REPORT: MACROBOTANICAL ANALYSIS OF FLOTATION SAMPLES FROM THE

AGRICULTURAL SECTOR, MACHUPICCHU

by Emily Dean, under the supervision of Dr. Christine Hastorf

Paleoethnobotany Laboratory

University of California, Berkeley

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Introduction

Between October 1995 and December 1996, Lcda. Elva Torres Piño of the Instituto Nacional de Cultura (I.N.C.), Cuzco, Perú collected and floated[1] 46 soil samples from excavations she was supervising at the Inca archaeological site of Machu Picchu (Figure 1). These samples, excavated from 14 units located in three different sectors, were the first soil samples ever collected from this world-renowned site for the purpose of conducting an archaeobotanical analysis. In addition to the samples sent to our lab for macrobotanical analysis in 1999, Ms. Torres also collected samples for isotope, pollen, and soil chemistry assays -- these last two in conjunction with the Wright Paleohydrological Institute of Denver, CO (Wright, et al. 1999 and 2000). The overall goals of the project were to:

1) Investigate the sophisticated Inca agricultural system by examining the use, structure, and function of the complex of terraces and canals that sculpt the hill and mountain slopes surrounding Machu Picchu.

2) Address what crops, and in what quantities, the Incas might have grown on these terraces by employing botanical and soil analyses (Torres Piño 1996:1).

In fall 2000, I began the sorting, identification, and analysis of the 46 light fraction[2] flotation samples collected by Ms. Torres. The analysis concluded in spring 2001. I specifically hoped to address the following questions:

1) What types of crops were grown on the terraces?

2) Are there detectable spatial distribution patterns of plant taxa across the site?

Before presenting my results and interpretations, I will briefly describe the site, the location of the excavation units, and the field and laboratory methodologies. Figures and raw data tables are appended at the end of this report.

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[1] Flotation is the process of submerging and agitating soil samples in water so that carbonized plant remains 'float' to the top of the flotation machine where they can then be collected for archaeobotanical analysis. Carbonized plant remains are generally too small to be spotted by the naked eye during the course of excavation.

[2] During the course of flotation heavier items sink to the bottom of a mesh lined bucket that sits inside the flotation tank while lighter items, such as carbonized seeds and wood fragments, float to the top. These lighter items, which are collected and analyzed separately, are known as the light fraction.

Machu Picchu , the royal estate of the Inca ruler Pachacuti, was occupied sometime between 1450 and 1540 A.D. The permanent population only numbered 300 or so inhabitants, but could have reached around 1000 inhabitants when the Inca ruler was in residence (Rowe 1990). Today the site which is located in the district of Machupicchu, province of Urubamba, department of Cuzco, is Peru's most visited tourist attraction and a strong symbol of cultural pride.

The site was first described to the Western world by the American explorer and archaeologist Hiram Bingham who visited the site in 1911. Since the 'discovery' of Machu Picchu, numerous archaeologists, notably Bingham and the resident archaeologists from the I.N.C., have conducted excavation and restoration work at the central core of site, as well as mapping and recording the many surrounding sites that comprise the way stations of the Inca trail. Most of this archaeological work has centered on documenting the impressive architectural remains.

It wasn't until 1974 that the 'Agricultural Sectors' of the site, with their remarkable terracing and irrigation, received any archaeological attention. Arminda Gibaja of the Cuzco I.N.C. recorded 60 terraces, both rectangular and semi-circular in form, that were beautifully adapted to the topography of the place. She and Alfredo Valencia estimated that the cultivable area of Machu Picchu totaled some 44,913 m2 (Torres Piño 1996:2). As to what plants, if any, were grown on these terraces, researchers could only guess.

Located 13 degrees south of the equator on a high mountain ridge overlooking a cloud rain forest, Machu Picchu is surrounded by remarkable ecological diversity. It sits at an elevation of 2,438 m. above sea level and is characterized by a mild, temperate climate. Both the lowland jungle and the highland puna are only a day's walk away to the east and to the west. Galiano and Nuñez have recorded more than 2700 plant species -- most famously 190 different species of orchids -- within the sanctuary of Machu Picchu (Galiano 2000). While this makes for a breathtaking landscape, it also complicates the process of macrobotanical identification as discussed later in the report.

Proveniences of Samples

Torres collected the 46 soil samples from 14 two by two meter excavation units in three different sectors of the site. Units 1,2, 3, and 4 were located in the upper part of sector I (zona Agrícola), bordered to the north by the terrace associated with the "Guard's House" and to the west by two terraces in the area known as the cemetery. Unit 5 was located in the lower part of sector I on the second to last terrace. Units 6, 7, 8, 10, 11, and 13 were located in sector II, sub-sector B (zona Urbano, parte baja). Finally, units 14, 15, and 16 were located in the principal plaza, in sector V (Torres 1996:4-5). Unfortunately I don't have a map that pinpoints the unit locations.

Methods

Field methods

Samples of approximately 8 liters each were collected from every natural level (i.e. defined stratigraphically), and in those cases where natural levels were large enough to warrant further division, from arbitrary 10 cm. sub-levels as well. It is unclear whether or not the samples were collected as bulk or as scatter samples.

Samples were processed using a motorized flotation system, modified from the SMAP machine design described by Watson in 1976. Light fraction residues were bagged, labeled, and sent to our laboratory for analysis. The heavy fractions are currently being stored in the I.N.C. storehouse at Machu Picchu. As no poppy seed tests were run (see Wagner 1982, 1988) as a check on the functioning of the flotation machine, I cannot comment on the recovery rate for these samples.

Laboratory methods

Samples were first weighed (see Appendix 2 for weights). In order to facilitate sorting (it is easier to focus one's eyes on items of roughly the same size), samples were next passed through a series of 2mm, 1.18, and 0.5 mm geologic sieves. Using a low power stereoscopic microscope (6-25 X) lit by a fiber optic light source, I extracted all charred material larger than 0.5 mm from the samples. Because very small pieces of wood are too difficult to identify wood was not removed from the <2 mm fraction. Due to the small size of the samples, each sample was completely sorted. I identified items with the assistance of Dr. Hastorf's

modern and archaeological plant reference collections housed in the Paleoethnobotany Lab as well as referring to botany reference works such as Martin and Barkley's Seed Identification Manual (2000). Seeds I could not identify were examined by Dr. Hastorf, and in cases where no identification could be made, seeds were added to the Lab's unknown seed collection to await future identification. Taxon counts and weights of wood > 2 mm were entered onto standardized recording forms.

