSI AND TSI (TN)

TSI	Trophic State	Water Transparency (Secchi Disk, m)	Chlorophyll <u>a</u> (µg/L)	Total Phosphorus (µg P/L)	Total Nitrogen (mg N/L)
0	ultraoligotrophic	64	0.04	0.75	0.02
10	ultraoligotrophic	32	0.12	1.5	0.05
20	ultraoligotrophic	16	0.34	3	0.09
30	oligotrophic	8	0.94	6	0.18
40	oligotrophic	4	2.6	12	0.37
45	mesotrophic	2.8	4.4	17	0.52
50	mesotrophic	2	7.3	24	0.74
53	eutrophic	1.6	10	30	0.92
60	eutrophic	1	20	48	1.47
70	hypereutrophic	0.5	56	96	2.94
80	hypereutrophic	0.25	154	192	5.89
90	hypereutrophic	0.12	427	384	11.8
100	hypereutrophic	0.06	1183	768	23.6

where: TSI (SD)[1/] = 10 (6 - ln (SD)/ln 2), SD in meters

TSI (CHA)[1/] = 10 (6 - (2.04 - 0.68 ln (CHA())/ln 2), CHA in µg/L

TSI (TP)[1/] = 10 (6 - ln (48/TP)/ ln 2), TP in µg/L

TSI (TN)[2/] = 10 (6 - ln (1.47/TN)/ln 2), TN in mg/L

[1/] from Carlson (1977)

[2/] from Kratzer and Brezonik (1981)

on the Kratzer (1979) critical values for chlorophyll a, total phosphorus, total nitrogen, and their relationships of Carlson's (1977) TSI values. Annual TSI values for each parameter and the TSI (AVG) are given in Table 9-7.

All the TSI values for Lake Okeechobee are above 53, the value delineating eutrophic classification. The general conclusion of the TSI analysis agrees with the previous assessment based on trophic state indicators.

Besides this general conclusion, two interesting trends can be determined from the TSI values shown in Table 9-7. The first is that, in all cases,the TSI (SD) values are significantly higher than the other three TSI's. This is to be expected in Lake Okeechobee due to the poor correlation between the Secchi disk transparency and chlorophyll a and nutrient concentrations (Kratzer 1979). Extensive wave-induced turbidity and moderately high color (Chapter VII) are the primary reasons for this poor correlation; however, the Secchi disk TSI values are still averaged with the other TSI's to compute TSI (AVG) because the clarity of water is an important physical measure of trophic state, regardless of its relationship with the other parameters. The second trend noted in the TSI values is that the TSI (TN) values and the TSI (TP) values are very close for all years except 1979. In fact, based on a comparison of these values the lake has apparently changed from a nutrient balanced condition with fluctuations from P to N limitation to N limitation during the seven year study period. The lake change appeared to occur during the period from 1977 to 1979. This trend is supported by the inorganic N/P ratios for the lake as discussed earlier in this report in Chapter VII.

TABLE 9-7

TROPHIC STATE INDEX VALUES FOR LAKE OKEECHOBEE

Year	TSI(SD)[1/]	TSI(CHA)[2/]	TSI(TP)[3/]	TSI(TN)[4/]	TSI(AVG)[5/]
1973	67.9	-	60.3	61.5	64.1
1974	68.4	61.7	60.3	59.8	63.3
1975	70.6	62.9	62.7	61.2	64.9
1976	67.9	62.6	61.4	64.6	64.0
1977	66.2	-	63.9	61.6	63.9
1978	-	-	64.8	62.7	62.7
1979	-	-	70.1	64.6	64.6
Average 1973-79	68.1	62.4	63.9	62.3	64.3

1/ $TSI(SD) = 10\ (6 - \ln(SD)/\ln 2)$

2/ $TSI(CHA) = 10\ (6 - (2.04 - 0.68 \ln(CHA))/\ln 2)$

3/ $TSI(TP) = 10\ (6 - \ln(48/TP)/\ln 2)$

4/ $TSI(TN) = 10\ (6 - \ln(1.47/TN)/\ln 2)$

5/ If $TSI(TP) \geq TSI(TN)$, $TSI(AVG) = \left[TSI(SD) + TSI(CHA) + TSI(TN)\right] \div 3$

If $TSI(TP) \leq TSI(TN)$, $TSI(AVG) = \left[TSI(SD) + TSI(CHA) + TSI(TP)\right] \div 3$

APPLICABILITY OF NUTRIENT LOADING MODELS AS APPLIED TO LAKE OKEECHOBEE

The eight nutrient loading models presented in Table 9-4 were evaluated to determine which of these models is most applicable to Lake Okeechobee. The primary criteria used in the evaluation of these models were: (1) the degree to which the model's trophic state assessment agreed with the trophic state assessment based upon trophic state indicators and indices; (2) the data base on which the model was developed; and (3) the ability of the model to predict the actual ambient lake concentrations.

Trophic ratios (actual nutrient loading rate ÷ excessive loading rate) for each model were used to classify Lake Okeechobee based upon both phosphorus and nitrogen (where applicable). These ratios were then compared to the classification based upon trophic state indicators and indices. A trophic ratio of 0 - 0.5 represents an oligotrophic classification, 0.5 - 1 a mesotrophic classification, and 1 and above a eutrophic classification. A ratio greater than 2 was given a hypereutrophic classification.

Tables 9-8 and 9-9 present the trophic state classifications for each model along with the classification based on the trophic state indicators and indices. The modified Vollenweider (1976) model was the only model to accurately classify Lake Okeechobee as eutrophic for each of the seven years, and for the average case, based upon both phosphorus and nitrogen. The Vollenweider (1975) and Dillon (1975) models accurately classified the lake in 7 and 4 years, respectively, based upon phosphorus; however, these models do not have a nitrogen counterpart. The modified

TABLE 9-8. TROPHIC RATIOS FOR PHOSPHORUS LOADING MODELS

Year	Classification by Trophic State: Indicators	Classification by Trophic State: Indices	Vollenweider (1968)	Shannon & Brezonik (1972) 1/	Vollenweider (1975)	Modified Vollenweider (1975)	Dillon 2/ (1975)	Modified 2/ Dillon (1975)	Vollenweider (1976)	Modified Vollenweider (1976)
1973	E	E	3.79 H 3/	0.60 M 3/	1.42 E 3/	1.19 E	1.16 E	0.68 M	3.51 H	1.46 E
1974	E	E	5.00 H	0.78 M	1.83 E	1.47 E	2.72 H	1.60 E	4.72 H	1.97 E
1975	E	E	2.68 H	0.43 M	1.01 E	0.87 M	1.47 E	0.86 M	2.93 H	1.22 E
1976	E	E	3.60 H	0.57 M	1.36 E	1.14 E	0.70 M	0.41 M	3.03 H	1.26 E
1977	E	E	3.60 H	0.57 M	1.41 E	1.24 E	1.33 E	0.78 M	4.54 H	1.89 E
1978	E	E	3.55 H	0.52 M	1.59 E	1.30 E	2.34 H	1.37 E	3.92 H	1.63 E
1979	E	E	4.92 H	0.72 M	1.89 E	1.54 E	2.37 H	1.39 E	4.66 H	1.94 E
Average 1973-79	E	E	3.88 H	0.60 M	1.51 E	1.26 E	1.83 E	1.07 E	4.00 H	1.66 E
No./% of correct classifications			1/13%	0/0%	8/100%	7/88%	7/88%	4/50%	1/13%	8/100%

1/ Using the volumetric loading of (0.22 g/m^3-yr)

2/ Using $R_p = R_{exp}$

3/ M = mesotrophic classification
E = eutrophic classification
H = hypereutrophic classification

TABLE 9-9. TROPHIC RATIOS FOR NITROGEN LOADING MODELS

Year	Classification by Trophic State: Indicators	Classification by Trophic State: Indices	Vollenweider (1968)	Shannon & Brezonik (1972) [1]	Modified Vollenweider (1975)	Modified Dillon (1975) [2]	Modified Vollenweider (1976)
1973	E [3]	E	3.13 H	1.09 E	0.87 M	0.67 M	1.32 E
1974	E	E	3.85 H	1.33 E	0.98 M	1.35 E	1.65 E
1975	E	E	3.09 H	1.09 E	0.90 M	0.91 M	1.53 E
1976	E	E	2.99 H	1.04 E	0.85 M	0.47 M	1.15 E
1977	E	E	2.97 H	1.03 E	0.94 M	0.84 M	1.70 E
1978	E	E	3.79 H	1.22 E	1.01 E	1.29 E	1.58 E
1979	E	E	3.59 H	1.15 E	0.92 M	1.31 E	1.44 E
Average 1973-79	E	E	3.34 H	1.13 E	0.93 M	1.02 E	1.51 E
No./% of Correct Classifications			2/25%	8/100%	1/13%	4/50%	8/100%

[1] Using the volumetric loading rate (1.5 g/m^3-yr)

[2] Using $R_N = R_{exn}$

[3] M = Mesotrophic classification
E = Eutrophic classification
H = Hypereutrophic classification

TABLE 9-10. DATA BASE FOR NUTRIENT LOADING MODEL DEVELOPMENT

Model	Data Base
Vollenweider (1968)	Temperate lakes
Shannon & Brezonik (1972)	Florida lakes excluding Lake Okeechobee
Vollenweider (1975)	Temperate lakes
Modified 1975 Vollenweider (Kratzer 1979)	Florida including Lake Okeechobee
Dillon (1975)	Temperate lakes
Modified Dillon (Kratzer 1979)	Florida including Lake Okeechobee
Vollenweider (1976)	Temperate lakes
Modified Vollenweider (1976)	Florida including Lake Okeechobee

Vollenweider (1975) model classified the lake correctly six of the seven years based upon phosphorus; however, it classified the lake correctly for only one year based upon nitrogen.

The Shannon and Brezonik model (1972) correctly classified the lake for each year based upon nitrogen; however, it did not correctly classify the lake for any of the years based upon phosphorus. The modified Dillon (1975) model correctly classified the lake 50 percent of the time based upon both phosphorus and nitrogen. The Vollenweider (1968) and Vollenweider (1976) models were the least accurate in classifying the lake; therefore, based upon the trophic state classifications, the modified Vollenweider (1976) model appears to be the most applicable model for Lake Okeechobee.

The second criterion in evaluating the applicability of the eight models to Lake Okeechobee involves the data base on which the models were developed. Table 9-10 presents the eight models along with the general geographic region in which the model development lakes were located. The Vollenweider (1968), Vollenweider (1975), Dillon (1975), and Vollenweider (1976) models were developed for temperate lakes, and therefore, are probably the least applicable to Lake Okeechobee. The Shannon and Brezonik (1972) model was developed using a data base consisting of lakes located in Florida; however, Lake Okeechobee was not included among the lakes. The modified models of Vollenweider (1975), Dillon (1975), and Vollenweider (1976) were developed from a data base of Florida lakes which included Lake Okeechobee. Based upon the most pertinent data base, it would appear that one of the latter three models (modified Dillon 1975 or modified Vollenweider 1975, 1976) would be the most applicable to Lake Okeechobee since it was included in the original data base used to develop (calibrate) the model.

The third criterion was the ability of the models to predict the actual ambient lake concentrations. The results of the predictive equations for total phosphorus and total nitrogen are shown in Tables 9-11 and 9-12, respectively. Note that the Vollenweider (1968) and the Shannon and Brezonik (1972) models do not have corresponding predictive equations. Thus, these two models cannot be evaluated on this criteria. The test used to determine the best predictive model was the percent difference between the predicted values and the corresponding measured ambient values for each year. Negative percent differences indicate an under prediction while positive percent differences indicate an over prediction. The average percent difference is based on a comparison of the average ambient concentration during this study and the predicted concentrations based upon the average seven year material budget. The modified Vollenweider (1976) model was the best predictor of total phosphorus, with an average percent difference of only 2 percent compared to average percent differences ranging between 19 and 54 for the other five models (Table 9-11). The best predictor of ambient total nitrogen levels was also the modified Vollenweider (1976) model with an average percent difference of 26 percent. This is in comparison to 33 and 47 percent for the other two models (Table 9-12). The modified Vollenweider (1976) model was also the best predictor for total phosphorus and total nitrogen for 5 of the 7 individual years. The modified Vollenweider (1976) model had almost an even split between under predictions (4) and over predictions (3) for phosphorus, while nitrogen was consistently under predicted. The consistent under prediction for nitrogen may have resulted from an underestimation of the nitrogen loading rate, since nitrogen fixation and dry deposition of NO_2 were

TABLE 9-11. APPLICATION OF PREDICTIVE EQUATIONS FOR TOTAL PHOSPHORUS

Year	Lake Average $(\bar{P})_1$	Vollenweider[1/] (1975)		Modified[2/] Vollenweider (1975)		Dillon & Rigler[3/] (1975)		Modified Dillon & Rigler[4/] (1975)		Vollenweider[5/] (1976)		Modified[6/] Vollenweider (1976)	
1973	0.049	0.028	-43%[7/]	0.049	0%	0.023	-53%	0.029	-41%	0.070	43%	0.057	16%
1974	0.049	0.037	-24%	0.061	24%	0.054	10%	0.061	24%	0.094	92%	0.075	53%
1975	0.058	0.020	-66%	0.038	-34%	0.029	-50%	0.036	-38%	0.059	2%	0.048	-17%
1976	0.055	0.027	-51%	0.048	-13%	0.014	-75%	0.019	-65%	0.061	11%	0.050	-9%
1977	0.063	0.028	-56%	0.049	-22%	0.027	-57%	0.033	-48%	0.091	44%	0.073	16%
1978	0.067	0.032	-52%	0.055	-18%	0.047	-30%	0.054	-19%	0.079	18%	0.064	-4%
1979	0.097	0.038	-61%	0.063	-35%	0.047	-52%	0.054	-44%	0.093	-4%	0.074	-24%
Average 1973-79	0.063	0.029	-54% [8/]	0.051	-19% [8/]	0.037	-41%[8/]	0.044	-30% [8/]	0.080	27% [8/]	0.064	2%[8/]

1/ $TP = L_p / (10 + q_s)$

2/ $TP = 0.843 \left(L_p / (10 + q_s)\right)^{0.795}$

3/ $TP = L_p (1-R_{exp}) / q_s$

4/ $TP = 0.748 \left(L_p(1-R_{exp}) / q_s\right)^{0.862}$

5/ $TP = L_p / \left(q_s (1 + \sqrt{\tau_\omega})\right)$

6/ $TP = 0.682 \left(L_p / \left(q_s (1 + \sqrt{\tau_\omega})\right)\right)^{0.934}$

7/ Percent difference = ((predicted - measured) / measured) X 100
Negative indicates under prediction/positive indicates over prediction

8/ Percent difference between the average ambient concentration (1973-1979) and the predicted concentration based upon the average material budget for the 7 years of the study.

TABLE 9-12 APPLICATION OF PREDICTIVE EQUATIONS FOR TOTAL NITROGEN

Year	$(\bar{N})_1$	Modified Vollenweider (1975) [1]		Modified Dillon & Rigler (1975) [2]		Modified Vollenweider (1976) [3]	
1973	1.63	2.27	39% [4]	0.60	-63%	1.14	-30%
1974	1.45	2.37	63%	1.21	-17%	1.39	-4%
1975	1.60	2.27	42%	0.82	-49%	1.30	-19%
1976	2.02	2.26	12%	0.43	-79%	1.02	-50%
1977	1.64	2.27	38%	0.76	-54%	1.42	-13%
1978	1.77	2.37	34%	1.15	-35%	1.34	-24%
1979	2.02	2.32	15%	1.17	-42%	1.24	-39%
Average 1973-79	1.73	2.31	33% [5]	0.91	-47% [5]	1.28	-26% [5]

1/ TN = $2.85\,(L_N / (10 + q_s))^{0.216}$

2/ TN = $0.899\,(L_N(1-R_{exn})/q_s)^{0.976}$

3/ TN = $1.29\,(L_N / (q_s\,(1 + \sqrt{\tau_\omega})))^{0.858}$

4/ Percent difference = ((measured-predicted)/measured) X 100
Negative indicates under prediction/ positive indicates over prediction

5/ (See #8) in Table 9-11).

not considered in the nitrogen budget. The worst case for the phosphorus model was in 1974, percent difference of -53, when the lake had the highest hydraulic loading rate and the lowest water residence time during the study. It appears that the modified Vollenweider (1976) model tends to break down at very low water residence times rather than at high hydraulic loading rates. The rationale being that the relative difference in the 1974 water residence time, as compared to the seven year average, was substantially greater than the relative difference in the 1974 hydraulic loading rate (Table 6-4). Although the modification of the Dillon (1975) model best fits the Florida NES lakes as a group (Table 9-3), the modified Vollenweider (1976) model was the best predictor of limnetic nutrient levels for Lake Okeechobee.

Table 9-13 summarizes the results of the criteria for determining which of the eight models evaluated was most applicable to Lake Okeechobee. In summary, the modified Vollenweider (1976) model was selected because (1) it most accurately and consistently correctly classified the lake as eutrophic based on both phosphorus and nitrogen; (2) it was the best predictor of ambient total phosphorus and total nitrogen levels; and (3) it was based on a data base of Florida lakes which includes Lake Okeechobee.

APPLICATION OF THE MODIFIED VOLLENWEIDER (1976) MODEL TO LAKE OKEECHOBEE

As shown in Table 9-14, the proper application of nutrient loading models requires many assumptions. The main sources of error in these assumptions as applied to Lake Okeechobee are listed below:

(a) The total phosphorus concentration in the lake changed from 1973 to 1979. The effect of these nutrient changes on the

TABLE 9-13. SUMMARY OF NUTRIENT LOADING MODEL EVALUATION

Model	Trophic State Classifications % of Correct Classifications P	N	Ambient Lake Predictions Percent Difference P	N	Data Base
Vollenweider (1968)	13%	25%	- [2/]	-	Temperate lakes
Shannon & Brezonik (1972)	0%	100%	-	-	Florida lakes excluding Okeechobee
Vollenweider (1975)	100%	- [1/]	53% [3/] 24%-63% [4/]	-	Temperate lakes
Modified 1975 Vollenweider (Kratzer 1979)	88%	13%	19% 0-35%	33% 12-63%	Florida including Lake Okeechobee
Dillon (1975)	88%	-	41% 10-75%	-	Temperate lakes
Modified Dillon (Kratzer 1979)	50%	50%	30% 19-65%	47% 17-79%	Florida including Lake Okeechobee
Vollenweider (1976)	13%	-	27% 2-92%	-	Temperate lakes
Modified Vollenweider (1976)	100%	100%	2% 4-53%	26% 4-50%	Florida including Lake Okeechobee

1/ No nitrogen model available

2/ No predictive equation available

3/ Percent difference between average ambient level during this 7 year study and the predicted concentration based upon the average 7 year material budget

4/ Range of percent differences for the individual years (excluding the average case).

TABLE 9-14

SOME ASSUMPTIONS OF NUTRIENT LOADING MODELS AND THE NUTRIENT LOADING WATER QUALITY RELATIONSHIPS

Assumption	Comments of Applicability of Assumption to Lake Okeechobee
Lake is at steady state (i.e., $dP/dt = 0$ and $dN/dt=0$).	Reasonable assumption based on annual average, except for P from 1978-79.
Lake acts as a constantly stirred reactor (homogeneous).	Good assumption for vertical mixing. Fair assumption for horizontal mixing (i.e., north lake is significantly different from south lake).
Internal nutrient cycling is insignificant.	Poor assumption as discussed in Chapter VII.
Surface outflow, sedimentation and denitrification are the only significant sinks.	Reasonable assumption.
Surface inflows and rainfall are the only significant nutrient sources.	Poor assumption for nitrogen. Nitrogen fixation can supply up to 20% of the total nitrogen loading (Messer and Brezonik 1979), and internal recycling of nutrients from the sediments is a nutrient source.
Annual averages of $(\overline{P})_1$, $(\overline{N})_1$, Chl-*a*, and Secchi disk adequately characterize the lake's trophic state.	Reasonable assumption due to year-round growing season.
Chlorophyll *a* is an accurate measure of the lake's primary produced biomass.	Questionable assumption due to significant macrophyte population.
Secchi disk transparency depends upon the algal biomass.	Poor assumption due to significant interferences from color and wind induced turbidity.

steady state assumption could be considerable, although the results to date suggest that this increase may be a cyclical phenomena.

(b) The recycling of nutrients from the sediments and littoral zone may exert a major influence on the concentration of nutrients in the water column of Lake Okeechobee.

(c) The Secchi disk transparency in Lake Okeechobee is poorly correlated (Kratzer 1979) with the algal biomass as measured by chlorophyll a due to interferences from color and turbidity. Also, the significant macrophyte population in the lake may reduce the chlorophyll a concentration in certain areas of the lake by the competing for nutrients.

Although several of the assumptions of the models are possibly invalid for Lake Okeechobee,the modified Vollenweider (1976) model does predict conditions of the lake fairly accurately. Therefore, since the model appears robust in terms of these assumptions, it is reasonable to use the model to predict the lake's present condition and to predict future trends, provided the limitations of the model are considered.

Determination of Excessive Loading Rates and Trophic State Classification for Lake Okeechobee

The information required for calculation of the excessive phosphorus and nitrogen loading rates based upon the modified Vollenweider (1976) model is L_p, L_n, q_s, and τ_ω. For Lake Okeechobee this information is given in Table 9-15. The excessive loading line according to equation (24) is drawn on a plot of L_p/q_s versus τ_ω in Figure 9-12. The excessive rate is that nutrient loading rate above which the lake would

TABLE 9-15. HYDROLOGIC PARAMETERS AND NUTRIENT LOADING RATES FOR LAKE OKEECHOBEE

Year	Water Residence[1/] Time τ_{ω}, yrs	Hydraulic[2/] Loading Rate q_s, m/yr	Areal P Loading Rate L_p, g/m2-yr	Areal N Loading Rate L_N, g/m2-yr
1973	4.63	1.47	0.325	4.03
1974	1.85	1.96	0.437	5.05
1975	4.74	1.22	0.227	3.92
1976	6.78	1.42	0.310	3.87
1977	6.17	0.98	0.310	3.82
1978	2.85	1.78	0.376	5.00
1979	3.96	1.75	0.443	4.53
Average				
1973-79	3.47	1.52	0.347	4.32

1/ Based on surface outflow (excluding evaporation)

2/ Based on surface inflow (excluding rainfall)

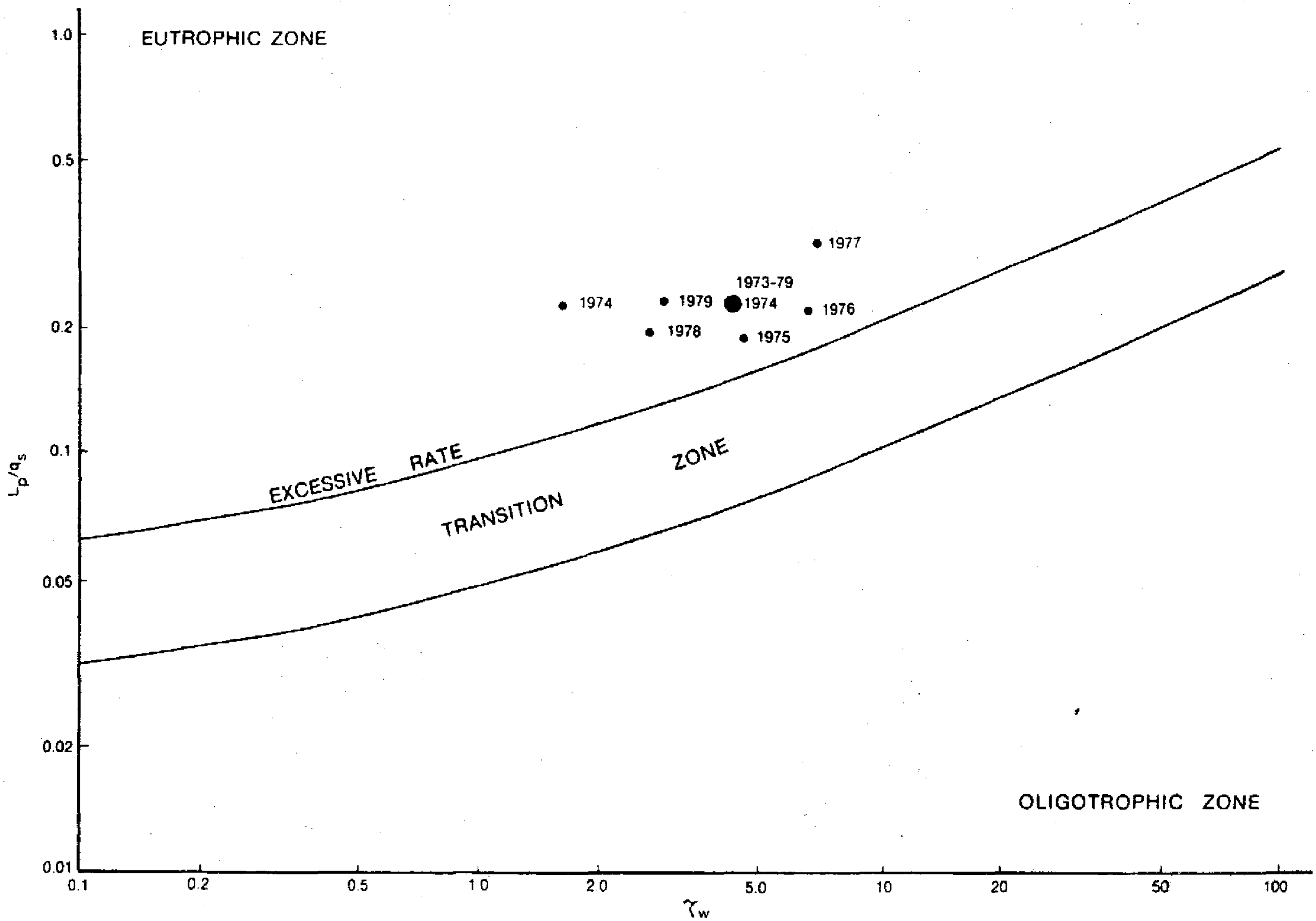


Figure 9-12 APPLICATION OF MODIFIED VOLLENWEIDER (1976) PHOSPHORUS MODEL TO LAKE OKEECHOBEE

have a high probability of progressing to a eutrophic/hypereutrophic state. Also shown is the permissible line (= 1/2 excessive line) and the points corresponding to the Lake Okeechobee data for each year individually and the 1973-1979 average. The same is done for nitrogen in Figure 9-13 using equation (29). The points on the loading plots are essentially visual representations of the trohic ratios presented in Tables 9-8 and 9-9. Thus, Figures 9-12 and 9-13 indicate that Lake Okeechobee is eutrophic based on both phosphorus and nitrogen loading rates. The trophic ratios for phosphorus range from 1.22 to 1.97, and for nitrogen they range from 1.15 to 1.70 (Tables 9-8 and 9-9).

Trophic State Classification Probability Analysis of the Modified Vollenweider (1976) Model

The trophic state probability analysis discussed in the previous section was applied to the modified Vollenweider (1976) model for Lake Okeechobee to determine the probability of the trophic state classifications illustrated in Figures 9-12 and 9-13. The required information for both the phosphorus and nitrogen analysis is presented in Table 9-16. Since the nutrient budget for the Florida NES data base was measured, the loading uncertainty (S_L) is zero (as per Reckhow 1978) and the total prediction uncertainty (S_T) is, therefore, equal to the model standard error (s_m). The oligotrophic and eutrophic lines on Figures 9-14 and 9-15 are drawn by calculating P_e (or N_e) from the appropriate $P_{t.s.}$) and S_T using equation (32) ($Z_n = \frac{P_{t.s.} - P_e}{S_T}$) for given Z_n values. The Z_n values are then translated in probabilities from a table relating Z values to the area under a normal curve (see Mendenhall and Schaeffer).

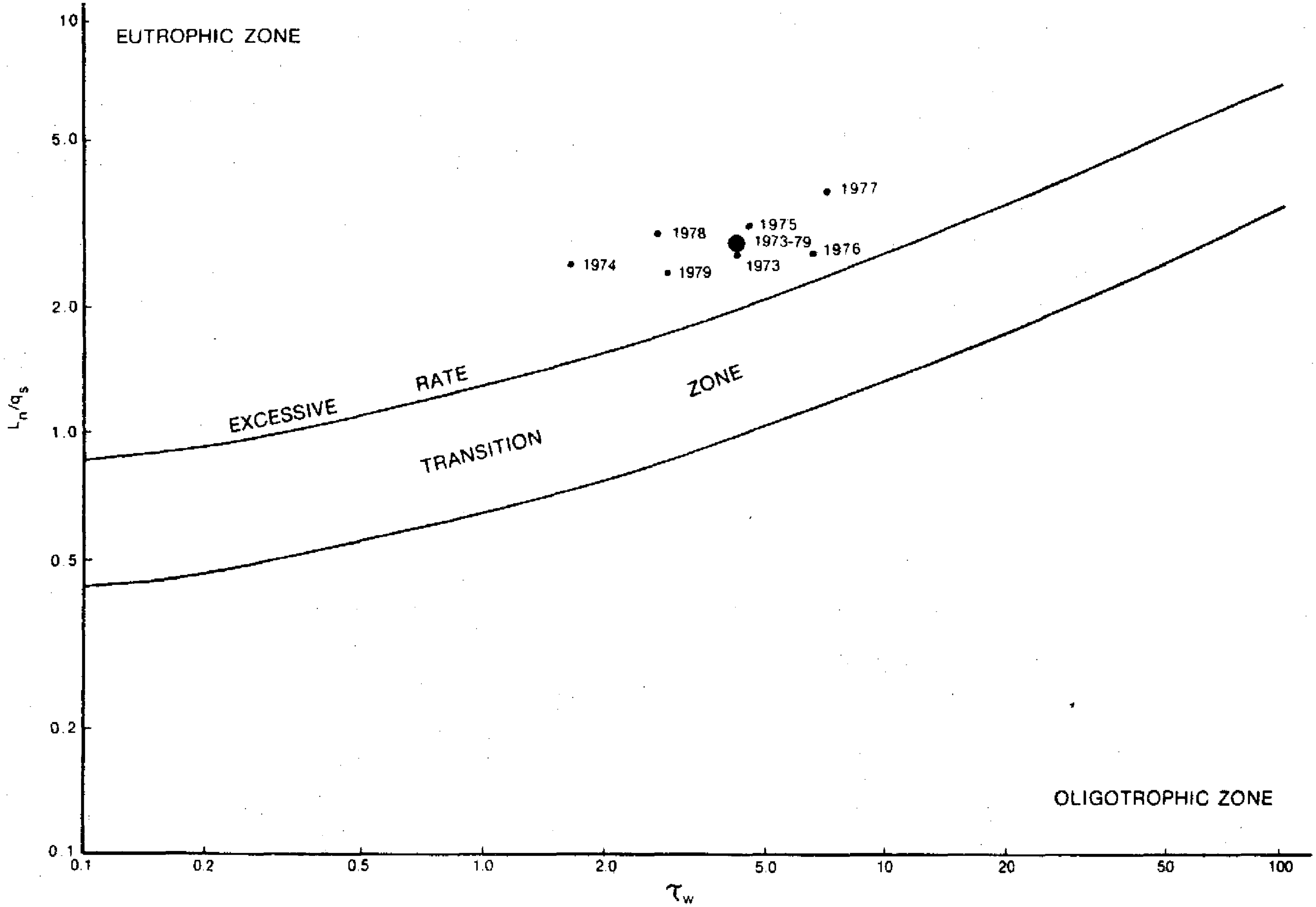


Figure 9-13 APPLICATION OF MODIFIED VOLLENWEIDER (1976) NITROGEN MODEL TO LAKE OKEECHOBEE

TABLE 9-16

TROPHIC STATE PROBABILITY ANALYSIS FOR LAKE OKEECHOBEE

1. Phosphorus: n = 29 lakes from Florida NES

S_m = 0.266

S_L = 0

S_T = 0.266

P_e = $TP = 0.682\ (L_p/q_s\ (1 + \sqrt{\tau_\omega})\ )^{0.934}$

for mesotrophic/eutrophic delineation,

$$L_c(P)_{excessive} = 0.048\ q_s\ (1 + \sqrt{\tau_\omega})$$

$$P_{t.s.} = 0.682\ (0.048)^{0.934} = 0.040\ mg/L$$

for oligotrophic/mesotrophic delineation,

$$L_c(P)_{permissible} = 0.024\ q_s\ (1 + \sqrt{\tau_\omega})$$

$$P_{t.s.} = 0.682\ (0.024)^{0.934} = 0.021\ mg/L$$

Year	P_e 1/	$(\overline{P})_l$ 2/	P(O)	P(M)	P(E)
1973	0.057	0.049	0.05	0.23	0.72
1974	0.075	0.049	0.02	0.14	0.84
1975	0.048	0.058	0.09	0.30	0.61
1976	0.050	0.055	0.08	0.28	0.64
1977	0.073	0.063	0.02	0.14	0.84
1978	0.064	0.067	0.03	0.19	0.78
1979	0.074	0.097	0.02	0.14	0.84
Average 1973-79	0.064	0.063	0.03	0.19	0.78

1/ Predicted P inlake concentration

2/ Actual limnetic concentrations

TABLE 9-16. TROPHIC STATE PROBABILITY ANALYSIS FOR LAKE OKEECHOBEE (CONT.)

2. Nitrogen: $n = 27$ lakes from Florida NES

$S_m = 0.186$

$S_L = 0$

$S_T = 0.186$

$$N_e = TN = 1.29\ (L_N/q_s\ (1 + \sqrt{\tau_\omega})\ )^{0.858}$$

for mesotrophic/eutrophic delineation,

$$L_c(N)_{excessive} = 0.66\ q_s\ (1 + \sqrt{\tau_\omega})$$
$$N_{t.s.} = 1.29\ (0.66)^{0.858} = 0.90\ mg/L$$

for oligotrophic/mesotrophic delineation,

$$L_c(N)_{permissible} = 0.33\ q_s\ (1 + \sqrt{\tau_\omega})$$
$$N_{t.s.} = 1.29\ (0.33)^{0.858} = 0.50\ mg/L$$

Year	N_e 1/	$(\overline{N})_1$ 2/	P(O)	P(M)	P(E)
1973	1.14	1.63	0.02	0.26	0.72
1974	1.39	1.45	0.01	0.15	0.84
1975	1.30	1.60	0.01	0.18	0.81
1975	1.02	2.02	0.05	0.34	0.61
1977	1.42	1.64	0.01	0.14	0.85
1978	1.34	1.77	0.01	0.17	0.82
1979	1.24	2.02	0.02	0.20	0.78
Average 1973-79	1.28	1.73	0.02	0.19	0.79

1/ Predicted N inlake concentration

2/ Actual limnetic concentration

The predicted nutrient concentration (P_e, N_e) parameter is then plotted versus P (O) and P (E) to produce the oligotrophic and eutrophic lines, respectively. Since the trophic state probabilities must sum to zero, the probability of mesotrophic classification P (M) is equal to 1 - (P (O) + P (E)).

The probability of Lake Okeechobee being oligotrophic, mesotrophic, or eutrophic is calculated in Table 9-16 from Figures 9-14 and 9-15 for both phosphorus and nitrogen from 1973-1979. The probabilities are based on the predicted nutrient concentrations (P_e, N_e) from the modified Vollenweider (1976) models, and the assumptions inherent in both the predictive model and the probability analysis. For phosphorus, the probabilities for the entire seven year period (1973-79) are: P (oligotrophic) 3 percent, P (mesotrophic) 19 percent and P (eutrophic) 78 percent. For nitrogen, the probabilities for the period are P (O) - 2 percent, P (M) - 19 percent, and P (E) - 79 percent. Again note the close correspondence between the classification based upon either phosphorus or nitrogen. Thus, besides qualitatively classifying the lake as eutrophic, Lake Okeechobee has essentially the same probability of being eutrophic (78% to 79%) based on either phosphorus or nitrogen.

MANAGEMENT RAMIFICATIONS

The current study (Chapter VII) indicates that Lake Okeechobee was potentially phosphorus limited from 1973 to 1977, was in transition in 1978, and shifted towards potential nitrogen limitation in 1979, according to the inorganic N/P ratios. This is in accord with Brezonik et al. (1979),

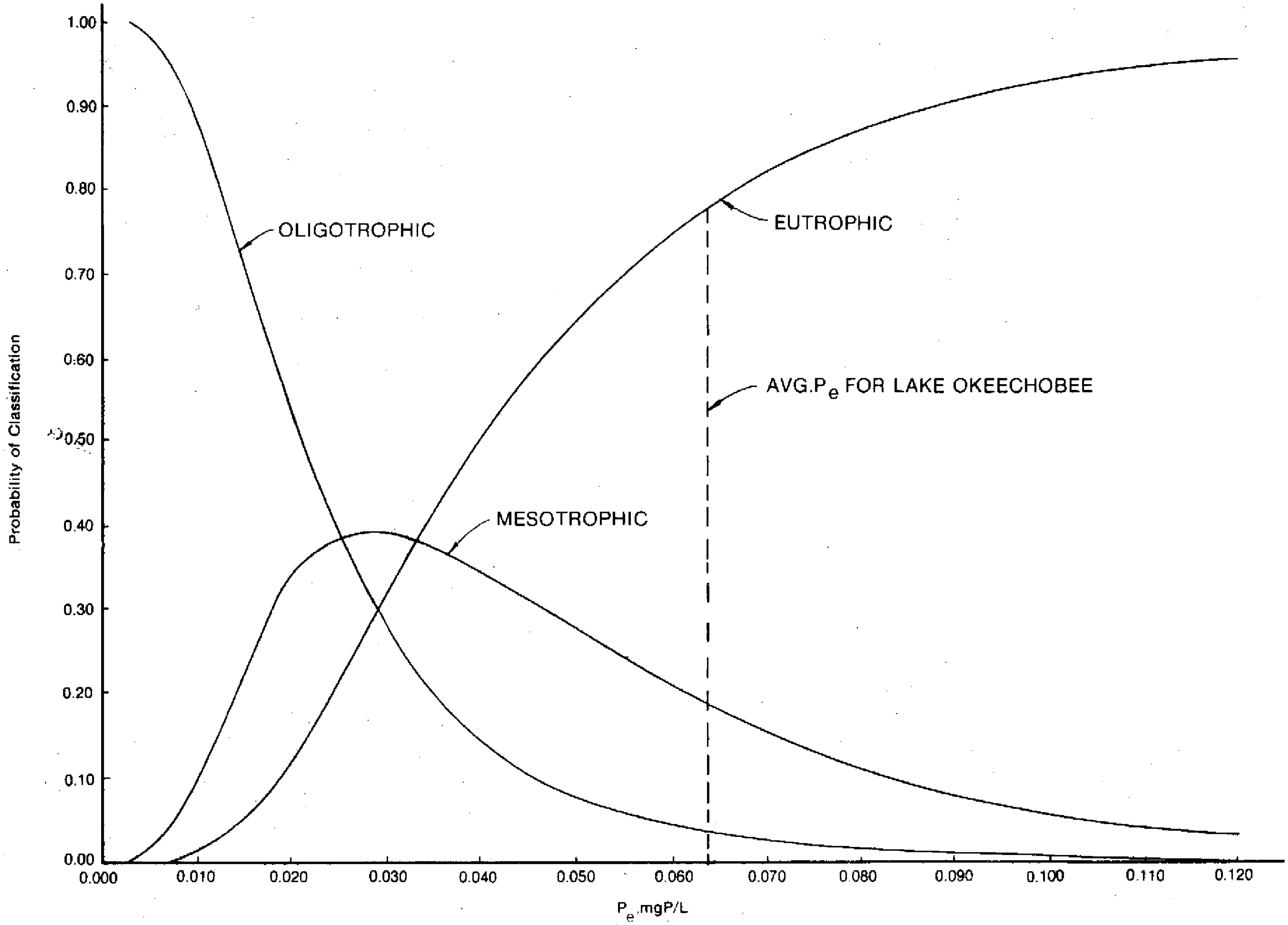
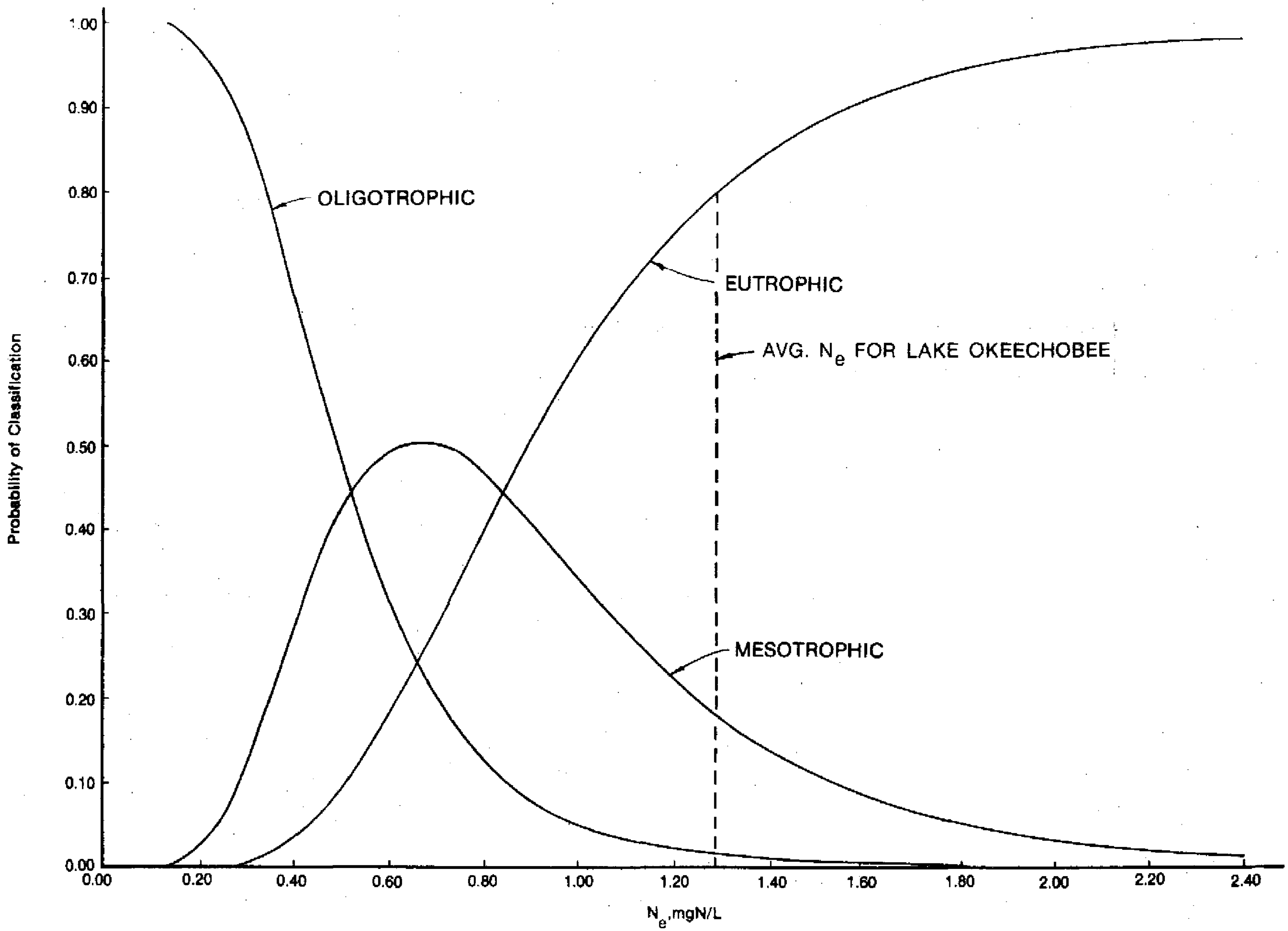


Figure 9-14 **TROPHIC STATE PROBABILITY PLOT FOR PHOSPHORUS**



Fi... 5 TROPHIC STATE PROBABILITY PLOT FOR NITROGEN who indicated that in 1978 the lake was neither wholly phosphorus limited nor wholly nitrogen limited, although it exhibited greater tendencies for the former condition. Since this possible shift toward potential nitrogen limitation (1) occurred only recently, (2) is still in the borderline range, and (3) may be transitory, both models should be considered applicable to the lake at this time. A significant reduction in either nutrient would theoretically make that the limiting nutrient; however, this hypothesis is dependent on the lake being completely mixed, as well as the other assumptions of the nutrient loading models discussed previously.

