INTERNAL REPORT 159

FINDLEY LAKE LYSIMETER LEACHATE, PRECIPITATION INFLOW, OUTFLOW, AND THROUGHFALL DATA JUNE 1973-JANUARY 1974

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ABSTRACT

Data on soil leachate at three sites and four depths, throughfall, precipitation, and lake inflow and outflow are presented in this report.

METHODS

Lysimeters

A total of twelve 6-in (15.2-cm) Alundum lysimeter plates were strategically placed within soil profiles at three sites in the Findley Lake Basin by Dr. Michael J. Singer. The plates were placed at the lower boundaries of the O2, A2, IIIB2hir, and IIIB3 horizons. Suction is maintained within the plates at 0.1 atmosphere by means of an aspirator located below the lake outlet falls.

Soil water samples are collected in large glass jugs within the soil pit and returned to the laboratory for analysis at two-week intervals, or as frequently as access to the lake is possible. The jugs are emptied at each collection.

To prevent ice formation within the vacuum or water lines, or both, the lines were taped coaxially to a soil heating cable and the entire assemblage was placed through a 2-m (5.1-cm) styrene pipe. The pipe extends from the soil pits (sites 6 and 7) to their common vacuum manifold. Sites 6 and 7 are located approximately 35 m north of the cabin (Fig. 1).

Sampling was begun on 7 June 1973 and continues through the present date. A record of the volumes collected within each jug is maintained.

Throughfall Collection

Three throughfall collectors are located around the periphery of site II at approximately 165 m east-southeast of the cabin (Fig. 1). These consist of a plastic funnel 16 cm in diameter placed in the neck of a 2-liter bottle. A fine plastic screen is placed over the funnel to exclude large throughfall debris and insects.

Precipitation

Rainfall is monitored and collected atop a 4-m tall tower located in a clearing at the base of the talus to the northwest of Findley Lake (Fig. 1). This position should be beyond the influence of the forest canopy.

Inflow and Outflow

Outflow samples were obtained at the north end of the lake, from the upstream side of the footbridge across the lake outlet (Fig. 1). A 500-m poly bottle is immersed about middepth until full.

Surface inflow exists as numerous small seasonal streamlets, the largest of which is sampled regularly. The streamlet, when flowing, enters the east side of the lake just north of the largest of the meadows adjacent to the lake. Sampling is accomplished in a manner similar to that used in outflow.

RESULTS and DISCUSSION

Lysimeter Leachate

The mean pH values as seen in Table 1 increase with increasing depth for sites 6 and 7, which lie in close proximity. Site 11 proves to be the exception to this trend, as seen in Figure 2. Sites 6 and 7 show greater than one-pH-unit increase between zero and 60 cm in depth.

The mean conductivity of the soil leachate appears to be least at the bottom of the IIIB2hir (Table 1) in all three profiles. This is shown graphically in Figure 3. As with pH values, site 11 appears less consistent in the conductivity values than sites 6 and 7.

In many cases the ionic concentrations do not follow a definite trend. Additional results of laboratory analysis (presently awaited) and detailed statistical analysis will help to clarify apparent inconsistencies between the sites, for a given ion concentration and depth. Such is the case for PO_4-P, Al, Ca, Mg, Na, K, and total P as seen in a comparison between profiles in Tables 1 and 2.

In the case of ammonium ion concentrations (Table 1 and Figure 4) a minimum value results at the collection point below the IIIB2hir. The concentration increases through the IIIB3 horizon. Site 11 shows a slightly different trend (Figure 4) than sites 6 and 7. Nitratenitrite nitrogen values (Table 1) approach the lower limit of laboratory procedure resolution, hence changes in concentration with depth may not be significant. Differences between NH_4-N and NO_3 NO_2-N concentrations, at this time, appears to be significant; the ammonium form is greater.

Soluble iron concentrations drop off sharply below the IIIB2hir, as expected for a Podzol, and little iron is lost below it. Site 11 (Figure 5) loses were soluble iron from the A2 horizon than sites 6 and 7; however a sharp drop still is observed below the spodic horizon, the IIB2hir.

Agreement is found in a decreasing concentration of soluble silica with increasing depth between the profiles of sites 6 and 11 (Table 1). This is not entirely supported by site 7 (Figure 6).

Very low concentrations of manganese have been found consistently at all depths, in all three sites (Table 2). Total nitrogen concentration decreases markedly between the IIA2 and IIIB2hir horizons in all cases (Table 2).