Quantification Methods

In order to analyze the plant taxa recovered from the samples, I entered taxa counts and wood weights into an Excell database and employed three different quantification schemes, density, ubiquity, and relative percentages, in order to present the results. **Density** is the number of seeds, or seed fragments, per liter of site matrix. If one had 25 *Chenopodium* spp. seeds in a 10 liter sample, the density of *Chenopodium* spp. would be 2.5 seeds per liter of matrix. Density measures standardized counts so that one can compare samples with different original volumes. Each taxon can also be considered independently (Pearsall 2000, Popper 1988). **Ubiquity** is calculated as the percentage of samples which contain each taxon (Popper 1988). Thus if one identified *Chenopodium* spp. 25 out of 50 samples, it would have a ubiquity of %50. One advantage of this method is that the amount of each taxon in a sample does not affect the ubiquity value. Finally, **relative percentages** state the percentage each taxon makes up relative to the number of items in an individual sample. All taxa can be viewed at once with this method (often in the form of a pie chart), and relative proportions of taxa from different units can be easily compared.

List of Plant Taxa

Plant remains were most often identified to the family level, occasionally to a broader category such as "Herbaceous Material", and even more occasionally to genus or species.

Lumps (unidentifiable charred plant fragments, potentially fragments of domesticates)
Parenchymous Tissue (likely fragments of tubers)
Tuber fragments
Domesticated Fabaceae
Wild Fabaceae
Chenopodium spp.
Zea mays kernels and cob fragments
Nutshell
Unk. Drupe
Herbaceous Material (unidentifiable, non-seed, plant material)

Rubus
Galium
Poaceae
Relbunium
Labiatae
Amaranthus
Potamogeton
Nyctaginaceae
Sisrhynchium
Malvaceae
Euphorbaceae
Cyperaceae
Solanaceae
Asteraceae
Scirpus
Oxalis
Rosaceae
Unk. Aggregate
Unidentifiable Seed (too eroded/broken for identification)
Unknown Seed 321
Unknown Seed 322
Unknown Seed 323
Unknown Seed 324
Unknown Seed 325
Unknown Seed 326
Unknown Seed 327
Unknown Seed 328
Unknown Seed 329
Unknown Seed 330
Unknown Seed 331
Wood and Twig Fragments

Discussion of Results

The most striking pattern present in the data is the ubiquity and density of wild plant taxa in all of

the samples analyzed (Figure 3, Figure 6). Wild plant taxa such as Malvaceae, Poaceae, and Nyctaginaceae

far and away outnumber everything else, even the relatively abundant carbonized wood and lumps. I suspect

that most of these wild taxa (which naturally occur in the surrounding area) accidentally found their way into

the archaeological contexts. The common agricultural practice of field burning, for example, would explain

the high percentage of carbonized wild plant seeds in the samples. Seed densities, and especially wild seed

densities, are highest in the upper levels of the units (see Figure 8, for example) and may be the result of

relatively recent burning episodes. Many of the wild taxa could have important economic and social uses,

but given the sheer diversity of the Machu Picchu flora, collecting, identifying, and ethnographically

researching the wild taxa of the zone would be a monumental (though worthwhile) effort. Even the process

of identifying these wild taxa is daunting. Despite my best efforts, 85% of the wild taxa eluded identifcation and could only be classified as as "Unknowns" (see Figure 7).

Domesticates, such as Andean tubers, Beans (Fabaceae), and especially *Zea mays* sp. are present, but in low numbers. Nonetheless their presence does support the idea that these terraces were used for bean and corn agriculture (see Wright et al. 2000 for a similar conclusion). The small size and vascular structure of some of the carbonized wood fragments is suggestive of maize stalks – perhaps suggesting that dried out maize stalks were burned during field clearings.

Spatially, plant taxa are most abundant and diverse in Sector II-B, the 'urban' zone of the site. Interestingly enough, Units 6, 7, 8, and 10, the units with the highest plant remain densities (both carbonized wood and seed see Figures 4 and 5) lie in the plaza immediately adjacent to the "temple of the Condor" one of the most important shrines at Machu Picchu. Units 6 and 8 also have the highest densities of maize for the whole site (Figure 6). While it's advisable not to speculate too wildly without more detailed provenience information, it is possible that these higher densities may be the residue of ritual feasting at the plaza. Sector I, the Agricultural zone, and Sector V, the principal plaza of the urban center shows markedly lower plant densities (Figure 9). In general (and somewhat ironically) terraces are not necessarily the best places to obtain macrobotanical data since there are generally fewer opportunities for the carbonization of seeds than in contexts where you might encounter hearths and food preparation areas. This may explain the low densities in Sector I. I currently have no ready theories to explain the low density of plant remains in Sector V.

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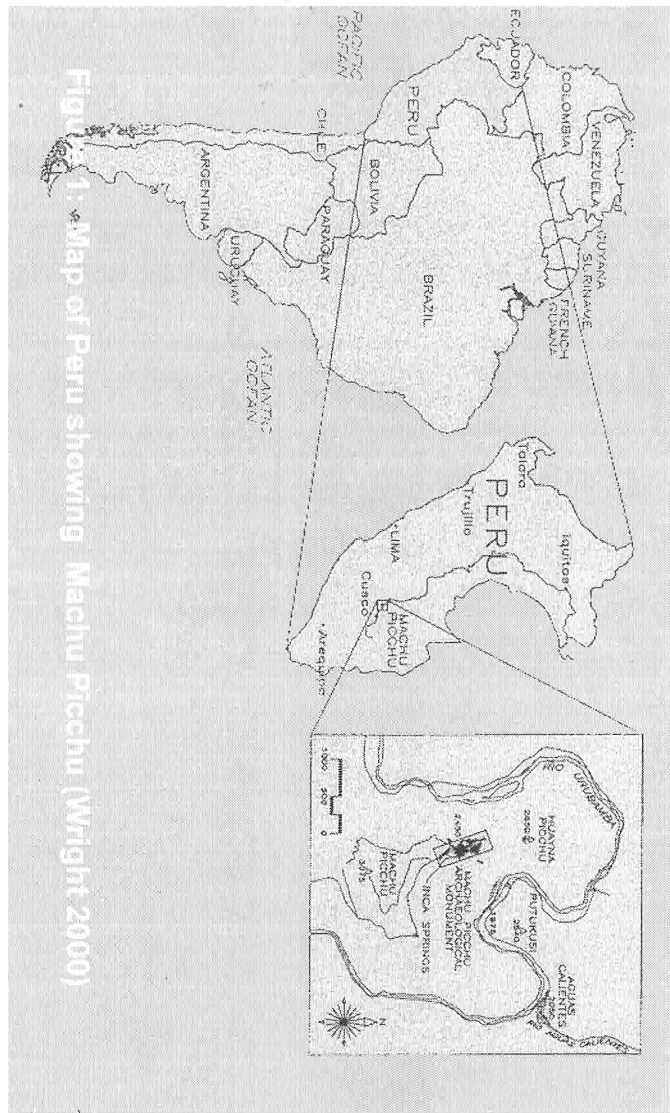
Figure 1: Map of Peru showing Machu Picchu (Wright 2000)