Table 9-17 presents, for the time period 1973 to 1979, the actual phosphorus and nitrogen loading rates and the excessive loading rates based upon the modified Vollenweider (1976) model as it applies to Lake Okeechobee. The excessive loading criteria were selected over the permissible criteria since it is unlikely that Lake Okeechobee was historically a classically defined oligtrophic lake (Gleason and Stone 1975, Brezonik et al. 1979). During the period 1973 to 1979 the phosphorus loading rate to the lake was between 18 and 49 percent above the excessive level. The nitrogen load to the lake was between 13 and 41 percent above the excessive level. On the average, the phosphorus and nitrogen load to the lake was 40 and 34 percent, respectively, above the excessive levels (Table 9-17).

Reduction in the external loading rates to the lake would not produce immediate reductions in nutrient and chlorophyll a levels. The lag time would be a function of the nutrient residence time and internal nutrient loadings. A lag time approximately equal to 3 times the nutrient residence time is needed in order for 95 percent of the reduction in

TABLE 9-17. EXCESSIVE NUTRIENT LOADING RATES[1/] FOR LAKE OKEECHOBEE

	Phosphorus					Nitrogen				
	Actual Loading Rate (L_p)		Excessive Loading Rate		Percent[2/]	Actual Loading Rate (L_N)		Excessive Loading Rate		Percent[2/]
Year [3/]	g/m^2-yr	10^6 g/yr	g/m^2-yr	10^6 g/yr	Difference	g/m^2-yr	10^6 g/yr	g/m^2-yr	10^6 g/yr	Difference
1973	0.325	547.5	0.223	375.8	31%	4.03	6792.6	3.05	5139.3	24%
1974	0.437	743.5	0.222	378.1	49%	5.05	8607.1	3.06	5211.2	39%
1975	0.227	371.4	0.186	304.5	18%	3.92	6410.3	2.56	4190.7	35%
1976	0.310	533.5	0.246	422.9	21%	3.87	6659.9	3.37	5793.0	13%
1977	0.310	524.4	0.164	277.2	47%	3.83	6475.9	2.25	3802.5	41%
1978	0.376	687.1	0.230	420.4	39%	5.00	9142.0	3.16	5776.5	37%
1979	0.443	810.4	0.228	416.8	49%	4.53	8277.0	3.14	5739.9	31%
Average 1973-79	0.347	602.5	0.209	360.9	40%	4.32	7480.7	2.87	4956.5	34%

1/ Based upon Modified Vollenweider (1976) model. See Table 9-4 for equations

2/ Percent above actual loading rate (or percent reduction needed to meet excessive loading rate.

3/ Annual period April through March

ambient nutrient levels to be realized in a completely mixed system (Brezonik et al., 1979). The average residence for phosphorus and nitrogen is 0.5 and 1.1 years, respectively. Therefore, after a reduction in phosphorus inputs, it would take 1.5 years for 95 percent of the expected change in ambient water column phosphorus levels to occur. Similarly, after a reduction in nitrogen inputs, approximately 3.3 years would need to transpire before 95 percent of the expected reduction in ambient nitrogen levels would be realized. Significant internal nutrient loadings could delay substantially these response times.

Assuming phosphorus and nitrogen loads to the lake are reduced to the excessive level and significant net internal loadings don't occur, then Lake Okeechobee would have a 50 percent probability of no longer being eutrophic.

In 1978 the SFWMD proposed permissible and excessive loading rates for Lake Okeechobee basedupon the Shannon and Brezonik (1972) model (SFWMD Technical Publication #78-3, Dickson et al. 1978). The basic rationale for selection of the Shannon and Brezonik model was that it was the only nutrient loading model available at that time which was developed for Florida lakes. It was rationalized that differences between Florida lakes and temperate lakes were more significant than differences between the theoretical considerations of the models available at that time. The Shannon and Brezonik permissible criteria was subsequently adopted by the Florida Department of Environmental Regulation as the criteria by which to manage the eutrophication of Lake Okeechobee.

Since 1972 additional models have been developed which have more refined theoretical considerations and which have been modified for use on Florida lakes. In addition, a larger and more extensive data base now exists on the lake by which to evaluate the trophic state and nutrient loading models. Therefore, as discussed in this report, the modified Vollenweider (1976) model appears to be more applicable to Lake Okeechobee and should replace the Shannon and Brezonik (1972) model as the criteria by which to manage the eutrophication of the lake. More specifically, the permissible rate of the Shannon and Brezonik model should be replaced by the excessive rate of the modified Vollenweider (1976) model. This change would require a much greater reduction in phosphorus inputs (i.e. an increase from a 10 percent reduction to a 40 percent reduction) and a slightly lower reduction in nitrogen inputs (i.e. a decrease from a 51% reduction to a 34% reduction. These proposed percent reductions assume no change in the hydrological characteristics of the lake (i.e. the average water residence time and hydraulic loading don't change). If nutrient abatement strategies do appreciably alter the average water residence time and hydraulic loading rate, then the excessive nutrient loading rate should be recalculated.

SUMMARY

A comparison of Lake Okeechobee with literature critical values for six common trophic state indicators (Secchi disk, chlorophyll a, total phosphorus, ortho phosphate, total nitrogen, and inorganic nitrogen) produced a subjective trophic state assessment of eutrophic. The same assessment was determined for the lake using a quantitative trophic state index (TSI (AVG)) based on four of the indicators (Secchi disk, chlorophyll a, total phosphorus and total nitrogen). This assessment was then used as one criterion for selecting an appropriate nutrient loading model for Lake Okeechobee. Other criteria considered in the selection were the model's predictive ability for nutrient concentration, and the model development data base.

The model which best fits the above criteria for both phosphorus and nitrogen was the modified Vollenweider (1976) model. It predicts the total phosphorus concentration in the lake from 1973-79 within 2 percent, and the total nitrogen concentration within 26 percent. The model was developed from a Florida data base with measured nutrient budgets and considers the effect of the water residence time on the lake's response to nutrient loadings. The modified Vollenweider (1976) model also accurately classified Lake Okeechobee as eutrophic based upon both phosphorus and nitrogen loadings.

Probability analysis was applied to the modified Vollenweider (1976) model to determine the probability of the trophic state classifications made by the model. Based on this analysis, Lake Okeechobee had a 78 percent probability of being eutrophic using the phosphorus loadings and a 79% probability using the nitrogen loadings.

On the average, the phosphorus and nitrogen loads to the lake from 1973 to 1979 were 40 percent and 34 percent, respectively, above the excessive levels set by the modified Vollenweider (1976) model. Since the lake is neither conclusively phosphorus or nitrogen limited, and since the model predicts the same trophic state based on either nutrient, both the phosphorus and nitrogen based models should be used to manage the lake at this time. After a reduction in phosphorus loadings, it would take approximately 1.5 years for 95 percent of the expected reduction in ambient phosphorus levels to occur. Similarly, it would take about 3.3 years for 95 percent of the expected reduction in ambient nitrogen levels to occur after a reduction in nitrogen loadings.

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APPENDIX A

SUMMARY STATISTICS FOR

THE INLAKE STATIONS

BASELINE EIGHT STATION LAKE OKEECHOBEE WATER CHEMISTRY DATA

PARAMETER	RANGE OF VALUES		UNITS
DATE	4/ 1/73 -	3/31/80	MO/DA/YR
DEPTH	0 -	0	METERS
SAMPLE	0.	0.	TYPE

STATION = L001 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		119	73	73	72	71
AVERAGE		0.0	24.3	8.6	99.	539.
ST. DEV.		0.0	5.0	1.6	18.	154.
MIN. VAL.	830.	0.0	12.7	5.1	64.	125.
MAX. VAL.	1545.	0.0	31.2	16.0	204.	760.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	73	46	97	69	33	107
AVERAGE	8.17	0.52	12.7	54.	34.6	0.013
ST. DEV.	0.47	0.26	9.6	28.	34.2	0.019
MIN. VAL.	6.20	0.08	2.1	20.	2.3	0.002
MAX. VAL.	9.00	1.22	42.0	200.	125.6	0.099

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	101	105	108	105	107	104
AVERAGE	0.064	0.085	0.005	0.081	0.03	0.11
ST. DEV.	0.033	0.124	0.002	0.123	0.03	0.12
MIN. VAL.	0.019	0.003	0.002	0.004	0.01	0.01
MAX. VAL.	0.157	0.533	0.016	0.529	0.19	0.54

	TKN-NH4 MG N/L	TOTAL N MG N/L	CHLOR A MG/M3	TOTAL FE MG/L	NA MG/L	K MG/L
NUM. VALS.	103	101	54	50	79	51
AVERAGE	1.53	1.65	30.2	0.39	49.74	4.15
ST. DEV.	0.46	0.48	16.5	0.31	13.52	0.82
MIN. VAL.	0.35	0.36	3.6	0.02	8.30	1.76
MAX. VAL.	3.06	3.08	90.7	1.43	70.78	5.92

	CA MG/L	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	80	80	105	40	102
AVERAGE	40.41	15.04	76.8	51.6	2.21
ST. DEV.	10.87	4.05	21.2	13.2	0.67
MIN. VAL.	4.20	2.20	15.4	6.8	0.14
MAX. VAL.	58.20	21.54	107.8	76.8	3.41

BASELINE EIGHT STATION LAKE OKEECHOBEE WATER CHEMISTRY DATA

PARAMETER	RANGE OF VALUES		UNITS
DATE	4/ 1/73 -	3/31/80	MO/DA/YR
DEPTH	0 -	0	METERS
SAMPLE	0.	0.	TYPE

STATION = L002 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		117	71	71	70	69
AVERAGE		0.0	24.4	8.6	100.	592.
ST. DEV.		0.0	5.0	1.3	13.	119.
MIN. VAL.	843.	0.0	12.8	6.2	76.	137.
MAX. VAL.	1710.	0.0	31.5	11.9	153.	780.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	72	46	96	69	36	98
AVERAGE	8.20	0.50	16.9	43.	32.0	0.014
ST. DEV.	0.27	0.28	13.8	17.	23.5	0.020
MIN. VAL.	7.23	0.12	1.2	19.	2.8	0.002
MAX. VAL.	9.10	1.28	73.0	140.	96.8	0.104

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	94	97	99	97	99	97
AVERAGE	0.061	0.123	0.005	0.120	0.03	0.15
ST. DEV.	0.043	0.188	0.002	0.187	0.03	0.20
MIN. VAL.	0.021	0.003	0.002	0.004	0.01	0.01
MAX. VAL.	0.297	1.412	0.017	1.408	0.25	1.43

	TKN-NH4 MG N/L	TOTAL N MG N/L	CHLOR A MG/M3	TOTAL FE MG/L	NA MG/L	K MG/L
NUM. VALS.	95	93	46	42	69	42
AVERAGE	1.54	1.68	26.4	0.42	55.71	4.23
ST. DEV.	0.48	0.52	11.6	0.33	8.85	0.70
MIN. VAL.	0.28	0.30	3.8	0.02	22.80	1.90
MAX. VAL.	2.91	3.12	55.4	1.09	73.91	6.30

	CA MG/L	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	70	70	98	34	95
AVERAGE	45.31	17.03	87.6	54.4	2.46
ST. DEV.	7.20	2.60	14.0	11.9	0.45
MIN. VAL.	21.40	7.20	24.0	15.8	0.69
MAX. VAL.	63.29	21.65	114.0	68.1	3.48

BASELINE EIGHT STATION

LAKE OKEECHOBEE WATER CHEMISTRY DATA

PARAMETER	RANGE OF VALUES		UNITS
DATE	4/ 1/73 -	3/31/80	MO/DA/YR
DEPTH	0 -	0	METERS
SAMPLE	0.	0.	TYPE

STATION = L003 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		116	71	71	70	69
AVERAGE		0.0	24.6	8.4	98.	606.
ST. DEV.		0.0	5.1	1.3	12.	103.
MIN. VAL.	856.	0.0	13.0	2.7	35.	136.
MAX. VAL.	1705.	0.0	31.7	11.6	124.	755.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	72	44	95	69	35	98
AVERAGE	8.13	0.45	20.7	41.	40.6	0.016
ST. DEV.	0.29	0.28	17.6	11.	40.6	0.018
MIN. VAL.	6.80	0.09	1.7	17.	2.8	0.002
MAX. VAL.	8.80	1.14	94.0	64.	226.9	0.077

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	93	97	98	97	97	96
AVERAGE	0.063	0.139	0.005	0.135	0.02	0.16
ST. DEV.	0.033	0.155	0.002	0.154	0.02	0.16
MIN. VAL.	0.019	0.001	0.002	0.004	0.01	0.01
MAX. VAL.	0.170	0.661	0.017	0.653	0.13	0.67

	TKN-NH4 MG N/L	TOTAL N MG N/L	CHLOR A MG/M3	TOTAL FE MG/L	NA MG/L	K MG/L
NUM. VALS.	94	94	47	42	68	41
AVERAGE	1.54	1.69	26.3	0.58	57.51	4.37
ST. DEV.	0.54	0.58	12.7	0.61	8.22	0.62
MIN. VAL.	0.41	0.42	3.4	0.02	33.00	3.40
MAX. VAL.	3.70	4.08	63.2	2.67	89.00	5.87

	CA MG/L	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	68	67	96	33	93
AVERAGE	45.55	17.18	89.5	56.8	2.53
ST. DEV.	8.31	2.67	11.1	10.5	0.38
MIN. VAL.	22.87	8.40	46.1	17.6	1.69
MAX. VAL.	80.73	22.03	129.0	73.1	3.48

BASELINE EIGHT STATION LAKE OKEECHOBEE WATER CHEMISTRY DATA

PARAMETER	RANGE OF VALUES			UNITS
DATE	4/ 1/73	-	3/31/80	MO/DA/YR
DEPTH	0	-	0	METERS
SAMPLE	0.		0.	TYPE

STATION = L004 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		120	74	74	73	72
AVERAGE		0.0	24.2	8.7	101.	611.
ST. DEV.		0.0	5.3	1.4	14.	106.
MIN. VAL.	935.	0.0	13.4	6.3	79.	132.
MAX. VAL.	1805.	0.0	32.5	14.5	188.	840.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	73	42	99	71	35	106
AVERAGE	8.14	0.37	23.2	39.	44.1	0.018
ST. DEV.	0.30	0.19	16.4	12.	39.3	0.018
MIN. VAL.	7.00	0.12	1.6	11.	5.6	0.002
MAX. VAL.	8.80	0.85	66.0	65.	180.8	0.074

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	103	106	108	105	107	105
AVERAGE	0.071	0.139	0.006	0.136	0.04	0.17
ST. DEV.	0.043	0.150	0.010	0.150	0.06	0.16
MIN. VAL.	0.016	0.001	0.002	0.004	0.01	0.01
MAX. VAL.	0.226	0.544	0.099	0.540	0.47	0.58

	TKN-NH4 MG N/L	TOTAL N MG N/L	CHLOR A MG/M3	TOTAL FE MG/L	NA MG/L	K MG/L
NUM. VALS.	104	103	54	50	75	46
AVERAGE	1.59	1.76	23.6	0.72	57.66	4.41
ST. DEV.	0.51	0.57	7.9	0.64	8.05	0.76
MIN. VAL.	0.35	0.36	5.3	0.03	30.00	2.60
MAX. VAL.	3.20	3.61	38.9	2.45	74.00	6.17

	CA MG/L	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	77	77	106	39	102
AVERAGE	46.63	17.62	89.0	57.4	2.55
ST. DEV.	5.71	2.17	11.8	9.9	0.40
MIN. VAL.	24.79	11.60	27.5	24.6	1.58
MAX. VAL.	58.31	22.29	116.0	83.2	3.63

BASELINE EIGHT STATION

LAKE OKEECHOBEE WATER CHEMISTRY DATA

PARAMETER	RANGE OF VALUES			UNITS
DATE	4/ 1/73	-	3/31/80	MO/DA/YR
DEPTH	0	-	0	METERS
SAMPLE	0.		0.	TYPE

STATION = L005 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/C
NUM. VALS.		121	76	73	73	73
AVERAGE		0.0	24.5	8.7	101.	567.
ST. DEV.		0.0	5.1	1.3	12.	140.
MIN. VAL.	856.	0.0	13.2	3.2	40.	141.
MAX. VAL.	1645.	0.0	31.2	11.8	131.	750.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	74	48	102	71	35	110
AVERAGE	8.31	0.83	10.9	49.	25.7	0.013
ST. DEV.	0.60	0.36	12.7	23.	21.7	0.038
MIN. VAL.	5.00	0.24	0.5	1.	1.3	0.002
MAX. VAL.	9.20	1.80	64.0	149.	108.3	0.342

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	107	110	110	110	109	109
AVERAGE	0.045	0.070	0.005	0.067	0.02	0.09
ST. DEV.	0.049	0.124	0.002	0.123	0.02	0.13
MIN. VAL.	0.005	0.001	0.002	0.004	0.01	0.01
MAX. VAL.	0.406	0.599	0.017	0.593	0.15	0.61

	TKN-NH4 MG N/L	TOTAL N MG N/L	CHLOR A MG/M3	TOTAL FE MG/L	NA MG/L	K MG/L
NUM. VALS.	105	106	56	50	79	49
AVERAGE	1.52	1.61	25.2	0.28	54.81	4.13
ST. DEV.	0.48	0.51	17.2	0.37	11.18	0.97
MIN. VAL.	0.26	0.29	4.4	0.02	10.60	0.44
MAX. VAL.	4.05	4.06	84.8	1.86	77.05	6.27

	CA MG/L	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	80	80	108	42	105
AVERAGE	42.80	16.89	84.7	54.6	2.44
ST. DEV.	8.35	3.58	17.6	12.1	0.62
MIN. VAL.	6.20	3.60	4.0	10.8	0.15
MAX. VAL.	56.30	22.71	140.7	75.4	6.49

BASELINE EIGHT STATION LAKE OKEECHOBEE WATER CHEMISTRY DATA

PARAMETER	RANGE OF VALUES		UNITS
DATE	4/ 1/73 -	3/31/80	MO/DA/YR
DEPTH	0 -	0	METERS
SAMPLE	0.	0.	TYPE

STATION = L006 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		122	76	74	74	73
AVERAGE		0.0	24.3	8.4	97.	602.
ST. DEV.		0.0	5.0	1.2	11.	105.
MIN. VAL.	800.	0.0	13.0	6.4	79.	141.
MAX. VAL.	1535.	0.0	31.1	12.3	132.	790.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	75	47	101	70	36	109
AVERAGE	8.06	0.56	21.0	42.	34.3	0.023
ST. DEV.	0.39	0.31	17.6	13.	28.2	0.021
MIN. VAL.	6.15	0.15	1.3	18.	3.3	0.002
MAX. VAL.	9.10	1.68	76.0	80.	134.1	0.099

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	106	108	111	108	111	108
AVERAGE	0.065	0.186	0.005	0.182	0.03	0.21
ST. DEV.	0.041	0.153	0.002	0.152	0.05	0.16
MIN. VAL.	0.015	0.001	0.002	0.004	0.01	0.01
MAX. VAL.	0.267	0.602	0.016	0.596	0.50	0.64

	TKN-NH4 MG N/L	TOTAL N MG N/L	CHLOR A MG/M3	TOTAL FE MG/L	NA MG/L	K MG/L
NUM. VALS.	109	106	55	52	79	49
AVERAGE	1.44	1.65	19.4	0.40	56.73	4.29
ST. DEV.	0.56	0.59	14.2	0.36	7.80	0.68
MIN. VAL.	0.35	0.36	3.3	0.02	27.00	2.20
MAX. VAL.	4.46	4.75	65.0	1.67	73.91	6.44

	CA MG/L	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	81	81	109	44	106
AVERAGE	46.18	17.38	87.8	57.0	2.53
ST. DEV.	6.74	2.43	12.7	9.8	0.39
MIN. VAL.	27.93	9.80	10.0	36.2	1.59
MAX. VAL.	70.40	22.07	118.0	83.2	3.66

BASELINE EIGHT STATION

LAKE OKEECHOBEE WATER CHEMISTRY DATA

PARAMETER	RANGE OF VALUES			UNITS
DATE	4/ 1/73	-	3/31/80	MO/DA/YR
DEPTH	0	-	0	METERS
SAMPLE	0.		0.	TYPE

STATION = L007 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		117	73	71	71	70
AVERAGE		0.0	24.5	8.5	99.	615.
ST. DEV.		0.0	5.3	1.4	14.	114.
MIN. VAL.	820.	0.0	12.8	5.1	59.	138.
MAX. VAL.	1710.	0.0	36.6	11.7	158.	915.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	72	44	96	70	35	99
AVERAGE	8.10	0.83	13.4	44.	26.1	0.020
ST. DEV.	0.40	0.58	13.6	15.	22.0	0.022
MIN. VAL.	6.80	0.15	1.2	10.	1.9	0.002
MAX. VAL.	9.13	2.73	63.0	88.	96.0	0.088

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	96	97	99	97	99	97
AVERAGE	0.054	0.202	0.005	0.197	0.03	0.23
ST. DEV.	0.030	0.285	0.004	0.281	0.03	0.29
MIN. VAL.	0.010	0.001	0.002	0.004	0.01	0.01
MAX. VAL.	0.140	2.507	0.042	2.465	0.18	2.53

	TKN-NH4 MG N/L	TOTAL N MG N/L	CHLOR A MG/M3	TOTAL FE MG/L	NA MG/L	K MG/L
NUM. VALS.	96	94	44	43	69	42
AVERAGE	1.55	1.77	17.1	0.28	56.10	4.30
ST. DEV.	0.56	0.68	13.3	0.29	8.51	0.64
MIN. VAL.	0.10	0.10	0.1	0.02	30.00	3.20
MAX. VAL.	3.61	4.86	70.0	1.21	74.90	6.20

	CA MG/L	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	69	70	98	32	96
AVERAGE	45.86	17.29	89.2	56.3	2.58
ST. DEV.	6.81	2.60	11.4	9.1	0.43
MIN. VAL.	19.20	8.60	47.8	32.8	1.30
MAX. VAL.	58.80	22.50	119.4	71.8	3.76

BASELINE EIGHT STATION LAKE OKEECHOBEE WATER CHEMISTRY DATA

PARAMETER	RANGE OF VALUES			UNITS
DATE	4/ 1/73	-	3/31/80	MO/DA/YR
DEPTH	0	-	0	METERS
SAMPLE	0.		0.	TYPE

STATION * L008 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		114	68	67	66	67
AVERAGE		0.0	24.6	8.7	101.	608.
ST. DEV.		0.0	5.0	1.1	11.	109.
MIN. VAL.	904.	0.0	12.8	6.6	85.	138.
MAX. VAL.	1715.	0.0	31.0	11.6	134.	790.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	67	44	94	67	36	96
AVERAGE	8.21	0.45	27.2	44.	47.3	0.016
ST. DEV.	0.47	0.29	23.0	24.	50.4	0.019
MIN. VAL.	5.70	0.10	2.5	15.	3.7	0.002
MAX. VAL.	9.20	1.11	93.0	200.	256.0	0.097

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	93	95	95	94	94	93
AVERAGE	0.067	0.144	0.005	0.137	0.02	0.17
ST. DEV.	0.042	0.166	0.003	0.164	0.03	0.17
MIN. VAL.	0.016	0.003	0.002	0.004	0.01	0.01
MAX. VAL.	0.207	0.720	0.023	0.714	0.28	0.73

	TKN-NH4 MG N/L	TOTAL N MG N/L	CHLOR A MG/M3	TOTAL FE MG/L	NA MG/L	K MG/L
NUM. VALS.	91	91	47	39	68	41
AVERAGE	1.56	1.71	27.0	0.52	55.99	4.30
ST. DEV.	0.52	0.58	16.8	0.49	8.42	0.67
MIN. VAL.	0.22	0.23	2.3	0.04	36.00	3.30
MAX. VAL.	3.86	4.09	96.9	1.92	75.56	6.68

	CA MG/L	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	69	69	94	33	91
AVERAGE	45.32	17.24	88.5	55.6	2.55
ST. DEV.	6.79	2.55	11.2	8.1	0.41
MIN. VAL.	24.20	11.20	58.0	35.0	1.57
MAX. VAL.	62.69	23.27	114.1	73.2	3.82

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES			UNITS
DATE	5/20/78	-	9/15/79	MO/DA/YR
DEPTH	0	-	0	METERS
SAMPLE	0.		0.	TYPE

STATION = LZ1 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		16	16	16	16	16
AVERAGE		0.0	27.0	8.4	102.	486.
ST. DEV.		0.0	4.4	1.4	15.	136.
MIN. VAL.	1050.	0.0	15.9	6.1	76.	242.
MAX. VAL.	1540.	0.0	32.0	10.3	124.	665.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	16	0	16	16	0	16
AVERAGE	8.01		3.9	56.		0.032
ST. DEV.	0.69		1.5	34.		0.044
MIN. VAL.	6.05		1.9	29.		0.002
MAX. VAL.	9.10		6.8	160.		0.145

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	16	16	16	16	16	16
AVERAGE	0.106	0.038	0.005	0.034	0.02	0.06
ST. DEV.	0.056	0.080	0.002	0.078	0.02	0.08
MIN. VAL.	0.037	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	0.240	0.322	0.010	0.312	0.10	0.33

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	14	14	16	0	0	0
AVERAGE	1.73	1.78	0.20			
ST. DEV.	0.34	0.32	0.13			
MIN. VAL.	1.19	1.40	0.03			
MAX. VAL.	2.34	2.37	0.49			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	16	0	16
AVERAGE		71.2		1.84
ST. DEV.		21.5		0.48
MIN. VAL.		35.9		1.02
MAX. VAL.		96.9		2.48

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES			UNITS
DATE	5/20/78	-	9/15/79	MO/DA/YR
DEPTH	0	-	0	METERS
SAMPLE	0.		0.	TYPE

STATION = LZ2 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		16	16	16	16	16
AVERAGE		0.0	26.7	8.7	105.	480.
ST. DEV.		0.0	4.3	1.6	18.	123.
MIN. VAL.	1037.	0.0	15.7	5.8	71.	262.
MAX. VAL.	1525.	0.0	31.3	11.4	139.	645.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	16	0	16	16	1	16
AVERAGE	8.05		4.5	62.	8.0	0.022
ST. DEV.	0.74		3.5	41.		0.035
MIN. VAL.	6.30		1.3	22.	8.0	0.002
MAX. VAL.	9.00		16.0	170.	8.0	0.099

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	16	16	16	16	16	16
AVERAGE	0.092	0.021	0.004	0.018	0.01	0.03
ST. DEV.	0.055	0.044	0.001	0.043	0.00	0.05
MIN. VAL.	0.027	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	0.222	0.177	0.008	0.171	0.02	0.19

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	14	14	16	0	0	0
AVERAGE	1.63	1.66	0.23			
ST. DEV.	0.42	0.42	0.21			
MIN. VAL.	1.11	1.13	0.02			
MAX. VAL.	2.64	2.72	0.76			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	16	0	16
AVERAGE		70.3		1.74
ST. DEV.		20.5		0.50
MIN. VAL.		32.4		0.96
MAX. VAL.		96.9		2.39

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES			UNITS
DATE	5/20/78	-	9/15/79	MO/DA/YR
DEPTH	0	-	0	METERS
SAMPLE	0.		0.	TYPE

STATION = LZ3 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/C
NUM. VALS.		16	16	16	16	16
AVERAGE		0.0	26.7	8.5	103.	508.
ST. DEV.		0.0	4.4	1.3	15.	153.
MIN. VAL.	1102.	0.0	15.3	6.8	84.	120.
MAX. VAL.	1510.	0.0	31.9	10.6	130.	685.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	15	0	16	16	0	16
AVERAGE	7.92		5.6	55.		0.022
ST. DEV.	0.84		4.0	39.		0.026
MIN. VAL.	6.20		2.4	20.		0.002
MAX. VAL.	8.63		16.0	160.		0.088

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	16	16	16	16	16	16
AVERAGE	0.083	0.046	0.005	0.043	0.02	0.06
ST. DEV.	0.032	0.070	0.002	0.069	0.01	0.07
MIN. VAL.	0.044	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	0.151	0.262	0.011	0.258	0.04	0.27

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	14	14	16	0	0	0
AVERAGE	1.64	1.70	0.28			
ST. DEV.	0.65	0.65	0.21			
MIN. VAL.	0.10	0.10	0.03			
MAX. VAL.	3.07	3.14	0.71			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	16	0	16
AVERAGE		74.9		1.86
ST. DEV.		25.0		0.61
MIN. VAL.		13.5		0.30
MAX. VAL.		100.0		2.57

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES			UNITS
DATE	5/20/78	-	9/15/79	MO/DA/YR
DEPTH	0	-	0	METERS
SAMPLE	0.		0.	TYPE

STATION = LZ4 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		16	16	16	16	16
AVERAGE		0.0	27.0	7.9	96.	490.
ST. DEV.		0.0	4.7	2.7	33.	144.
MIN. VAL.	1113.	0.0	15.6	0.6	7.	152.
MAX. VAL.	1600.	0.0	34.3	10.7	144.	685.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	15	0	16	16	0	16
AVERAGE	7.81		4.6	85.		0.212
ST. DEV.	0.90		2.2	83.		0.259
MIN. VAL.	6.20		2.2	11.		0.002
MAX. VAL.	9.45		10.0	340.		0.946

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	16	16	16	16	16	16
AVERAGE	0.312	0.082	0.010	0.073	0.04	0.12
ST. DEV.	0.259	0.124	0.010	0.117	0.06	0.13
MIN. VAL.	0.059	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	1.019	0.364	0.039	0.345	0.22	0.39

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	14	14	16	0	0	0
AVERAGE	1.79	1.90	0.46			
ST. DEV.	0.58	0.55	0.70			
MIN. VAL.	0.81	1.18	0.03			
MAX. VAL.	3.03	3.05	2.99			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	16	0	16
AVERAGE		75.0		1.74
ST. DEV.		23.4		0.55
MIN. VAL.		29.9		0.59
MAX. VAL.		98.9		2.38

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES		UNITS
DATE	5/20/78 -	9/15/79	MO/DA/YR
DEPTH	0 -	0	METERS
SAMPLE	0.	0.	TYPE

STATION = L75 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		16	15	16	15	16
AVERAGE		0.0	26.9	9.5	116.	544.
ST. DEV.		0.0	4.5	2.1	27.	109.
MIN. VAL.	1010.	0.0	15.4	4.4	56.	300.
MAX. VAL.	1538.	0.0	31.8	13.4	174.	675.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	15	0	16	16	0	16
AVERAGE	8.31		6.1	48.		0.042
ST. DEV.	0.65		3.1	40.		0.077
MIN. VAL.	6.64		2.1	20.		0.002
MAX. VAL.	9.23		14.0	180.		0.302

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	16	16	16	16	16	16
AVERAGE	0.118	0.036	0.007	0.030	0.02	0.06
ST. DEV.	0.078	0.069	0.011	0.067	0.02	0.07
MIN. VAL.	0.030	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	0.314	0.262	0.049	0.258	0.10	0.27

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	14	14	16	0	0	0
AVERAGE	1.84	1.89	0.23			
ST. DEV.	0.37	0.34	0.18			
MIN. VAL.	1.08	1.35	0.02			
MAX. VAL.	2.44	2.56	0.62			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	16	0	16
AVERAGE		80.9		2.07
ST. DEV.		17.1		0.44
MIN. VAL.		42.0		1.23
MAX. VAL.		100.2		2.63

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES		UNITS
DATE	5/20/78 -	9/15/79	MO/DA/YR
DEPTH	0 -	0	METERS
SAMPLE	0.	0.	TYPE

STATION = LZ6 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		16	16	16	16	16
AVERAGE		0.0	27.0	9.2	113.	547.
ST. DEV.		0.0	4.5	1.6	21.	94.
MIN. VAL.	1024.	0.0	15.7	7.4	90.	360.
MAX. VAL.	1550.	0.0	32.0	12.8	158.	672.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	15	0	16	16	0	16
AVERAGE	8.22		7.4	50.		0.029
ST. DEV.	0.75		6.7	34.		0.030
MIN. VAL.	5.80		1.2	20.		0.002
MAX. VAL.	8.90		28.0	120.		0.106

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	16	16	16	16	16	16
AVERAGE	0.094	0.064	0.004	0.061	0.01	0.07
ST. DEV.	0.045	0.121	0.000	0.121	0.01	0.12
MIN. VAL.	0.032	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	0.202	0.357	0.004	0.353	0.03	0.37

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	14	14	16	0	0	0
AVERAGE	1.85	1.91	0.29			
ST. DEV.	0.88	0.86	0.28			
MIN. VAL.	0.94	0.98	0.05			
MAX. VAL.	4.39	4.41	1.01			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	16	0	16
AVERAGE		82.3		2.05
ST. DEV.		16.4		0.37
MIN. VAL.		45.9		1.37
MAX. VAL.		101.1		2.52

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES		UNITS
DATE	5/20/78 -	9/15/79	MO/DA/YR
DEPTH	0 -	0	METERS
SAMPLE	0.	0.	TYPE

STATION = LZ7 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		17	17	17	17	17
AVERAGE		0.0	25.7	7.2	85.	364.
ST. DEV.		0.0	4.8	2.4	25.	168.
MIN. VAL.	900.	0.0	15.4	2.8	36.	95.
MAX. VAL.	1435.	0.0	30.4	10.7	118.	565.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	16	0	17	17	0	17
AVERAGE	7.55		4.2	78.		0.038
ST. DEV.	1.02		3.6	60.		0.059
MIN. VAL.	5.70		1.6	30.		0.002
MAX. VAL.	8.84		17.0	270.		0.214

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	17	17	17	17	17	17
AVERAGE	0.103	0.029	0.010	0.021	0.05	0.08
ST. DEV.	0.048	0.048	0.013	0.044	0.06	0.08
MIN. VAL.	0.048	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	0.234	0.185	0.045	0.179	0.17	0.22

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	15	15	17	0	0	0
AVERAGE	1.63	1.71	0.38			
ST. DEV.	0.52	0.50	0.22			
MIN. VAL.	0.81	0.84	0.08			
MAX. VAL.	2.52	2.55	0.82			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	17	0	17
AVERAGE		54.4		1.39
ST. DEV.		28.3		0.71
MIN. VAL.		14.5		0.34
MAX. VAL.		92.1		2.35

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES		UNITS
DATE	5/20/78 -	9/15/79	MO/DA/YR
DEPTH	0 -	0	METERS
SAMPLE	0.	0.	TYPE

STATION = LZ8 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		17	17	17	17	17
AVERAGE		0.0	25.6	8.4	99.	455.
ST. DEV.		0.0	4.9	1.6	15.	157.
MIN. VAL.	1010.	0.0	15.0	5.5	69.	115.
MAX. VAL.	1445.	0.0	30.4	10.8	125.	680.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	16	0	17	17	0	17
AVERAGE	7.72		5.8	57.		0.014
ST. DEV.	0.95		6.4	37.		0.018
MIN. VAL.	5.60		1.9	18.		0.002
MAX. VAL.	8.73		30.0	150.		0.068

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	17	17	17	17	17	17
AVERAGE	0.076	0.035	0.004	0.032	0.01	0.05
ST. DEV.	0.034	0.065	0.000	0.065	0.00	0.07
MIN. VAL.	0.028	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	0.160	0.274	0.005	0.270	0.02	0.28

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	15	15	17	0	0	0
AVERAGE	1.56	1.60	0.38			
ST. DEV.	0.40	0.39	0.43			
MIN. VAL.	0.99	1.05	0.02			
MAX. VAL.	2.40	2.44	1.85			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	17	0	17
AVERAGE		67.5		1.69
ST. DEV.		26.5		0.69
MIN. VAL.		14.5		0.28
MAX. VAL.		102.8		2.58

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES			UNITS
DATE	5/20/78	-	9/15/79	MO/DA/YR
DEPTH	0	-	0	METERS
SAMPLE	0.		0.	TYPE

STATION = LZ9 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/C
NUM. VALS.		17	17	17	17	17
AVERAGE		0.0	25.7	8.9	106.	495.
ST. DEV.		0.0	5.0	2.4	29.	166.
MIN. VAL.	1020.	0.0	15.0	6.0	76.	125.
MAX. VAL.	1500.	0.0	31.0	16.0	204.	725.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	16	0	17	17	0	17
AVERAGE	7.94		6.7	58.		0.016
ST. DEV.	0.72		6.7	49.		0.021
MIN. VAL.	6.20		2.1	20.		0.002
MAX. VAL.	8.50		26.0	200.		0.086

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	17	17	17	17	17	17
AVERAGE	0.079	0.041	0.004	0.037	0.02	0.06
ST. DEV.	0.034	0.066	0.001	0.065	0.01	0.07
MIN. VAL.	0.024	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	0.145	0.258	0.008	0.254	0.06	0.27

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	15	15	17	0	0	0
AVERAGE	1.65	1.71	0.30			
ST. DEV.	0.45	0.46	0.24			
MIN. VAL.	0.80	0.85	0.04			
MAX. VAL.	2.36	2.46	0.85			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	17	0	17
AVERAGE		73.1		1.82
ST. DEV.		26.3		0.68
MIN. VAL.		15.4		0.35
MAX. VAL.		100.1		2.57

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES			UNITS
DATE	5/20/78	-	9/15/79	MO/DA/YR
DEPTH	0	-	0	METERS
SAMPLE	0.		0.	TYPE

STATION = LZ10 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		17	16	16	16	16
AVERAGE		0.0	26.9	8.8	107.	615.
ST. DEV.		0.0	4.5	1.8	24.	109.
MIN. VAL.	1035.	0.0	16.2	5.3	68.	460.
MAX. VAL.	1610.	0.0	33.5	11.8	153.	875.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	15	0	17	17	0	17
AVERAGE	8.17		8.2	40.		0.020
ST. DEV.	0.50		5.9	16.		0.027
MIN. VAL.	7.38		1.6	20.		0.002
MAX. VAL.	8.83		21.0	81.		0.100

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	17	17	17	17	17	17
AVERAGE	0.087	0.103	0.010	0.094	0.02	0.12
ST. DEV.	0.051	0.146	0.019	0.134	0.02	0.15
MIN. VAL.	0.022	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	0.200	0.464	0.082	0.385	0.08	0.51

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	15	15	17	0	0	0
AVERAGE	1.98	2.09	0.31			
ST. DEV.	0.89	0.92	0.28			
MIN. VAL.	1.11	1.38	0.02			
MAX. VAL.	4.93	5.12	0.91			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	17	0	17
AVERAGE		89.2		2.39
ST. DEV.		19.9		0.69
MIN. VAL.		55.2		1.39
MAX. VAL.		137.1		4.29

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES			UNITS
DATE	5/20/78	-	9/15/79	MO/DA/YR
DEPTH	0	-	0	METERS
SAMPLE	0.		0.	TYPE

STATION = L711 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		16	16	16	16	16
AVERAGE		0.0	26.7	9.1	111.	567.
ST. DEV.		0.0	4.4	1.7	21.	[illegible]
MIN. VAL.	1105.	0.0	16.5	6.7	83.	400.
MAX. VAL.	1625.	0.0	31.5	12.4	158.	690.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	15	0	16	16	0	16
AVERAGE	8.11		8.4	37.		0.017
ST. DEV.	0.54		6.4	18.		0.016
MIN. VAL.	6.50		3.0	20.		0.002
MAX. VAL.	8.70		22.0	90.		0.049

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	16	16	16	16	16	16
AVERAGE	0.083	0.106	0.008	0.099	0.01	0.12
ST. DEV.	0.041	0.147	0.014	0.140	0.01	0.15
MIN. VAL.	0.048	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	0.192	0.428	0.061	0.424	0.03	0.44

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	14	14	16	0	0	0
AVERAGE	1.72	1.82	0.31			
ST. DEV.	0.74	0.81	0.31			
MIN. VAL.	0.71	0.73	0.05			
MAX. VAL.	3.55	3.95	0.91			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	16	0	16
AVERAGE		84.1		2.14
ST. DEV.		14.3		0.29
MIN. VAL.		51.4		1.58
MAX. VAL.		104.0		2.52

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES			UNITS
DATE	5/20/78	-	9/15/79	MO/DA/YR
DEPTH	0	-	0	METERS
SAMPLE	0.		0.	TYPE

STATION * LZ12 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		16	16	16	16	16
AVERAGE		0.0	25.8	8.8	105.	602.
ST. DEV.		0.0	5.2	1.2	11.	70.
MIN. VAL.	928.	0.0	15.1	7.0	87.	490.
MAX. VAL.	1635.	0.0	31.5	10.8	132.	710.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	15	0	16	16	0	16
AVERAGE	8.16		8.7	31.		0.016
ST. DEV.	0.21		7.7	10.		0.016
MIN. VAL.	7.87		2.0	19.		0.002
MAX. VAL.	8.52		26.0	50.		0.058

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	16	16	16	16	16	16
AVERAGE	0.068	0.071	0.004	0.068	0.02	0.08
ST. DEV.	0.040	0.101	0.001	0.100	0.01	0.10
MIN. VAL.	0.030	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	0.165	0.291	0.006	0.287	0.04	0.31

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	14	14	16	0	0	0
AVERAGE	1.80	1.88	0.38			
ST. DEV.	0.51	0.57	0.38			
MIN. VAL.	1.16	1.18	0.03			
MAX. VAL.	2.78	3.09	1.09			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	16	0	16
AVERAGE		91.5		2.24
ST. DEV.		8.8		0.29
MIN. VAL.		74.0		1.61
MAX. VAL.		102.0		2.63

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES			UNITS
DATE	5/20/78	-	9/15/79	MO/DA/YR
DEPTH	0	-	0	METERS
SAMPLE	0.		0.	TYPE

STATION = LZ13 CODE

	TIME HOUR.MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		16	16	16	16	16
AVERAGE		0.0	26.0	8.5	101.	603.
ST. DEV.		0.0	5.2	1.2	10.	70.
MIN. VAL.	1005.	0.0	15.0	6.6	83.	472.
MAX. VAL.	1705.	0.0	31.6	11.2	115.	720.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	15	0	16	16	0	16
AVERAGE	7.99		11.5	32.		0.023
ST. DEV.	0.30		10.1	10.		0.015
MIN. VAL.	7.25		2.2	17.		0.002
MAX. VAL.	8.60		29.0	50.		0.054

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	16	16	16	16	16	16
AVERAGE	0.073	0.102	0.004	0.099	0.02	0.12
ST. DEV.	0.037	0.138	0.000	0.137	0.01	0.14
MIN. VAL.	0.029	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	0.154	0.418	0.004	0.414	0.03	0.43

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	14	14	16	0	0	0
AVERAGE	1.62	1.75	0.42			
ST. DEV.	0.41	0.44	0.43			
MIN. VAL.	0.99	1.17	0.02			
MAX. VAL.	2.32	2.53	1.27			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	16	0	16
AVERAGE		92.1		2.22
ST. DEV.		8.4		0.27
MIN. VAL.		77.9		1.69
MAX. VAL.		105.1		2.72

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES			UNITS
DATE	5/20/78	-	9/15/79	MO/DA/YR
DEPTH	0	-	0	METERS
SAMPLE	0.		0.	TYPE

STATION = LZ14 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		15	15	15	15	15
AVERAGE		0.0	26.1	8.6	103.	603.
ST. DEV.		0.0	5.4	1.7	19.	79.
MIN. VAL.	1046.	0.0	14.8	5.2	67.	368.
MAX. VAL.	1758.	0.0	31.5	10.6	136.	735.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	14	0	15	15	0	15
AVERAGE	8.07		18.1	42.		0.026
ST. DEV.	0.30		31.1	24.		0.024
MIN. VAL.	7.60		3.2	21.		0.002
MAX. VAL.	8.63		125.0	110.		0.070