Throughfall and Precipitation

Throughfall collection values appear consistent among individual collection for given ion (Tables 3 and 4). Individual collector values agree closely with the mean throughfall (TF) values found at the bottom of each column. The mean pH of the throughfall is considerably lower than that of the incoming precipitation (Table 3). The forest canopy, then, has a pronounced influence on the pH of incoming precipitation; electrical conductivity apparently (Table 3) is not greatly effected; PO_4-P values for precipitation and throughfall agree closely. This is not the case (Table 4) for total phosphorus; the mean throughfall concentration far exceeds that found in precipitation collected outside the forest canopy.

The total nitrogen concentration found in incoming precipitation is substantially greater than that found in the mean of throughfall collections (Table 4). This interception of nitrogen by the canopy is also apparent from a similar comparison of NH_4-N and NO_3-NO_2-N concentrations (Table 3).

Only trace amounts of iron are found in throughfall samples (Table 3). Very small concentrations of aluminum are found in the precipitation, whereas throughfall contains amounts of the magnitude found in the lysimeter leachate (Tables 1 and 3). Silicon appears to be of roughly equal concentration in precipitation and throughfall (Table 3). For calcium, magnesium, sodium, potassium, and manganese, mean throughfall values exceed those of incoming precipitation.

Inflow and Outflow

The mean pH of Findley Lake outflow is slightly more basic than the surface inflow (Table 3). Conductivity values agree closely and exceed both precipitation and mean throughfall. Lake inflow concentrations exceed or very nearly equal those of outflow for each of the 13 ions examined.

Table 1. Lysimeter leachate: pH, conductivity and soluble ion concentrations (ppm).

Sample source: Lysimeter plates					Soluble[a]					
Site	Depth (m)	Horizon	pH[b]	Cond.[b] (umoh/cm)	PO_4-P	NH_4-N	NO^-_2-NO_3-N	Fe	Al	Si
6.1	0.00	02	4.63	37.8	0.018	0.039	0.007	0.03	0.37	13.99
6.2	0.15	IIA2	4.72	20.2	0.018	0.006	0.006	0.03	0.56	9.12
6.3	0.30	IIIB2hir	5.25	12.9	0.028	0.002	0.002	0.00	0.27	5.27
6.4	0.60	IIIB3	6.06	39.6	0.038	0.007	0.002	0.00	0.56	5.26
7.1	0.00	02	4.34	27.0	0.161	0.016	0.002	0.04	0.93	5.60
7.2	0.15	IIA2	4.95	23.8	0.006	0.007	0.003	0.02	0.44	8.95
7.3	0.30	IIIB2hir	5.12	15.6	0.011	0.002	0.001	0.01	0.21	3.66
7.4	0.60	IIIB3	5.72	23.4	0.095	0.005	0.002	0.01	0.43	4.58
11.1	0.00	02	5.78	18.5	0.421	0 012	0.002	0.05	0.23	4.93
11.2	0.19	IIA2	5.44	28.0	0.244	0.012	0.001	0.07	1.67	4.36
11.3	0.28	IIIB2hir	5.74	16.2	0.025	0.004	0.004	0.01	0.08	3.62
11.4	0.54	IIIB3	5.64	20.8	0.029	0.011	0.003	0.01	0.08	2.28

[a]Samples passed through a 0.45-µm Millipore filter paper.,

[b]Measurements made between 7 June 1973 and 8 January 1974.

Table 2. Lysimeter leachate: total ion concentrations (ppm).

SAMPLE SOURCE Lysimeter plates Site	Depth (m)	Horizon	TOTAL Ca+	Mg+	Na+	K+	Mn+	N	P
6.1	0.00	02	1.72	2.66	4.44	2.00	0.01	0.858	0.060
6.2	0.15	IIA2	0.58	0.33	0.76	0.28	0.01	0.220	0.048
6.3	0.30	IIIB2hir	0.52	0.31	0.56	0.23	0.01	0.165	0.055
6.4	0.60	IIIB3	0.34	0.19	6.17	1.00	0.01	0.271	0.094
7.1	0.00	02	1.06	0.59	1.76	1.75	0.01	0.703	0.232
7.2	0.15	IIA2	1.81	2.23	3.25	1.36	0.01	0.465	0.023
7.3	0.30	IIIB2hir	0.67	0.39	0.64	0.75	0.01	0.283	0.033
7.4	0.60	IIIB3	1.11	0.71	0.65	0.91	0.01	0.299	0.229
11.1	0.00	02	1.25	0.61	1.73	2.23	0.01	0.651	0.188
11.2	0.19	IIA2	1.14	0.94	1.92	1.80	0.03	0.624	0.276
11.3	0.28	IIIB2hir	0.63	0.30	1.13	0.39	0.01	0.272	0.037
11.4	0.54	IIIB3	0.41	0.12	2.37	0.25	0.01	0.176	0.057

Samples passed through a no. #41 fast filter paper.