Figure 2: Raw Counts, Ubiquities, and Densities
for Domesticated, Wild, and Other Taxa
Combined Values for the Whole Site, Plotted on a Logarithmic Scale (N=46)

	Domesticates	Wild Taxa	Parenchymous Tissue	Lumps	Herbaceous Material	Nutshell
Raw Counts	99	13681	118	1993	128	38
Ubiquity	0.52	1.00	0.39	0.85	0.46	0.26
Density	0.52	37.18	0.82	6.39	0.76	0.40

	Tuber	Legume	Chenopodium	Maize
Raw Counts	34	22	1	42
Ubiquity	0.09	0.13	0.02	0.28
Density	1.06	0.46	0.13	0.40
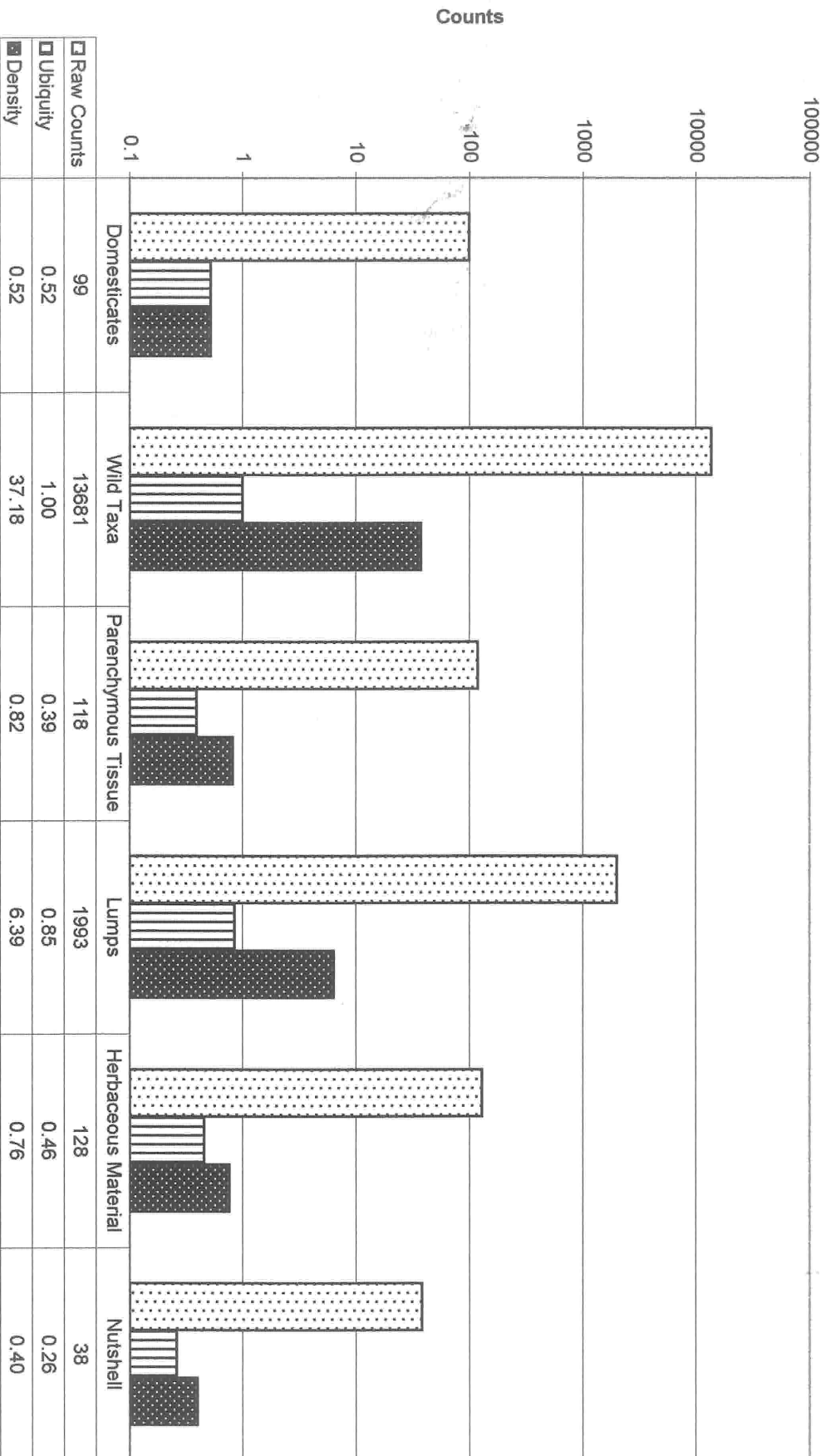
Counts