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	15	15	15	15	15	15
AVERAGE	0.094	0.170	0.017	0.155	0.02	0.19
ST. DEV.	0.061	0.204	0.047	0.180	0.02	0.21
MIN. VAL.	0.034	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	0.244	0.600	0.185	0.461	0.07	0.62

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	13	13	15	0	0	0
AVERAGE	1.71	1.89	0.47			
ST. DEV.	0.47	0.63	0.49			
MIN. VAL.	0.94	0.97	0.02			
MAX. VAL.	2.70	3.32	1.58			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	15	0	15
AVERAGE		88.7		2.25
ST. DEV.		12.9		0.32
MIN. VAL.		45.9		1.49
MAX. VAL.		101.8		2.67

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES		UNITS
DATE	5/20/78 -	9/15/79	MO/DA/YR
DEPTH	0 -	0	METERS
SAMPLE	0.	0.	TYPE

STATION = LZ15 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		16	16	16	16	16
AVERAGE		0.0	26.2	8.6	103.	596.
ST. DEV.		0.0	5.2	1.1	12.	69.
MIN. VAL.	1104.	0.0	15.2	6.7	84.	485.
MAX. VAL.	1810.	0.0	32.1	10.3	129.	738.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	15	0	16	16	0	16
AVERAGE	7.95		11.9	36.		0.021
ST. DEV.	0.29		12.5	14.		0.017
MIN. VAL.	7.50		1.8	16.		0.002
MAX. VAL.	8.55		40.0	60.		0.052

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	16	16	16	15	16	16
AVERAGE	0.083	0.093	0.013	0.092	0.02	0.11
ST. DEV.	0.048	0.126	0.034	0.129	0.01	0.13
MIN. VAL.	0.032	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	0.186	0.388	0.141	0.383	0.04	0.41

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	14	14	16	0	0	0
AVERAGE	1.63	1.73	0.48			
ST. DEV.	0.36	0.39	0.55			
MIN. VAL.	1.04	1.06	0.03			
MAX. VAL.	2.26	2.35	1.63			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	16	0	16
AVERAGE		89.8		2.20
ST. DEV.		8.4		0.22
MIN. VAL.		71.5		1.85
MAX. VAL.		104.9		2.56

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES			UNITS
DATE	5/20/78	-	9/15/79	MO/DA/YR
DEPTH	0	-	0	METERS
SAMPLE	0.		0.	TYPE

STATION = LZ16 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		16	16	16	16	16
AVERAGE		0.0	25.8	8.7	104.	609.
ST. DEV.		0.0	5.0	1.2	9.	69.
MIN. VAL.	1012.	0.0	15.0	6.9	85.	502.
MAX. VAL.	1805.	0.0	30.9	11.6	120.	735.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	15	0	16	16	0	16
AVERAGE	8.02		14.0	34.		0.025
ST. DEV.	0.28		12.4	15.		0.017
MIN. VAL.	7.35		2.4	16.		0.002
MAX. VAL.	8.50		34.0	65.		0.054

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	16	16	16	15	16	16
AVERAGE	0.086	0.111	0.010	0.112	0.02	0.13
ST. DEV.	0.048	0.141	0.024	0.144	0.01	0.15
MIN. VAL.	0.037	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	0.174	0.394	0.099	0.389	0.04	0.43

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	14	14	16	0	0	0
AVERAGE	1.66	1.78	0.52			
ST. DEV.	0.45	0.47	0.56			
MIN. VAL.	1.11	1.20	0.03			
MAX. VAL.	2.70	2.78	1.58			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	16	0	16
AVERAGE		92.3		2.21
ST. DEV.		7.6		0.29
MIN. VAL.		76.2		1.65
MAX. VAL.		101.3		2.76

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES			UNITS
DATE	5/20/78	-	9/15/79	MO/DA/YR
DEPTH	0	-	0	METERS
SAMPLE	0.		0.	TYPE

STATION = LZ17 CODE

	TIME HOUR.MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		17	17	17	17	17
AVERAGE		0.0	26.0	8.1	97.	611.
ST. DEV.		0.0	5.1	1.5	15.	65.
MIN. VAL.	1020.	0.0	14.5	5.6	69.	460.
MAX. VAL.	1550.	0.0	32.8	11.7	126.	715.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	17	0	17	17	0	17
AVERAGE	7.96		12.1	38.		0.030
ST. DEV.	0.28		12.9	16.		0.021
MIN. VAL.	7.65		1.1	21.		0.002
MAX. VAL.	8.58		44.0	70.		0.069

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	17	17	17	17	17	17
AVERAGE	0.085	0.179	0.014	0.165	0.02	0.20
ST. DEV.	0.048	0.234	0.038	0.218	0.01	0.23
MIN. VAL.	0.042	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	0.243	0.740	0.163	0.732	0.05	0.75

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	16	16	17	0	0	0
AVERAGE	1.75	1.95	0.43			
ST. DEV.	0.66	0.71	0.45			
MIN. VAL.	1.03	1.07	0.04			
MAX. VAL.	3.61	3.63	1.69			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	17	0	17
AVERAGE		92.7		2.30
ST. DEV.		10.9		0.32
MIN. VAL.		62.3		1.76
MAX. VAL.		113.7		2.98

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES			UNITS
DATE	5/20/78	-	9/15/79	MO/DA/YR
DEPTH	0	-	0	METERS
SAMPLE	0.		0.	TYPE

STATION = L718 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		17	17	17	17	17
AVERAGE		0.0	25.9	8.6	103.	610.
ST. DEV.		0.0	5.0	1.3	14.	64.
MIN. VAL.	1032.	0.0	14.6	6.7	81.	470.
MAX. VAL.	1603.	0.0	32.5	11.8	135.	715.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	17	0	17	17	0	17
AVERAGE	8.05		12.4	34.		0.026
ST. DEV.	0.22		12.1	11.		0.018
MIN. VAL.	7.85		1.5	16.		0.002
MAX. VAL.	8.71		48.0	60.		0.053

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	17	17	17	17	17	17
AVERAGE	0.080	0.145	0.011	0.142	0.01	0.16
ST. DEV.	0.045	0.188	0.028	0.187	0.01	0.19
MIN. VAL.	0.037	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	0.221	0.584	0.120	0.580	0.03	0.60

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	16	16	17	0	0	0
AVERAGE	1.69	1.86	0.46			
ST. DEV.	0.46	0.52	0.47			
MIN. VAL.	1.07	1.29	0.07			
MAX. VAL.	2.84	3.44	1.68			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	17	0	17
AVERAGE		92.4		2.22
ST. DEV.		6.7		0.27
MIN. VAL.		77.9		1.69
MAX. VAL.		100.5		2.64

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES		UNITS
DATE	5/20/78 -	9/15/79	MO/DA/YR
DEPTH	0 -	0	METERS
SAMPLE	0.	0.	TYPE

STATION = L719 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		17	17	17	17	17
AVERAGE		0.0	26.0	7.8	93.	631.
ST. DEV.		0.0	5.1	1.9	19.	59.
MIN. VAL.	945.	0.0	14.8	4.2	53.	500.
MAX. VAL.	1616.	0.0	32.5	11.9	117.	710.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	17	0	17	17	0	17
AVERAGE	7.81		8.0	37.		0.026
ST. DEV.	0.61		5.8	13.		0.015
MIN. VAL.	5.65		1.7	18.		0.002
MAX. VAL.	8.50		22.0	70.		0.050

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	17	17	17	17	17	17
AVERAGE	0.071	0.258	0.013	0.246	0.03	0.29
ST. DEV.	0.019	0.329	0.026	0.308	0.04	0.36
MIN. VAL.	0.040	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	0.114	1.281	0.113	1.168	0.15	1.43

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	16	16	17	0	0	0
AVERAGE	1.56	1.86	0.26			
ST. DEV.	0.43	0.58	0.25			
MIN. VAL.	0.79	0.85	0.02			
MAX. VAL.	2.19	3.26	0.81			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	17	0	17
AVERAGE		94.2		2.42
ST. DEV.		9.8		0.40
MIN. VAL.		71.8		1.82
MAX. VAL.		108.4		3.42

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES		UNITS
DATE	5/20/78 -	9/15/79	MO/DA/YR
DEPTH	0 -	0	METERS
SAMPLE	0.	0.	TYPE

STATION = LZ20 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		17	17	17	17	17
AVERAGE		0.0	26.2	8.7	105.	614.
ST. DEV.		0.0	5.3	1.5	18.	58.
MIN. VAL.	952.	0.0	14.8	6.7	83.	490.
MAX. VAL.	1626.	0.0	33.5	12.0	160.	695.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	17	0	17	17	0	16
AVERAGE	7.92		11.9	32.		0.028
ST. DEV.	0.60		11.1	10.		0.015
MIN. VAL.	5.87		2.6	16.		0.002
MAX. VAL.	8.75		48.0	51.		0.050

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	17	17	17	17	17	17
AVERAGE	0.077	0.167	0.008	0.160	0.02	0.18
ST. DEV.	0.039	0.166	0.013	0.162	0.01	0.17
MIN. VAL.	0.038	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	0.206	0.468	0.058	0.464	0.04	0.50

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	16	16	17	0	0	0
AVERAGE	1.61	1.80	0.40			
ST. DEV.	0.43	0.44	0.41			
MIN. VAL.	1.05	1.27	0.04			
MAX. VAL.	2.45	2.63	1.65			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	17	0	17
AVERAGE		93.5		2.28
ST. DEV.		8.8		0.26
MIN. VAL.		82.4		1.79
MAX. VAL.		119.0		2.64

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES			UNITS
DATE	5/20/78	-	9/15/79	MO/DA/YR
DEPTH	0	-	0	METERS
SAMPLE	0.		0.	TYPE

STATION = LZ21 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		17	17	17	17	17
AVERAGE		0.0	26.1	8.5	102.	612.
ST. DEV.		0.0	5.2	1.8	22.	65.
MIN. VAL.	959.	0.0	14.8	6.1	73.	490.
MAX. VAL.	1641.	0.0	33.5	12.8	171.	700.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	17	0	17	17	0	17
AVERAGE	8.01		8.0	33.		0.022
ST. DEV.	0.30		6.4	10.		0.016
MIN. VAL.	7.70		1.5	17.		0.002
MAX. VAL.	8.75		25.0	50.		0.051

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	17	17	17	17	17	17
AVERAGE	0.060	0.167	0.006	0.161	0.02	0.18
ST. DEV.	0.022	0.163	0.005	0.162	0.01	0.17
MIN. VAL.	0.032	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	0.098	0.509	0.025	0.505	0.05	0.52

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	16	16	17	0	0	0
AVERAGE	1.73	1.92	0.25			
ST. DEV.	0.64	0.64	0.22			
MIN. VAL.	0.91	1.10	0.02			
MAX. VAL.	3.51	3.88	0.71			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	17	0	17
AVERAGE		92.6		2.32
ST. DEV.		6.0		0.29
MIN. VAL.		83.0		1.76
MAX. VAL.		102.3		2.75

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES		UNITS
DATE	5/20/78 -	9/15/79	MO/DA/YR
DEPTH	0 -	0	METERS
SAMPLE	0.	0.	TYPE

STATION = LZ22 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		17	17	17	17	17
AVERAGE		0.0	25.2	7.4	89.	795.
ST. DEV.		0.0	5.2	1.5	19.	195.
MIN. VAL.	1007.	0.0	15.4	4.4	55.	495.
MAX. VAL.	1652.	0.0	32.8	9.6	118.	1200.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	17	0	17	17	0	17
AVERAGE	7.73		5.1	63.		0.027
ST. DEV.	0.34		3.9	41.		0.018
MIN. VAL.	7.15		1.0	25.		0.002
MAX. VAL.	8.45		13.0	173.		0.063

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	17	17	17	16	17	17
AVERAGE	0.071	0.534	0.054	0.522	0.08	0.61
ST. DEV.	0.020	0.879	0.089	0.839	0.10	0.90
MIN. VAL.	0.039	0.008	0.004	0.004	0.01	0.01
MAX. VAL.	0.118	3.261	0.306	3.130	0.39	3.30

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	15	15	17	0	0	0
AVERAGE	2.09	2.75	0.19			
ST. DEV.	0.87	1.64	0.20			
MIN. VAL.	0.73	0.82	0.02			
MAX. VAL.	3.53	6.69	0.63			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	17	0	17
AVERAGE		110.4		3.44
ST. DEV.		19.8		1.41
MIN. VAL.		81.0		1.96
MAX. VAL.		151.6		7.58

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES		UNITS
DATE	5/20/78 -	9/15/79	MO/DA/YR
DEPTH	0 -	0	METERS
SAMPLE	0.	0.	TYPE

STATION = LZ23 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		17	17	17	17	17
AVERAGE		0.0	26.4	6.2	74.	866.
ST. DEV.		0.0	5.3	2.6	31.	295.
MIN. VAL.	949.	0.0	15.6	1.2	15.	545.
MAX. VAL.	1800.	0.0	34.5	10.0	123.	1620.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	17	0	17	17	0	17
AVERAGE	7.62		4.9	69.		0.044
ST. DEV.	0.52		3.0	43.		0.062
MIN. VAL.	6.80		1.2	25.		0.002
MAX. VAL.	8.60		14.0	172.		0.261

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	17	17	17	17	17	17
AVERAGE	0.094	0.940	0.047	0.893	0.19	1.12
ST. DEV.	0.083	1.394	0.053	1.373	0.30	1.47
MIN. VAL.	0.033	0.008	0.004	0.004	0.01	0.02
MAX. VAL.	0.400	4.757	0.174	4.719	1.21	4.82

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	15	15	17	0	0	0
AVERAGE	2.48	3.71	0.16			
ST. DEV.	1.01	1.99	0.16			
MIN. VAL.	1.23	1.71	0.02			
MAX. VAL.	4.55	7.94	0.64			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	17	0	17
AVERAGE		116.2		3.90
ST. DEV.		27.7		1.83
MIN. VAL.		92.5		2.01
MAX. VAL.		186.0		7.42

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES			UNITS
DATE	5/23/78	-	9/15/79	MO/DA/YR
DEPTH	0	-	0	METERS
SAMPLE	0.		0.	TYPE

STATION = LZ24 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		17	17	17	17	17
AVERAGE		0.0	26.5	8.8	106.	864.
ST. DEV.		0.0	5.7	1.7	21.	235.
MIN. VAL.	914.	0.0	14.8	6.1	73.	595.
MAX. VAL.	1744.	0.0	37.4	12.1	151.	1350.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	17	0	17	17	1	17
AVERAGE	8.01		4.9	72.	10.0	0.005
ST. DEV.	0.29		2.8	41.		0.005
MIN. VAL.	7.60		1.8	35.	10.0	0.002
MAX. VAL.	8.73		13.0	180.	10.0	0.020

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	17	17	17	17	17	17
AVERAGE	0.056	0.332	0.048	0.286	0.04	0.37
ST. DEV.	0.023	0.512	0.088	0.454	0.07	0.55
MIN. VAL.	0.021	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	0.108	1.551	0.285	1.479	0.28	1.56

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	15	15	17	0	0	0
AVERAGE	2.66	3.08	0.11			
ST. DEV.	0.88	1.27	0.15			
MIN. VAL.	1.39	1.44	0.02			
MAX. VAL.	3.96	5.52	0.63			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	17	0	17
AVERAGE		118.0		4.07
ST. DEV.		24.7		1.72
MIN. VAL.		90.5		2.24
MAX. VAL.		167.2		8.70

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES			UNITS
DATE	5/20/78	-	9/15/79	MO/DA/YR
DEPTH	0	-	0	METERS
SAMPLE	0.		0.	TYPE

STATION = LZ25 CODE

	TIME HOUR.MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		17	17	17	17	17
AVERAGE		0.0	26.4	9.4	114.	679.
ST. DEV.		0.0	5.4	2.7	34.	75.
MIN. VAL.	935.	0.0	14.8	6.0	74.	495.
MAX. VAL.	1719.	0.0	36.5	18.3	232.	810.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	17	0	17	17	0	17
AVERAGE	8.22		9.2	43.		0.005
ST. DEV.	0.36		15.3	16.		0.007
MIN. VAL.	7.80		1.6	19.		0.002
MAX. VAL.	8.99		67.0	72.		0.031

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	17	17	17	17	17	17
AVERAGE	0.066	0.172	0.009	0.164	0.02	0.19
ST. DEV.	0.072	0.462	0.020	0.444	0.02	0.48
MIN. VAL.	0.017	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	0.333	1.804	0.087	1.717	0.08	1.88

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	15	15	17	0	0	0
AVERAGE	2.30	2.52	0.23			
ST. DEV.	1.89	1.90	0.54			
MIN. VAL.	1.17	1.18	0.02			
MAX. VAL.	8.87	8.94	2.30			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	17	0	17
AVERAGE		102.3		2.93
ST. DEV.		9.1		0.64
MIN. VAL.		87.4		2.19
MAX. VAL.		124.9		4.62

PARAMETER	RANGE OF VALUES		UNITS
DATE	5/20/78 -	9/15/79	MO/DA/YR
DEPTH	0 -	0	METERS
SAMPLE	0.	0.	TYPE

STATION = LZ26 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		17	17	17	17	17
AVERAGE		0.0	26.7	8.2	100.	794.
ST. DEV.		0.0	5.2	2.0	27.	220.
MIN. VAL.	903.	0.0	15.6	3.9	45.	538.
MAX. VAL.	1809.	0.0	33.1	12.2	162.	1450.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	17	0	17	17	0	17
AVERAGE	7.87		3.7	61.		0.020
ST. DEV.	0.50		1.9	35.		0.033
MIN. VAL.	7.00		0.8	30.		0.002
MAX. VAL.	9.10		7.3	138.		0.099

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	17	17	17	17	17	17
AVERAGE	0.090	0.362	0.046	0.316	0.06	0.42
ST. DEV.	0.086	0.362	0.077	0.309	0.08	0.37
MIN. VAL.	0.028	0.008	0.004	0.004	0.01	0.01
MAX. VAL.	0.350	1.156	0.321	0.932	0.30	1.17

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	15	15	17	0	0	0
AVERAGE	2.29	2.75	0.10			
ST. DEV.	0.84	1.08	0.13			
MIN. VAL.	1.28	1.36	0.02			
MAX. VAL.	4.13	5.02	0.58			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	17	0	17
AVERAGE		109.7		3.60
ST. DEV.		21.6		1.47
MIN. VAL.		92.1		2.30
MAX. VAL.		180.3		8.05

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES		UNITS
DATE	5/20/78 –	9/15/79	MO/DA/YR
DEPTH	0 –	0	METERS
SAMPLE	0.	0.	TYPE

STATION = LZ27 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		17	17	17	17	17
AVERAGE		0.0	26.5	7.2	86.	802.
ST. DEV.		0.0	5.2	2.1	24.	199.
MIN. VAL.	850.	0.0	15.8	3.7	46.	560.
MAX. VAL.	1830.	0.0	33.5	11.2	142.	1220.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	17	0	17	17	0	17
AVERAGE	7.90		4.6	64.		0.009
ST. DEV.	0.50		1.5	38.		0.014
MIN. VAL.	7.15		1.8	25.		0.002
MAX. VAL.	8.91		8.0	147.		0.050

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	17	17	17	17	17	17
AVERAGE	0.054	0.689	0.033	0.656	0.15	0.84
ST. DEV.	0.016	1.141	0.046	1.106	0.27	1.35
MIN. VAL.	0.028	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	0.093	3.374	0.144	3.335	0.91	3.79

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	15	15	17	0	0	0
AVERAGE	2.39	3.33	0.15			
ST. DEV.	0.90	2.19	0.18			
MIN. VAL.	1.15	1.21	0.02			
MAX. VAL.	4.15	7.94	0.69			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	17	0	17
AVERAGE		107.4		3.77
ST. DEV.		15.3		1.66
MIN. VAL.		91.3		1.96
MAX. VAL.		139.5		7.45

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES		UNITS
DATE	5/20/78 -	9/15/79	MO/DA/YR
DEPTH	0 -	0	METERS
SAMPLE	0.	0.	TYPE

STATION * LZ28 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		17	17	17	17	17
AVERAGE		0.0	26.3	8.6	103.	619.
ST. DEV.		0.0	5.4	1.7	21.	60.
MIN. VAL.	925.	0.0	15.2	5.1	59.	495.
MAX. VAL.	1710.	0.0	36.6	11.7	158.	715.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	17	0	17	17	0	17
AVERAGE	8.19		7.8	31.		0.018
ST. DEV.	0.40		5.0	12.		0.017
MIN. VAL.	7.70		1.2	10.		0.002
MAX. VAL.	9.13		17.0	61.		0.053

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	17	17	17	17	17	17
AVERAGE	0.057	0.154	0.004	0.151	0.01	0.16
ST. DEV.	0.024	0.163	0.000	0.162	0.00	0.16
MIN. VAL.	0.012	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	0.096	0.460	0.005	0.456	0.02	0.47

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	15	15	17	0	0	0
AVERAGE	1.82	1.97	0.22			
ST. DEV.	0.75	0.73	0.23			
MIN. VAL.	1.07	1.09	0.02			
MAX. VAL.	3.61	3.79	0.97			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	17	0	17
AVERAGE		93.9		2.37
ST. DEV.		8.3		0.25
MIN. VAL.		82.4		2.06
MAX. VAL.		119.4		2.79

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES		UNITS
DATE	5/20/78 -	9/15/79	MO/DA/YR
DEPTH	0 -	0	METERS
SAMPLE	0.	0.	TYPE

STATION = LZ29 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		17	17	17	17	17
AVERAGE		0.0	25.3	8.3	97.	598.
ST. DEV.		0.0	4.6	1.5	11.	60.
MIN. VAL.	800.	0.0	14.5	6.4	80.	500.
MAX. VAL.	1510.	0.0	29.9	12.3	120.	680.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	17	0	17	17	0	17
AVERAGE	7.85		14.2	30.		0.031
ST. DEV.	0.48		14.7	10.		0.018
MIN. VAL.	6.15		1.7	18.		0.002
MAX. VAL.	8.45		50.0	50.		0.055

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	17	17	17	17	17	17
AVERAGE	0.079	0.179	0.004	0.175	0.02	0.19
ST. DEV.	0.043	0.168	0.001	0.167	0.01	0.17
MIN. VAL.	0.017	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	0.201	0.602	0.006	0.596	0.04	0.64

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	16	16	17	0	0	0
AVERAGE	1.66	1.86	0.35			
ST. DEV.	0.56	0.60	0.38			
MIN. VAL.	0.92	1.08	0.02			
MAX. VAL.	2.80	3.02	1.36			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	17	0	17
AVERAGE		91.9		2.21
ST. DEV.		8.9		0.24
MIN. VAL.		83.1		1.80
MAX. VAL.		118.0		2.53

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES			UNITS
DATE	5/20/78	-	9/15/79	MO/DA/YR
DEPTH	0	-	0	METERS
SAMPLE	0.		0.	TYPE

STATION = LZ30 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		16	16	16	16	16
AVERAGE		0.0	25.4	8.6	102.	602.
ST. DEV.		0.0	4.6	1.4	12.	76.
MIN. VAL.	847.	0.0	14.4	7.2	87.	482.
MAX. VAL.	1435.	0.0	29.9	11.6	133.	700.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	16	0	16	16	1	16
AVERAGE	8.20		10.9	30.	7.5	0.022
ST. DEV.	0.29		8.4	9.		0.020
MIN. VAL.	7.90		1.5	19.	7.5	0.002
MAX. VAL.	8.83		30.0	51.	7.5	0.058

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	16	16	16	16	16	16
AVERAGE	0.070	0.141	0.006	0.138	0.02	0.16
ST. DEV.	0.041	0.175	0.009	0.175	0.01	0.18
MIN. VAL.	0.025	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	0.148	0.485	0.039	0.481	0.04	0.50

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	14	14	16	0	0	0
AVERAGE	1.58	1.75	0.31			
ST. DEV.	0.45	0.47	0.30			
MIN. VAL.	1.11	1.21	0.02			
MAX. VAL.	2.74	3.10	1.04			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	16	0	16
AVERAGE		92.7		2.20
ST. DEV.		10.0		0.25
MIN. VAL.		78.7		1.90
MAX. VAL.		119.6		2.63

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES		UNITS
DATE	5/20/78	- 9/15/79	MO/DA/YR
DEPTH	0	- 0	METERS
SAMPLE	0.	0.	TYPE

STATION = LZ31 CODE

	TIME HOUR.MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		17	17	17	17	17
AVERAGE		0.0	26.5	5.8	69.	685.
ST. DEV.		0.0	4.7	2.6	32.	125.
MIN. VAL.	815.	0.0	15.5	2.0	25.	370.
MAX. VAL.	1548.	0.0	33.0	10.7	131.	920.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	16	0	17	17	0	17
AVERAGE	7.47		3.3	57.		0.020
ST. DEV.	0.61		1.9	24.		0.022
MIN. VAL.	6.45		1.3	30.		0.002
MAX. VAL.	8.88		7.0	120.		0.103

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	17	17	17	17	17	17
AVERAGE	0.071	0.125	0.015	0.110	0.07	0.20
ST. DEV.	0.050	0.145	0.016	0.131	0.08	0.21
MIN. VAL.	0.025	0.004	0.004	0.004	0.01	0.02
MAX. VAL.	0.213	0.431	0.052	0.388	0.32	0.75

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	15	15	17	0	0	0
AVERAGE	1.99	2.21	0.10			
ST. DEV.	0.62	0.66	0.11			
MIN. VAL.	0.94	1.20	0.02			
MAX. VAL.	3.20	3.22	0.50			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	17	0	17
AVERAGE		95.9		3.02
ST. DEV.		8.2		0.64
MIN. VAL.		84.0		2.04
MAX. VAL.		112.1		4.20

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES		UNITS
DATE	5/20/78 -	9/15/79	MO/DA/YR
DEPTH	0 -	0	METERS
SAMPLE	0.	0.	TYPE

STATION = LZ32 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		15	15	15	15	15
AVERAGE		0.0	27.0	4.3	52.	658.
ST. DEV.		0.0	4.2	1.8	21.	174.
MIN. VAL.	825.	0.0	17.0	1.7	21.	257.
MAX. VAL.	1540.	0.0	32.2	8.0	88.	938.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	15	0	15	15	0	15
AVERAGE	7.18		2.1	112.		0.040
ST. DEV.	0.23		0.9	157.		0.062
MIN. VAL.	6.90		0.8	23.		0.002
MAX. VAL.	7.62		4.3	650.		0.182

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	15	15	15	15	15	15
AVERAGE	0.079	0.120	0.017	0.104	0.09	0.21
ST. DEV.	0.065	0.151	0.019	0.133	0.12	0.24
MIN. VAL.	0.028	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	0.233	0.544	0.070	0.474	0.47	0.79

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	13	13	15	0	0	0
AVERAGE	1.78	2.00	0.13			
ST. DEV.	0.59	0.70	0.14			
MIN. VAL.	1.00	1.02	0.04			
MAX. VAL.	2.77	3.23	0.55			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	15	0	15
AVERAGE		90.3		2.79
ST. DEV.		23.0		0.87
MIN. VAL.		33.2		0.85
MAX. VAL.		123.3		4.15

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES		UNITS
DATE	5/20/78 -	9/15/79	MO/DA/YR
DEPTH	0 -	0	METERS
SAMPLE	0.	0.	TYPE

STATION = LZ33 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/C
NUM. VALS.		14	14	14	14	14
AVERAGE		0.0	26.0	8.5	102.	619.
ST. DEV.		0.0	4.0	1.1	8.	95.
MIN. VAL.	825.	0.0	16.1	7.2	89.	452.
MAX. VAL.	1245.	0.0	30.0	11.2	113.	800.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	14	0	14	14	0	14
AVERAGE	8.42		6.7	32.		0.008
ST. DEV.	0.25		4.1	11.		0.012
MIN. VAL.	8.05		2.7	15.		0.002
MAX. VAL.	8.85		15.0	57.		0.041

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	14	14	14	14	14	14
AVERAGE	0.056	0.061	0.004	0.059	0.01	0.07
ST. DEV.	0.054	0.119	0.000	0.118	0.00	0.12
MIN. VAL.	0.008	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	0.210	0.419	0.005	0.415	0.01	0.43

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	12	12	14	0	0	0
AVERAGE	1.87	1.91	0.19			
ST. DEV.	0.35	0.33	0.18			
MIN. VAL.	1.41	1.52	0.02			
MAX. VAL.	2.52	2.53	0.51			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	14	0	14
AVERAGE		92.1		2.34
ST. DEV.		9.6		0.42
MIN. VAL.		78.4		1.46
MAX. VAL.		110.8		3.25

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES			UNITS
DATE	5/20/78	-	9/15/79	MO/DA/YR
DEPTH	0	-	0	METERS
SAMPLE	0.		0.	TYPE

STATION = LZ34 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		14	14	14	14	14
AVERAGE		0.0	26.3	8.4	101.	609.
ST. DEV.		0.0	4.3	1.4	14.	81.
MIN. VAL.	904.	0.0	16.1	6.6	85.	465.
MAX. VAL.	1335.	0.0	30.0	11.2	134.	715.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	14	0	14	14	0	14
AVERAGE	8.34		12.3	30.		0.012
ST. DEV.	0.30		10.4	10.		0.012
MIN. VAL.	7.95		3.2	15.		0.002
MAX. VAL.	9.00		40.0	52.		0.037

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	14	14	14	14	14	14
AVERAGE	0.066	0.075	0.004	0.072	0.01	0.08
ST. DEV.	0.035	0.127	0.001	0.126	0.01	0.13
MIN. VAL.	0.017	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	0.133	0.433	0.006	0.429	0.03	0.44

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	12	12	14	0	0	0
AVERAGE	1.67	1.73	0.33			
ST. DEV.	0.35	0.32	0.28			
MIN. VAL.	1.27	1.29	0.04			
MAX. VAL.	2.44	2.45	0.86			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	14	0	14
AVERAGE		92.5		2.30
ST. DEV.		7.6		0.30
MIN. VAL.		83.2		1.61
MAX. VAL.		104.6		2.76

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES			UNITS
DATE	5/20/78	-	9/15/79	MO/DA/YR
DEPTH	0	-	0	METERS
SAMPLE	0.		0.	TYPE

STATION = LZ35 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		14	14	14	14	14
AVERAGE		0.0	26.3	8.7	105.	607.
ST. DEV.		0.0	4.2	1.5	15.	92.
MIN. VAL.	856.	0.0	16.4	5.9	74.	463.
MAX. VAL.	1320.	0.0	30.8	11.6	131.	720.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	14	0	14	14	0	14
AVERAGE	8.53		6.6	29.		0.005
ST. DEV.	0.22		4.2	13.		0.005
MIN. VAL.	8.25		2.2	1.		0.002
MAX. VAL.	9.10		15.0	59.		0.018

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	14	14	14	14	14	14
AVERAGE	0.045	0.046	0.004	0.043	0.01	0.05
ST. DEV.	0.028	0.103	0.000	0.102	0.00	0.10
MIN. VAL.	0.010	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	0.106	0.348	0.005	0.344	0.02	0.36

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	12	12	14	0	0	0
AVERAGE	1.77	1.81	0.18			
ST. DEV.	0.42	0.41	0.17			
MIN. VAL.	1.20	1.22	0.02			
MAX. VAL.	2.37	2.38	0.58			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	14	0	14
AVERAGE		90.9		2.27
ST. DEV.		10.6		0.33
MIN. VAL.		75.8		1.55
MAX. VAL.		105.2		2.85

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES			UNITS
DATE	5/20/78	-	9/15/79	MO/DA/YR
DEPTH	0	-	0	METERS
SAMPLE	0.		0.	TYPE

STATION = LZ36 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		15	15	15	15	15
AVERAGE		0.0	26.1	8.[illegible]	96.	49[illegible].
ST. DEV.		0.0	4.3	1.6	17.	12[illegible].
MIN. VAL.	813.	0.0	15.7	4.7	60.	230.
MAX. VAL.	1525.	0.0	30.6	10.8	132.	650.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	15	0	15	15	0	15
AVERAGE	8.24		4.0	81.		0.024
ST. DEV.	0.49		2.1	94.		0.057
MIN. VAL.	7.15		1.0	25.		0.002
MAX. VAL.	8.88		9.3	360.		0.229

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	15	15	15	15	15	15
AVERAGE	0.074	0.030	0.005	0.025	0.04	0.07
ST. DEV.	0.059	0.066	0.006	0.064	0.11	0.14
MIN. VAL.	0.015	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	0.255	0.257	0.028	0.248	0.45	0.49

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	13	13	15	[illegible]	0	0
AVERAGE	1.92	1.90	0.29			
ST. DEV.	0.47	0.51	0.25			
MIN. VAL.	1.04	1.32	0.06			
MAX. VAL.	2.75	3.20	0.81			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	15	0	15
AVERAGE		68.5		1.74
ST. DEV.		21.7		0.52
MIN. VAL.		16.9		0.42
MAX. VAL.		98.4		2.48

LAKE OKEECHOBEE 40 STATION DATA [illegible]

PARAMETER	RANGE OF VALUES			UNITS
DATE	5/20/78	-	9/15/79	MO/DA/YR
DEPTH	0	-	0	METERS
SAMPLE	0.		0.	[illegible]

STATION = L737 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP. COND [illegible]
NUM. VALS.		15	15	15	15	[illegible]
AVERAGE		0.0	26.2	6.4	77.	[illegible]
ST. DEV.		0.0	4.4	2.1	26.	[illegible]
MIN. VAL.	851.	0.0	19.7	2.2	[illegible]	[illegible]
MAX. VAL.	1510.	0.0	31.1	10.5	133.	[illegible]

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	[illegible]
NUM. VALS.	15	0	15	15	0	[illegible]
AVERAGE	7.17		2.3	137.		[illegible]
ST. DEV.	0.88		1.6	83.		[illegible]
MIN. VAL.	5.95		0.7	30.		[illegible]
MAX. VAL.	8.80		5.8	340.		0.211

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	15	15	15	15	15	15
AVERAGE	0.119	0.067	0.008	[illegible]	0.04	[illegible]
ST. DEV.	0.051	0.084	0.004	[illegible]	0.04	[illegible]
MIN. VAL.	0.057	0.004	0.004	0.004	0.01	[illegible]
MAX. VAL.	0.231	0.307	0.015	0.294	0.13	[illegible]

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	13	13	15	0	0	0
AVERAGE	1.66	1.77	0.40			
ST. DEV.	0.52	0.48	0.25			
MIN. VAL.	0.82	1.00	0.09			
MAX. VAL.	2.82	2.84	0.92			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	14	0	14
AVERAGE		40.3		0.99
ST. DEV.		21.8		0.50
MIN. VAL.		10.3		0.49
MAX. VAL.		95.5		2.17

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES			UNITS
DATE	5/20/78	-	9/15/79	MO/DA/YR
DEPTH	0	-	0	METERS
SAMPLE	0.		0.	TYPE

STATION = LZ38 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		14	14	14	14	14
AVERAGE		0.0	26.6	8.1	98.	542.
ST. DEV.		0.0	4.5	1.8	18.	146.
MIN. VAL.	912.	0.0	16.3	5.2	64.	370.
MAX. VAL.	1216.	0.0	31.1	11.9	127.	882.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	14	0	14	14	0	14
AVERAGE	8.33		4.8	45.		0.007
ST. DEV.	0.56		2.0	18.		0.009
MIN. VAL.	6.95		1.5	18.		0.002
MAX. VAL.	8.80		10.0	83.		0.034

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	14	14	14	14	14	14
AVERAGE	0.059	0.019	0.005	0.015	0.02	0.04
ST. DEV.	0.031	0.036	0.005	0.030	0.03	0.06
MIN. VAL.	0.025	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	0.138	0.139	0.023	0.116	0.10	0.24

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	12	12	14	0	0	0
AVERAGE	1.60	1.85	0.23			
ST. DEV.	0.46	0.48	0.21			
MIN. VAL.	1.15	1.17	0.02			
MAX. VAL.	2.78	2.89	0.71			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	14	0	14
AVERAGE		78.2		2.01
ST. DEV.		18.3		0.42
MIN. VAL.		45.2		1.18
MAX. VAL.		99.9		2.64

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES			UNITS
DATE	5/20/78	-	9/15/79	MO/DA/YR
DEPTH	0	-	0	METERS
SAMPLE	0.		0.	TYPE

STATION = LZ39 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHO/CM
NUM. VALS.		14	14	14	14	14
AVERAGE		0.0	26.4	8.5	103.	[illegible]
ST. DEV.		0.0	4.4	1.3	13.	100.
MIN. VAL.	932.	0.0	16.1	6.4	81.	410.
MAX. VAL.	1225.	0.0	31.7	11.1	127.	[illegible]

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SO MG/L	OPO4 MG P/L
NUM. VALS.	14	0	14	14	0	14
AVERAGE	8.44		7.1	32.		0.007
ST. DEV.	0.29		4.5	18.		[illegible]
MIN. VAL.	8.10		2.2	[illegible]		0.002
MAX. VAL.	9.13		18.0	75.		0.024

	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	14	14	14	14	14	14
AVERAGE	0.056	0.044	0.004	0.042	0.01	[illegible]
ST. DEV.	0.026	0.080	0.000	0.079	0.00	[illegible]
MIN. VAL.	0.026	0.004	0.004	0.004	0.01	[illegible]
MAX. VAL.	0.115	0.245	0.005	0.241	0.02	[illegible]

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	12	12	14	0	0	0
AVERAGE	1.99	2.03	0.42			
ST. DEV.	0.64	0.63	0.75			
MIN. VAL.	1.25	1.39	0.06			
MAX. VAL.	3.77	3.79	2.97			

	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	14	0	14
AVERAGE		89.0		2.27
ST. DEV.		11.7		0.28
MIN. VAL.		55.7		1.71
MAX. VAL.		101.7		2.69

LAKE OKEECHOBEE 40 STATION DATA SET

PARAMETER	RANGE OF VALUES			UNITS
DATE	5/20/78	-	9/15/79	MO/DA/YR
DEPTH	0	-	0	METERS
SAMPLE	0.		0.	TYPE

STATION = L740 CODE

	TIME HOUR,MIN	DEPTH METERS	TEMP CENT	D.O. MG/L	%SAT. DO	SP COND UMHOS/CM
NUM. VALS.		15	15	15	15	15
AVERAGE		0.0	25.5	8.1	98.	618.
ST. DEV.		0.0	3.8	1.1	11.	72.
MIN. VAL.	820.	0.0	16.8	6.7	79.	560.
MAX. VAL.	1527.	0.0	30.0	10.4	123.	758.