Table 3. Precipitation, inflow, outflow, throughfall, pH, conductivity, and soluble ion concentrations (ppm).

Sample source		pH[b]	Cond.[b] (umoh/cm)	Soluble[a] PO_4-P	NH_4-N	NO_2^- NO_3-N	Fe	Al	Si
Precipitation		5.77	15.6	0.008	0.059	0.259	0.02	0.05	0.13
Lake inflow		6.15	22.0	0.006	0.017	0.004	0.02	0.02	4.34
Lake outflow		6.37	20.0	0.008	0.007	0.006	0.01	0.01	3.58
Throughfall collectors	1	4.86	14.8	0.010	0.012	0.011	<0.05	0.152	0.11
	2	4.85	16.9	0.008	0.026	0.016	<0.05	0.060	0.08
	3	5.10	13.0	0.008	0.011	0.016	<0.05	0.092	0.08
TF mean value		4.92	14.9	0.009	0.016	0.014	<0.05	0.101	0.09

[a]Samples passed through a 0.45-µm Millipore filter paper.,

[b]Measurements made between 7 June 1973 and 8 January 1974.

Table 4. Precipitation, inflow, outflow, throughfall, and total ion concentrations (ppm).

Sample source		TOTAL Ca+	Mg+	Na+	K+	Mn+	N	P
Precipitation		0.23	0.05	0.45	0.20	0.00	0.493	0.13
Lake inflow		3.27	0.46	1.42	0.30	0.00	0.165	0.013
Lake outflow		2.88	0.43	0.03	0.19	0.00	0.160	0.011
Throughfall collectors	1	0.27	0.15	0.61	0.40	0.06	0.216	0.050
	2	0.35	0.13	0.55	0.52	0.04	0.181	0.095
	3	0.37	0.13	0.43	0.45	0.05	0.264	0.036
TF mean value		0.33	0.14	0.53	0.46	0.05	0.235	0.060

Samples passed through a no. #41 fast filter paper.