Figure 3: Raw Counts, Ubiquities, and Densities for Domesticated Taxa Combined Values for the Whole Site, Plotted on a Logarithmic Scale (N=24)
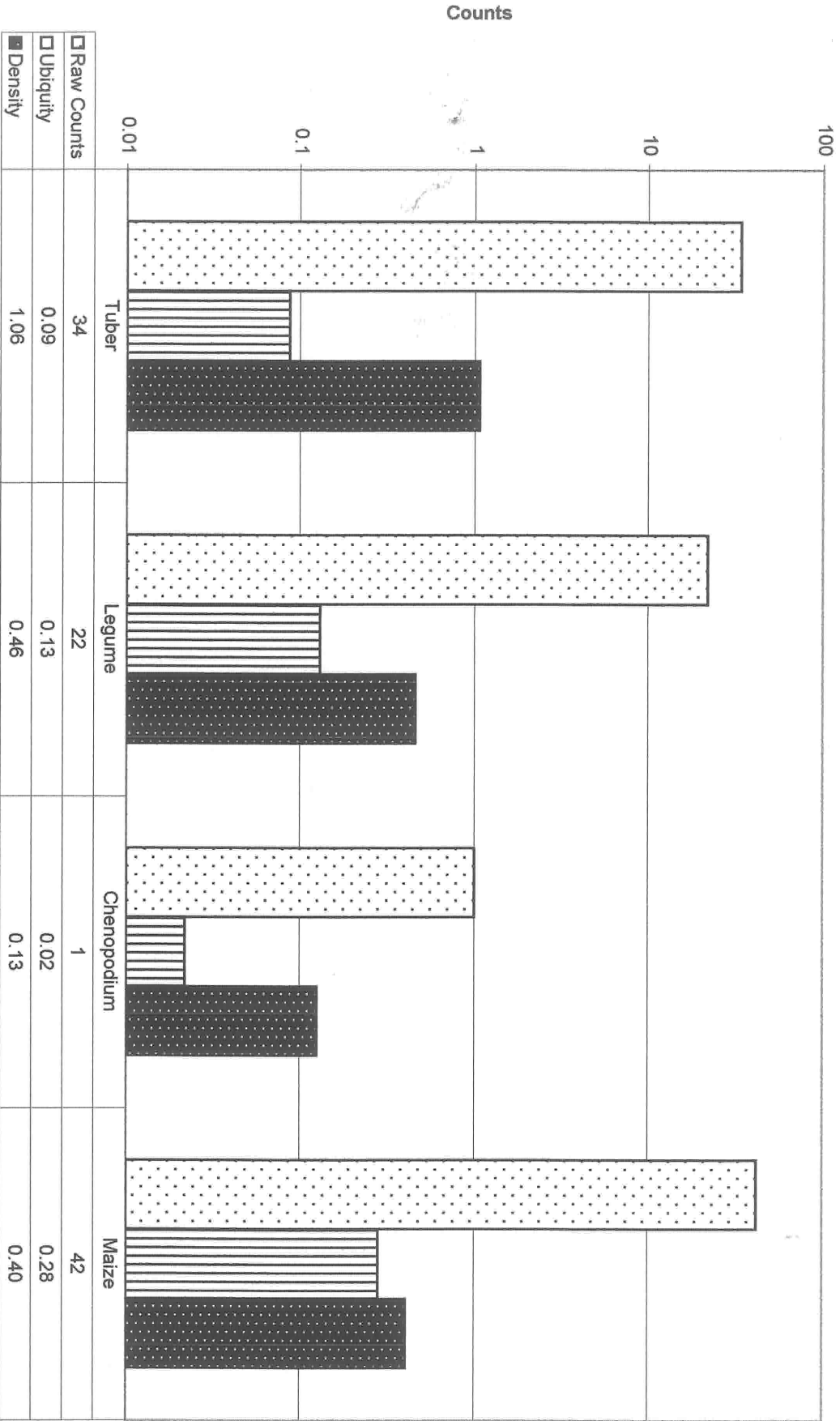
Figure 4: Density of Plant Remains, Excluding Wood, by Sector and Unit (N=46)

# of Items per Liter

Seeds/Liter	7.41	9.35	7.27	2.54	2.33	56.68	37.67	73.17	36.75	41.38	28.75	39.31	8.06	7.63
Unit Number	1	2	3	4	5	6	7	8	10	12	13	14	15	16

Sector 1

Sector II-B

Sector V

0.00 10.00 20.00 30.00 40.00 50.00 60.00 70.00 80.00
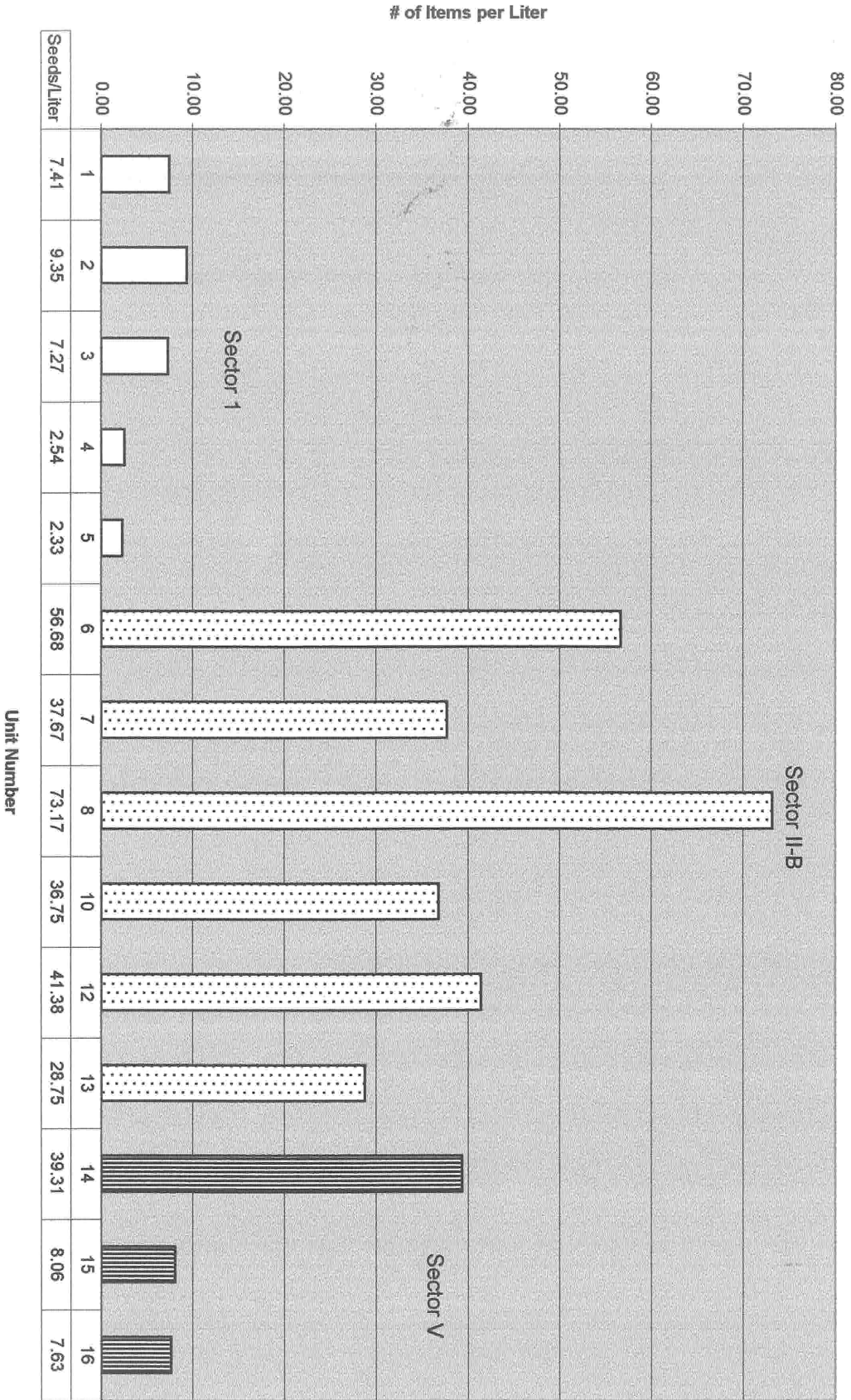
Figure 5: Wood Density by Sector and Unit (N=46)