	PH	SECCHI M	TURB JTU	COLOR UNITS	T.SUS.SD MG/L	OPO4 MG P/L
NUM. VALS.	15	0	15	15	0	15
AVERAGE	7.84		17.0	32.		0.026
ST. DEV.	0.52		14.3	13.		0.016
MIN. VAL.	6.35		3.5	3.		0.002
MAX. VAL.	8.75		50.0	53.		0.056

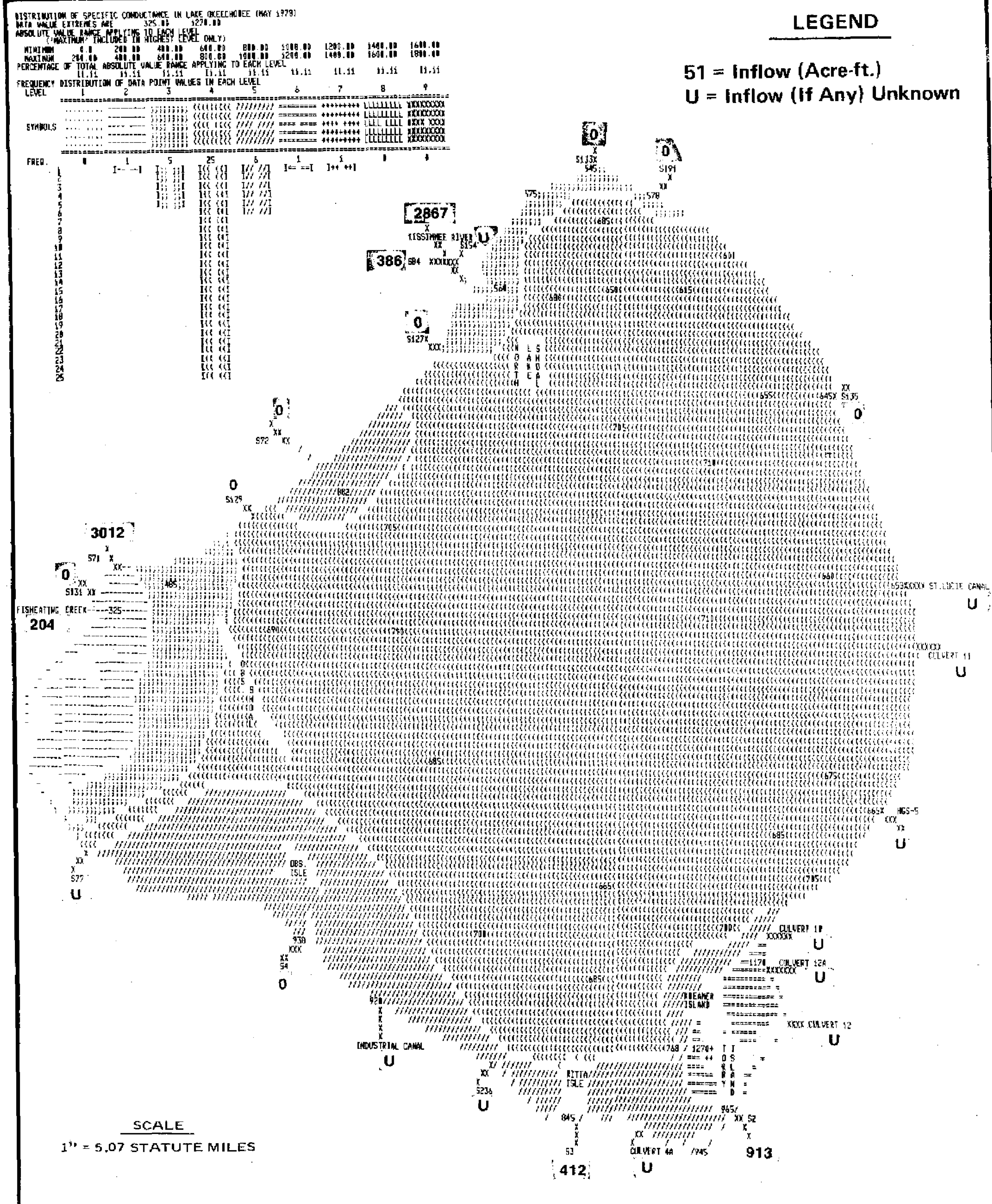
	TPO4 MG P/L	NOX MG N/L	NO2 MG N/L	NO3 MG N/L	NH4 MG N/L	NOX+NH4 MG N/L
NUM. VALS.	15	15	15	15	15	15
AVERAGE	0.083	0.136	0.005	0.132	0.01	0.15
ST. DEV.	0.038	0.143	0.003	0.142	0.00	0.14
MIN. VAL.	0.040	0.004	0.004	0.004	0.01	0.01
MAX. VAL.	0.159	0.380	0.015	0.376	0.02	0.39

	TKN-NH4 MG N/L	TOTAL N MG N/L	TOTAL FE MG/L	NA MG/L	K MG/L	CA MG/L
NUM. VALS.	14	14	15	0	0	0
AVERAGE	1.62	1.78	0.46			
ST. DEV.	0.58	0.53	0.36			
MIN. VAL.	0.66	0.88	0.06			
MAX. VAL.	2.88	3.01	1.15			

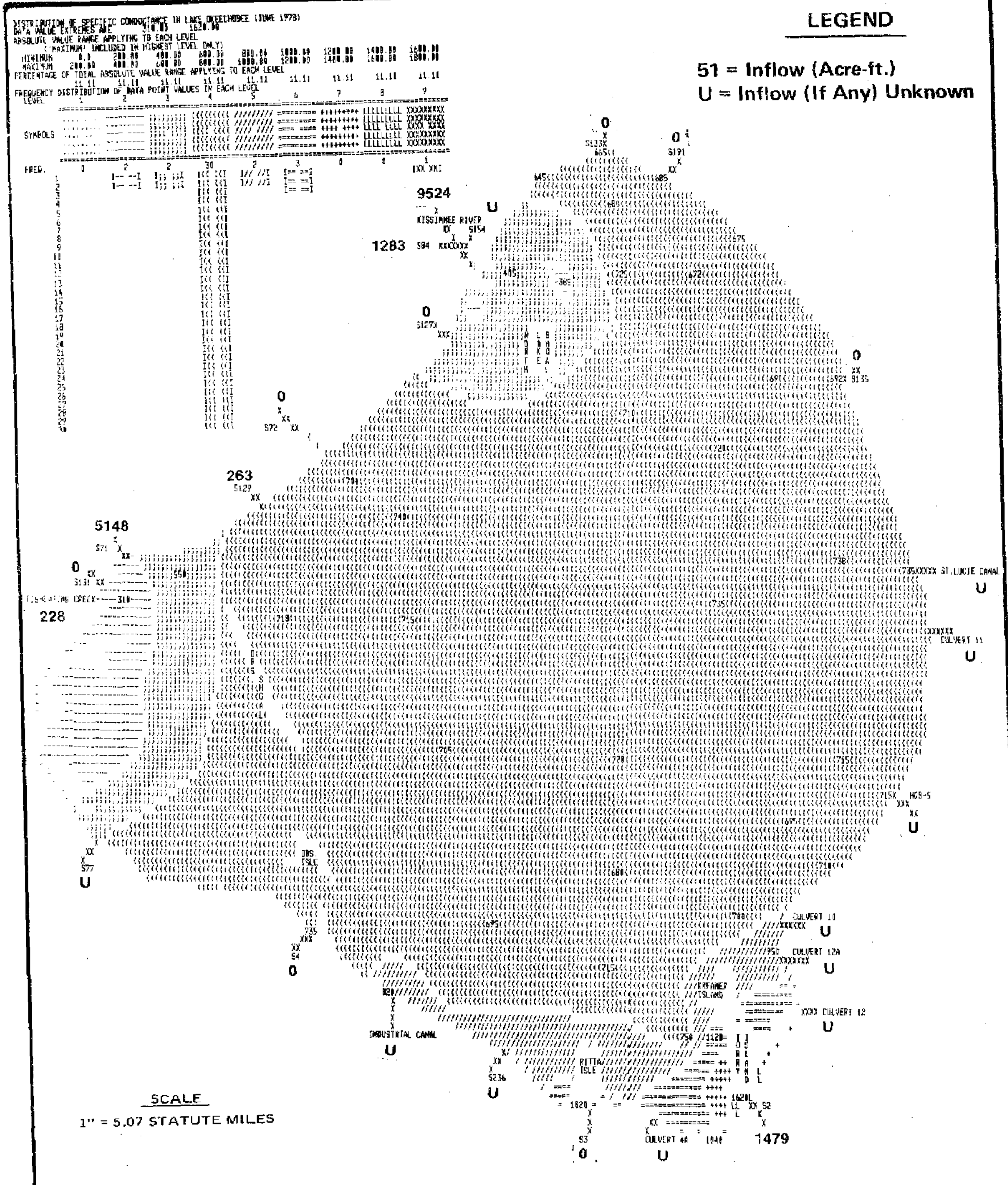
	MG MG/L	CL MG/L	SO4 MG/L	ALK MEQ/L
NUM. VALS.	0	15	0	15
AVERAGE		91.4		2.27
ST. DEV.		7.4		0.31
MIN. VAL.		83.8		1.74
MAX. VAL.		102.4		2.83

APPENDIX B

CONTOUR MAPS



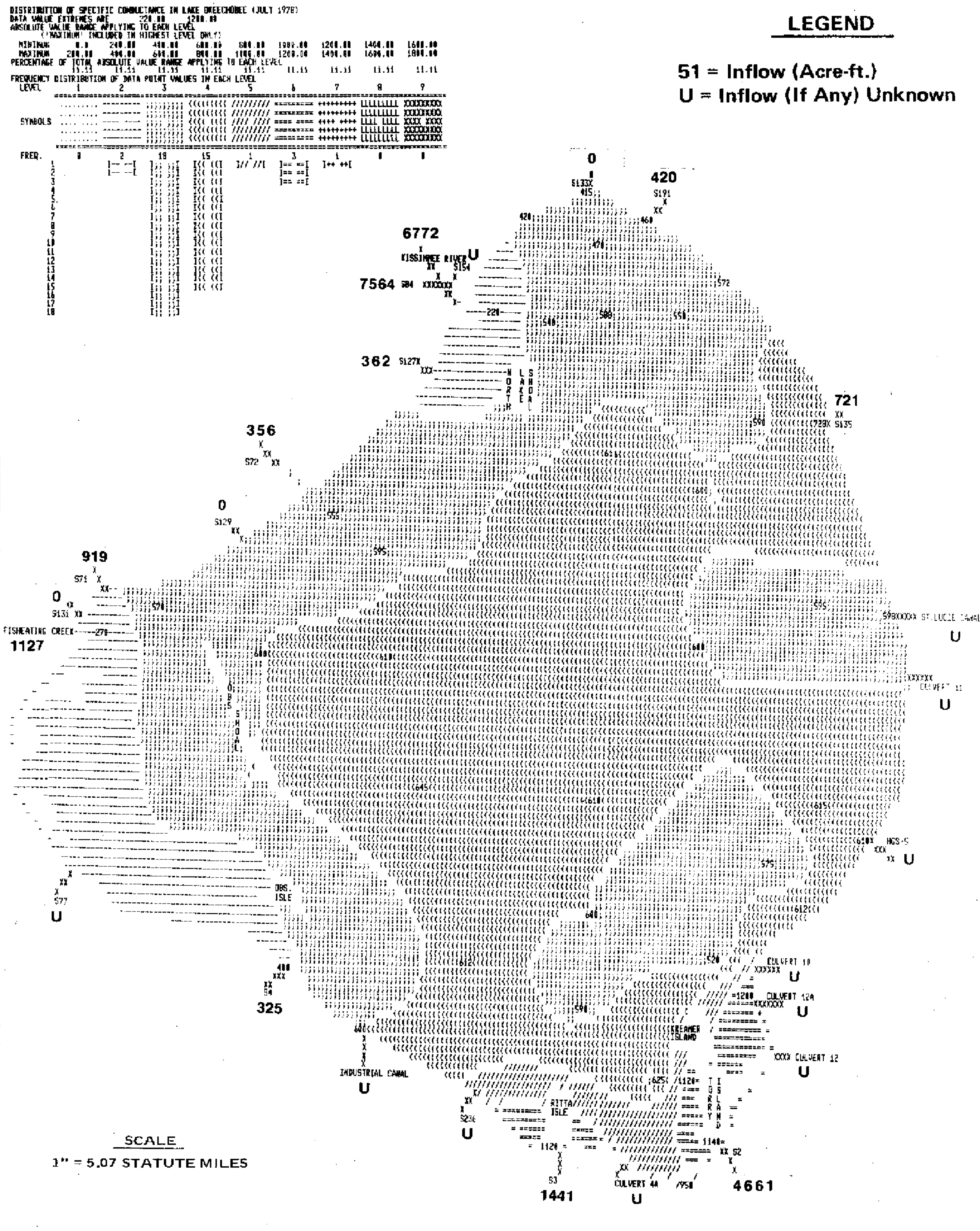
200umho/cm. CONTOUR INTERVALS FOR SPECIFIC CONDUCTANCE (MAY 1978)



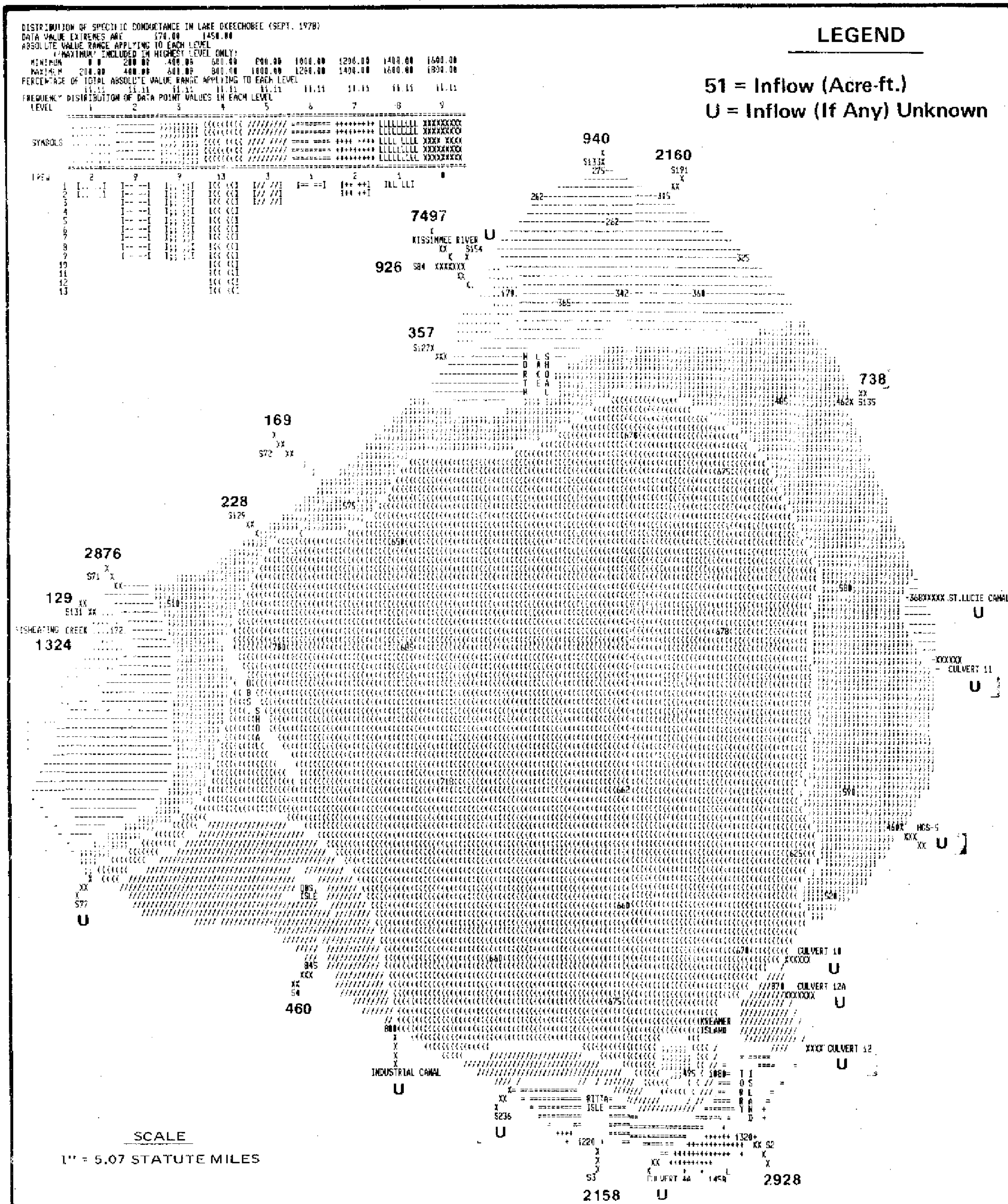
200 umho/cm. CONTOUR INTERVALS FOR SPECIFIC CONDUCTANCE (JUNE 1978)

LEGEND

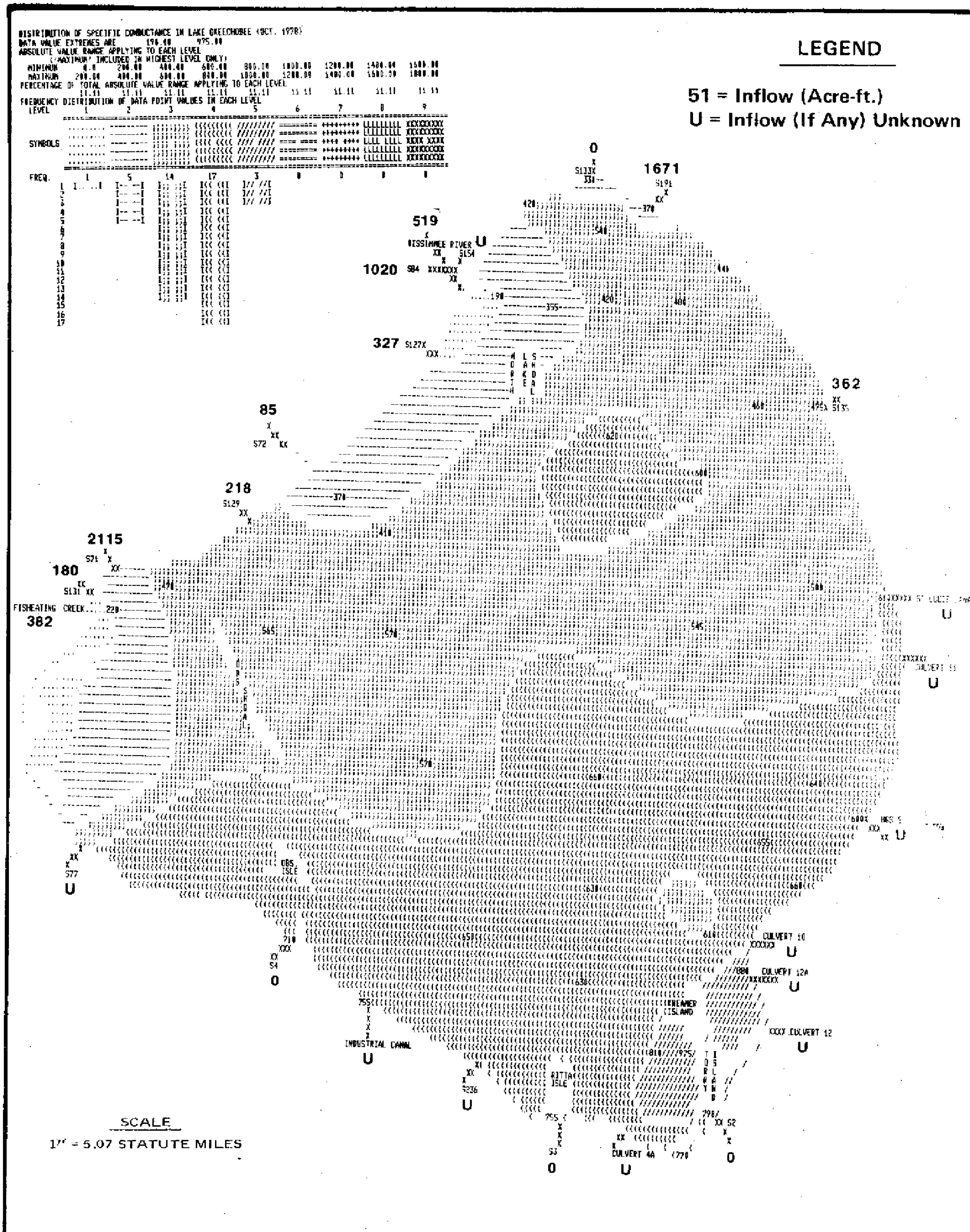
51 = Inflow (Acre-ft.)
U = Inflow (If Any) Unknown



200 umho/cm. CONTOUR INTERVALS FOR SPECIFIC CONDUCTANCE (JULY 1978)



200 umho/cm. CONTOUR INTERVALS FOR SPECIFIC CONDUCTANCE (SEPT. 1978)



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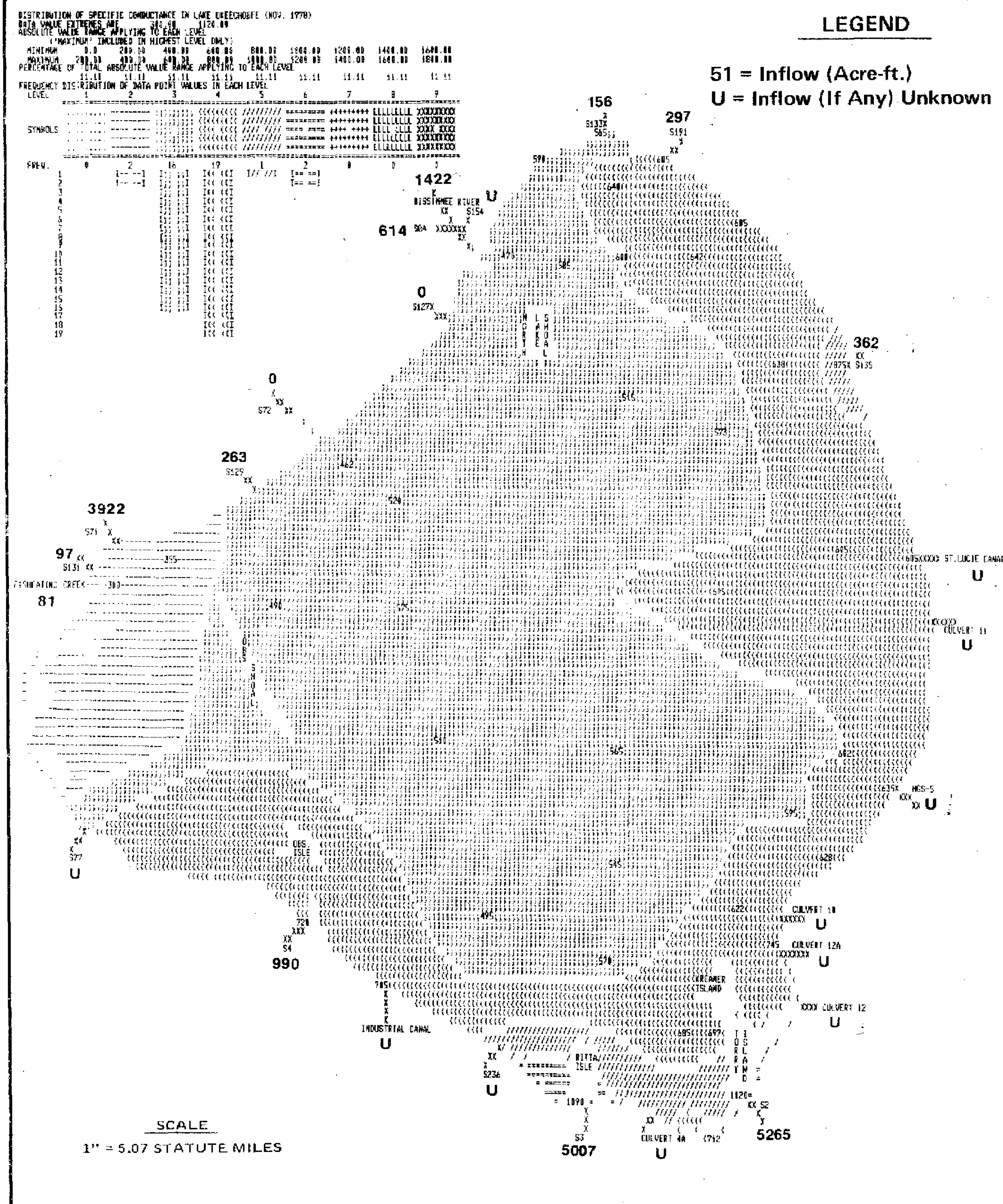

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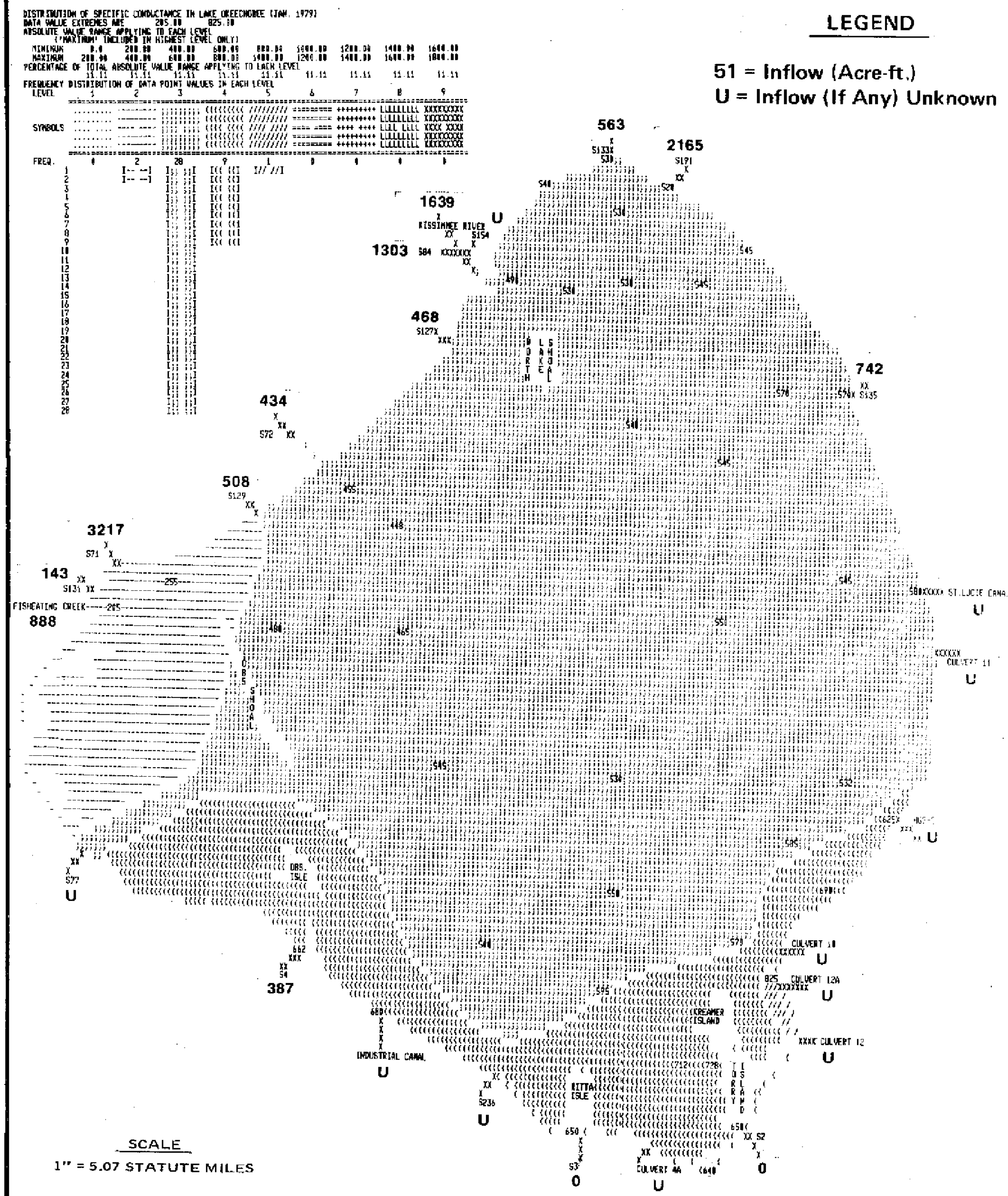

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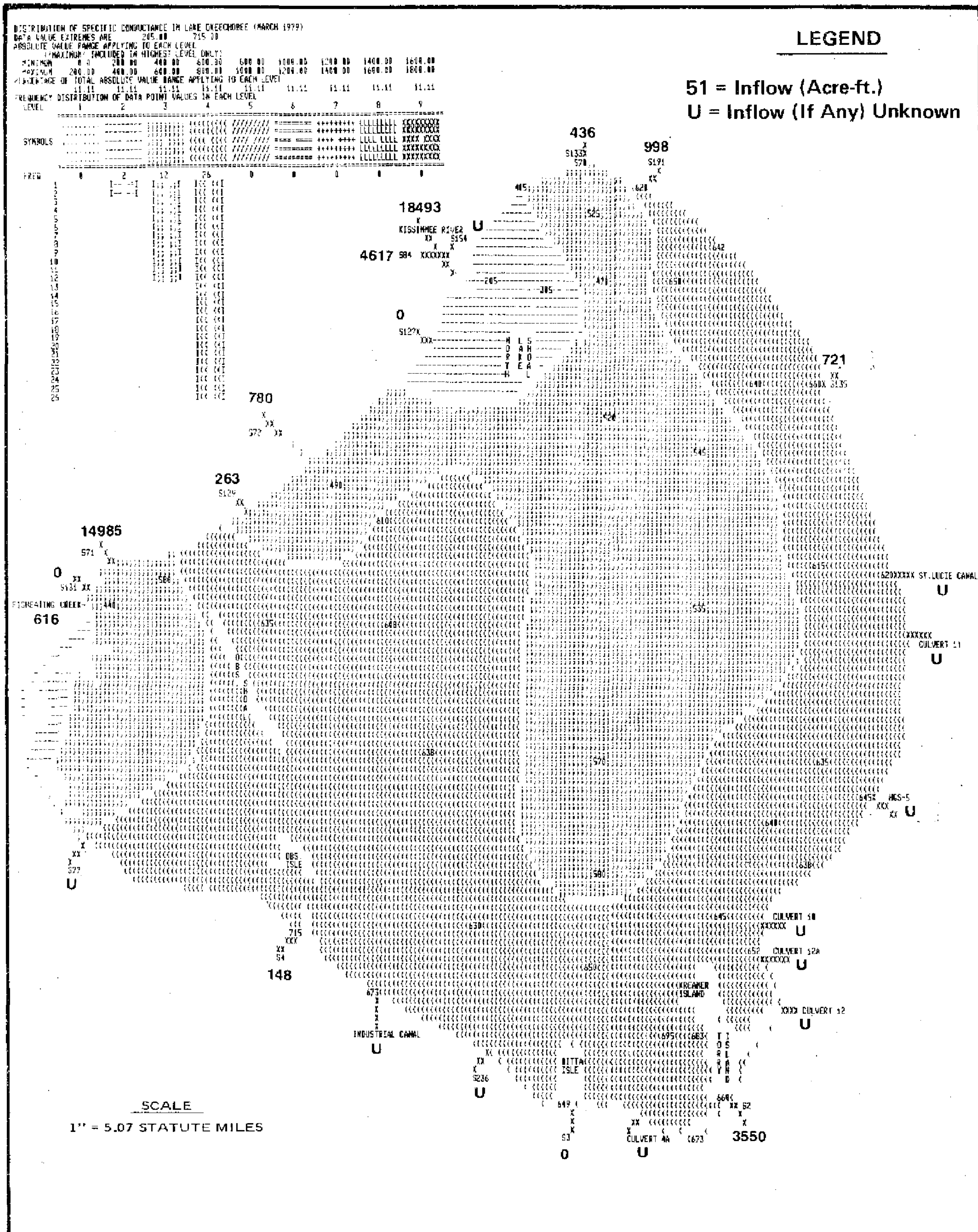

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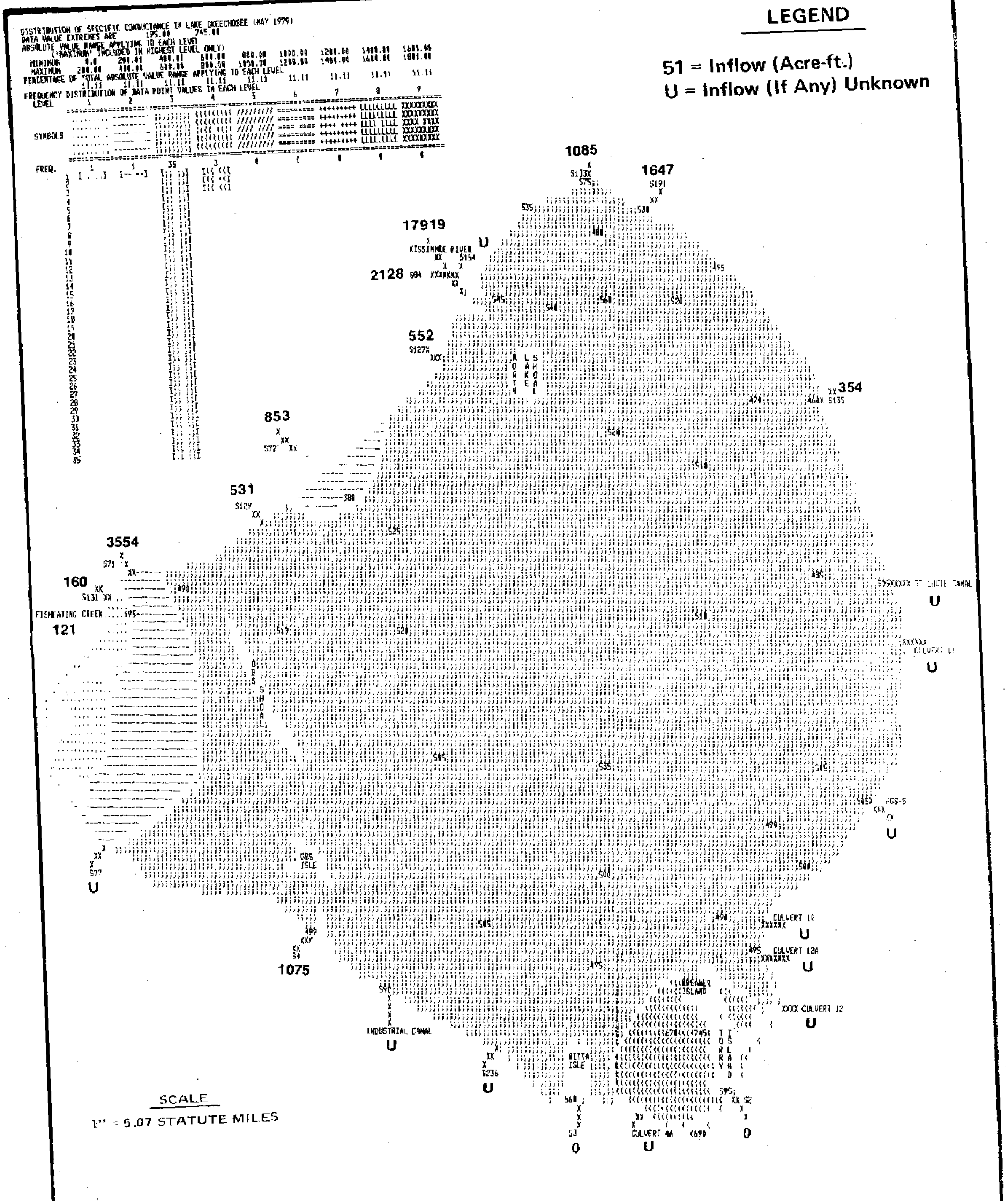

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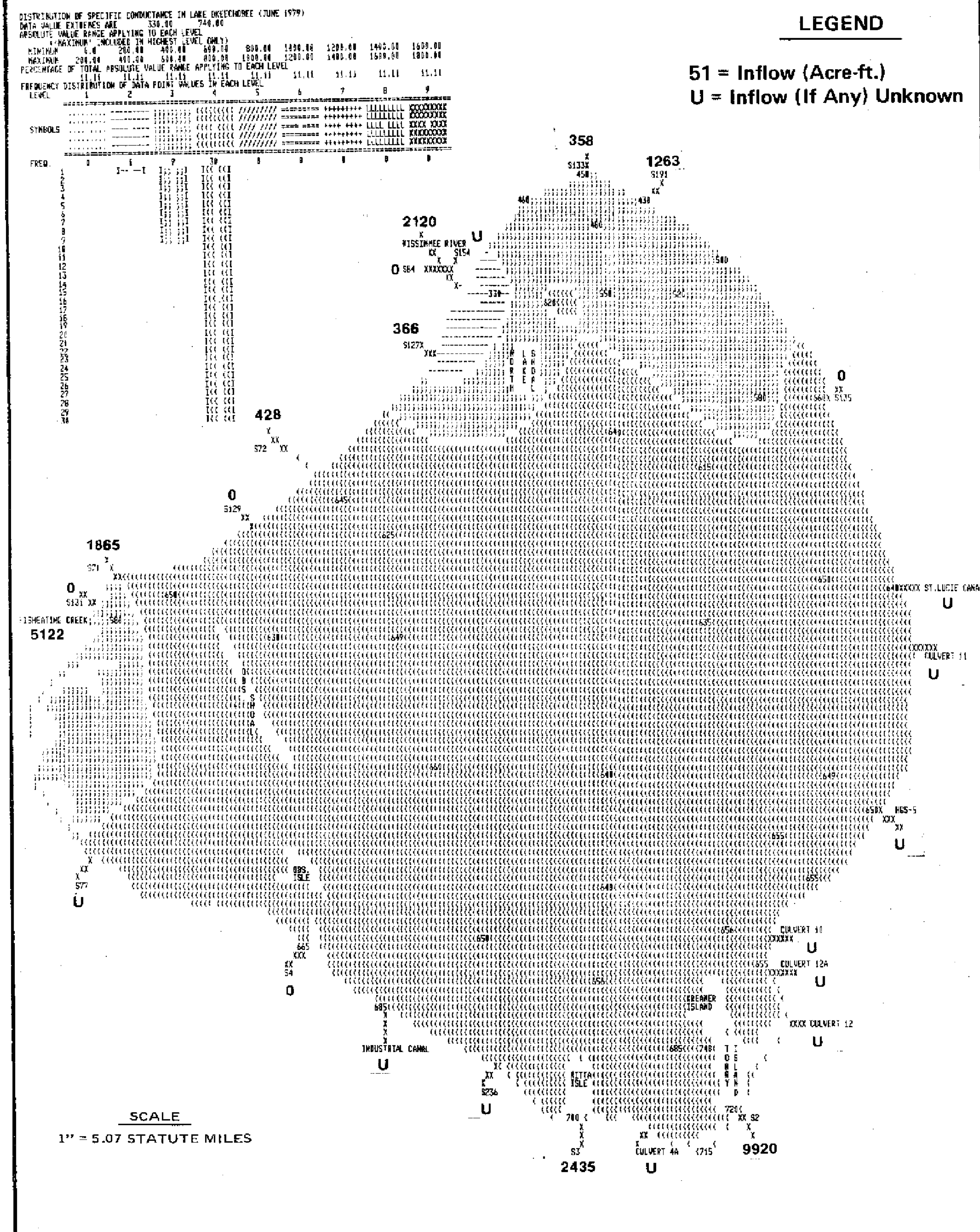

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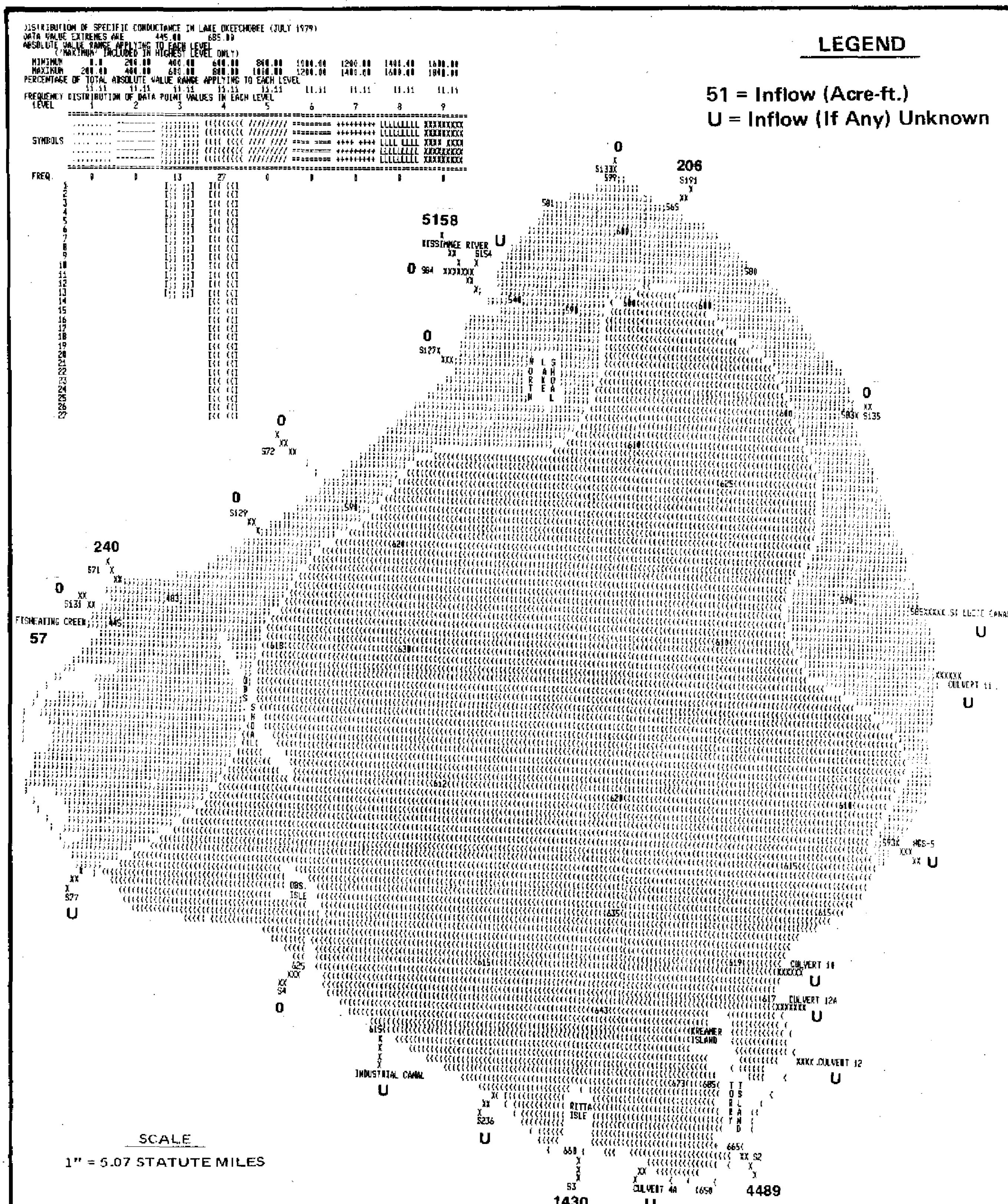

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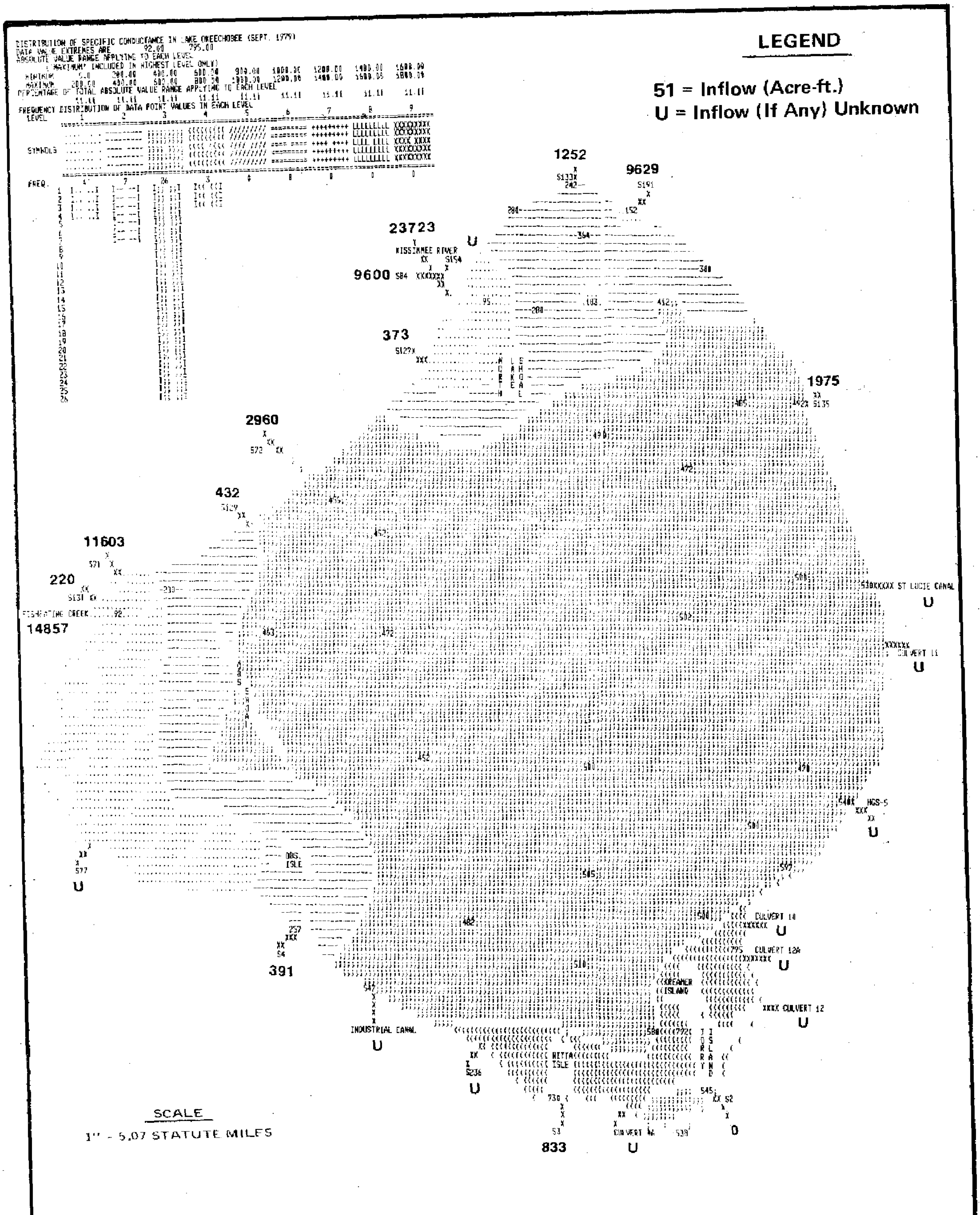

