ABSTRACT

This study intended to demonstrate patterns in growth production of *Betula papyrifera* growing at elevations of 730, 820, 910, and 1000 meters in Underhill, Vermont. *Betula papyrifera* competes well at upper elevations on mountains, and is tolerant to cold weather and extreme conditions while intolerant to light limitations. Production, calculated as dbh/age, was therefore hypothesized to decrease with increasing elevation because less

INTRODUCTION:

Paper birch, *Betula papyrifera,* is a northern species adapted to cold climates. Its range is [redacted]

[redacted]

top 3cm of the mineral soil, where concentrations of calcium, nitrogen, phosphorous,

[illegible]

elevation (Whittaker, 1970). [illegible]

[illegible]

for every 100m increase in elevation in the mountains of the Northeast (Marchand, 1987). Along with this decrease there is an increase in precipitation of about 2.9cm per 100m increase in elevation (Whitney, 1988). All of this has a telling influence on tree growth. On Mount Mansfield it is hypothesized that overall productivity of *Betula papyrifera* across size classes will decrease with elevation. This is expected because with an increase in elevation environmental factors become harsher. The most obvious effect of lower temperature is a reduction of chemical and biological reaction rates that slow all life processes, even for organisms adapted to growing [illegible]

METHODS AND MATERIALS

Betula papyrifera was sampled on the western slope of Mount Mansfield (Underhill, Vermont) at four elevations working off the Teardrop trail. These elevations were 730m, 820m, 910m, 1000m. These elevations were determined by using an altimeter. A compass was used to determine the direction of each transect traveled. The 730m transect followed the direction of N80E, the 820m transect followed a direction of N80E, the 910m transect followed a direction of

[illegible]

were between sites. Results included comparisons of pH, available phosphorus, reserve phosphorus, potassium, calcium, and aluminum at each elevation and are represented by bar graphs. Any differences will give insight as to the available nutrients on each site which could relate to growth productivity.

of production rates is observed for all the other elevations showing no trends of maximum production for any aged tree at any elevation.

Age specific production was evaluated in a different way by graphing production vs dbh size classes (Figure 4). Again, maximum production levels are observed to act independently of

dbh size classes or elevation (Figure 4). At 820m and 1000m maximum production occurs at production rate that may or may not represent the real production rate at that elevation. Thus we can not accurately assume production went down for the first three elevations.

There are some possible explanations as to why overall production (Figure 1) responded the way it did. One explanation could be attributed to the soil conditions at each site. The amount of calcium (figure 6) and available phosphorus (Figure 7) showed patterns similar to that of the overall production rates. Both calcium and phosphorus are highest at 730m and decrease may be and it is then that high production occurs. These gap disturbances can and do occur at any elevation and because *Betula papyrifera* competes well at high elevation and in harsh conditions, production would increase in response to new light regimes. An interesting study [illegible]

similar nature produce better at higher elevations than low elevation. This would be similar to varieties to see if this variety overlap really does occur due to a response to an elevation gradient.

[redacted]

classes will decrease with elevation. The hypothesis that age specific productivity of *Betula*

[redacted]

REFERENCES:

[redacted]

[redacted]

CA. pp253

Brower, J.E. 1984. Field and Laboratory Methods for General Ecology. W.C. Brown Publishers, Dubuque, IA. pp92-97

[redacted]