WOOD	1	2	3	4	5	6	7	8	10	12	13	14	15	16
	0.0779	0.0529	0.0933	0.0147	0.0919	0.1968	0.1100	0.1904	0.1346	0.0361	0.0378	0.0355	0.0917	0.1077

Weight in grams

Unit Number

Sector I
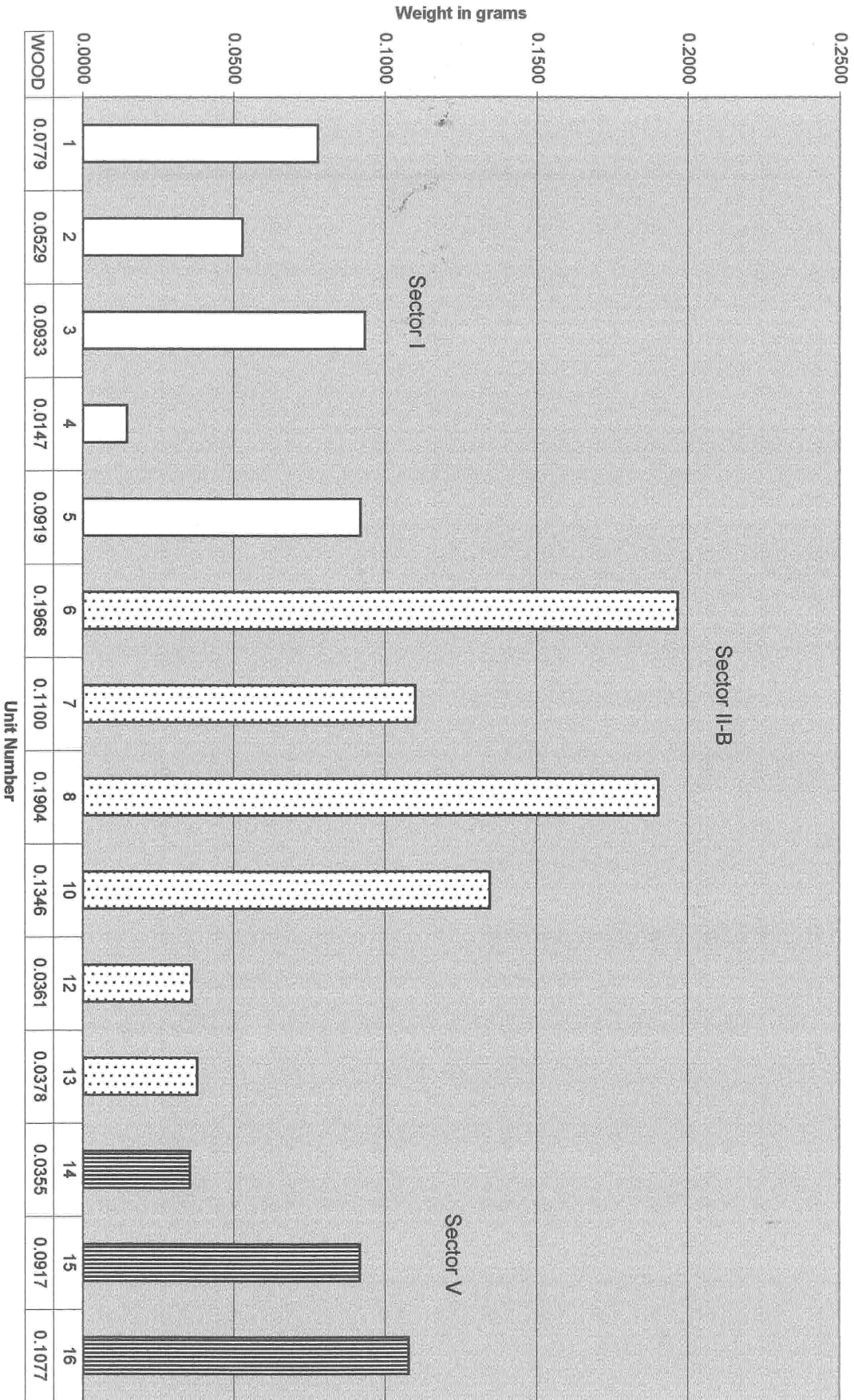
Sector II-B

Sector V

Figure 6: Relative Taxa Percentages by Unit (N=46)

Items per Liter

	1	2	3	4	5	6	7	8	10	12	13	14	15	16
☐ Wild Taxa	3.03	2.90	3.10	0.50	1.08	48.39	29.83	52.54	28.50	24.88	12.31	28.00	2.50	3.75
▨ Herbaceous	0.97	0.15	0.06	0.42	0.38	0.59	0.42	0.46	0.00	0.13	0.06	0.00	0.19	0.00
☑ Nutshell	0.00	0.04	0.08	0.00	0.00	0.07	0.08	0.54	0.00	0.50	0.06	0.38	0.00	0.13
■ Maize	0.03	0.06	0.02	0.00	0.04	0.38	0.00	0.50	0.06	0.13	0.00	0.13	0.00	0.00
☐ Chenopod.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00
☐ Legume	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.25	0.06	0.00	0.06	0.06	0.00	0.00
☐ Tuber	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.33	0.00	0.00	0.00	0.00	0.13	0.00
☐ Parenchyma	0.16	0.15	0.02	0.04	0.00	0.34	0.25	2.67	0.31	0.38	0.06	0.38	0.25	0.00
▨ Lumps	3.19	5.67	3.69	1.46	0.88	6.02	6.42	14.29	7.13	12.75	2.94	10.13	3.81	3.00

Figure 7: Wild Seed Densities, Combined Values for the Whole Site, Plotted on a Logarithmic Scale (N=46)