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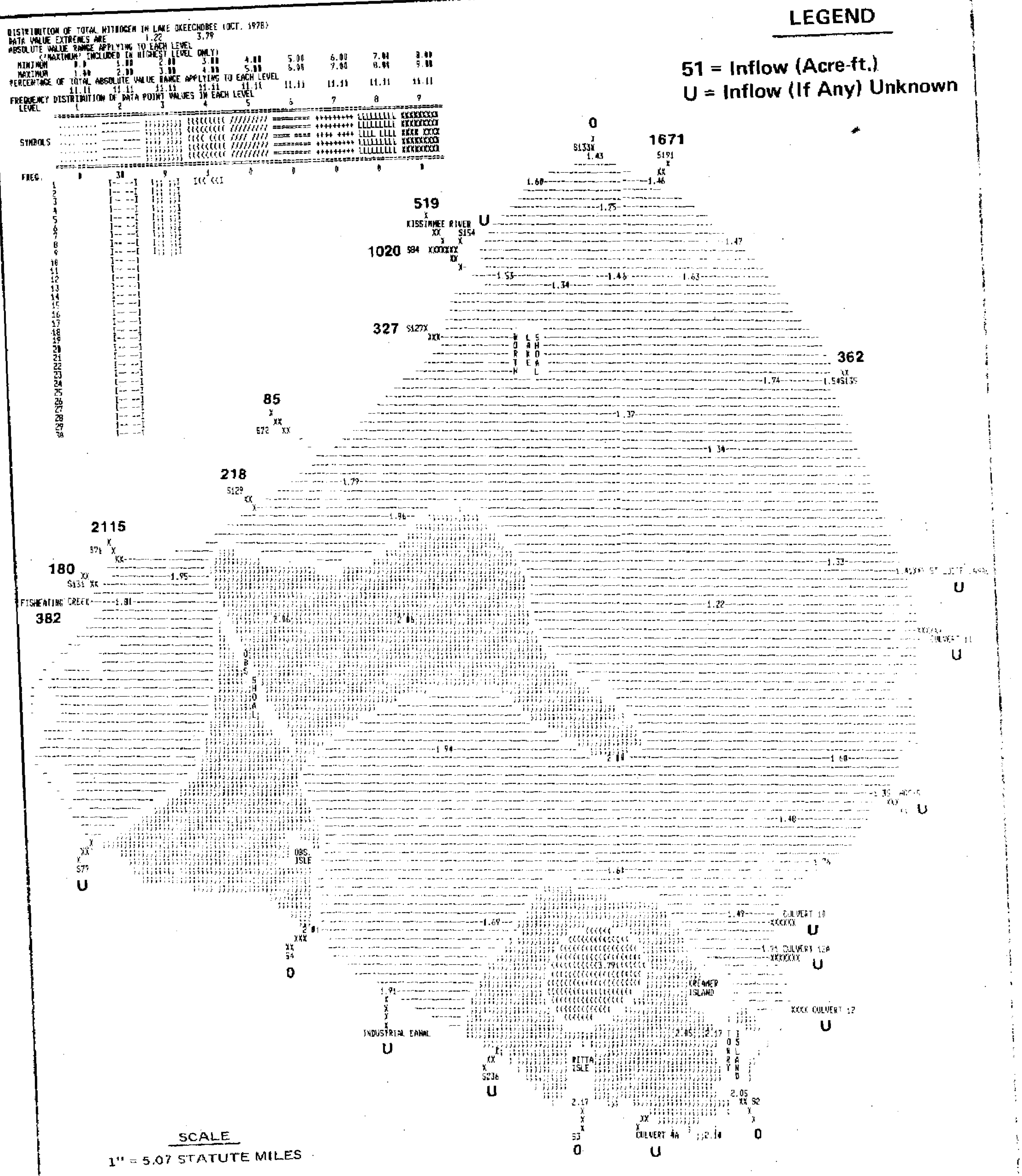
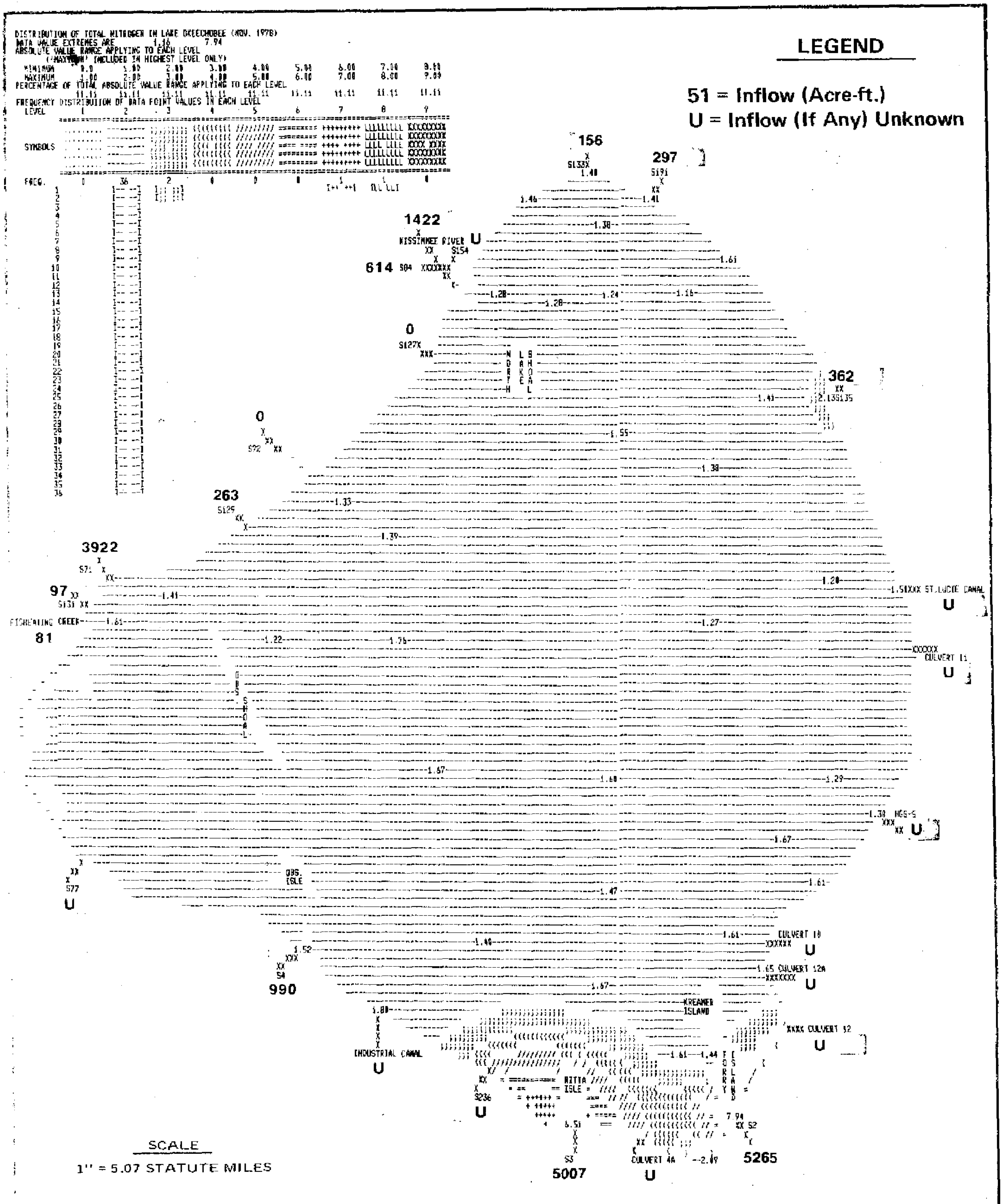


1.00 mg/L CONTOUR INTERVALS FOR TOTAL NITROGEN (OCT. 1978)



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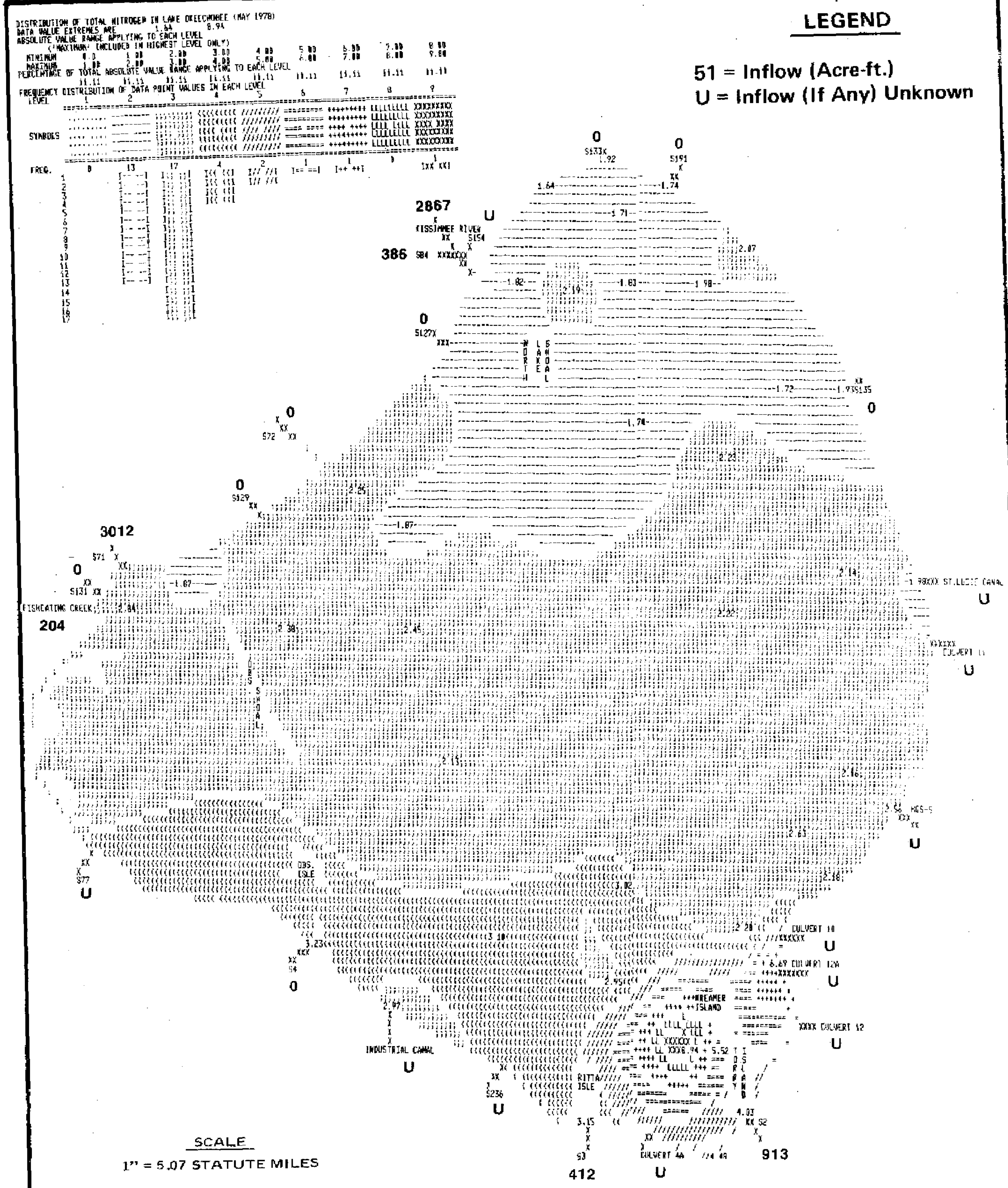

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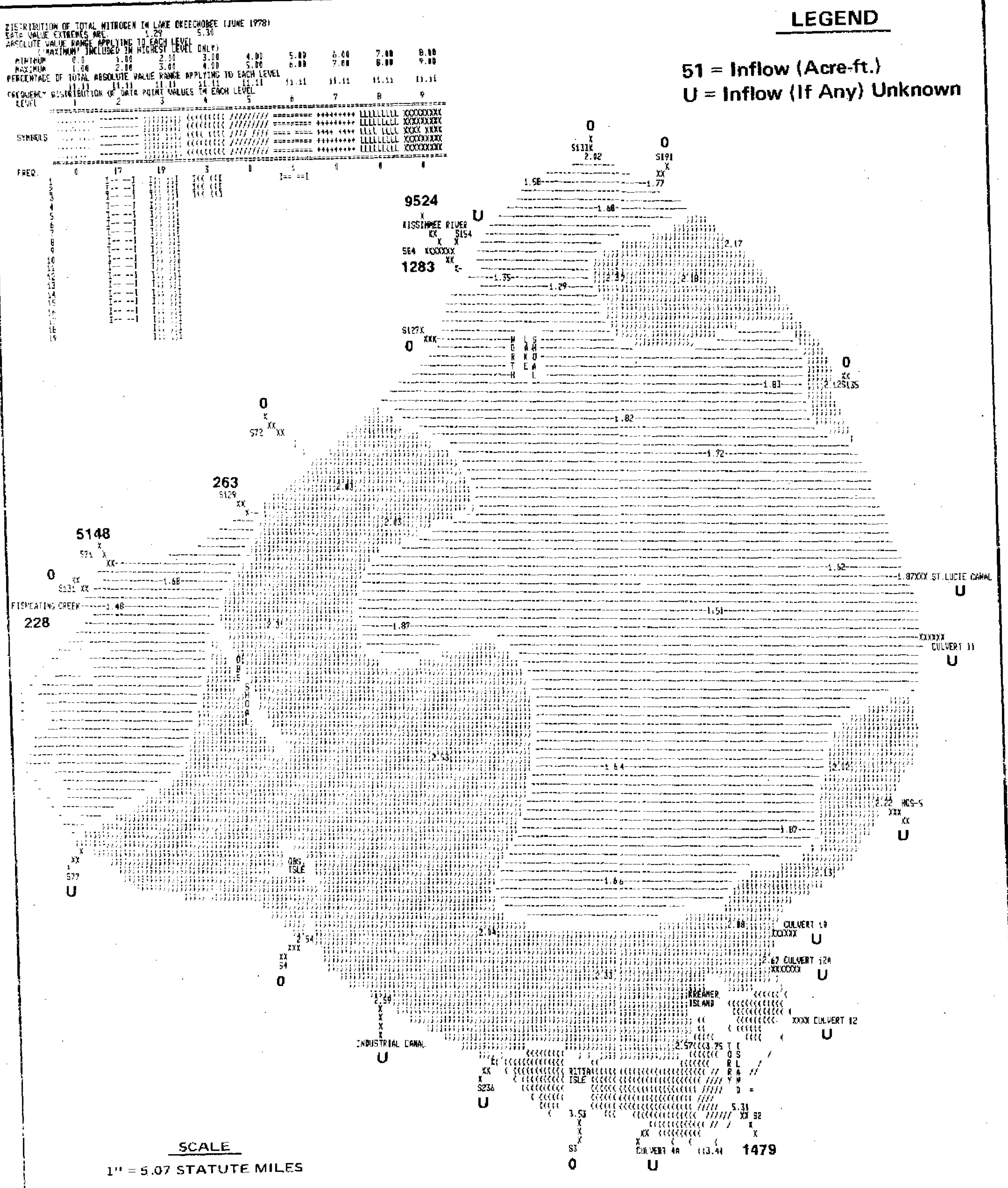

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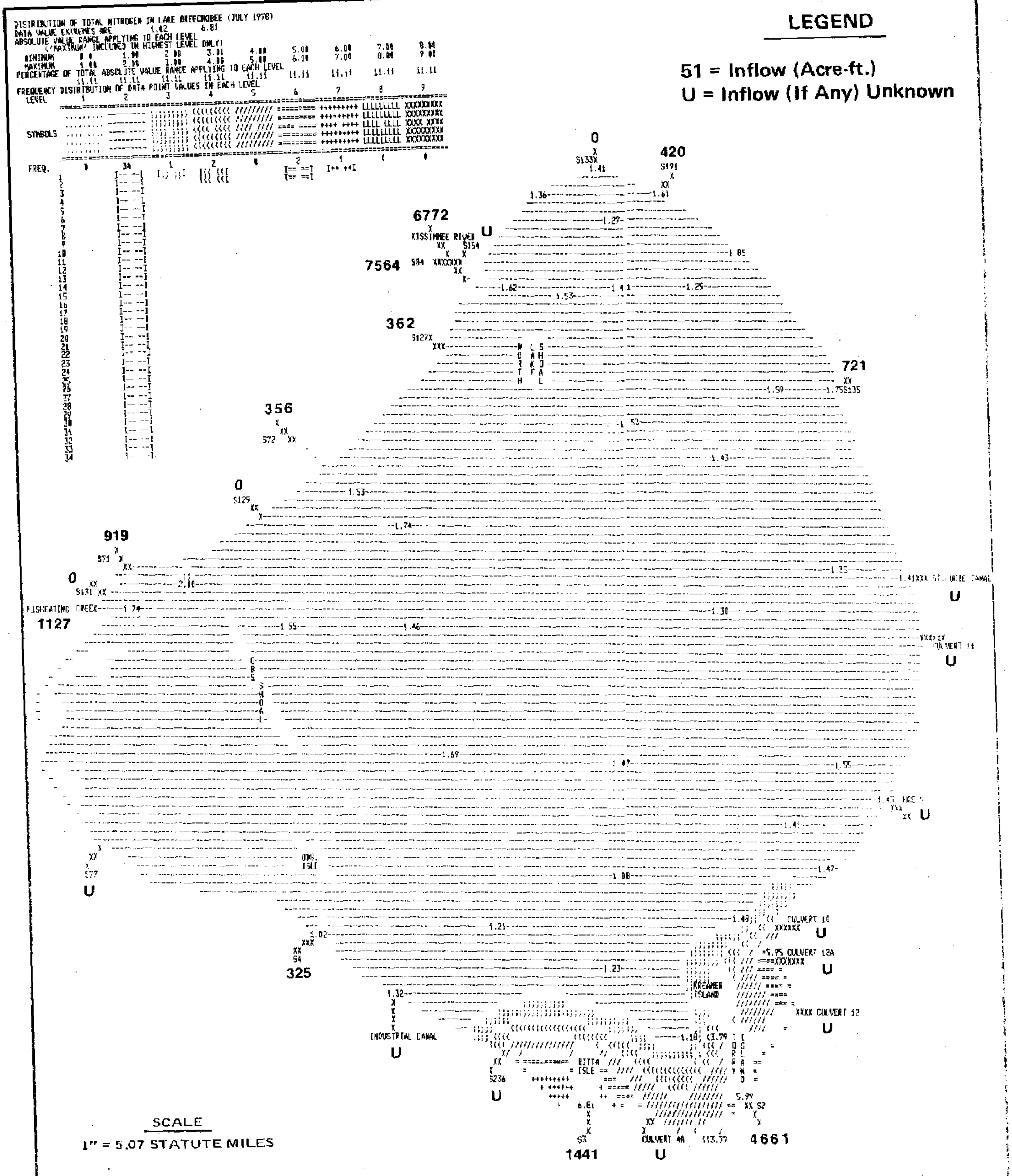

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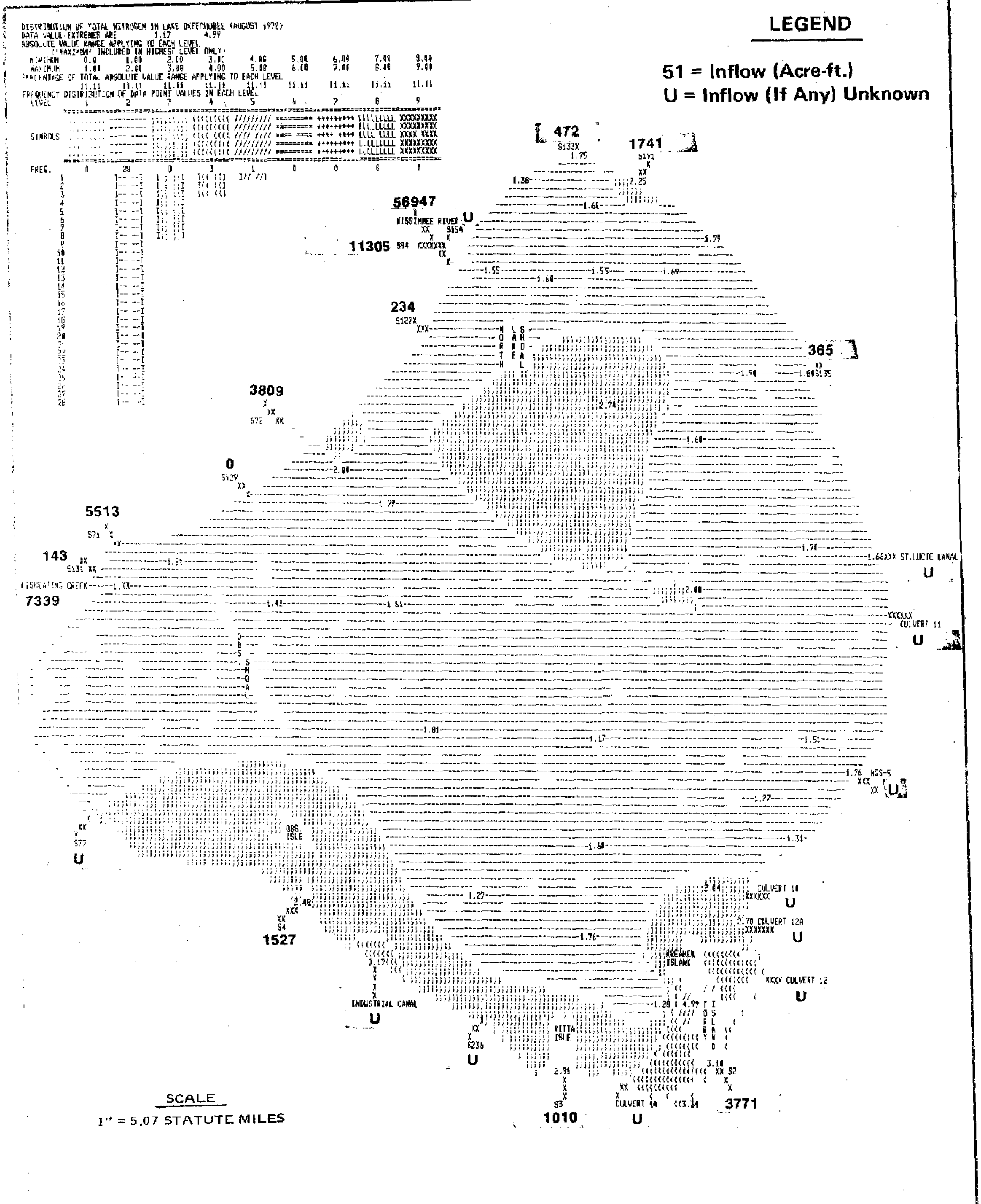

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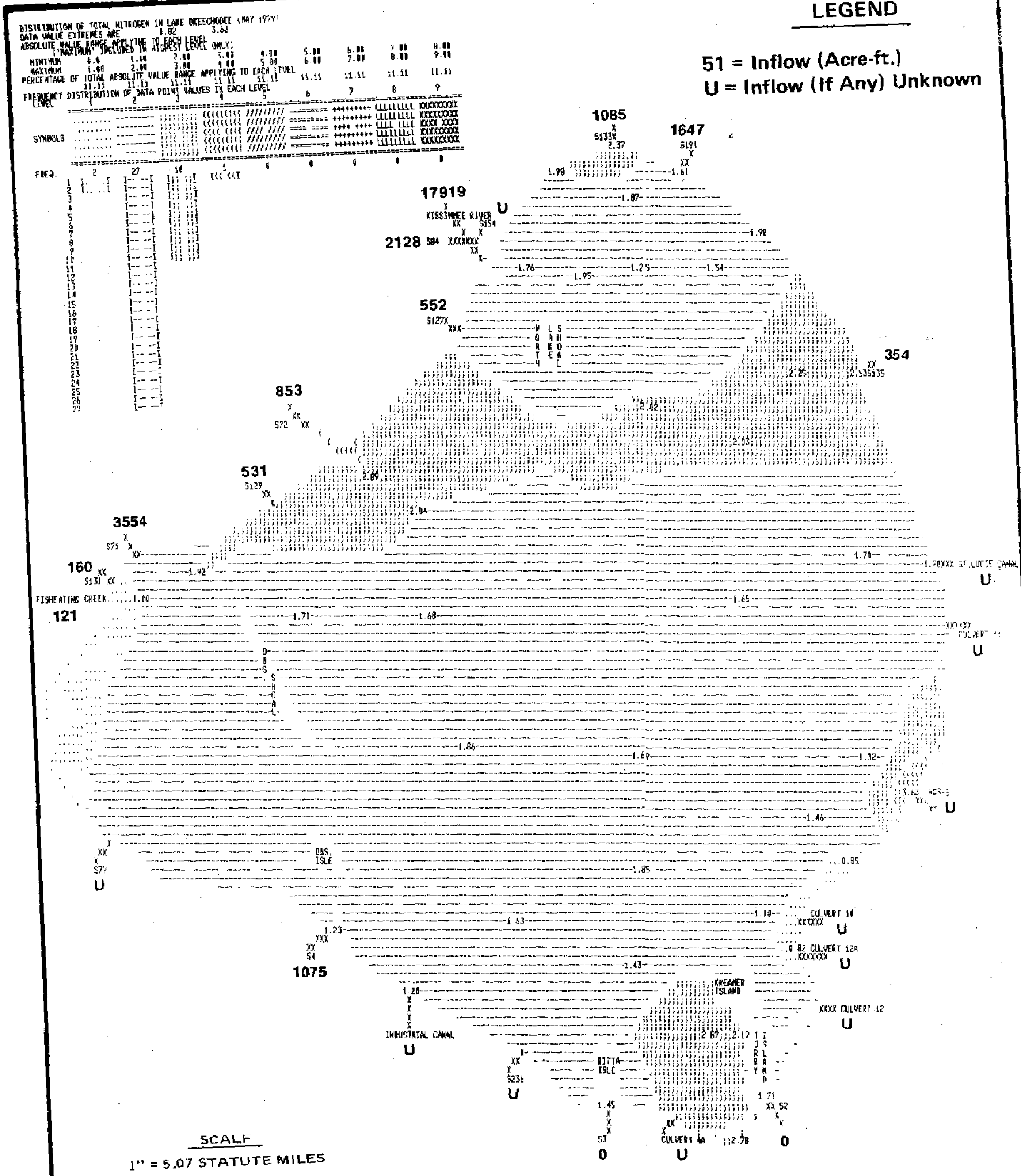

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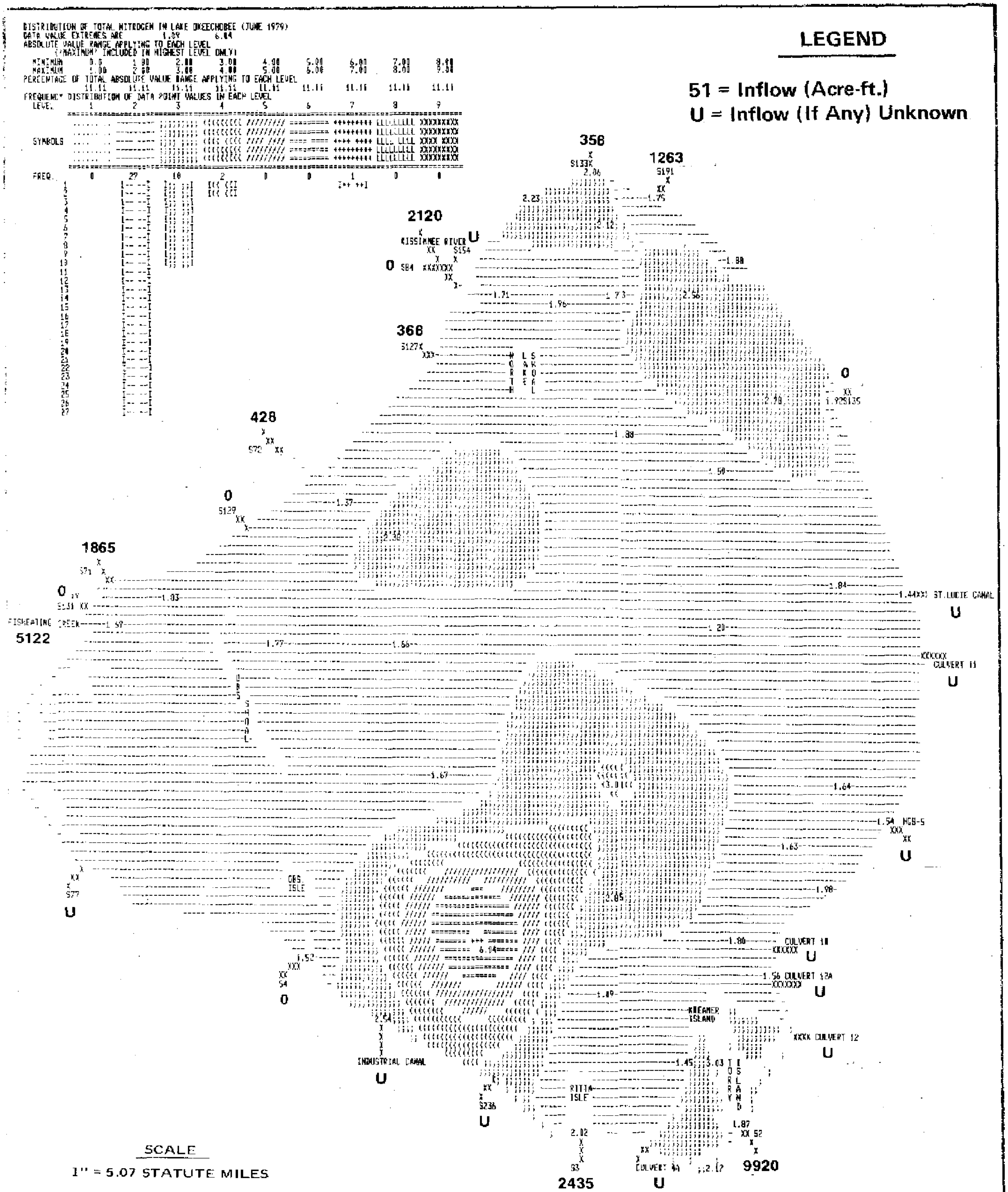

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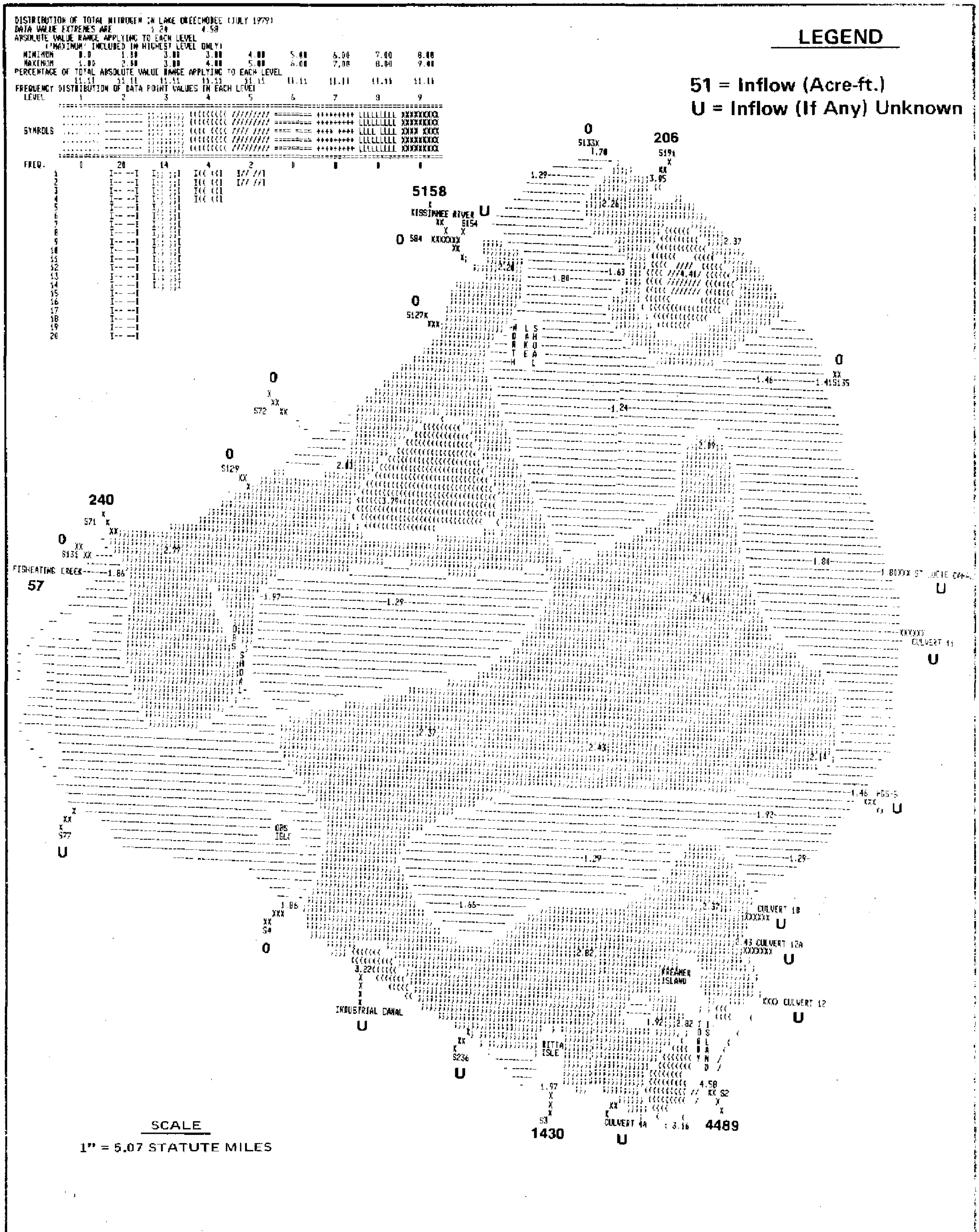

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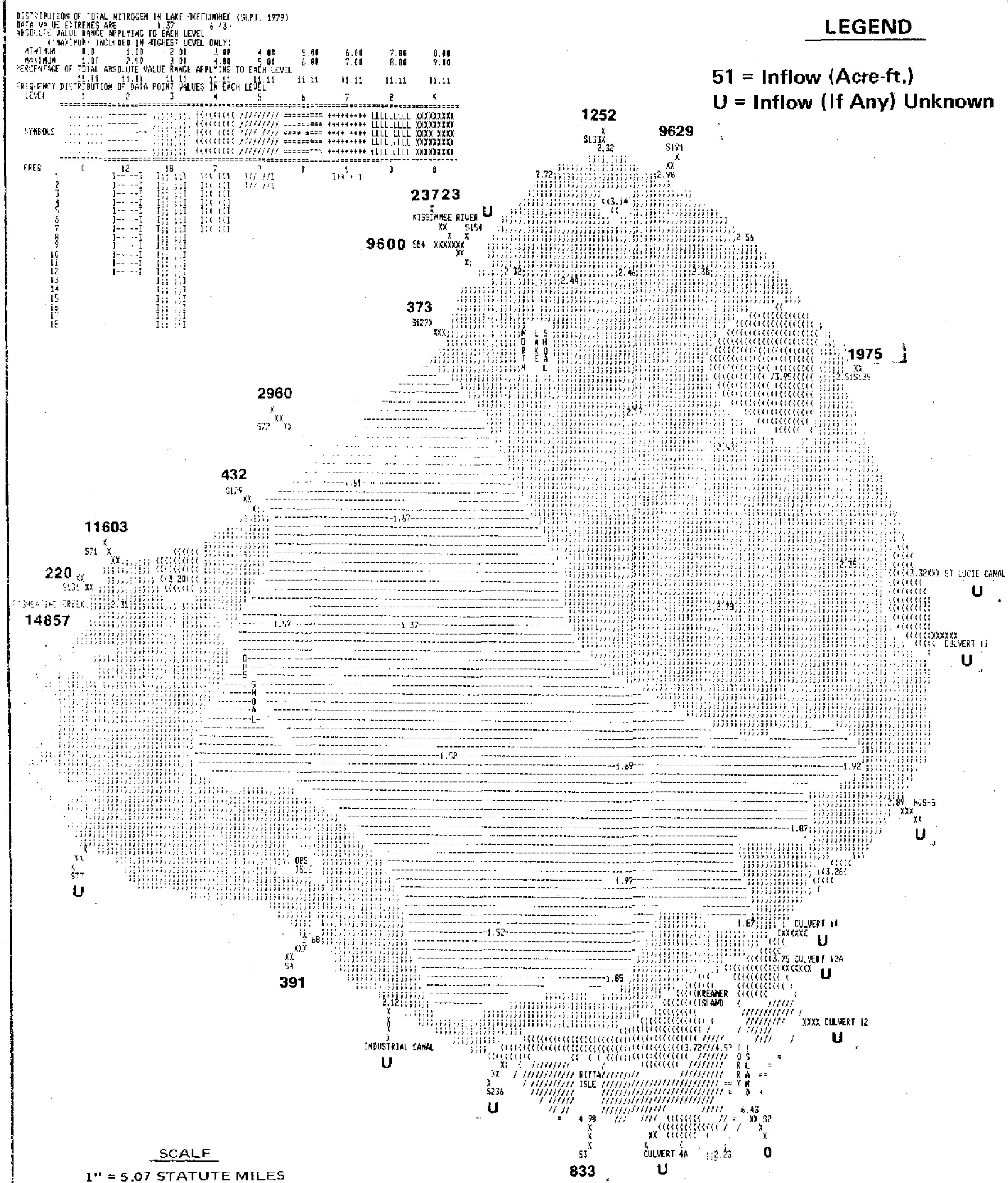

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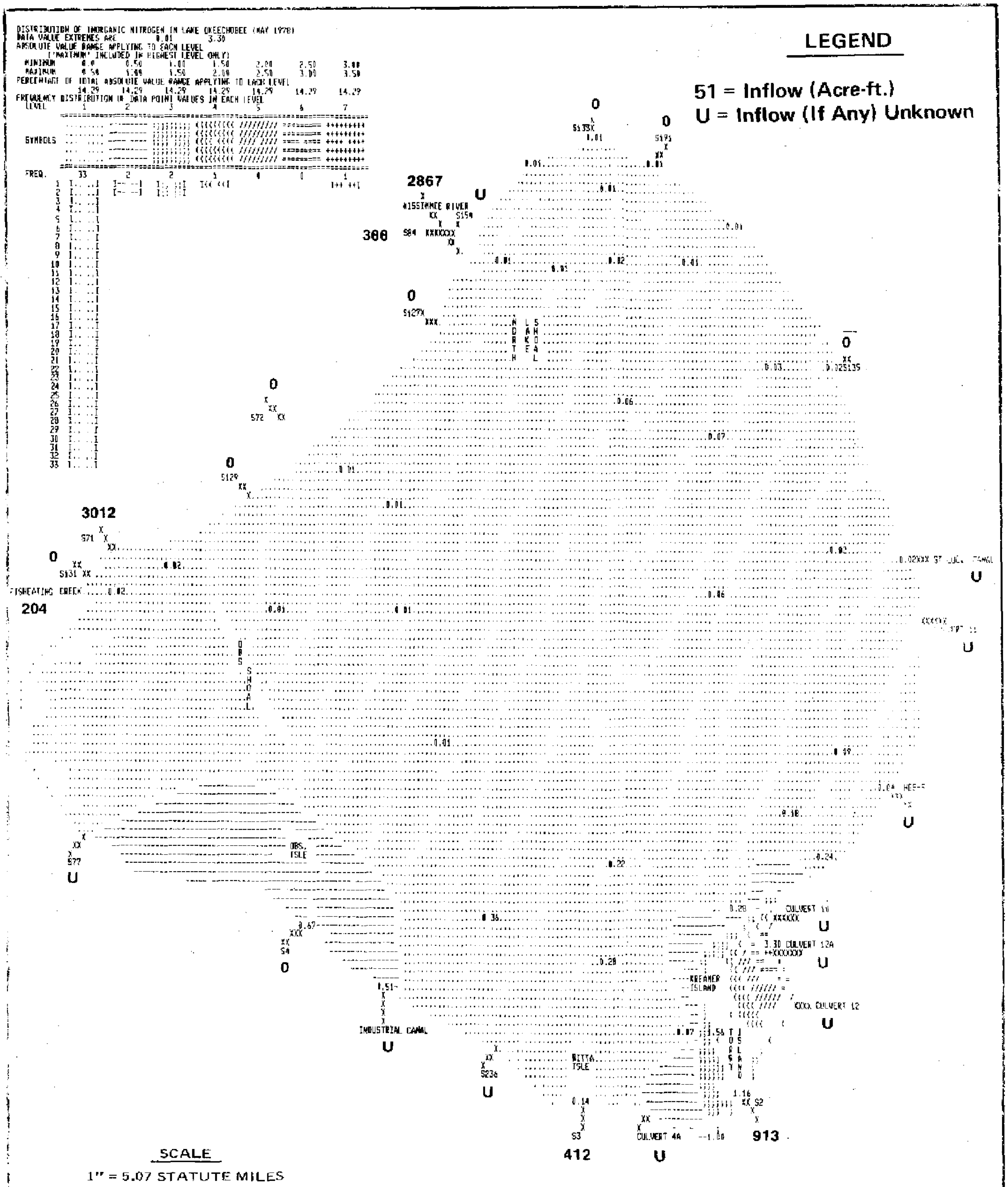

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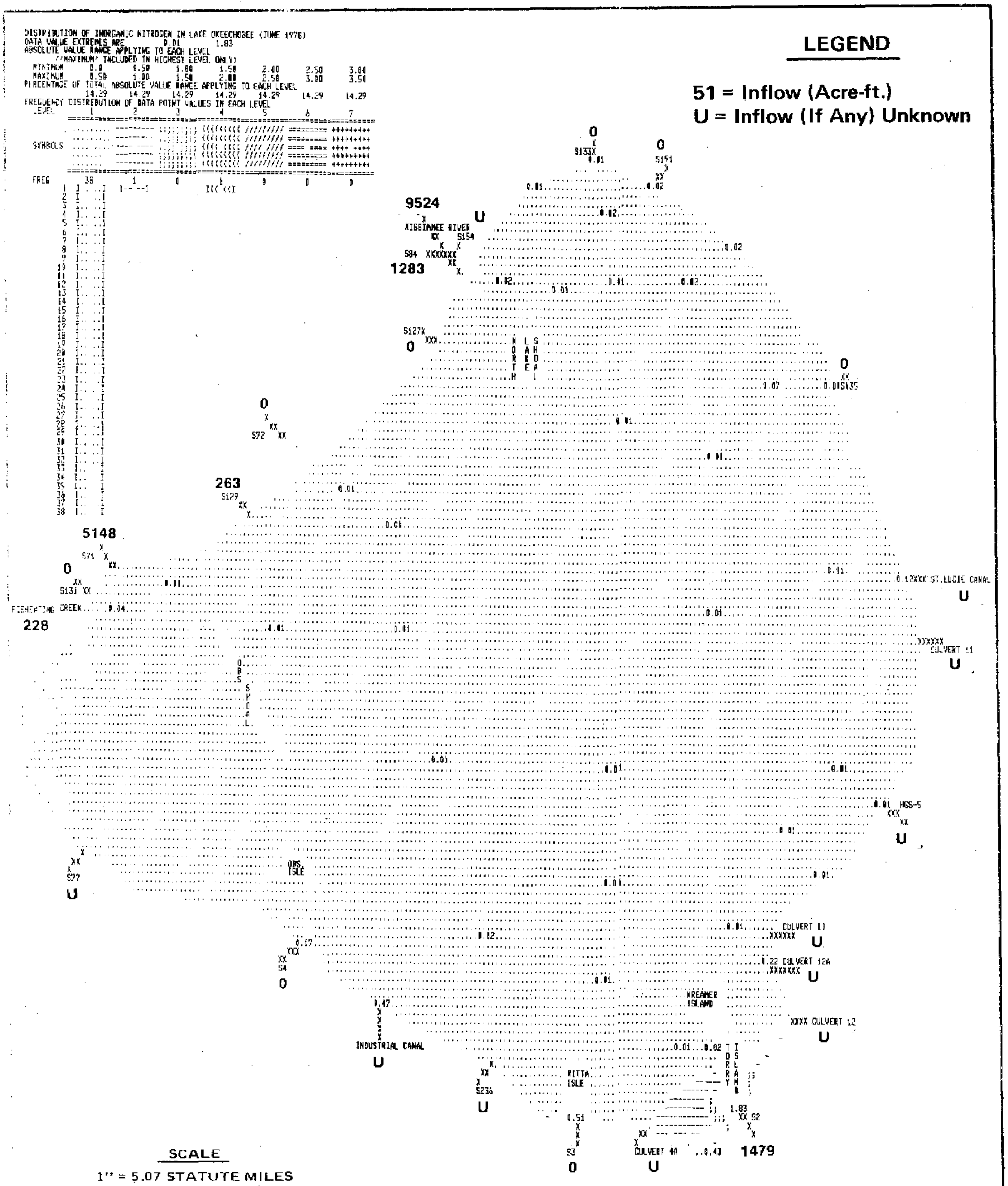