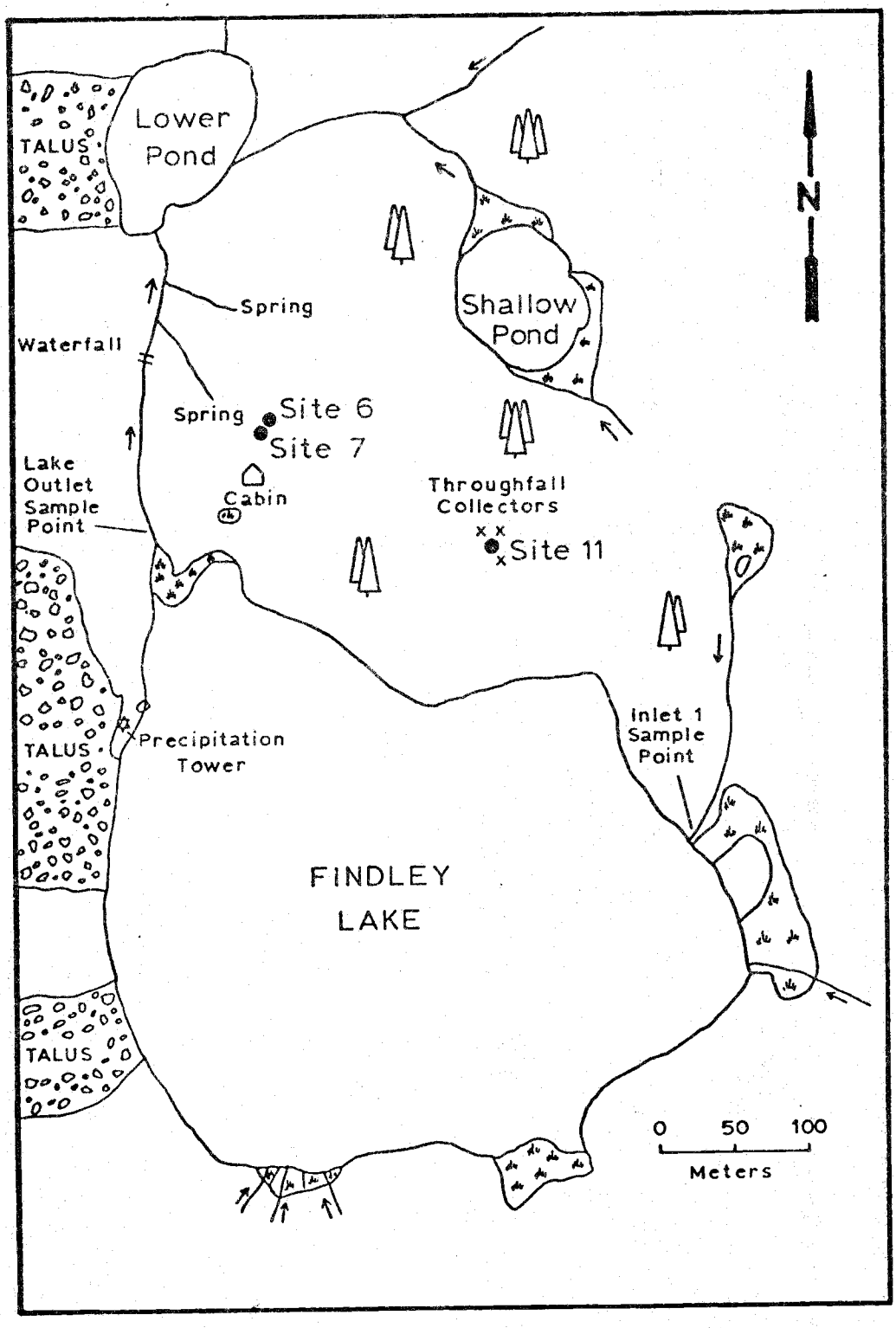

Figure 1. Findley Lake and location of sampling sites.