Seeds/Liter	Rubus	Galium	Poaceae	Relbunium	Labiateae	Amaranthaceae	Potamogeton	Nyctaginaceae	Sisyrinchium	Malvaceae	Euphorbaceae	Cyperaceae	Solanaceae	Asteraceae	Scirpus	Rosaceae	Unk. Seed	Unid. Seed
	0.0253	0.0614	0.1484	0.0509	0.0055	0.0313	0.0028	0.0290	0.0055	0.0221	0.0028	0.0028	0.0364	0.0198	0.0109	0.0028	17.7092	0.4537
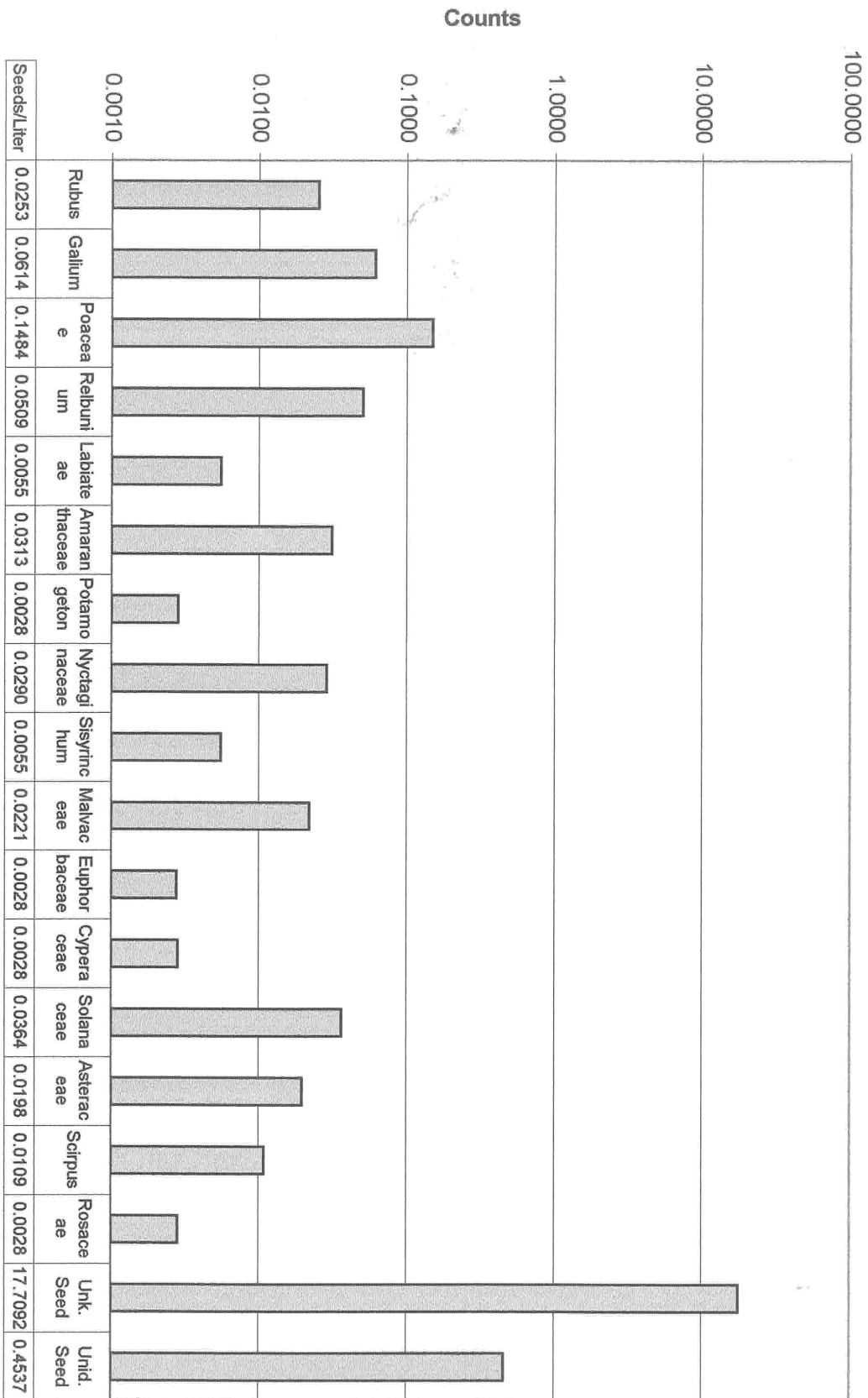
Figure 8: Sector II-B, Unit 6: Seed Density by Elevation (N=6)
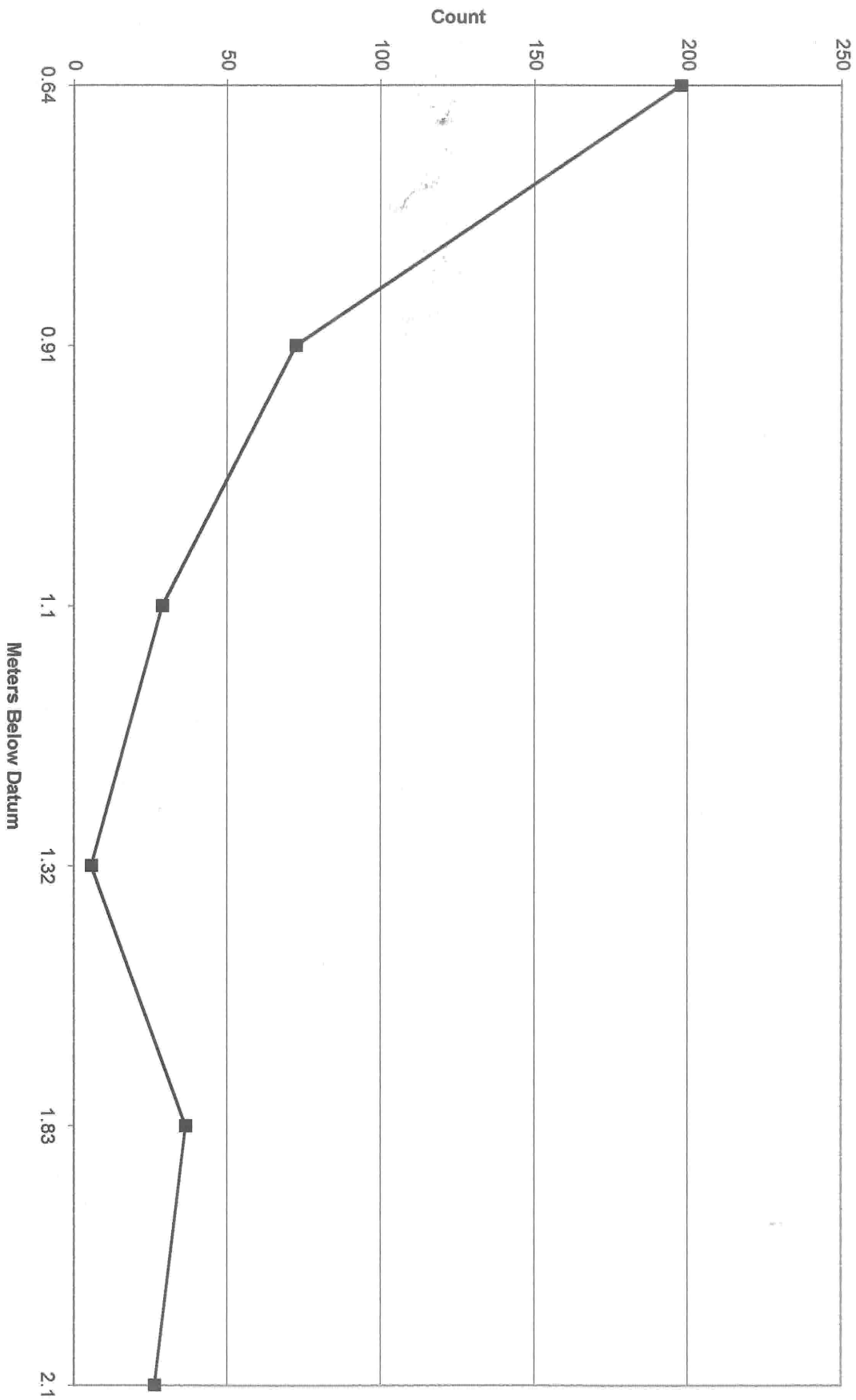
APPENDIX 1:
RAW SEED COUNTS