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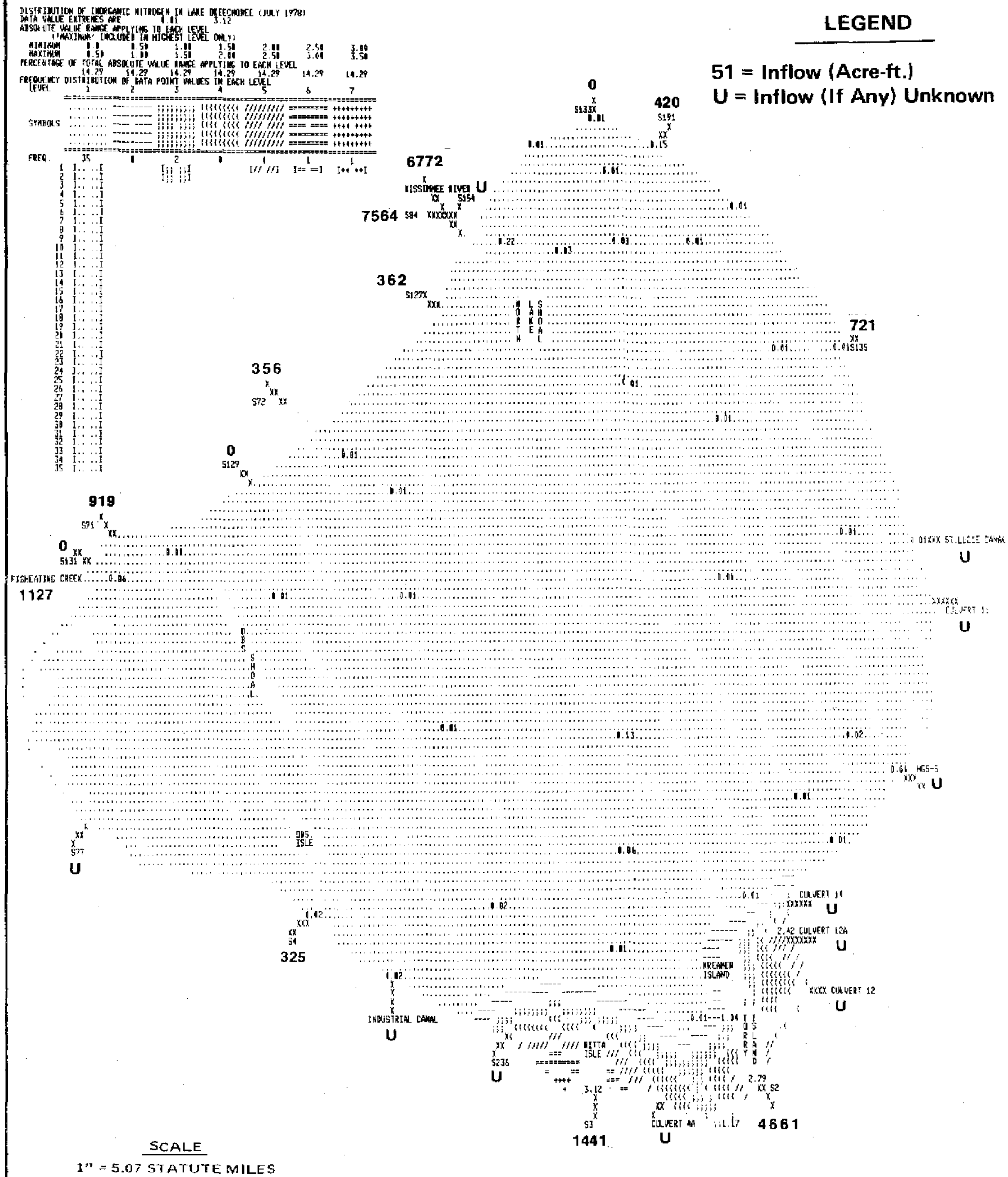

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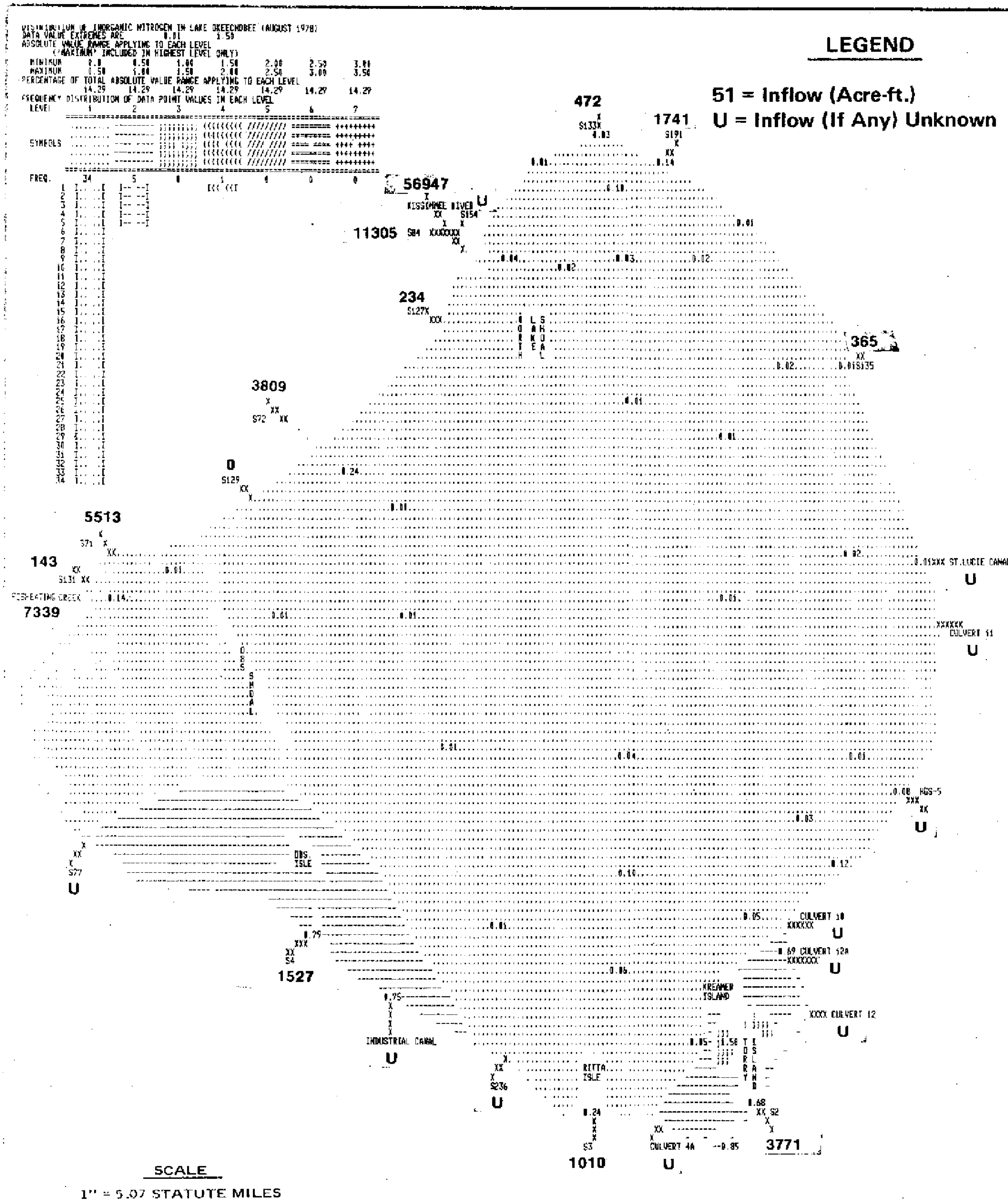

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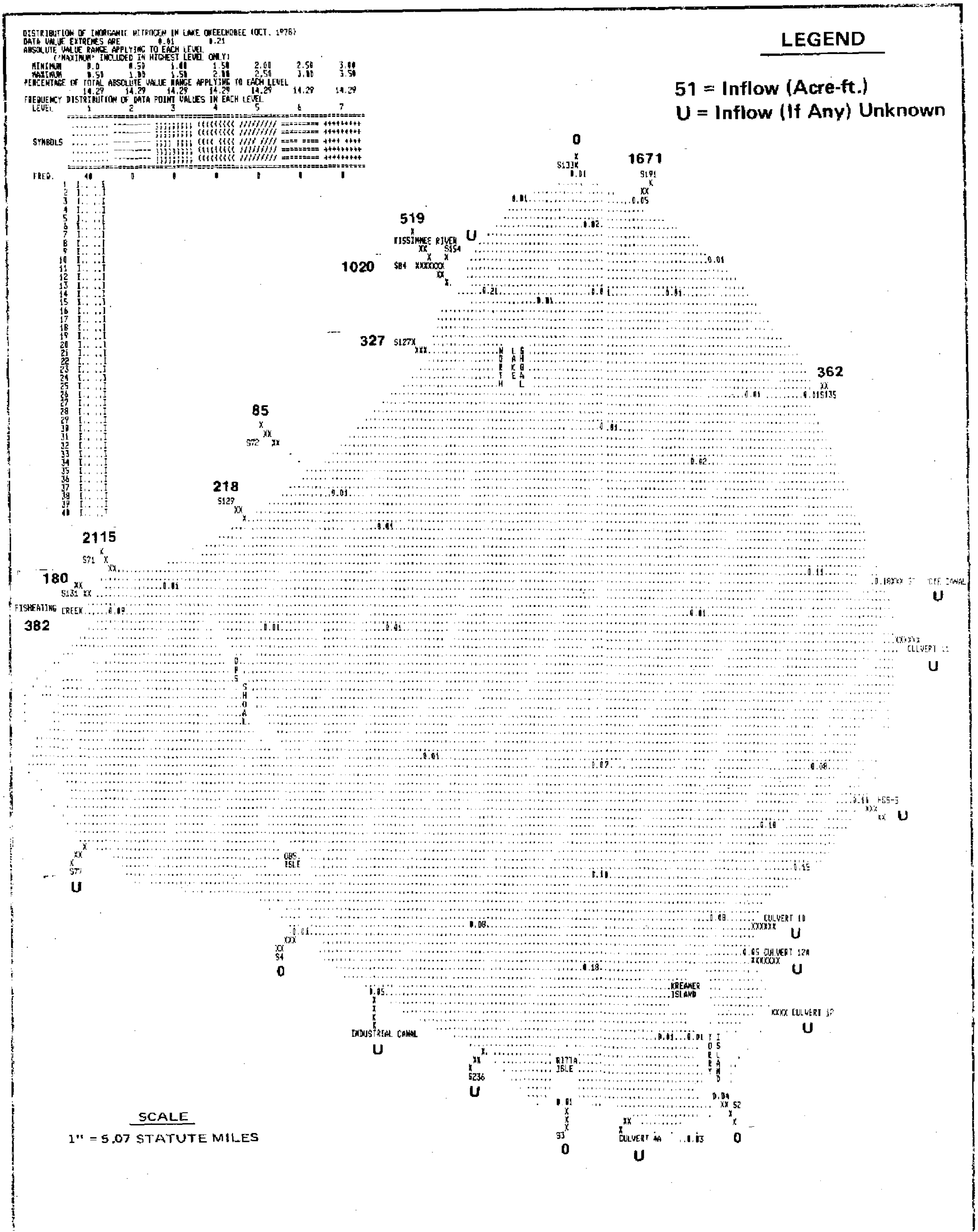

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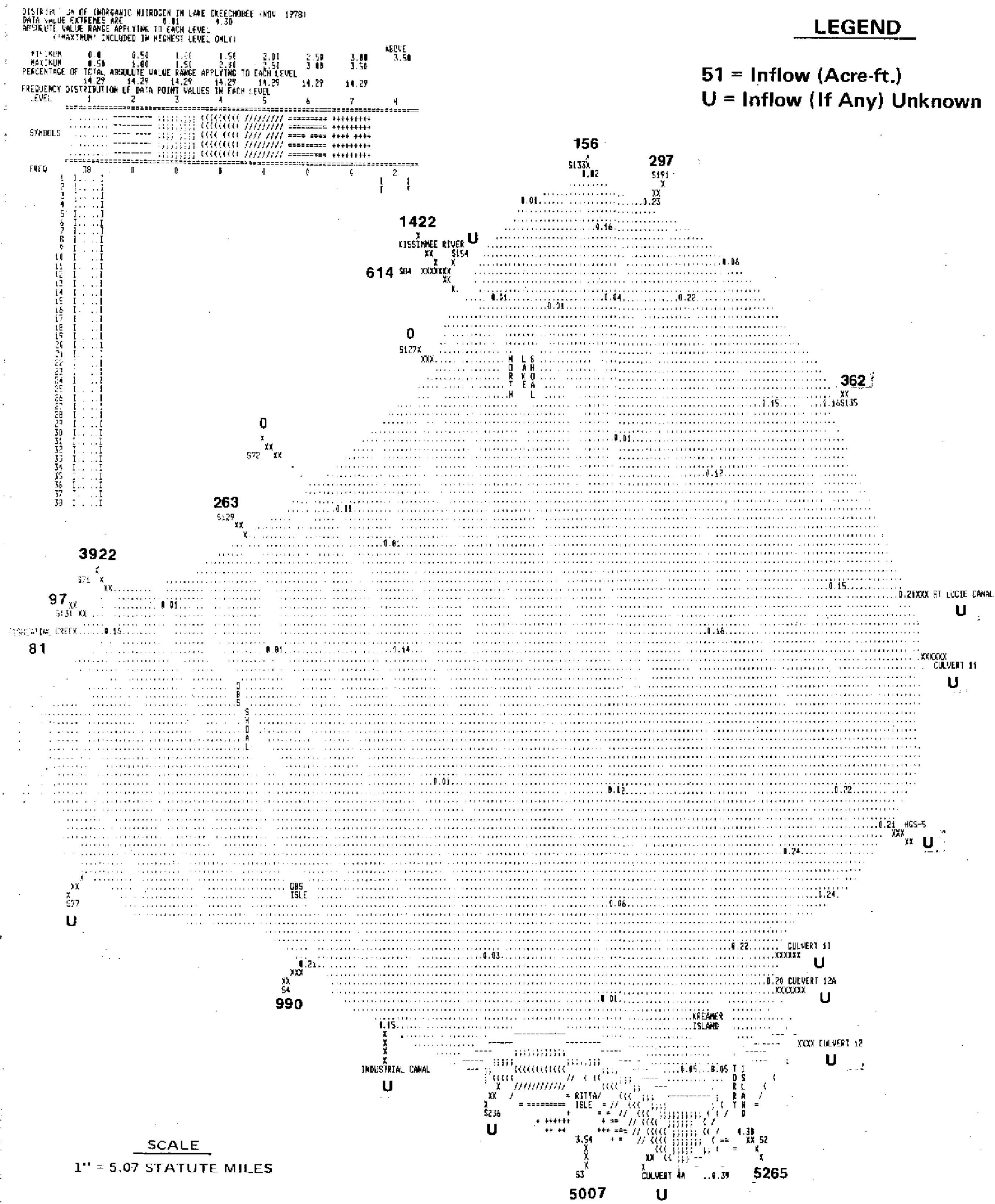

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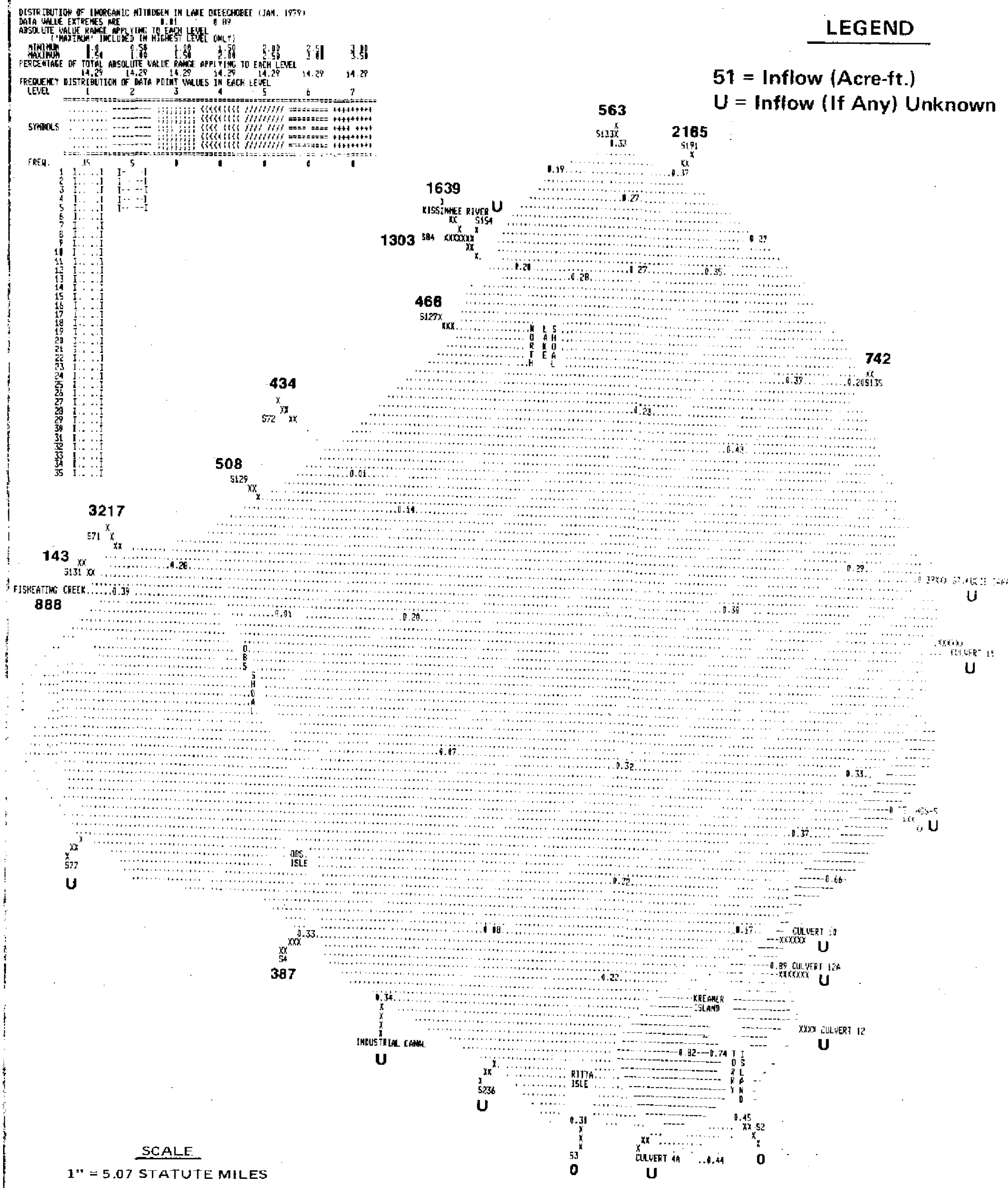

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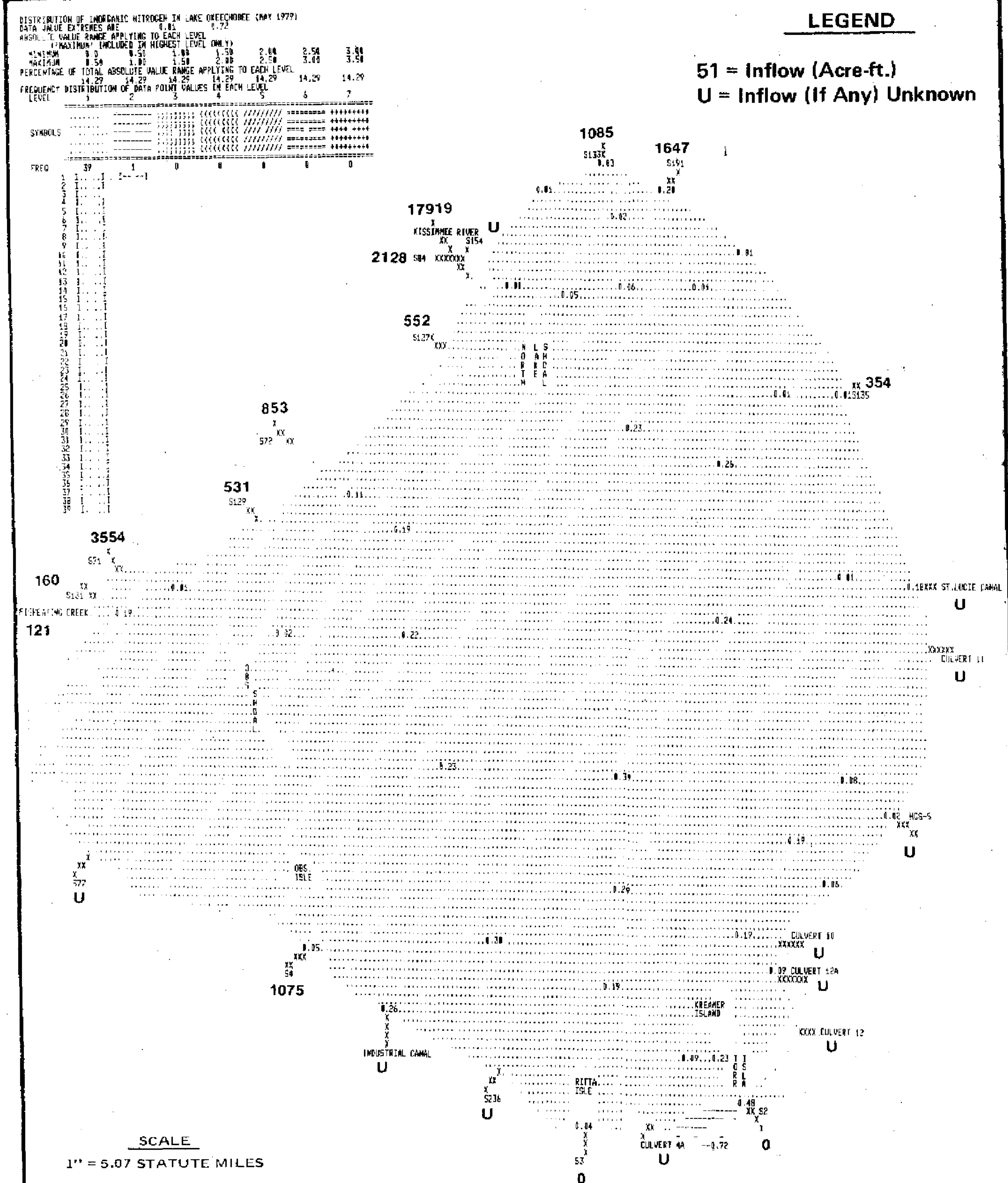

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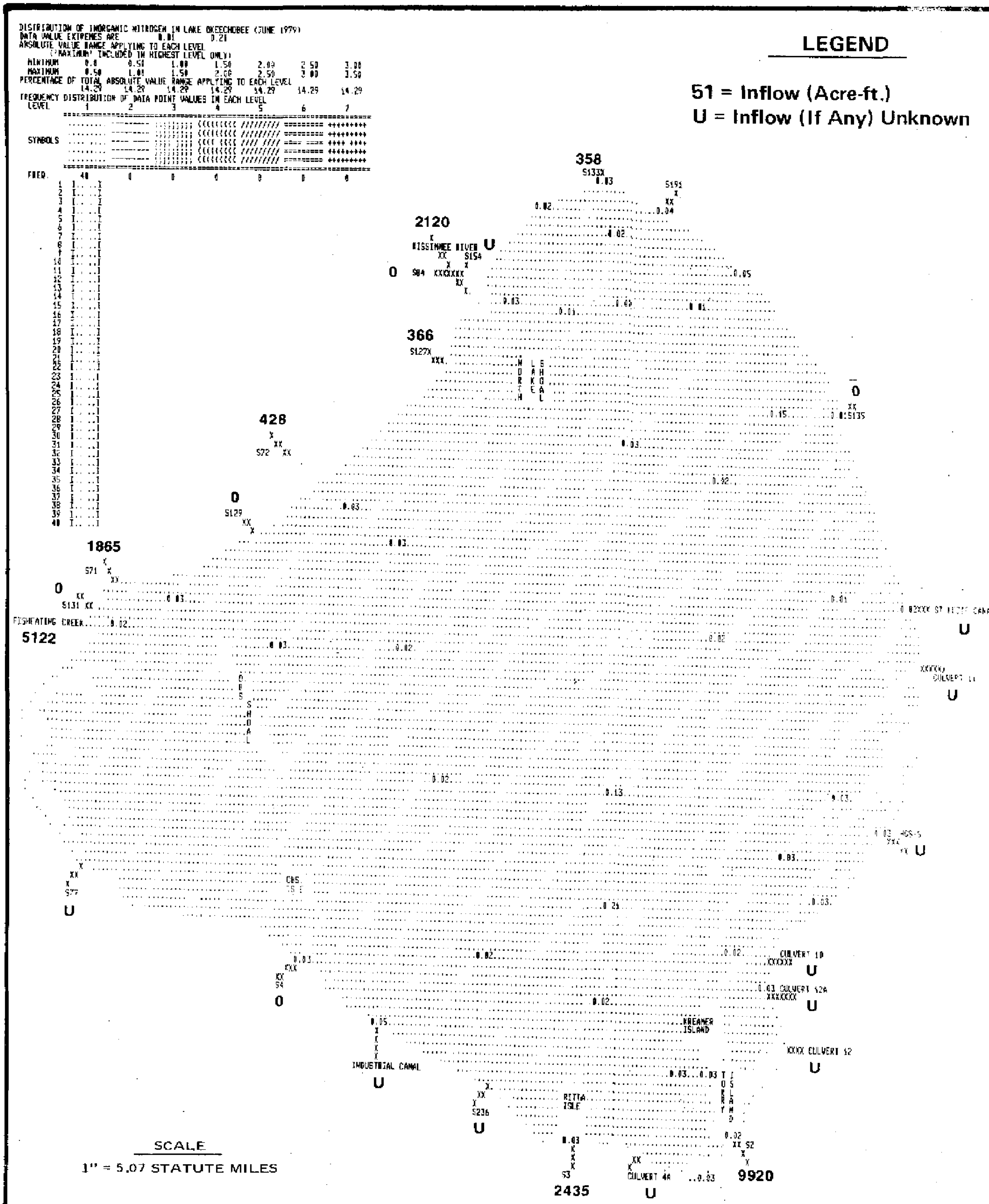

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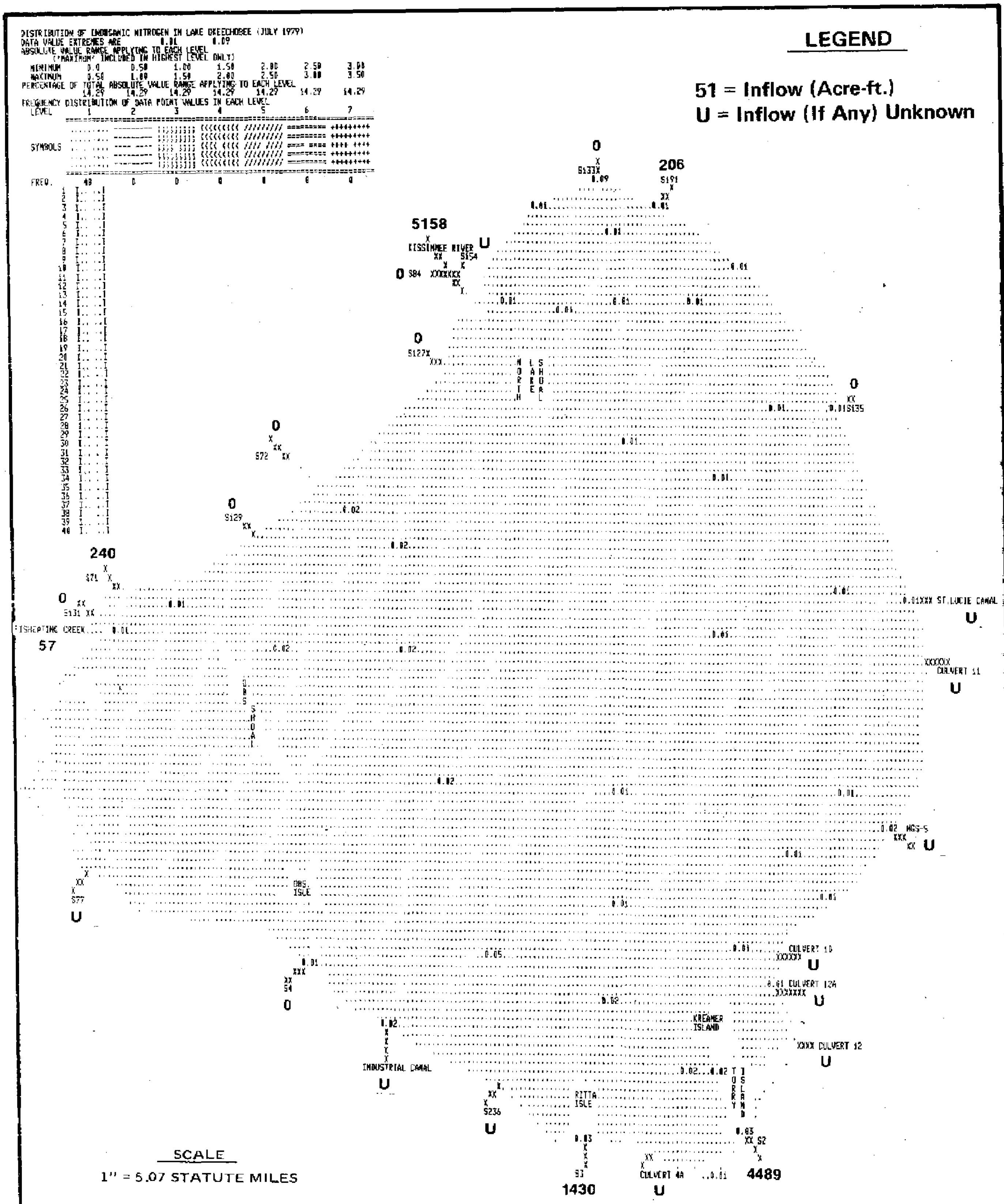

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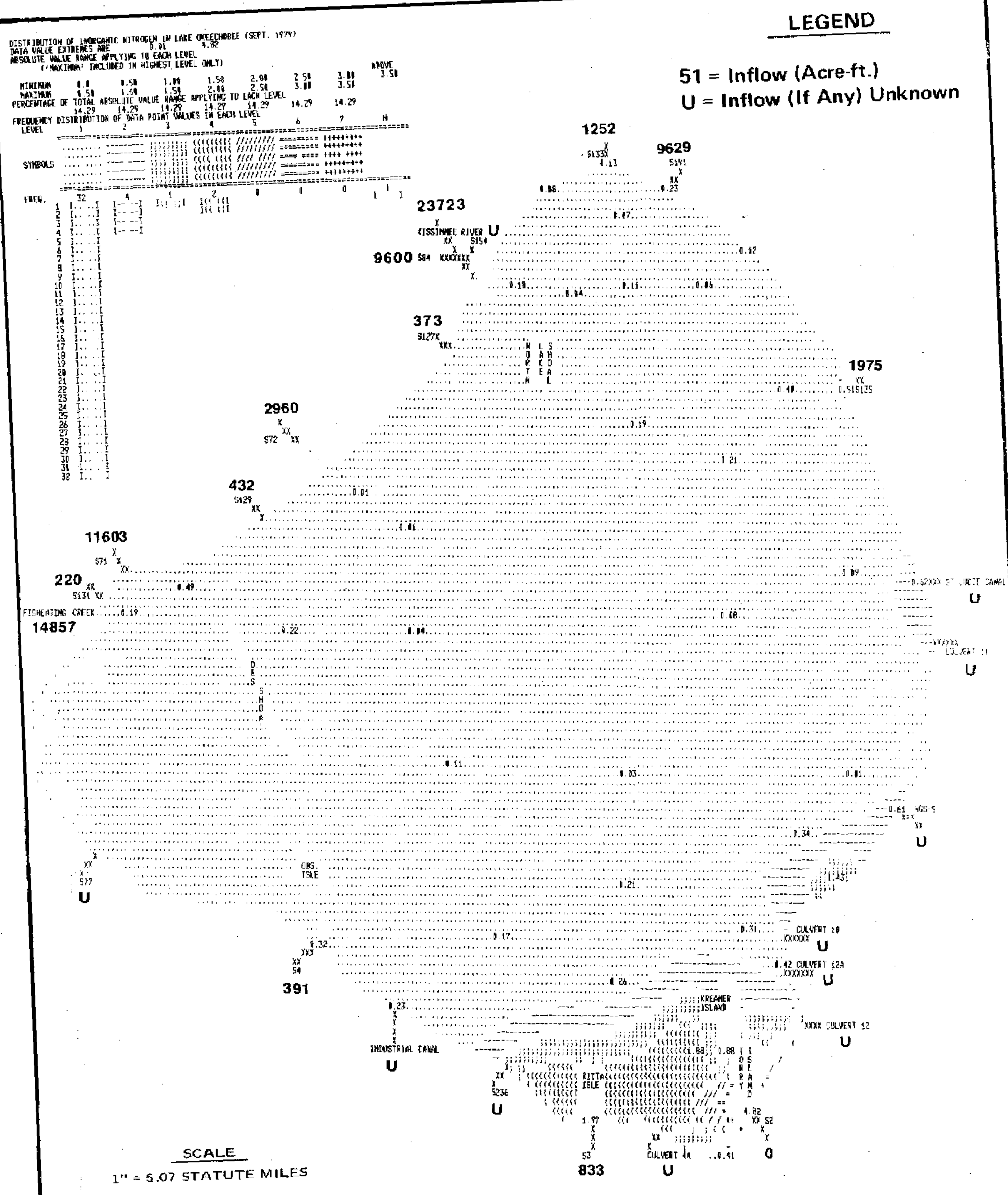

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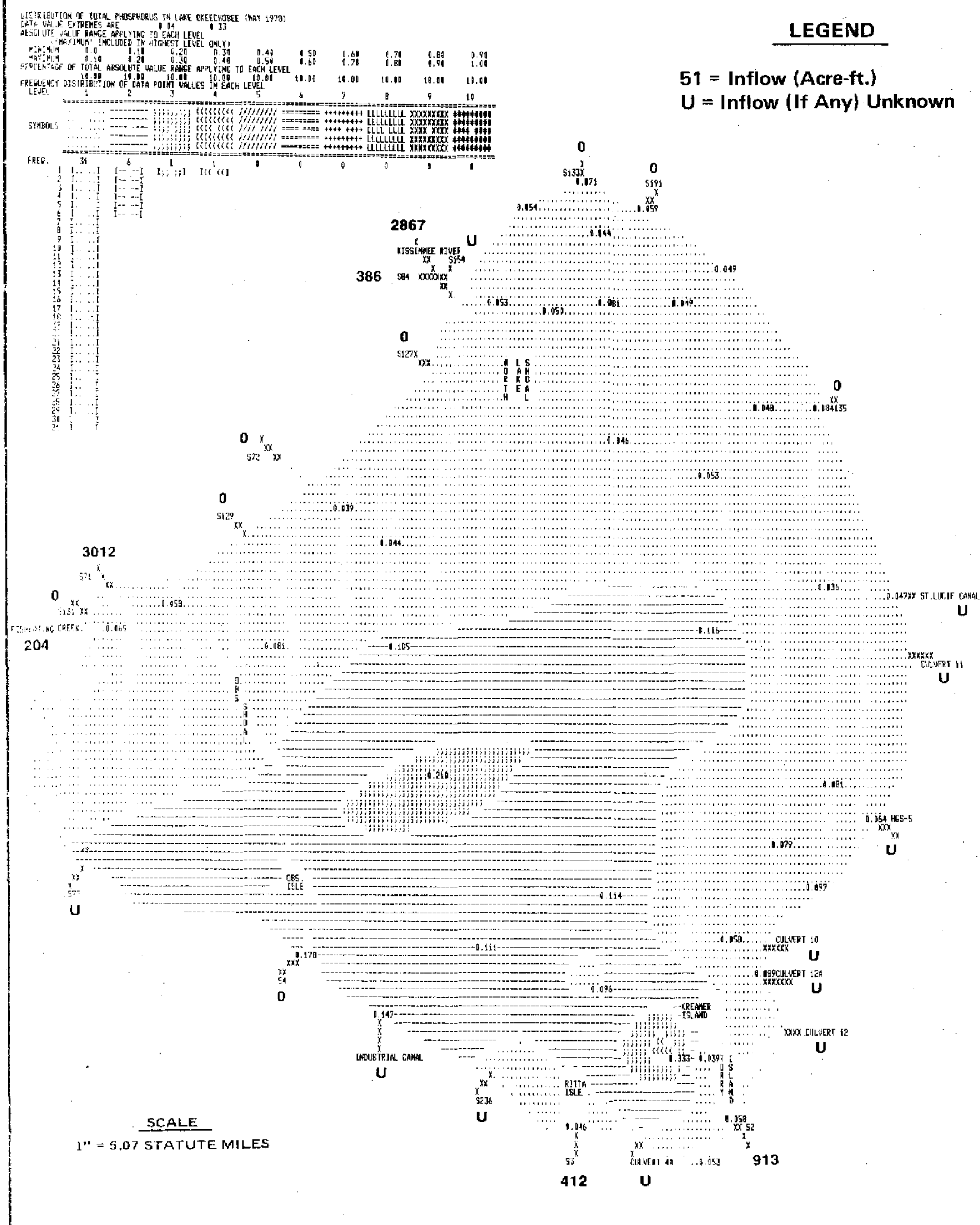
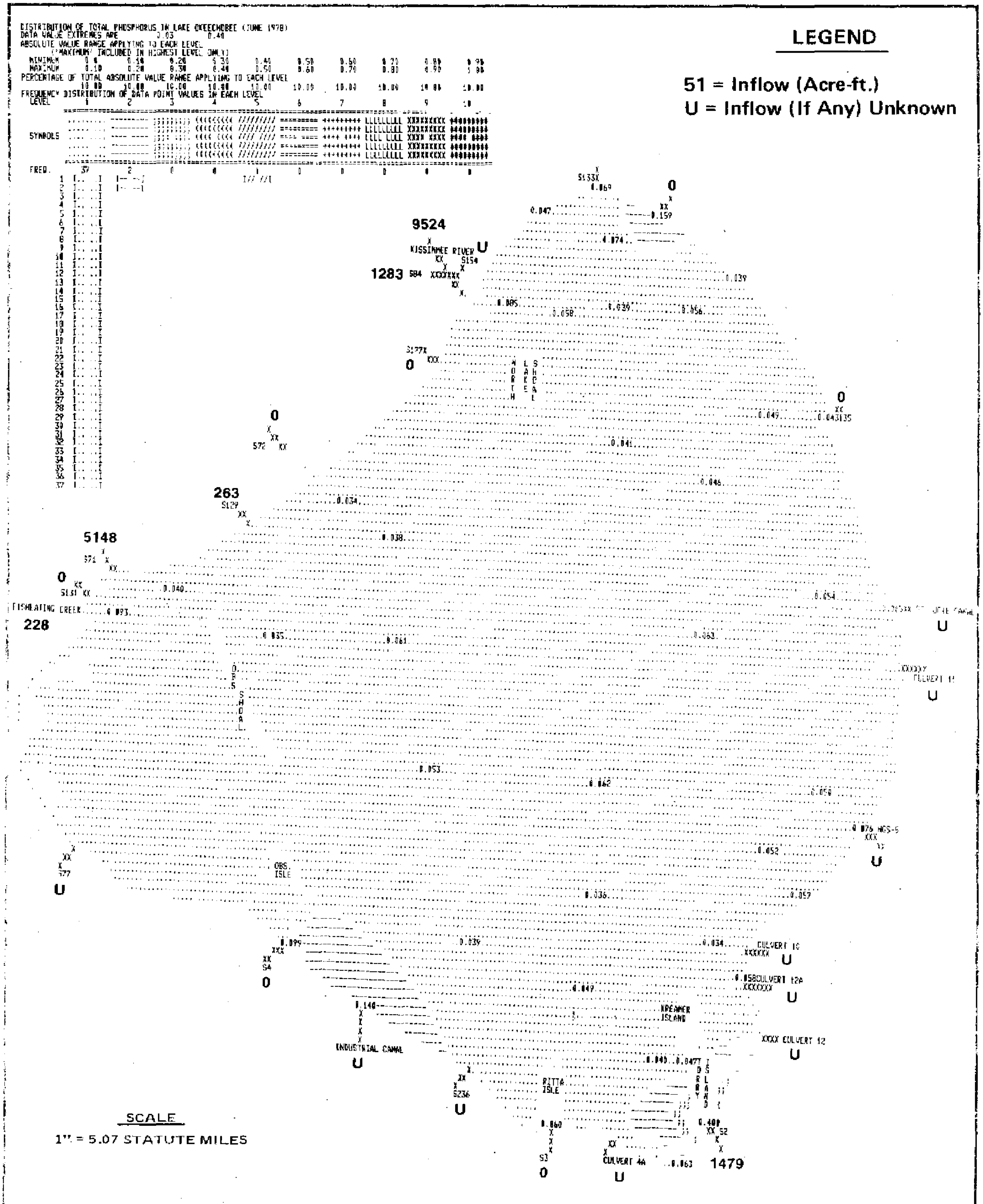


0.10 mg/L CONTOUR INTERVALS FOR TOTAL PHOSPHORUS (MAY 1978)



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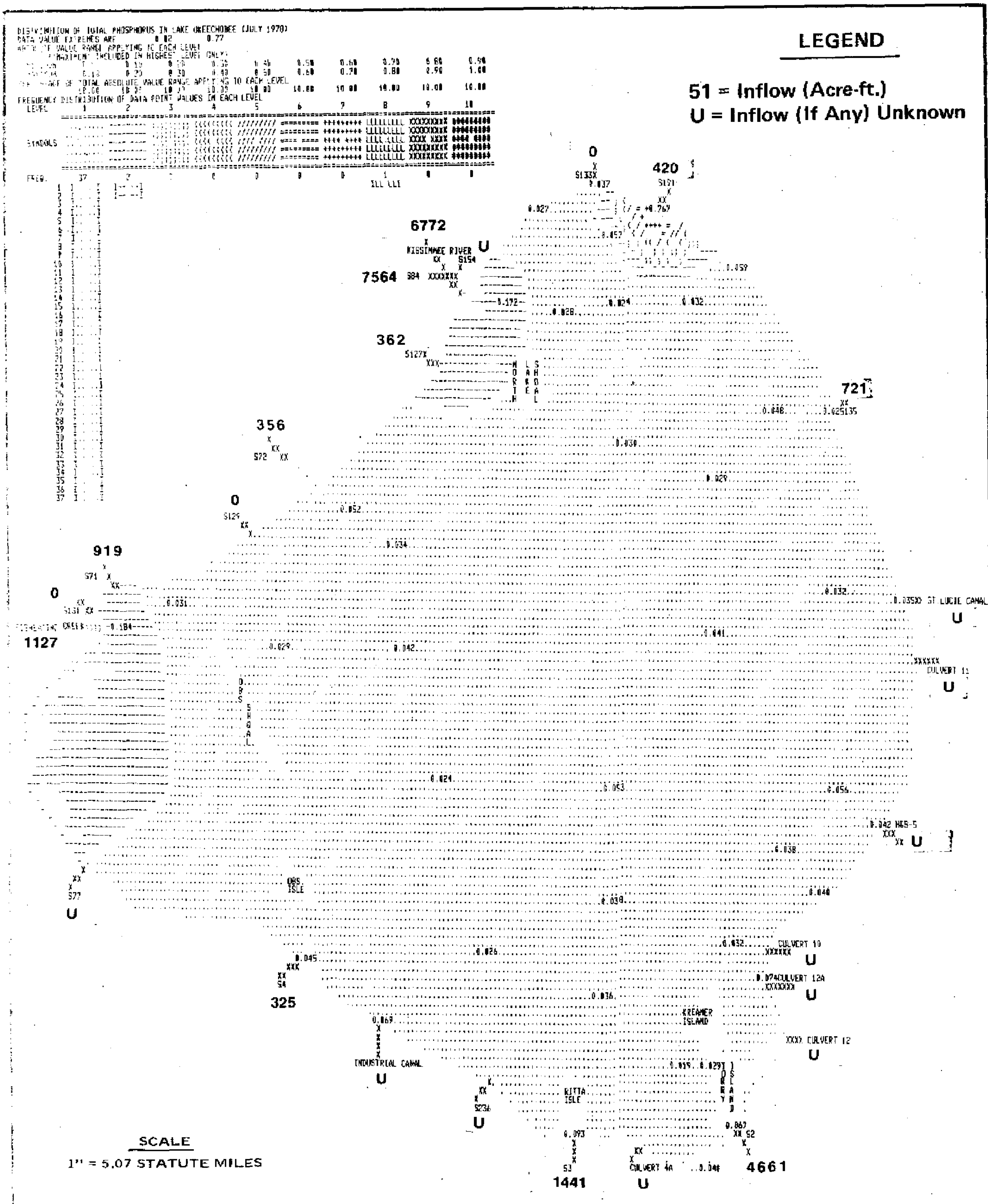