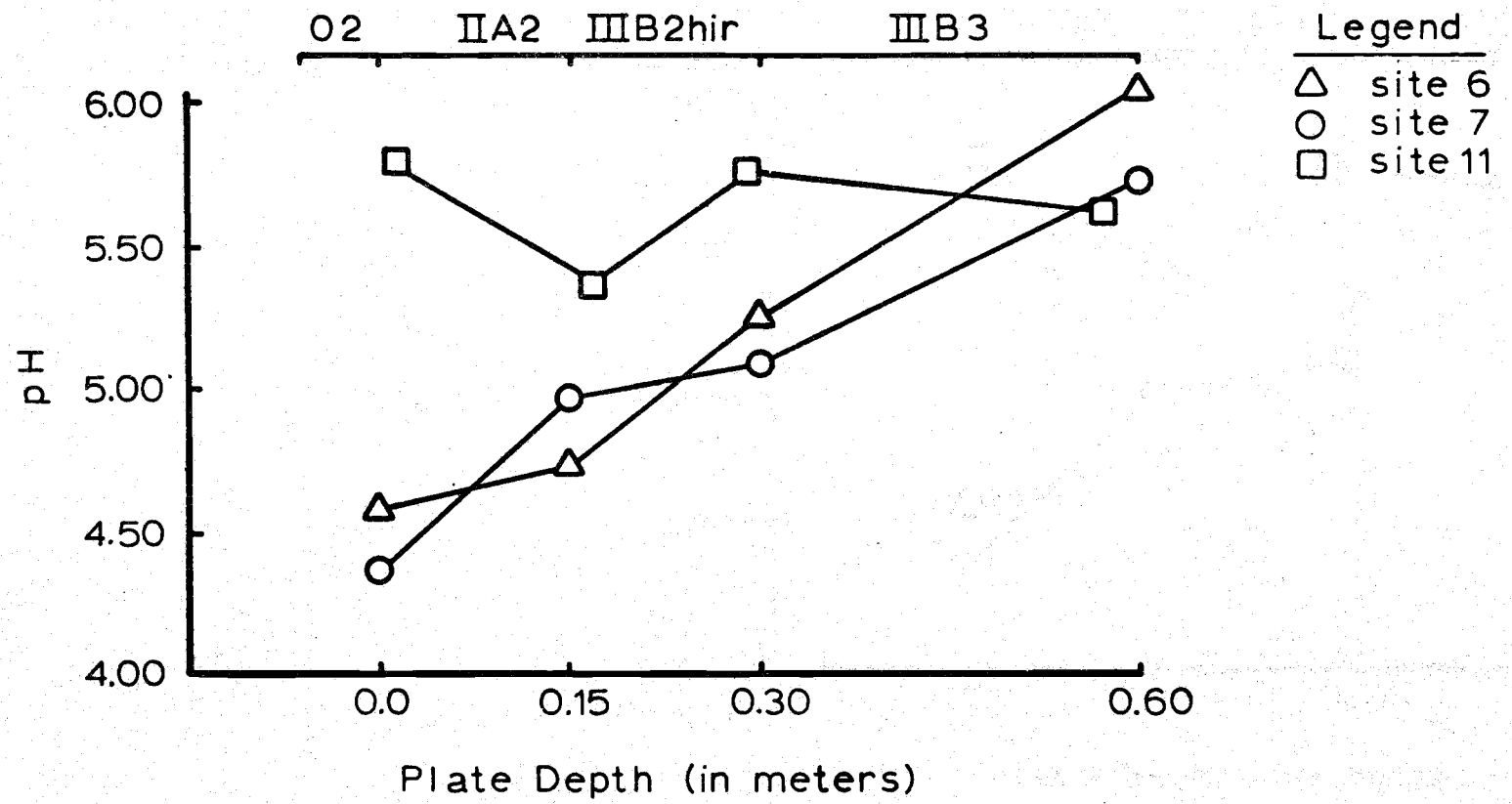

Figure 2. pH changes with depth.