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC
1	ESP	SECTOR	UNIDAD	ESTRATO	NIVEL	ELEV	VOL.	LUMPS	PARENCH-YMA	TUBER	DOM. LEGUME	WILD LEGUME	CHENO-PODIUM	MAIZE C.	MAIZE K.	MAIZE E.	NUTSHELL	NUTLET	DRUPE	HERB. MAT.	RUBUS	GALIUM	POACEAE	KELDUN-IUM	LABIATAE	AMARANT-THUS	POTAMOG-ETON	NYCTAGIN-ACEAE	3ISKRHYN-CHIUM
2	4	1	1	=	2	2.07	8	8																					
3	6	1	1	=	1	2.27	8	21																					
4	11	1	1	=	4	2.77	8	31																					
5	14	1	1	=	1-5	2.71	8	42	5											3	3								
6	19	1	2	=	2	2.8	8	8																					
7	20	1	2	=	2	2.8	8	11																					
8	22	1	2	=	1	2.99	8	54	4			1		1			1			3		2	1	1		1		3	
9	23	1	2	≡	2	2.99	8	41												3	1	1	1			1			
10	26	1	2	≡	2	3.2	8	72									1			4		1	1			1			
11	27	1	2	≡	2	3.2	8	86	3		1			1			1			1		1		1	1				
12	31	1	3	≡	2	3.8	8	67	1			2			1		4			2	1	1	1	2					
13	32	1	3	=	2	3.8	8	33												2		1	28						
14	34	1	3	=	1	3.9	8	36												1									
15	35	1	3	=	1	3.9	8	15																					
16	37	1	3	≡	3	4.6	8	20														1	1		1				
17	38	1	3	≡	3	4.6	8	6												9		2	1			1	1		
18	46	1	4	≡	2	4.61	8	27	1			1																	
19	48	1	4	=	1	4.88	8	8															1						
20	51	1	4	≡	1	6.15	8													1									
21	54	1	5	=	2	0.72	8	13												9									
22	58	1	5	=	2	1.27	8	5																					
23	60	1	5	=	3	1.5	8	3					1?																
24	62	1	6	≡	1	0.64	8	64	8			8		3								3		3		1		1	
25	65	1	6	≡	1	0.91	8	63	10						9		2		24	4				3					
26	69	II-B	6	=	2	1.1	8	106																					
27	70	II-B	6	≡	3	1.1	8	11	1			3								17	1								
28	73	II-B	6	=	2	1.83	8	66								2			1		2	5	5						2
29	76	II-B	6	=	1	1.32	8	11				3			4					2									
30	77	II-B	6	≡	3	2.1	8	16												2								1	
31	82	II-B	7	=	1	0.53	8	67	6	8							2												
32	84	II-B	8	=	1	1.16	8	71	4	8								3					3						
33	85	II-B	7	=	2	0.65	8	68																					
34	87	II-B	8	=	2	1.16	8	235	51		6			2	5	3	6	4		3				3		1			
35	89	II-B	7	=	1	1.17	8	19												10									
36	91	II-B	8	=	1	1.48	8	37	9			2			2					8			1						
37	99	II-B	10	=	1	0.53	8	25	1					1								1	1						
38	103	II-B	10	=	2	1.39	8	89	4								2			1	1		1					3	
39	118	II-B	12	=	1	0.52	8	102	3		1			1		1	2	2		1		1	2					3	
40	123	II-B	13	=	1	0.91	8	18																					
41	124	II-B	13	=	1	1.34	8	47	1							1	1							7					
42	128	V	14	=	2	0.69	8	59	3					2			2									2			
43	132	V	14	=	1	1.12	8	103	3	4	2	10	1				4			3			3			4			
44	134	V	15	=	2	0.93	8	57																				2	
45	139	V	15	≡	1	2.17	8	4																					
46	144	V	16	=	3	1.3	8	48									1	1					1						
47	145	V	16	=	1	2.29	8																						
48	TOTAL							1993	118	17	11	32	1	12	24	6	26	12	25	119	9	22	53	18	2	11	1	10	2

#	MALV-ACEAE	EUPHORB-ACEAE	CYPER-ACEAE	SOLAN-ACEAE	ASTER-ACEAE	SCIRPUS	OXALIS	ROSACEAE	AGGRE-GATE	UNIDABLE SEED	UNK. SEED	UNK. 321	UNK. 324	UNK. 325	UNK. 326	UNK. 327	UNK. 328	UNK. 329	UNK. 330	UNK. 331	UNK.	BONE	Seed Count	Seeds/Liter
1											11	12											22	2.75
2											21	17											51	6.38
3											12												92	11.50
4																							72	9.00
5				13																			13	1.63
6											4	4											27	3.38
7										1	10	3	2										98	12.25
8											23	13											66	8.25
9											1	13	2										112	14.00
10										4	3	28											128	16.00
11										1	3	23									1		116	14.50
12					2					6	7	6	25									1	94	11.75
13										3	4	16											73	9.13
14										3	14	20											24	3.00
15										1	1	4											28	3.50
16										1	4	3											14	1.75
17										1		5											44	5.50
18										1		3											16	2.00
19										1		4											1	0.13
20							1?																24	3.00
21											7	2											26	3.25
22												11	3										6	0.75
23						1					28	108	1376										1584	198.00
24											10	281	207										580	72.50
25											26	210	12										415	51.88
26	1										2	22	1										47	5.88
27											5	173											292	36.50
28	7	1								2		26											46	5.75
29			1								19	167	3										210	26.25
30											15	23	483										596	74.50
31											14	42	683										842	105.25
32					1					12	13	170	2										270	33.75
33					2					15	12	395	2	2									771	96.38
34								1	1	24	1	4			1	1		1	3	10			38	4.75
35										1		4											143	17.88
36										1	16	64											367	45.88
37										3	7	6	322										221	27.63
38										6		102	6				8						331	41.38
39					1					21		140	48				4						192	24.00
40						3				2	4	163											267	33.38
41										20	5	185											299	37.38
42										4	16	25	188								4		330	41.25
43										4	58	3	152										119	14.88
44										5	6	24	1										7	0.88
45							1			1	1	1											119	14.88
46	2?									12	7	48											3	0.38
47											2		1											
48	8	1	1	13	7	4	0	1	1	159	390	2575	3517	2	1	1	12	1	3	10	5	1	9236	25.12