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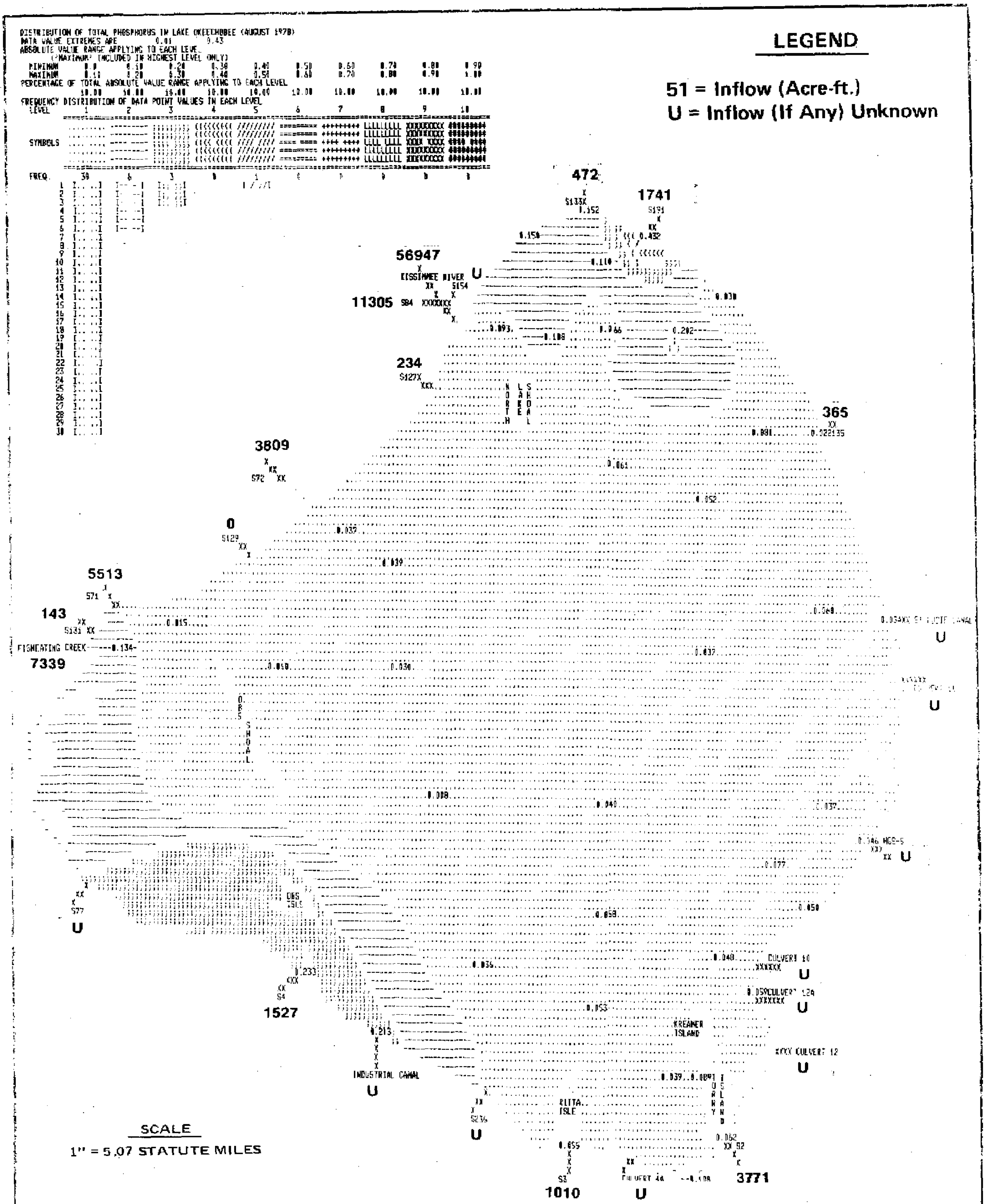

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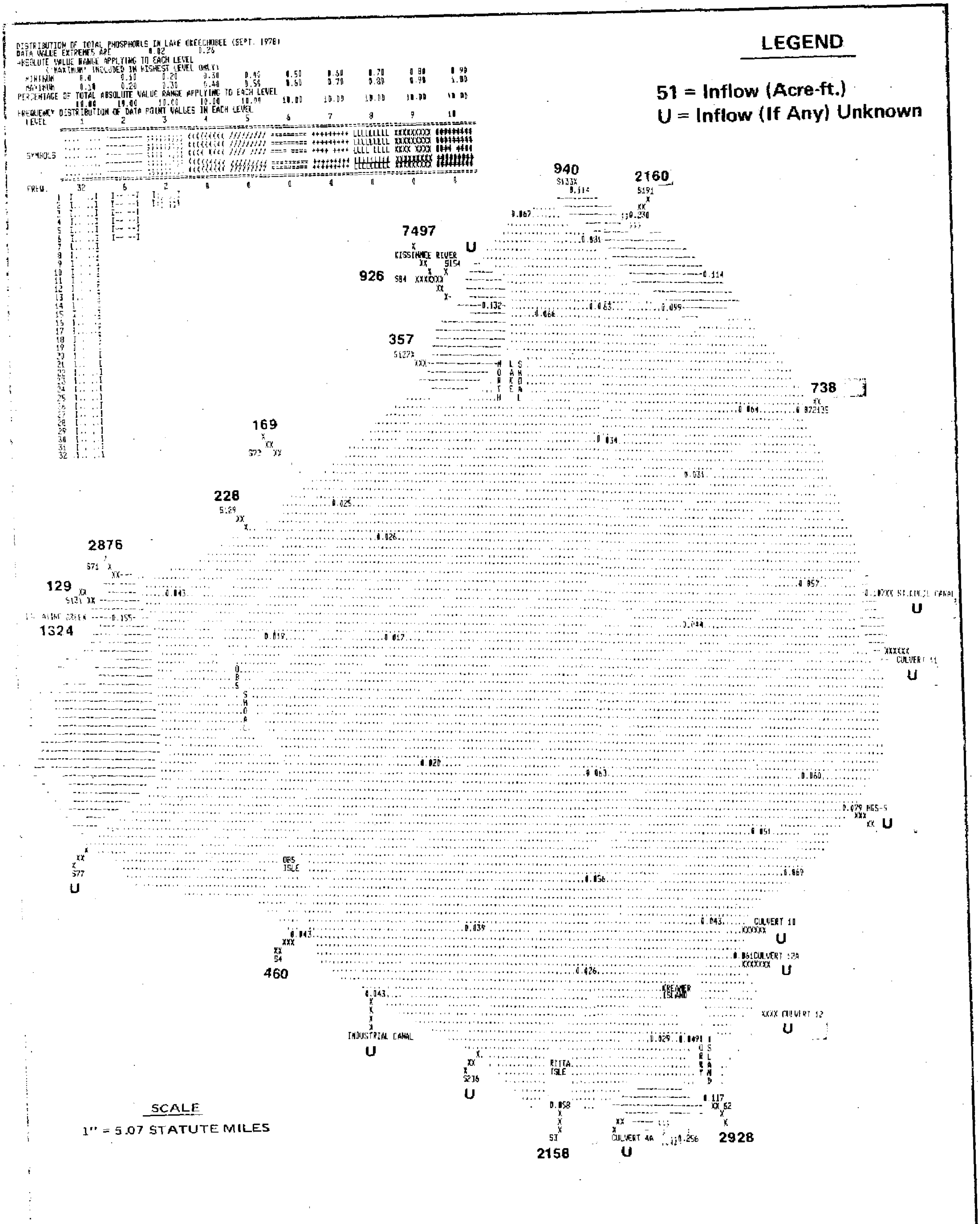

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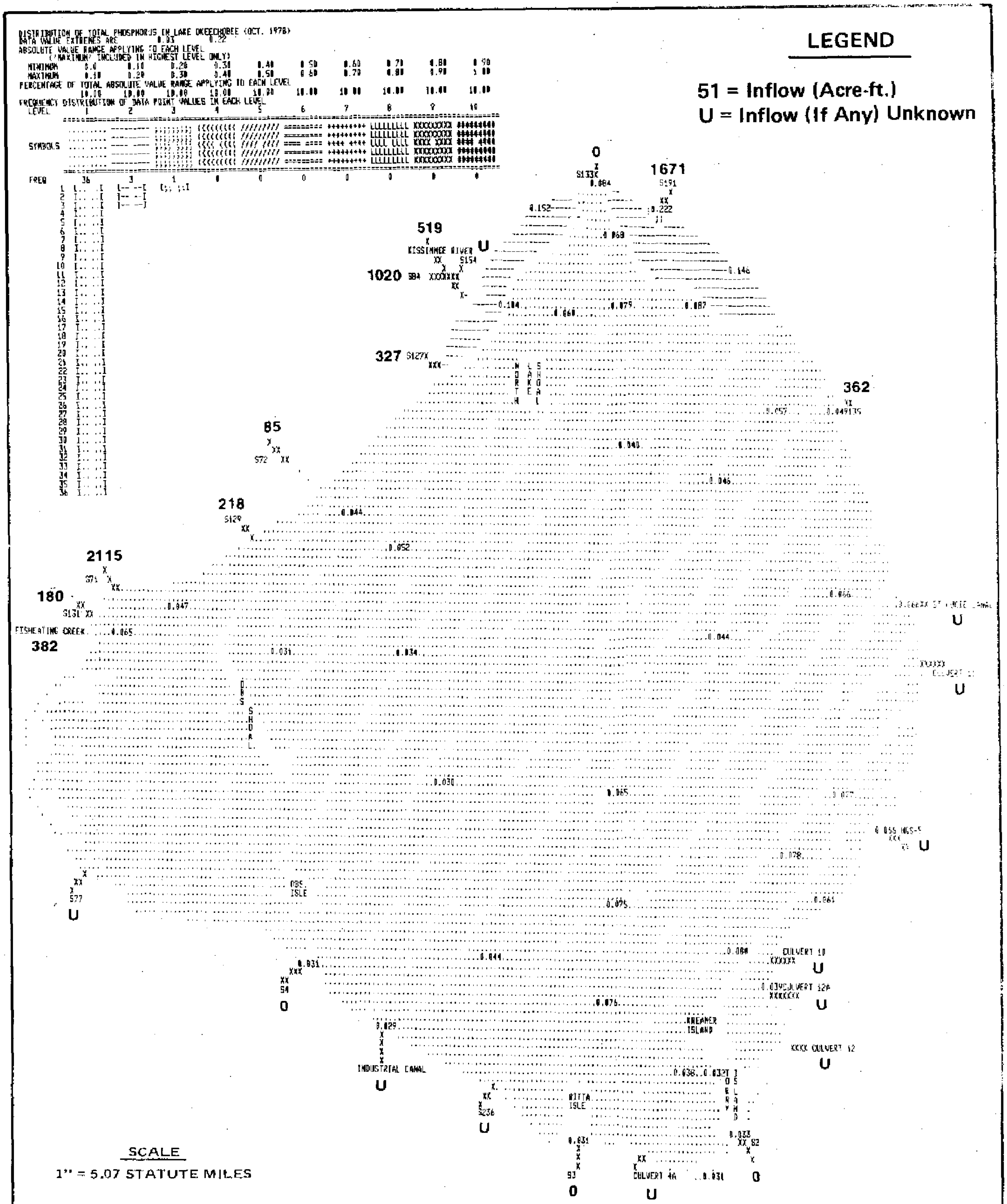
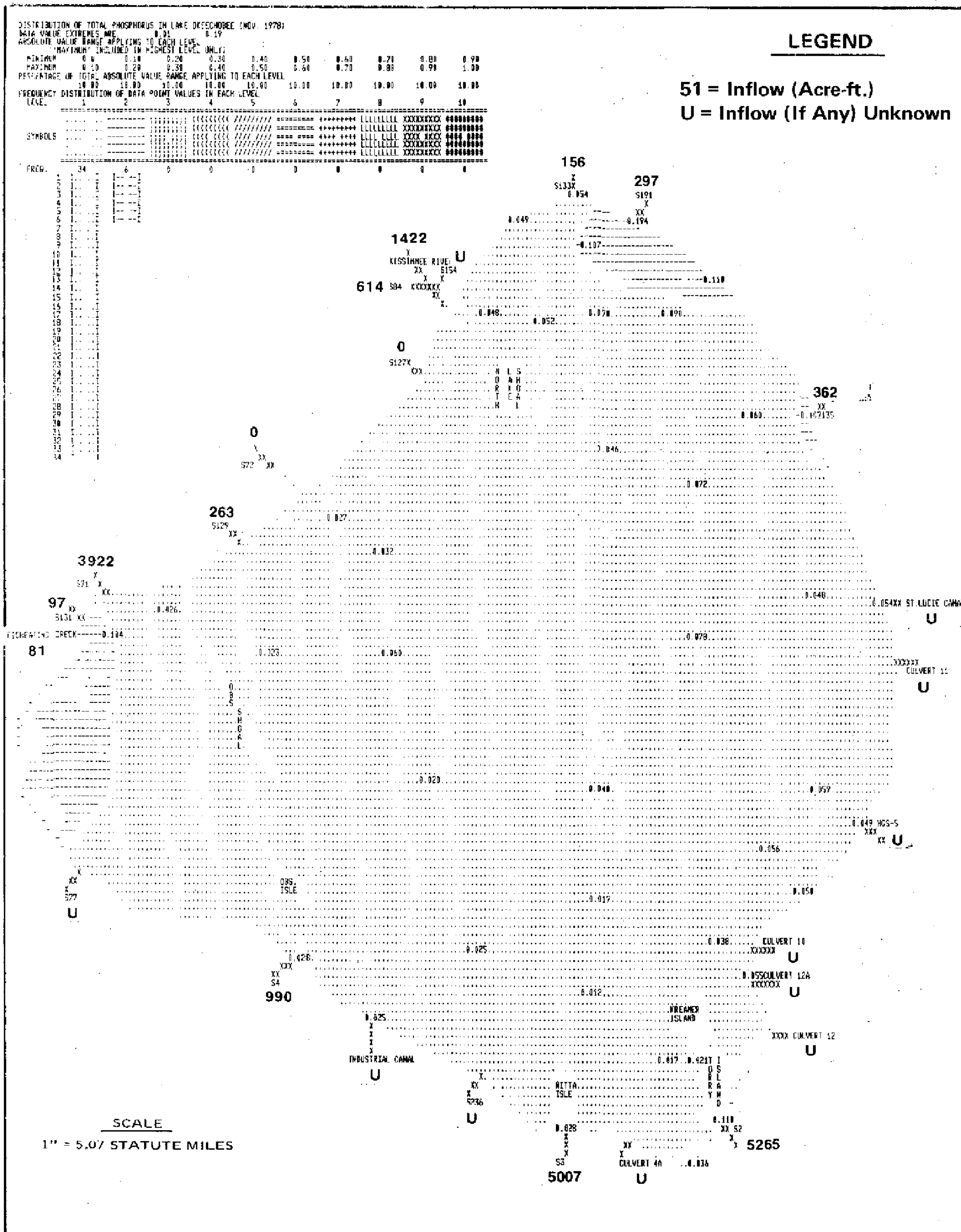


0.10 mg/L CONTOUR INTERVALS FOR TOTAL PHOSPHORUS (OCT. 1978)



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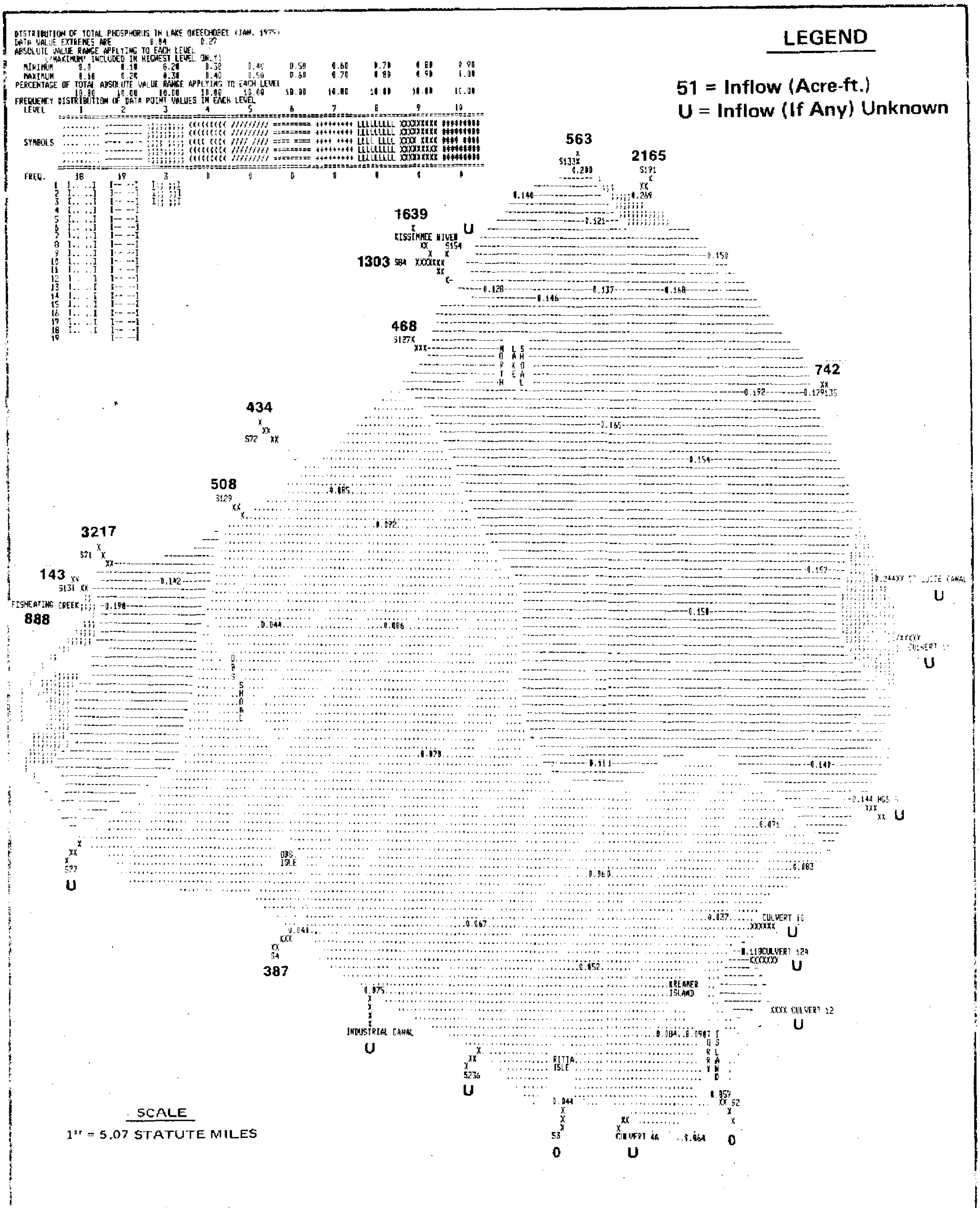

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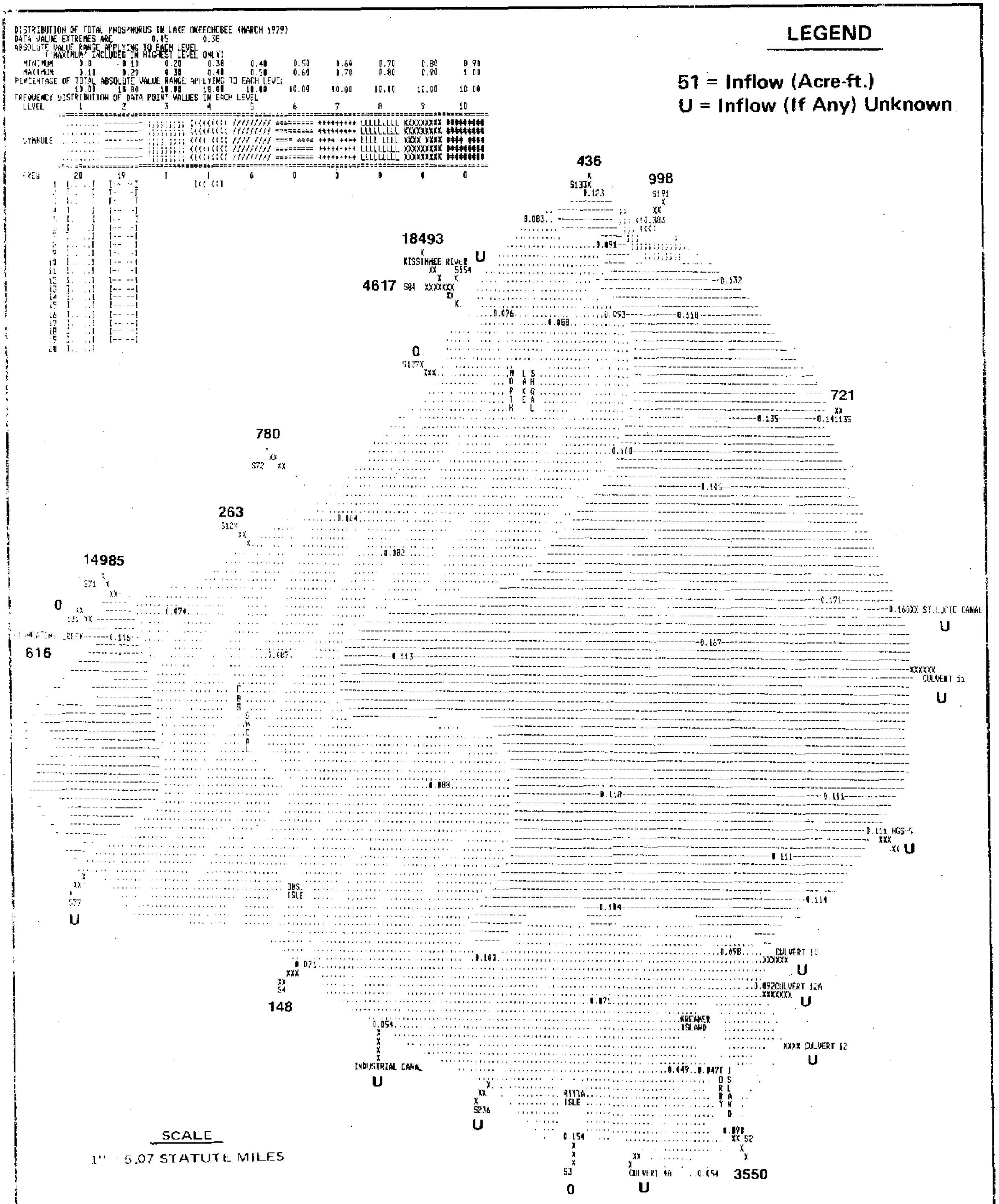
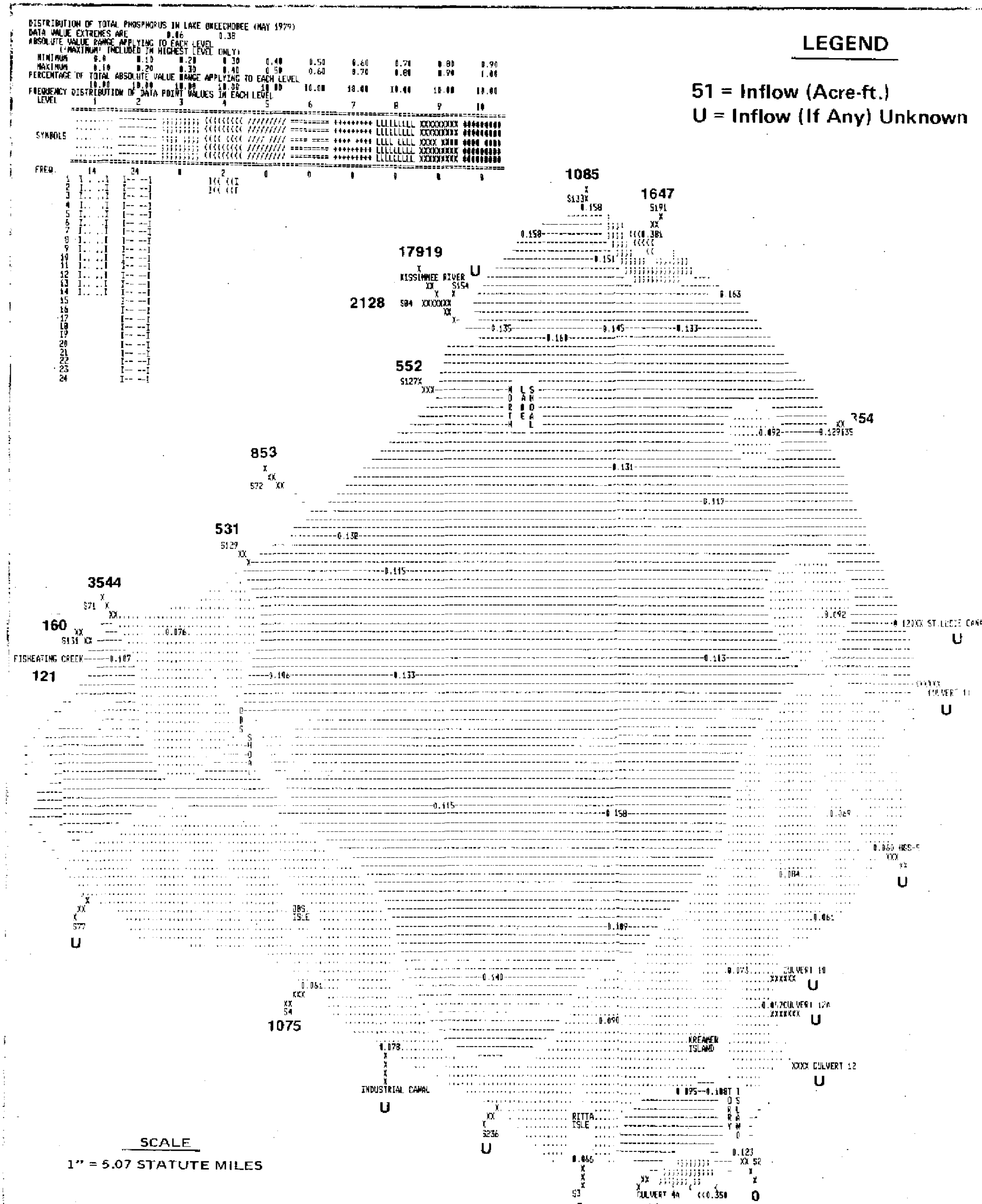


0.10 mg/L CONTOUR INTERVALS FOR TOTAL PHOSPHORUS (MARCH 1979)



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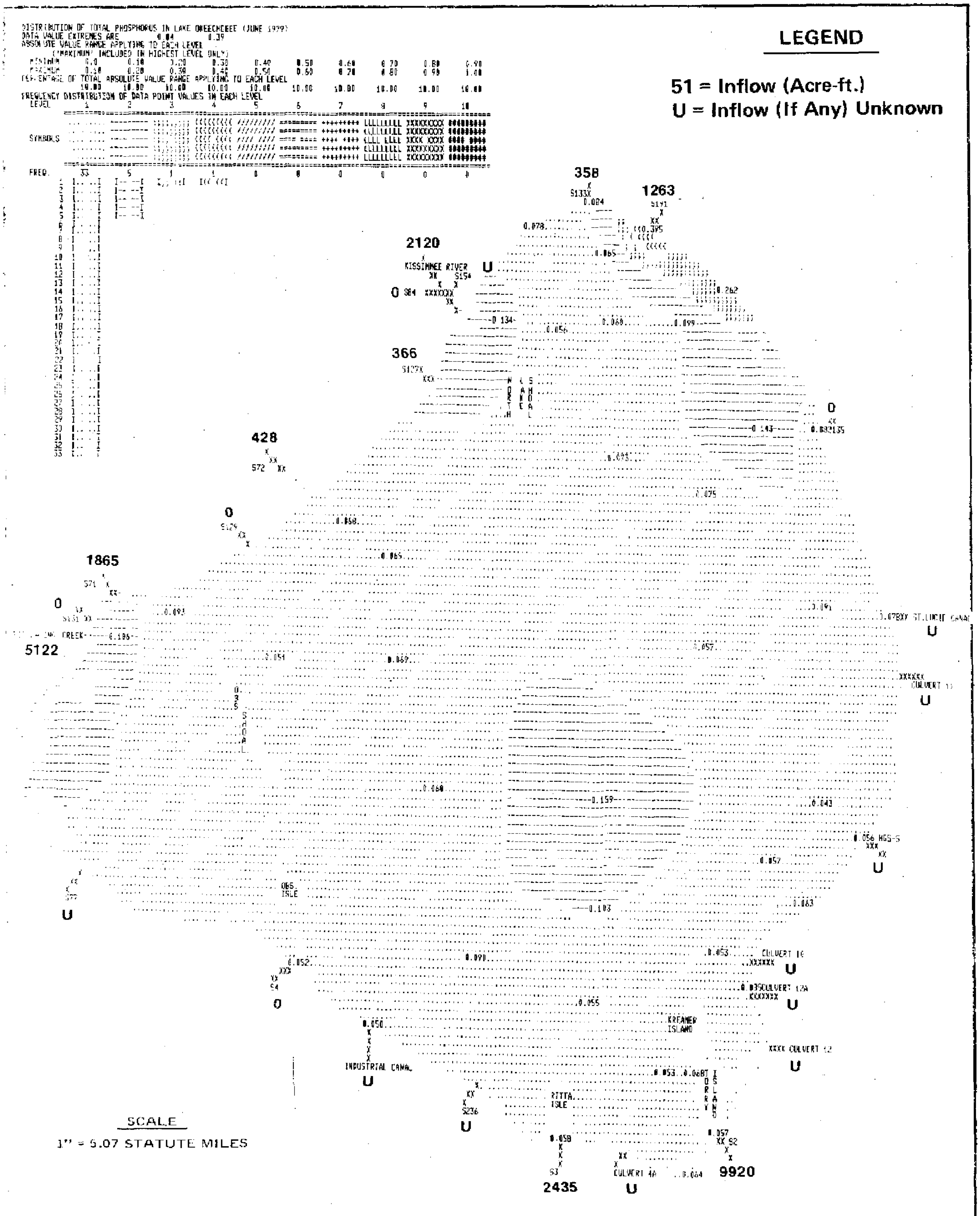

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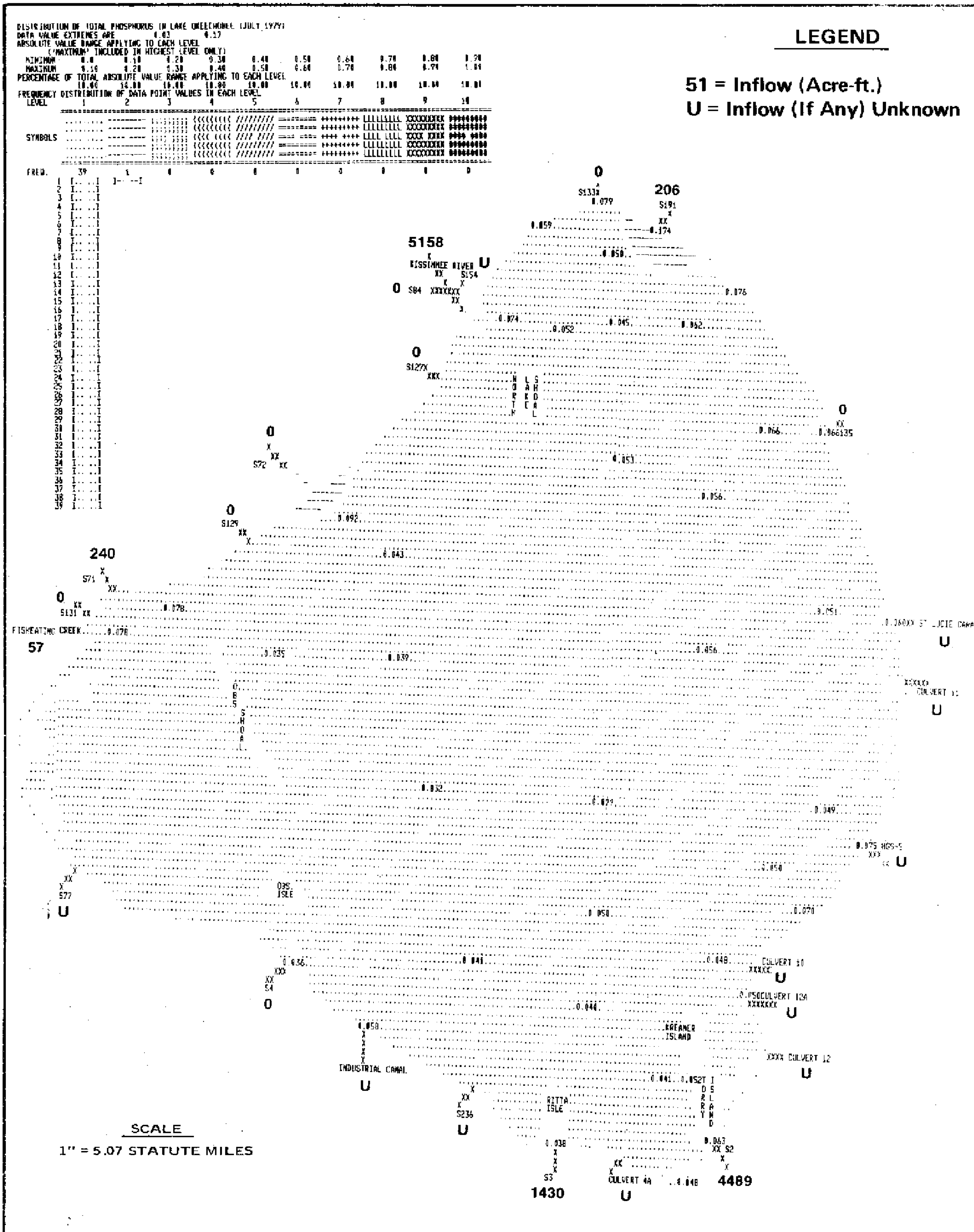


0.10 mg/L CONTOUR INTERVALS FOR TOTAL PHOSPHORUS (JULY 1979)

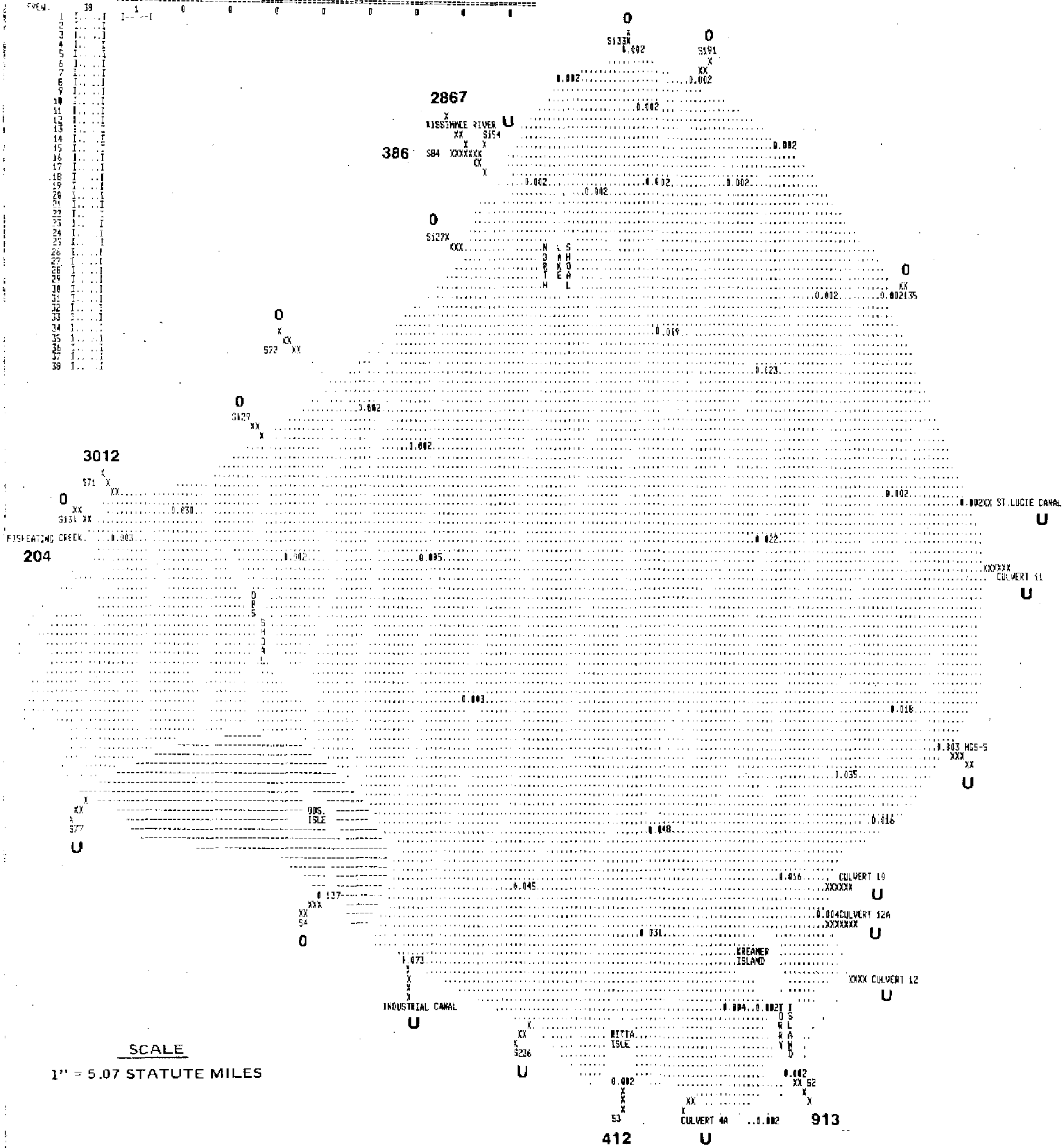
DISTRIBUTION OF ORTHOPHOSPHORUS IN LAKE OKEECHOBEE (MAY 1978)
DATA VALUE EXTREMES ARE 0.00 0.14
ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
('MAXIMUM' INCLUDED IN HIGHEST LEVEL ONLY)

LEVEL	1	2	3	4	5	6	7	8	9	10
MINIMUM	0.0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90
MAXIMUM	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
PERCENTAGE OF TOTAL ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
SYMBOLS	....	--------	;;;;;;;;	(((((((((	/////////	========	++++++++	LLLLLLLL	XXXXXXXX	########
FREQ.	38	1	0	0	0	0	0	0	0	0

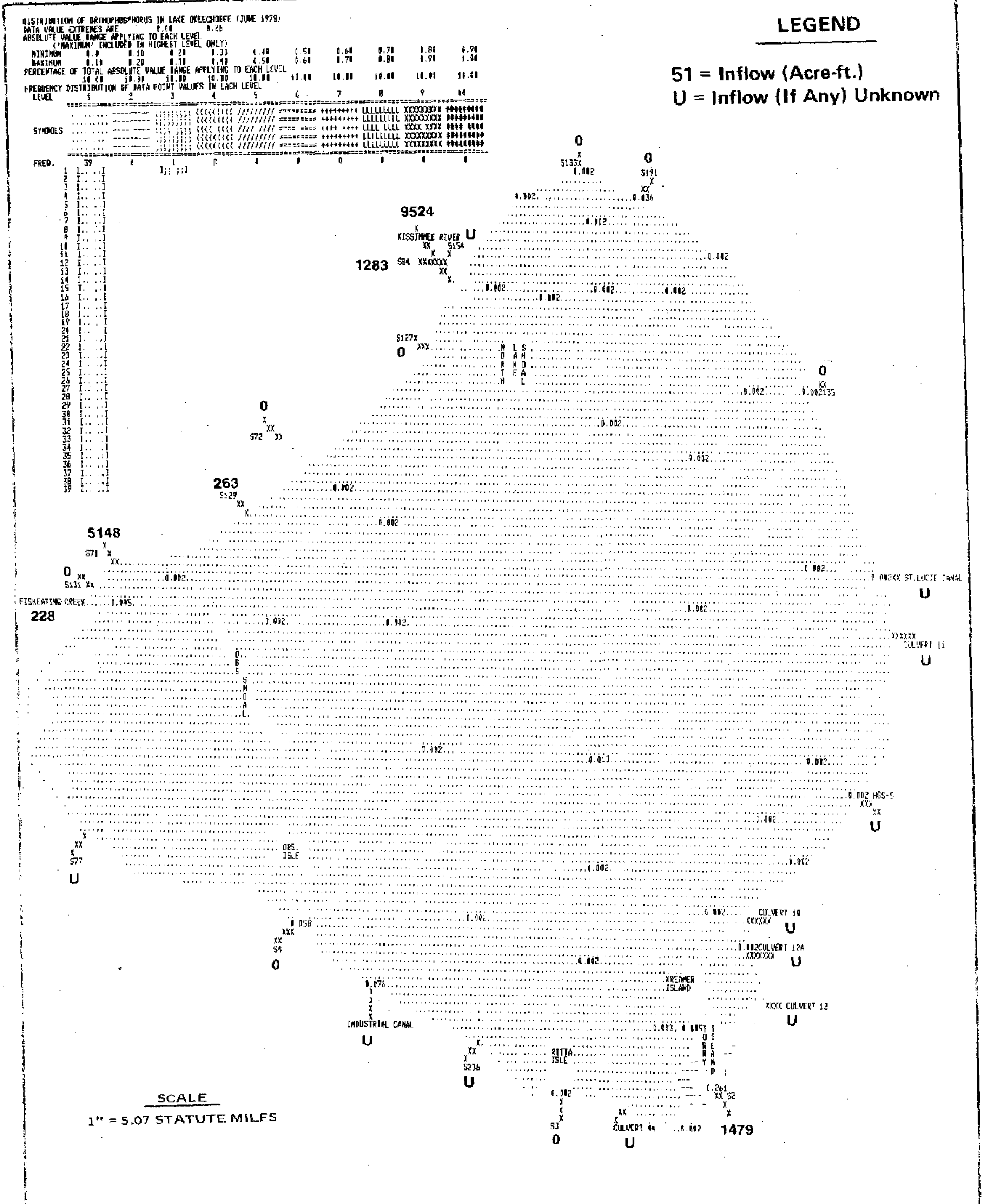
FREQUENCY DISTRIBUTION OF DATA POINT VALUES IN EACH LEVEL

LEGEND

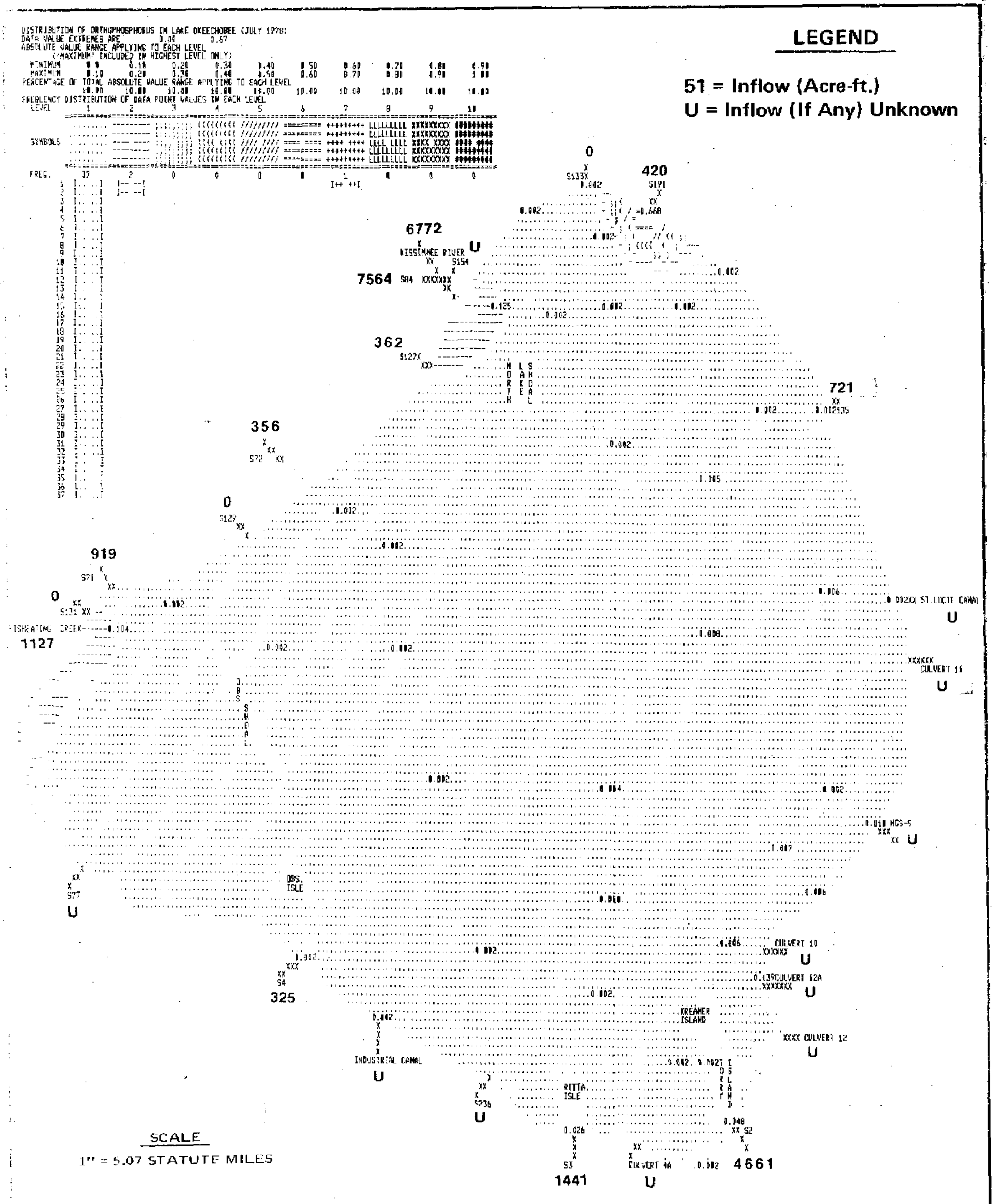
51 = Inflow (Acre-ft.)
U = Inflow (If Any) Unknown