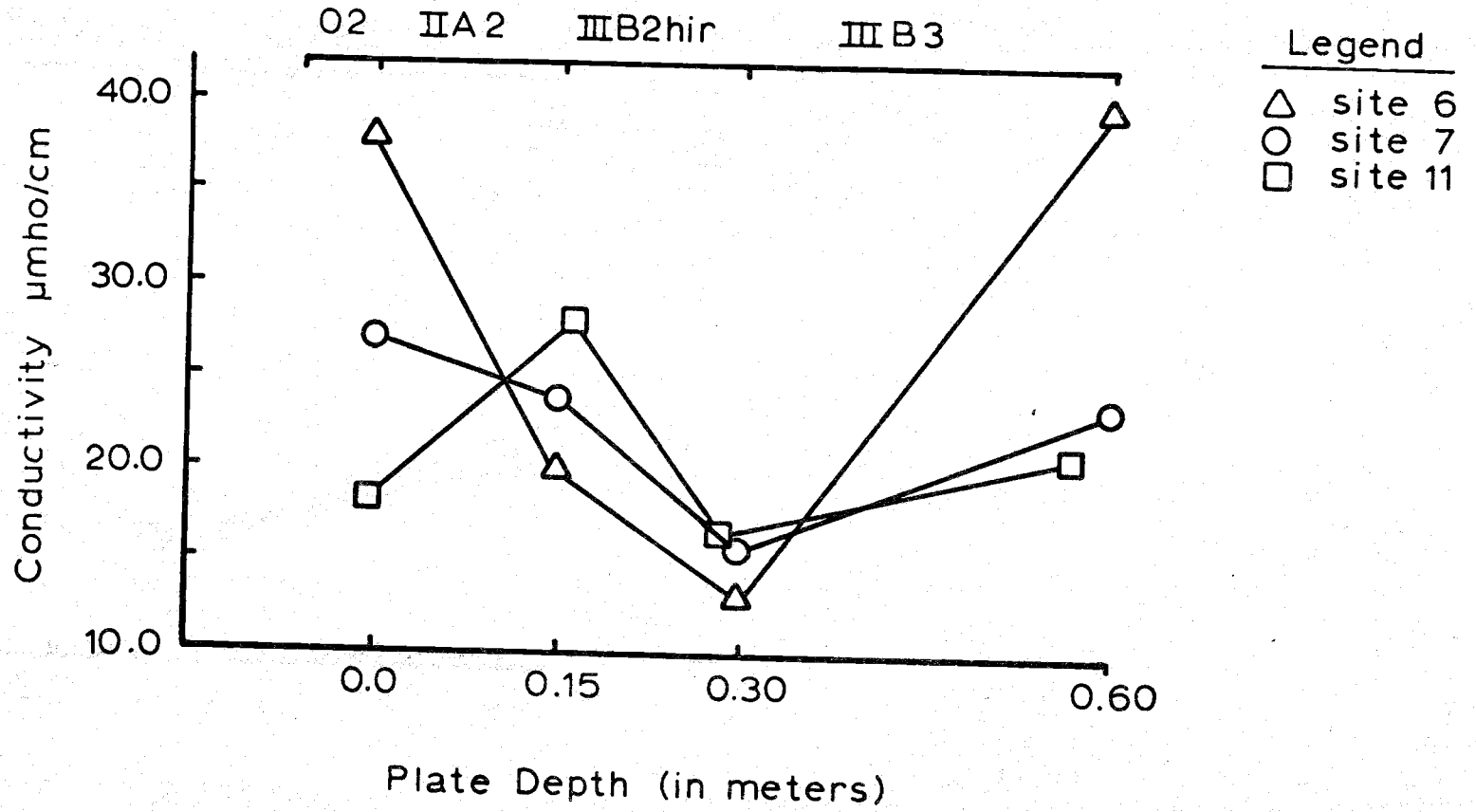

Figure 3. Changes in mean conductivity with depth.