ESP	SITIO	FECHA	EXCAV	SECTOR	UNIDAD	ESTRATO	NIVEL	ELEV	SECTOR	UNIDAD	ESTRATO	NIVEL	ELEV	Sample Weight in Grams	WOOD (wt. in grams)
4	MAPI	06/09/91	ET	I	1	II	2	2.07	I	1	II	2	2.07	21.06	0.2292
6	MAPI	09/09/91	ET	I	1	III	1	2.27	I	1	III	1	2.27	8.79	0.1628
11	MAPI	10/09/91	ET	I	1	III	4	2.77	I	1	III	4	2.77	14.21	1.1667
14	MAPI	10/09/91	ET	I	1	III	1-5	2.71	I	1	III	1-5	2.71	18.37	0.9327
19	MAPI	24/10/95	ET	I	2	II	2	2.8	I	2	II	2	2.80	4.36	0.1570
20	MAPI	24/10/95	ET	I	2	II	2	2.8	I	2	II	2	2.80	11.94	0.7104
22	MAPI	25/10/95	ET	I	2	III	2	2.99	I	2	III	2	2.99	10.70	0.3850
23	MAPI	25/10/95	ET	I	2	III	1	2.99	I	2	III	1	2.99	9.82	0.3337
26	MAPI	26/10/95	ET	I	2	III	2	3.2	I	2	III	2	3.20	10.36	0.5435
27	MAPI	26/10/95	ET	I	2	III	2	3.2	I	2	III	2	3.20	15.39	0.4077
31	MAPI	28/10/95	ET	I	3	I	2	3.8	I	3	I	2	3.80	10.91	1.0920
32	MAPI	28/10/95	ET	I	3	I	2	3.8	I	3	I	2	3.80	13.03	1.3764
34	MAPI	29/10/95	ET	I	3	II	1	3.9	I	3	II	1	3.90	7.62	0.5139
35	MAPI	29/10/95	ET	I	3	II	1	3.9	I	3	II	1	3.90	5.11	0.8300
37	MAPI	30/10/95	ET	I	3	III	3	4.6	I	3	III	3	4.60	14.02	0.4514
38	MAPI	30/10/95	ET	I	3	III	3	4.6	I	3	III	3	4.60	19.74	0.2131
46	MAPI	05/10/91	ET	I	4	I	2	4.61	I	4	I	2	4.61	10.58	0.1996
48	MAPI	05/10/91	ET	I	4	II	1	4.88	I	4	II	1	4.88	13.53	0.1195
51	MAPI	07/10/91	ET	I	4	III	1	6.15	I	4	III	1	6.15	3.45	0.0326
54	MAPI	26/11/95	ET	I	5	I	2	0.72	I	5	I	2	0.72	2.18	0.3072
58	MAPI	28/11/95	ET	I	5	II	2	1.27	I	5	II	2	1.27	6.44	1.3375
60	MAPI	29/11/95	ET	I	5	II	3	1.5	I	5	II	3	1.50	3.88	0.5614
62	MAPI	01/11/91	ET	II-B	6	I	1	0.64	II-B	6	I	1	0.64	32.81	3.2919
65	MAPI	04/11/91	ET	II-B	6	I	2	0.91	II-B	6	I	2	0.91	27.48	2.8070
69	MAPI	05/11/91	ET	II-B	6	I	3	1.1	II-B	6	I	3	1.10	32.11	1.3599
70	MAPI	05/11/91	ET	II-B	6	I	3	1.1	II-B	6	I	3	1.10	8.53	0.3737
73	MAPI	06/11/91	ET	II-B	6	II	2	1.83	II-B	6	II	2	1.83	46.55	2.1570
76	MAPI	06/11/91	ET	II-B	6	II	1	1.32	II-B	6	II	1	1.32	14.37	0.7960
77	MAPI	06/11/91	ET	II-B	6	II	3	2.1	II-B	6	II	3	2.10	12.96	0.2363
82	MAPI	22/05/96	ET	II-B	7	I	1	0.53	II-B	7	I	1	0.53	28.69	1.9931
85	MAPI	22/05/96	ET	II-B	7	I	2	0.65	II-B	7	I	2	0.65	54.13	0.5687
89	MAPI	27/05/96	ET	II-B	7	II	1	1.17	II-B	7	II	1	1.17	25.53	0.0782
84	MAPI	22/05/96	ET	II-B	8	I	1	1.16	II-B	8	I	1	1.16	18.85	3.0444
87	MAPI	25/05/96	ET	II-B	8	I	2	1.16	II-B	8	I	2	1.16	8.01	1.2981
91	MAPI	27/05/96	ET	II-B	8	II	1	1.48	II-B	8	II	1	1.48	15.20	0.2262
29	MAPI	14/06/96	ET	II-B	10	I	1	0.53	II-B	10	I	1	0.53	20.03	1.7798
103	MAPI	18/06/96	ET	II-B	10	II	2	1.39	II-B	10	II	2	1.39	18.15	0.3742
118	MAPI	08/06/92	ET	II-B	12	I	1	0.52	II-B	12	I	1	0.52	37.33	0.2884
123	MAPI	15/08/96	ET	II-B	13	I	1	0.91	II-B	13	I	1	0.91	22.24	0.4816
124	MAPI	16/08/96	ET	II-B	13	I	1	1.34	II-B	13	I	1	1.34	34.10	0.1229
128	MAPI	24/10/96	ET	V	14	I	2	0.69	V	14	I	2	0.69	22.68	1.0772
132	MAPI	29/10/96	ET	V	14	I	1	1.12	V	14	I	1	1.12	37.25	4.6070
134	MAPI	13/11/96	ET	V	15	I	2	0.93	V	15	I	2	0.93	27.22	1.3802
139	MAPI	19/11/96	ET	V	15	I	1	2.17	V	15	III	1	2.17	12.45	0.0871
144	MAPI	05/11/92	ET	V	16	I	3	1.3	V	16	I	3	1.30	85.91	1.7121
145	MAPI	05/11/92	ET	V	16	II	1	2.29	V	16	II	1	2.29	22.89	0.0110