0.10 mg/L CONTOUR INTERVALS FOR ORTHOPHOSPHORUS (MAY 1978)



0.10 mg/L CONTOUR INTERVALS FOR ORTHO PHOSPHORUS (JUNE 1978)



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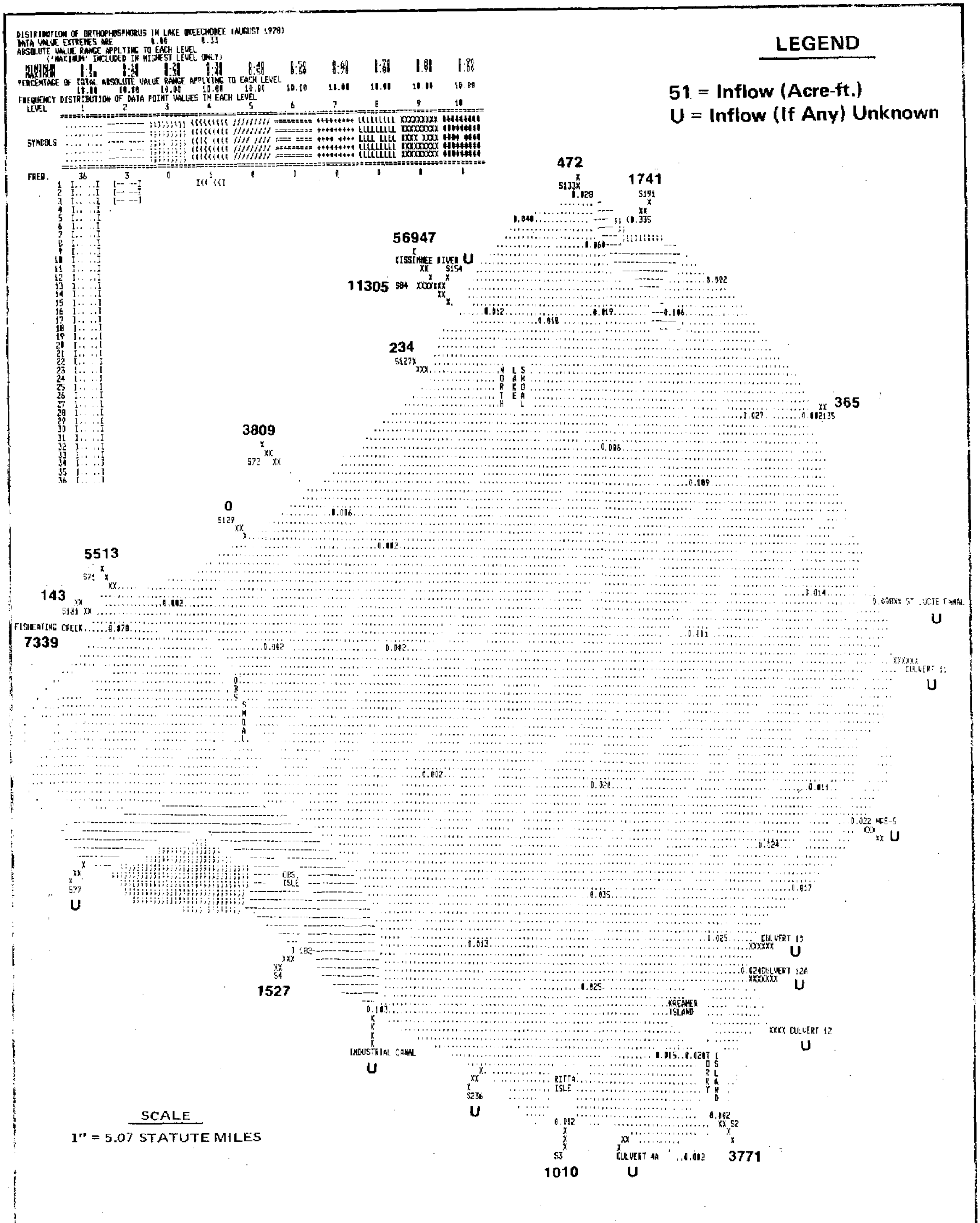
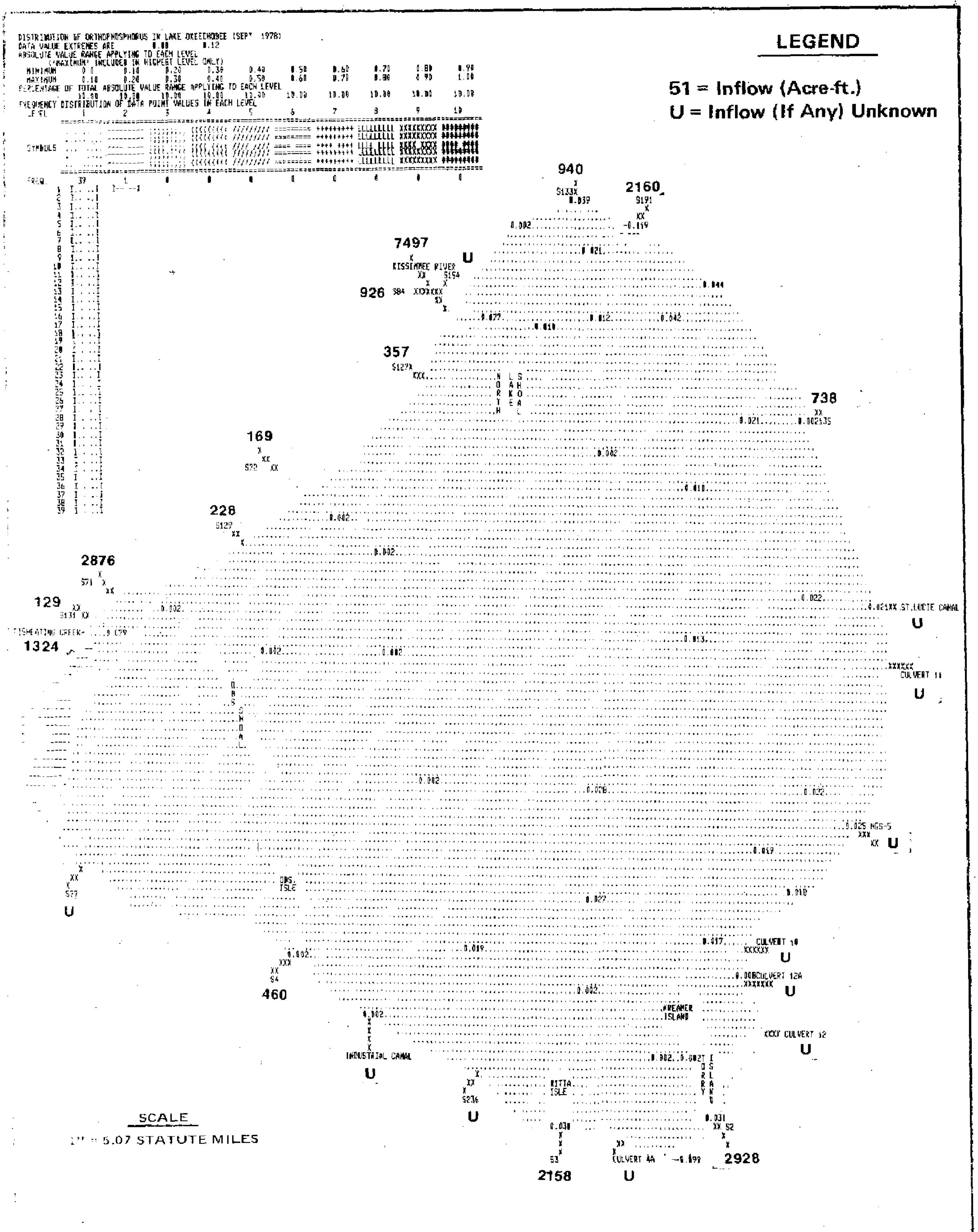
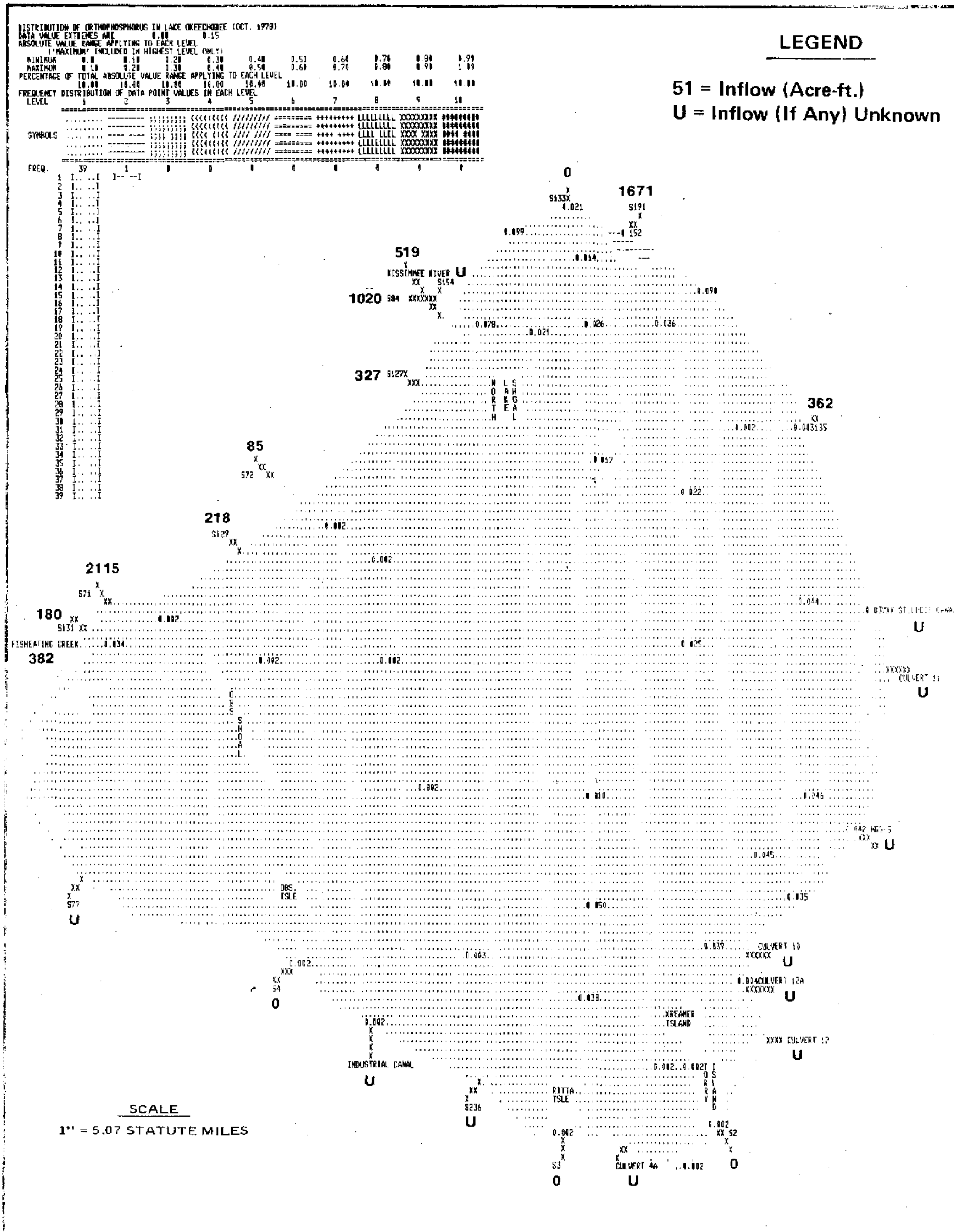


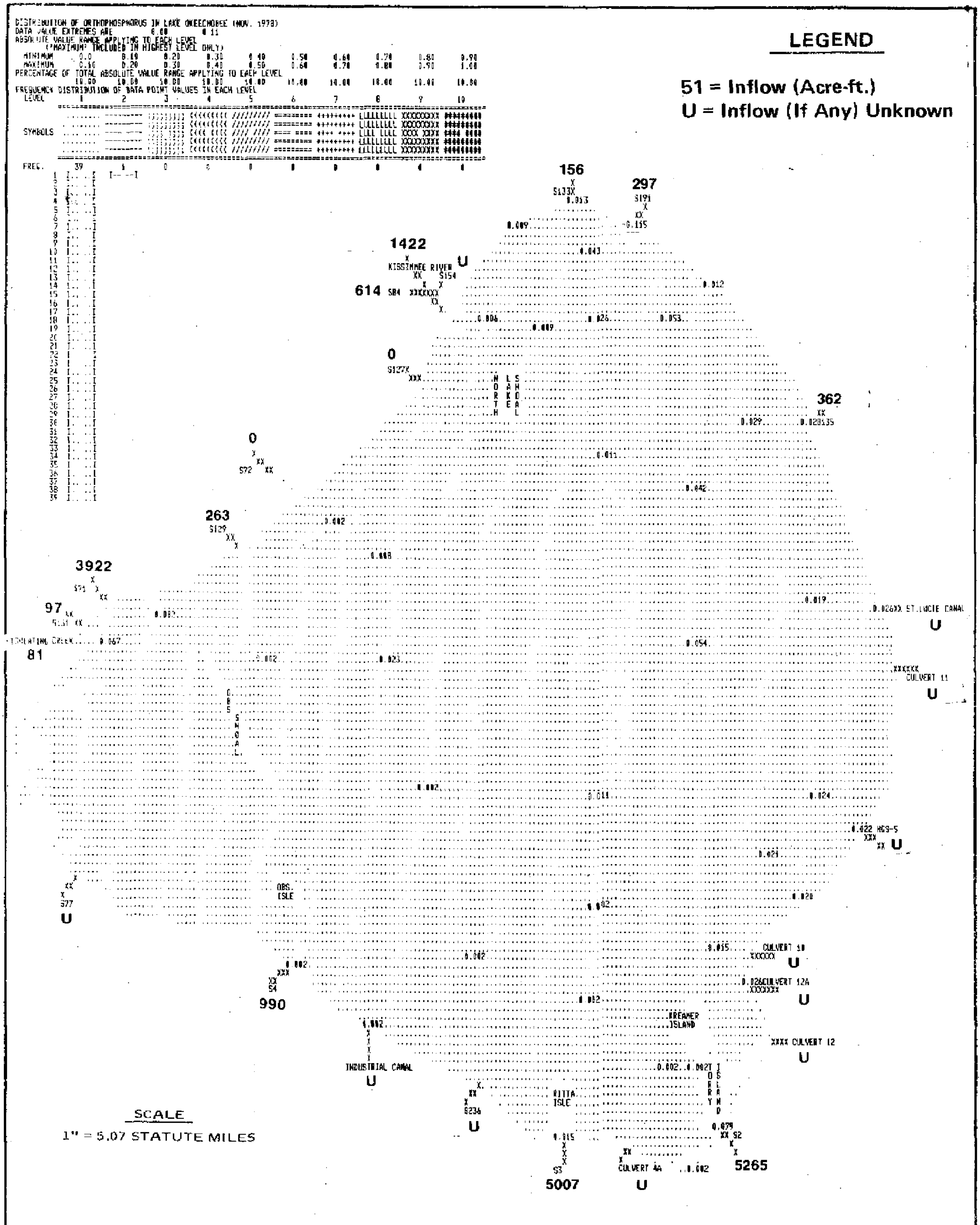
0.10 mg/L CONTOUR INTERVALS FOR ORTHOPHOSPHORUS (AUGUST 1978)



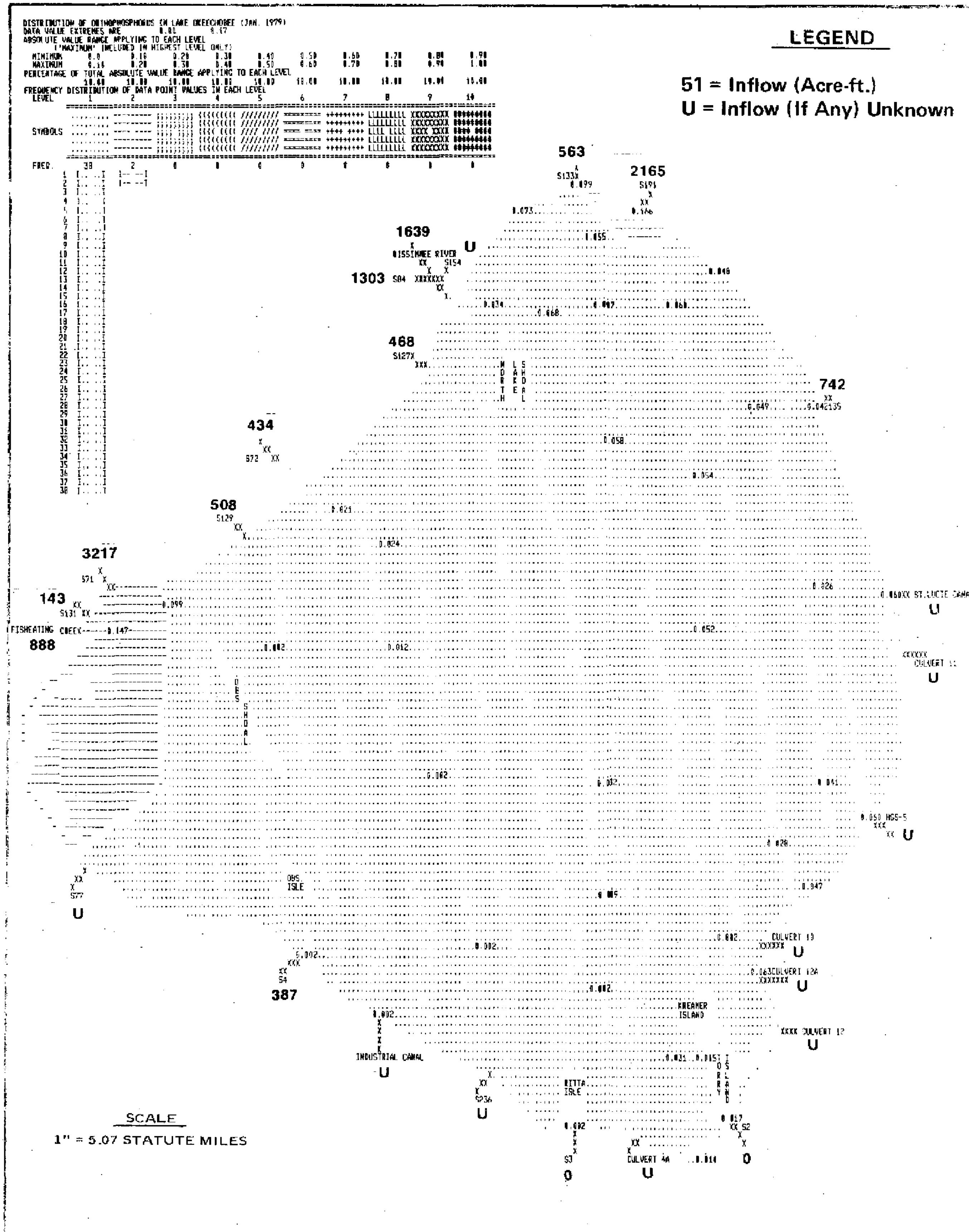
0.10 mg/L CONTOUR INTERVALS FOR ORTHOPHOSPHORUS (SEPT. 1978)



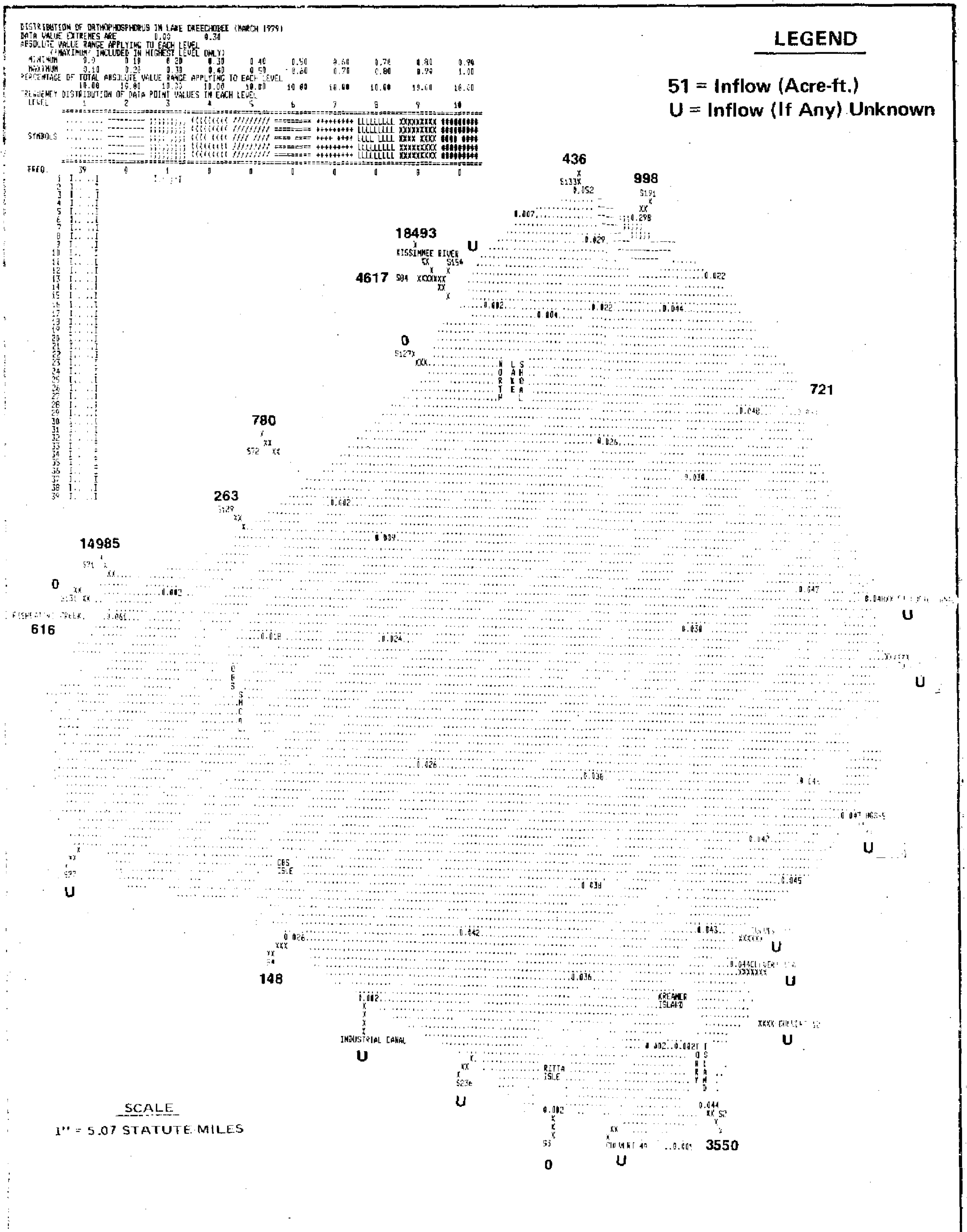
0.10 mg/L CONTOUR INTERVALS FOR ORTHOPHOSPHORUS (OCT. 1978)



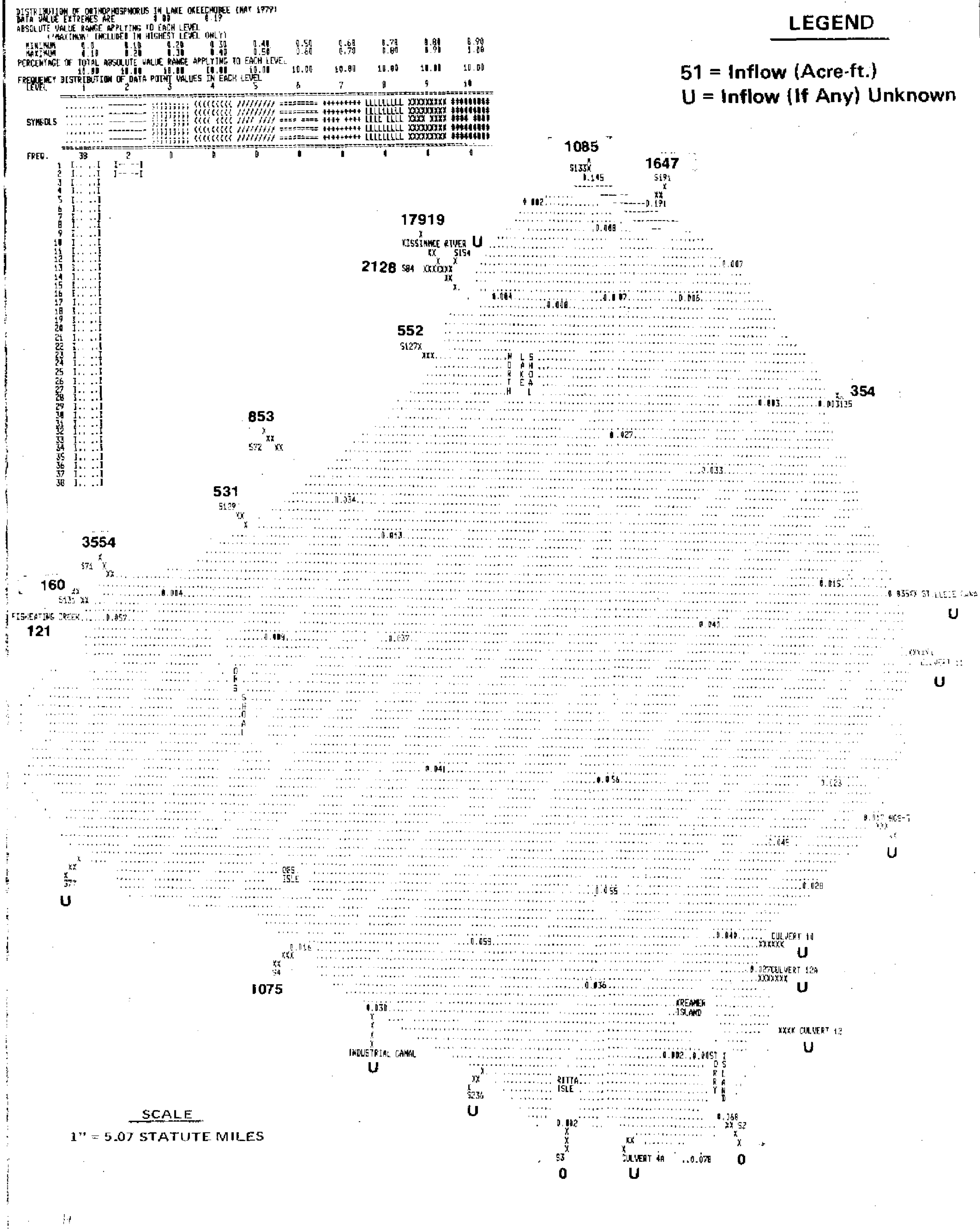
0.10 mg/L CONTOUR INTERVALS FOR ORTHOPHOSPHORUS (NOV. 1978)



0.10 mg/L CONTOUR INTERVALS FOR ORTHOPHOSPHORUS (JAN. 1979)



0.10 mg/L CONTOUR INTERVALS FOR ORTHOPHOSPHORUS (MARCH 1979)



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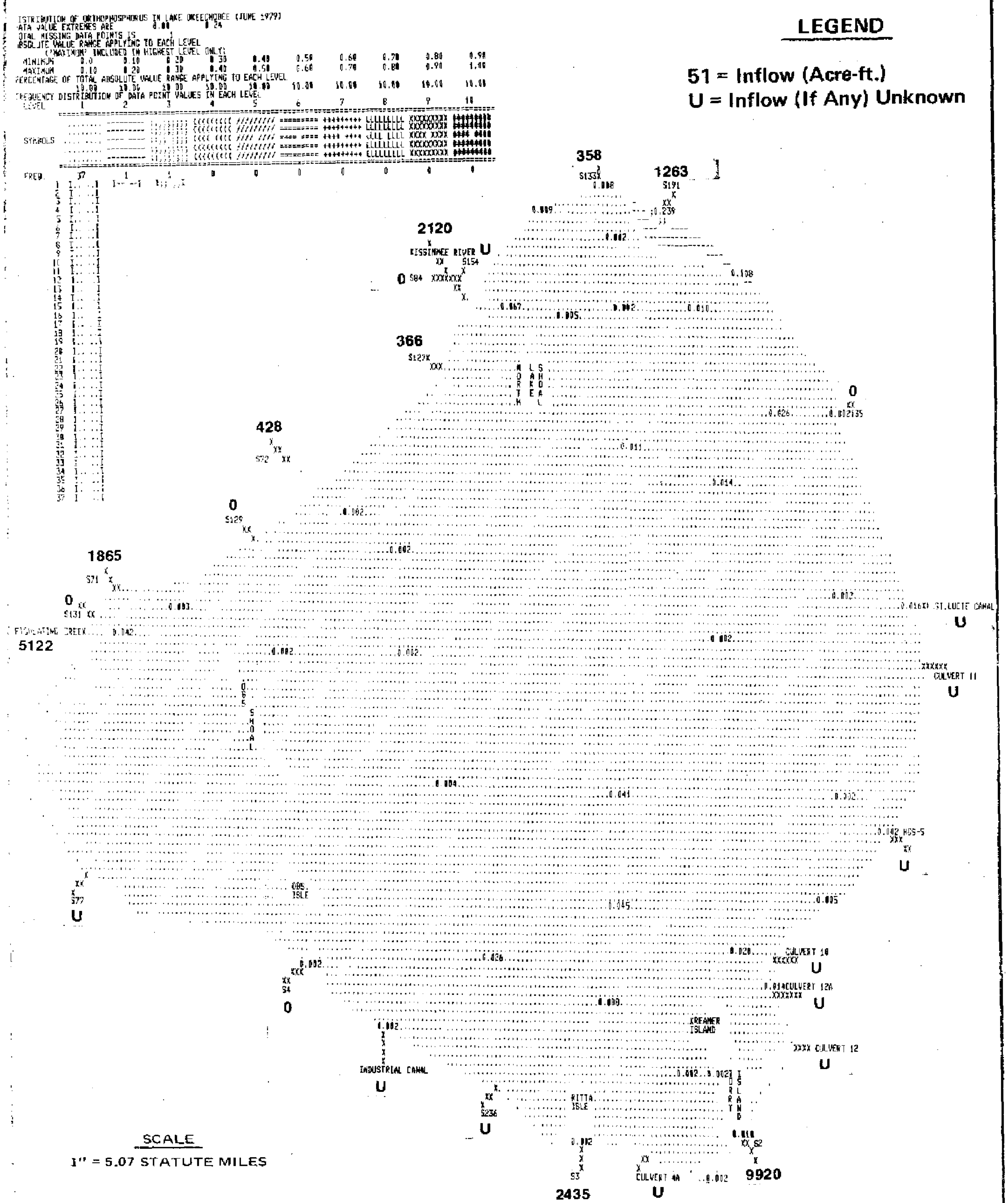

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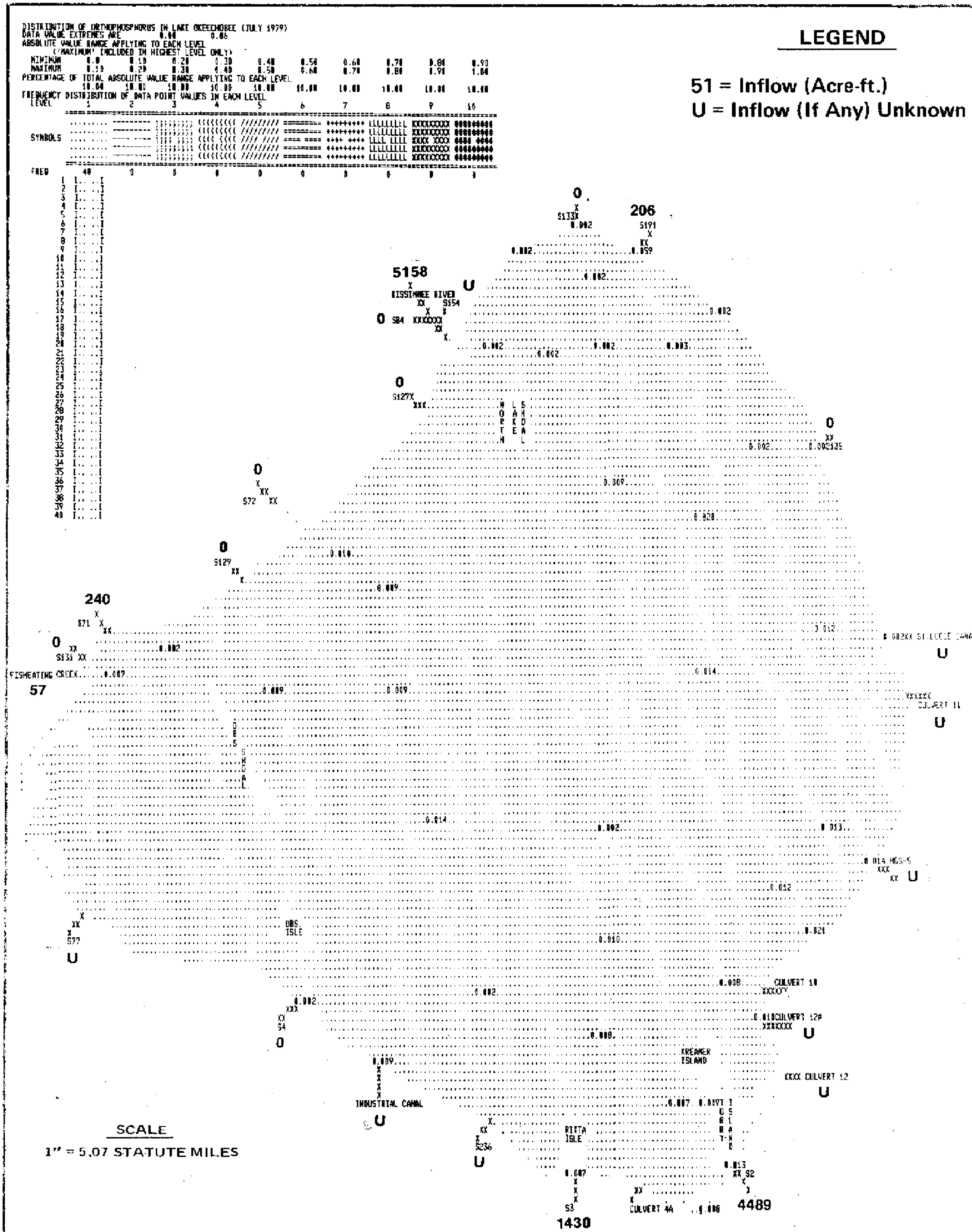

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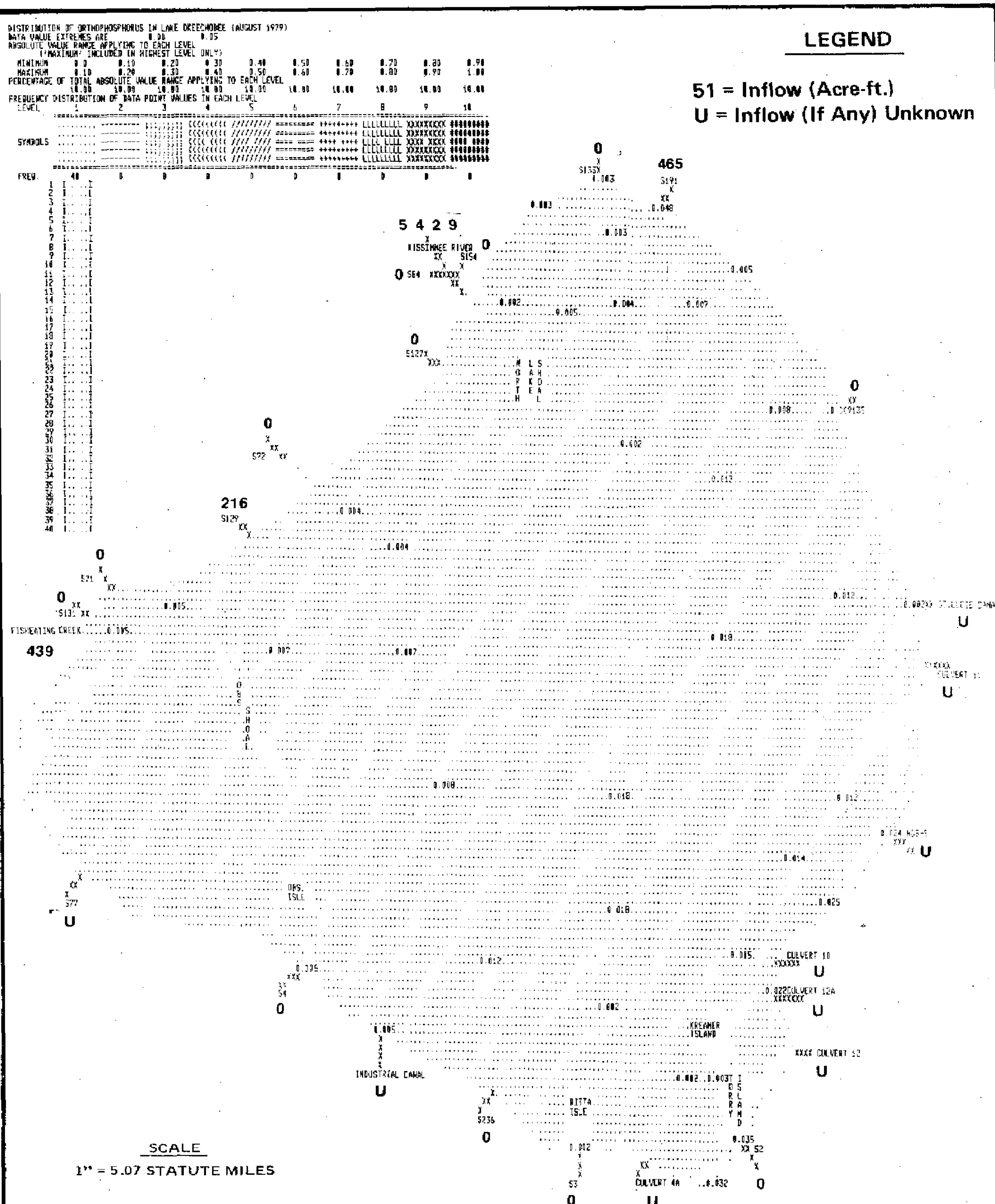

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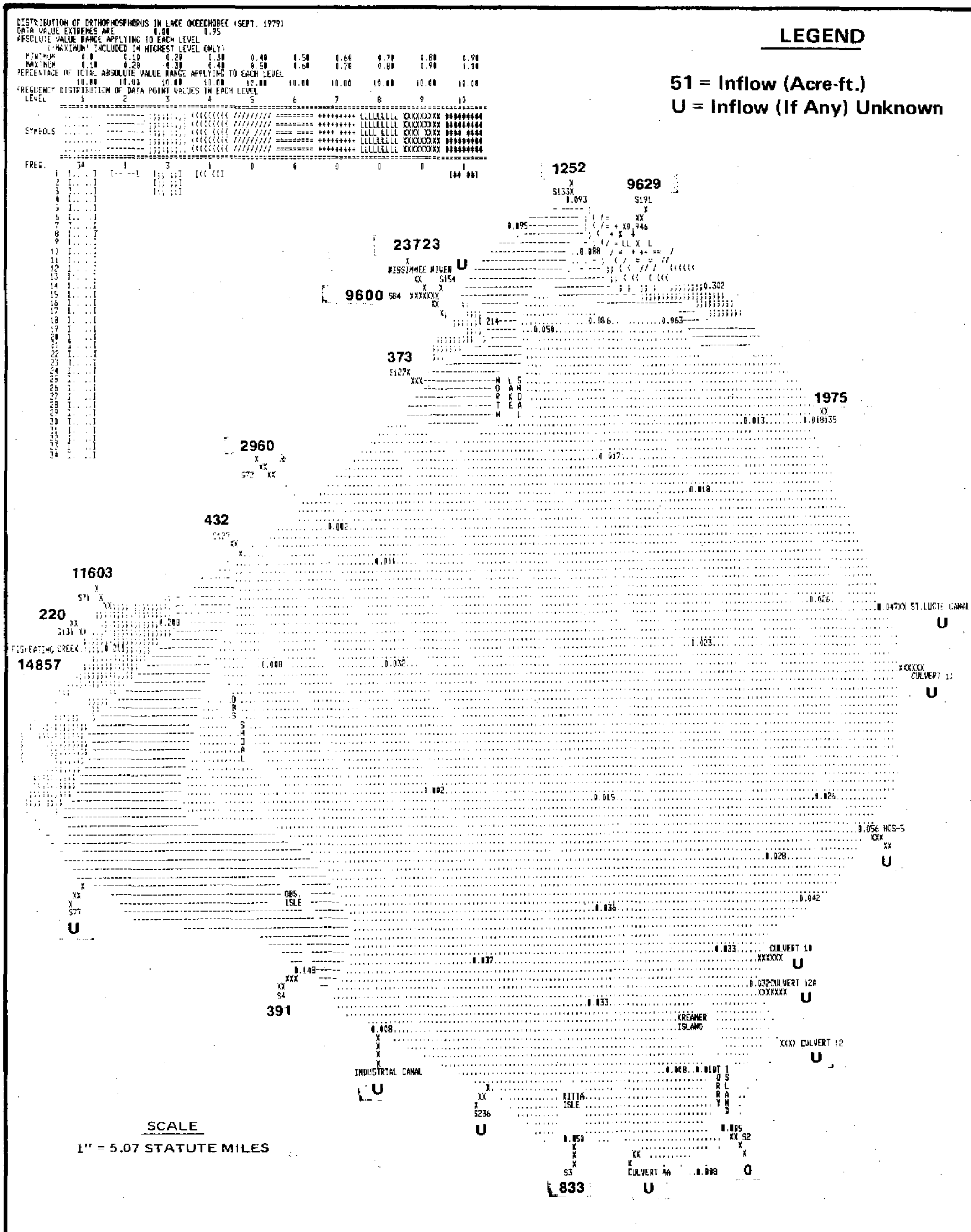

0.10 mg/L CONTOUR INTERVALS FOR ORTHOPHOSPHORUS (SEPT. 1979)