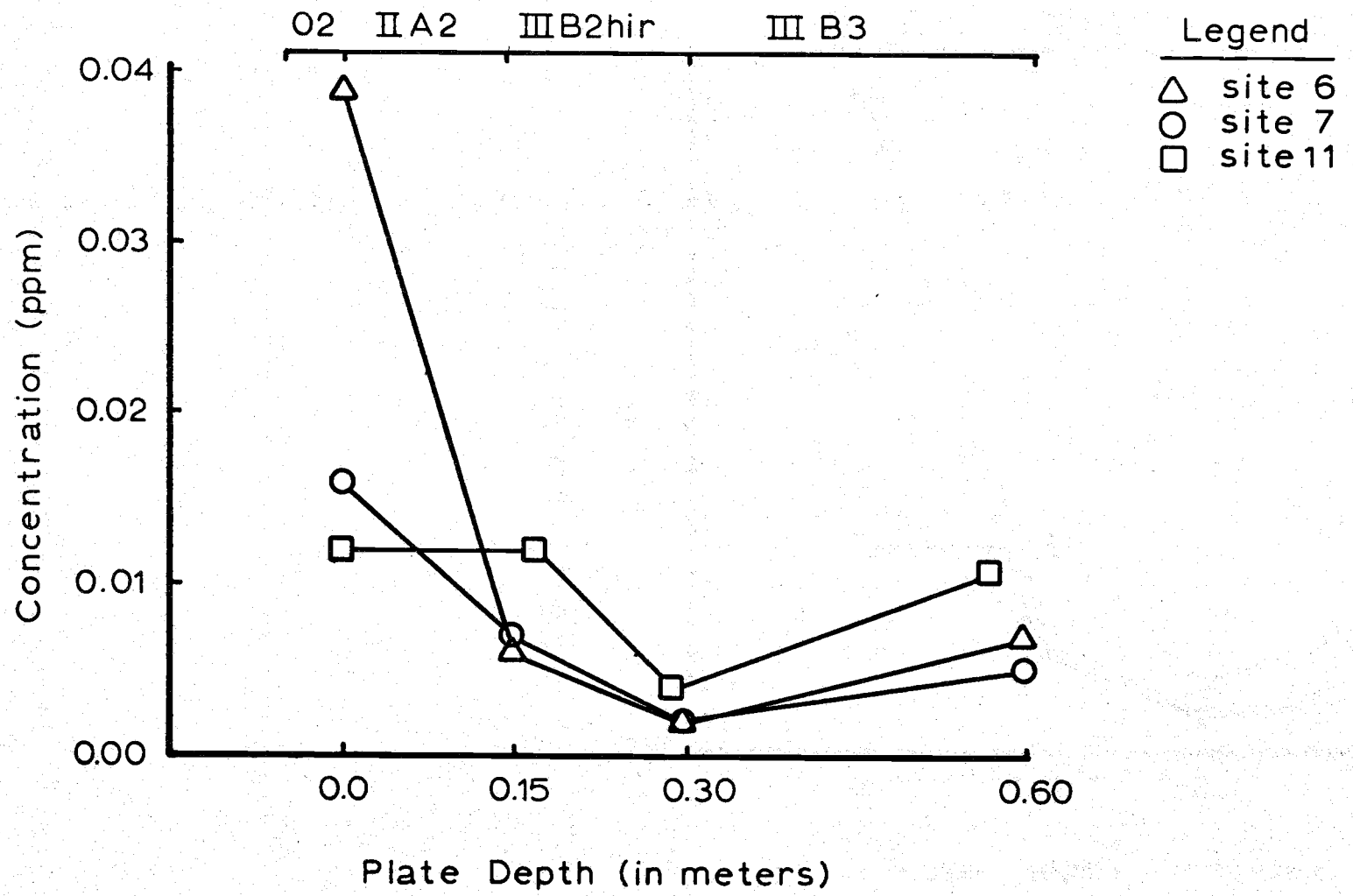

Figure 4. Changes in soluble NH_4-N concentration with depth.

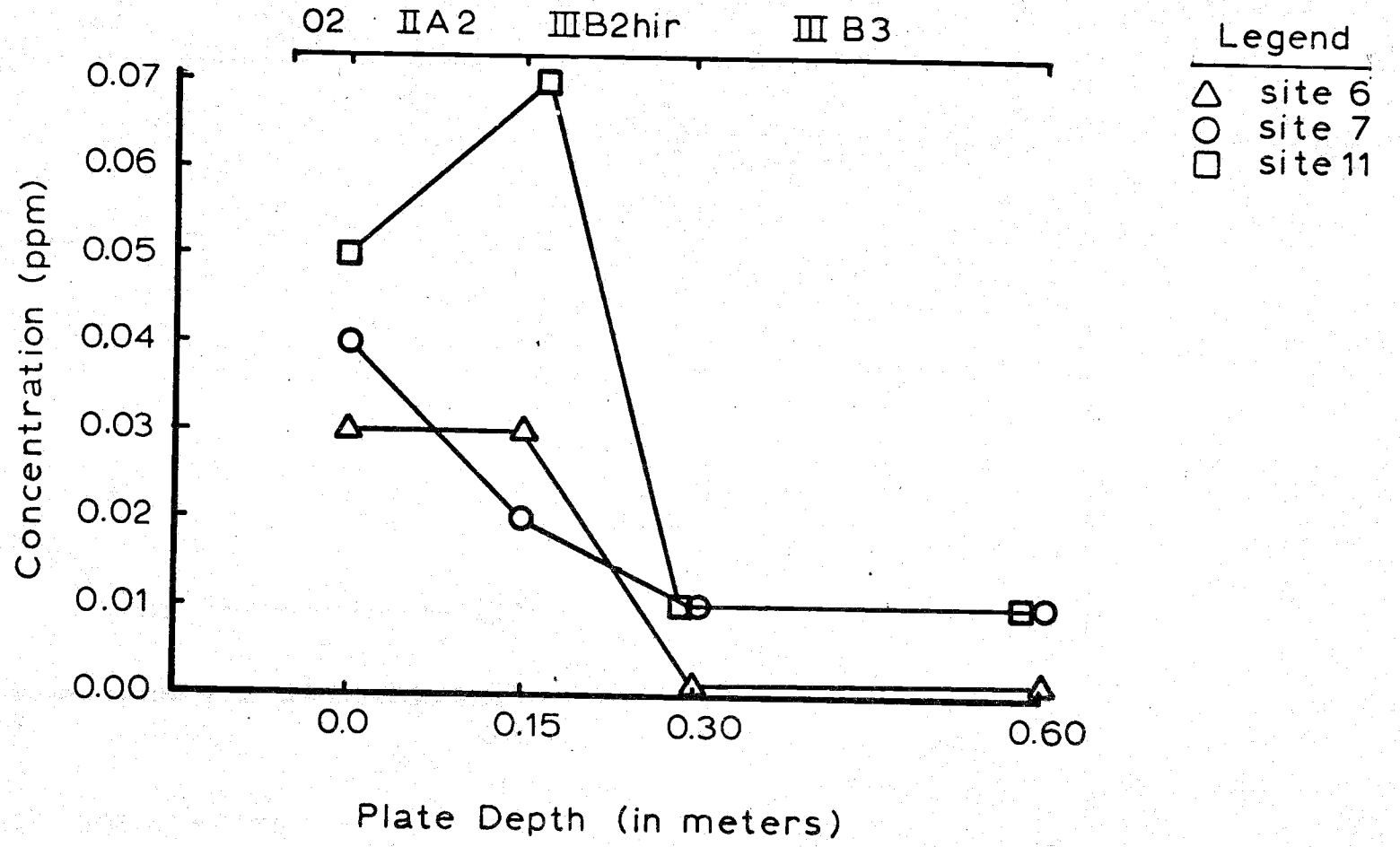

Figure 5. Changes in soluble iron concentration with depth.

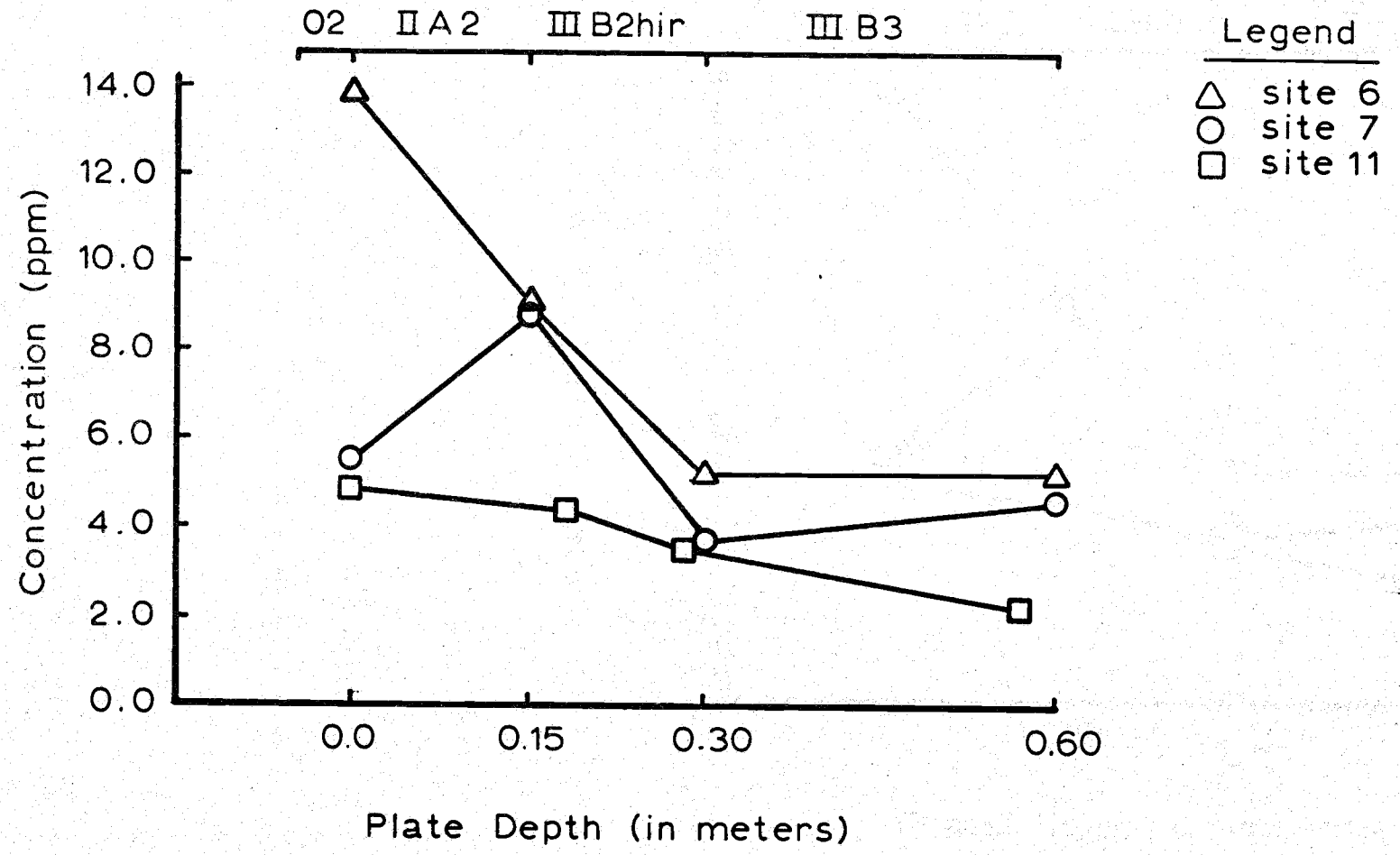

Figure 6. Changes in mean Si concentration with changes in depth.