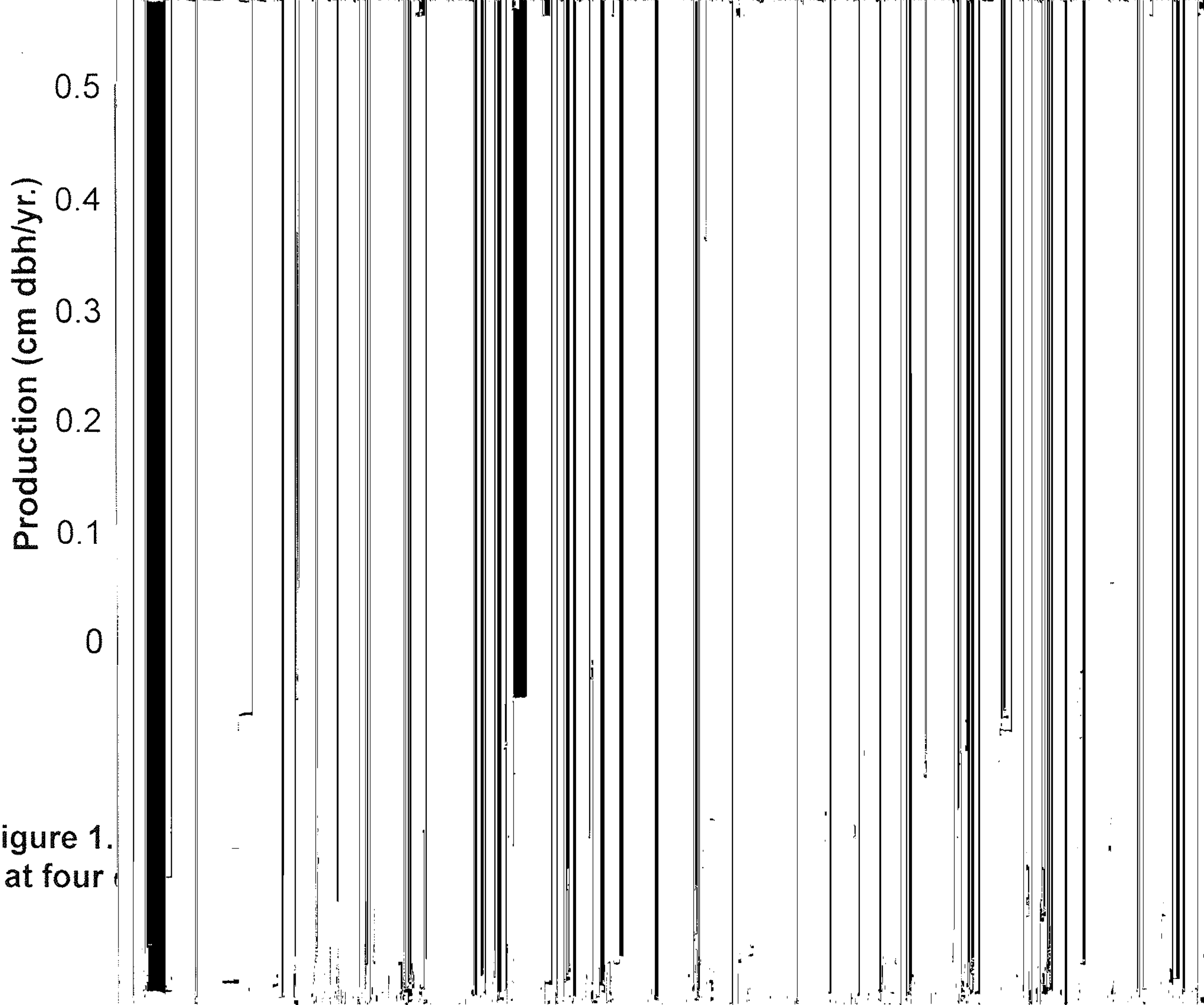


Figure 1.
at four

1

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

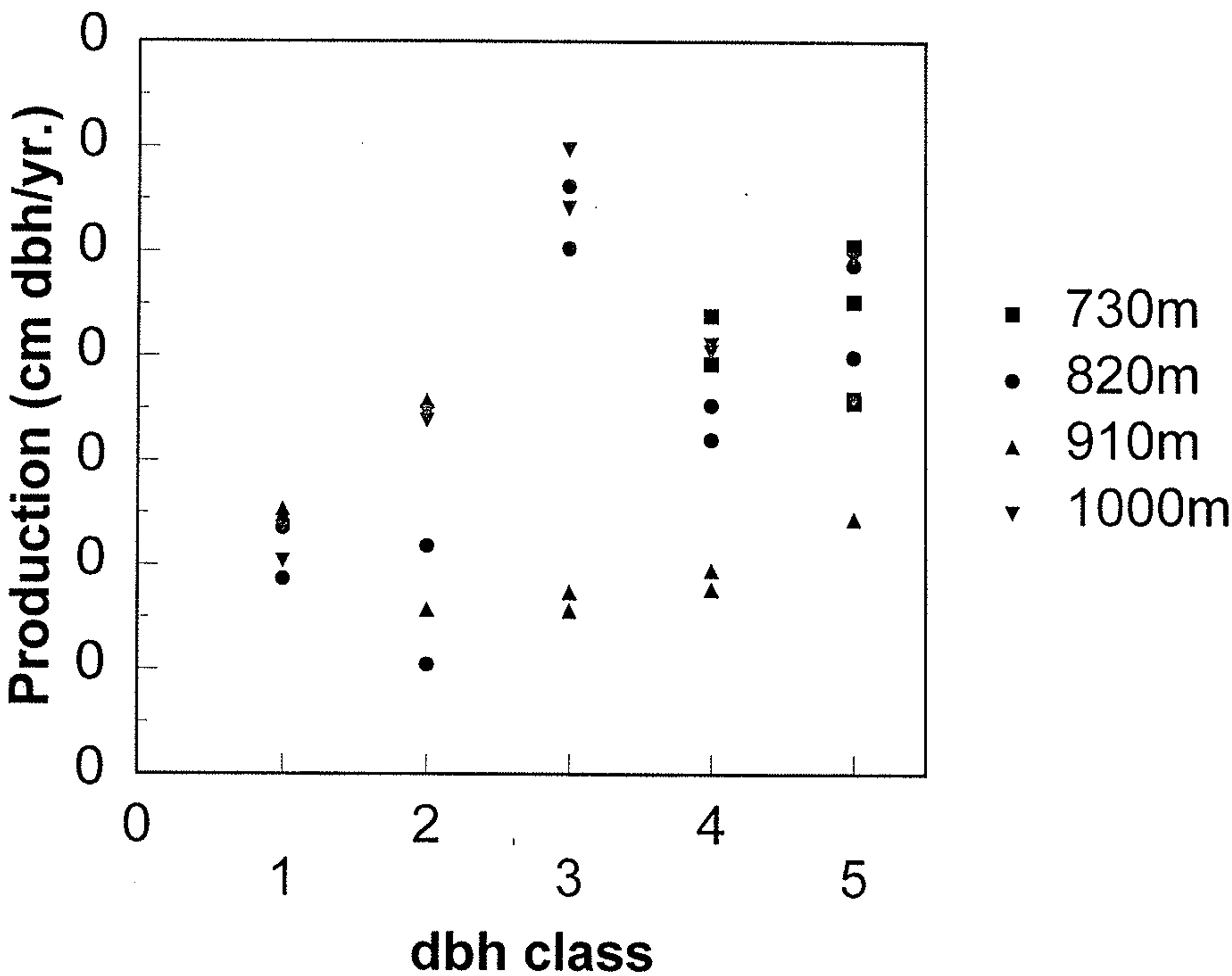
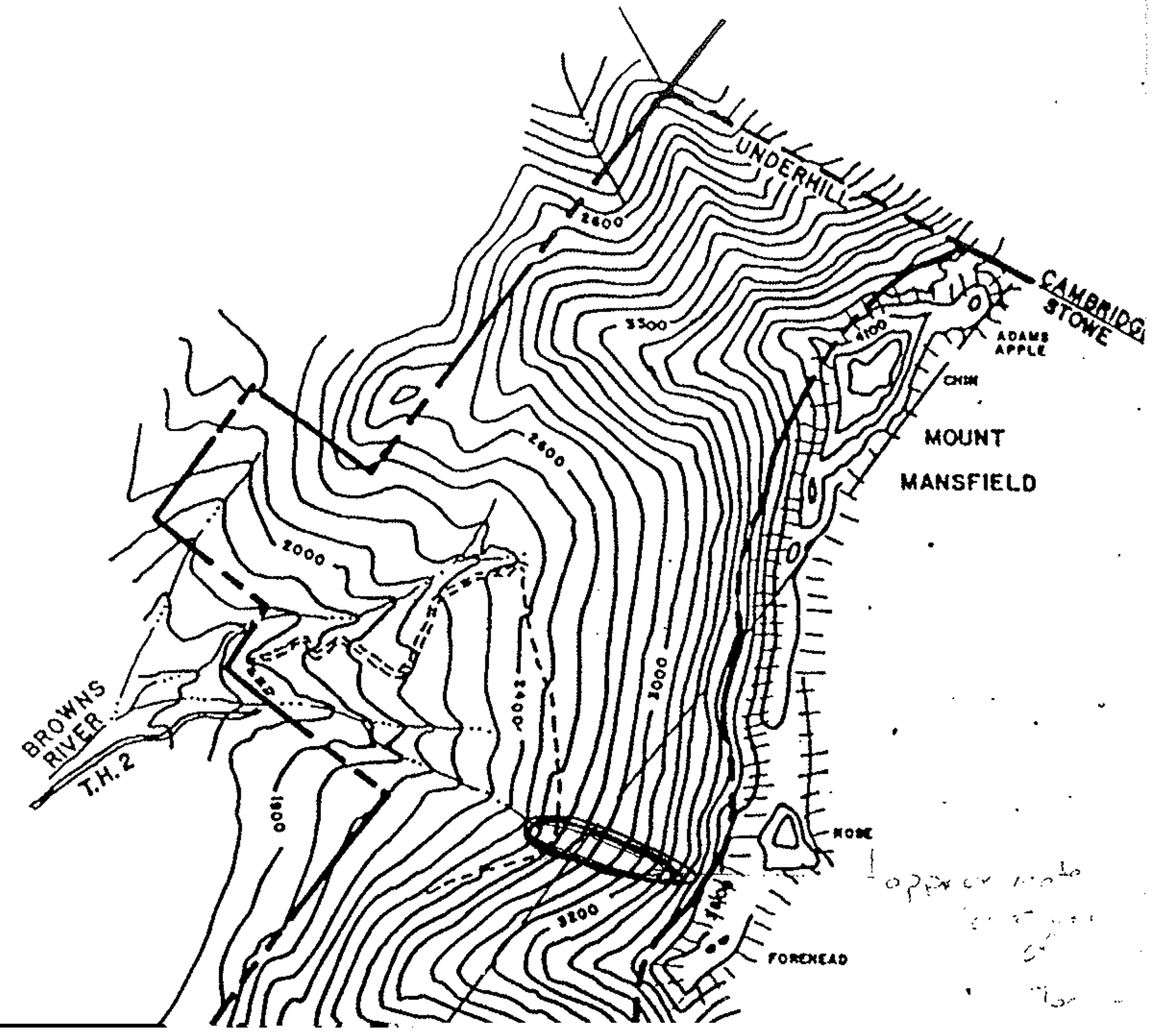


Figure 4. A scatter plot showing *Betula papyrifera* production levels for each of five dbh classes at four elevations.

erent

ent



[redacted]

[redacted]

[redacted]

SOIL DATA FROM 4 ELEVATIONS on MOUNT MANSFIELD (data of Landis & Lee, 1996)

730m	A	B	C	Average
pH	3.8	3.6	3.8	3.73
P(avaliable)	9.9	17.3	2.3	9.83
K	182	150	122	151.33
Mg	57	51	39	49.00
P(reserve)	27	24	28	26.33
Al	15	8	239	87.33
Ca	265	266	116	215.67

820m	A	B	C	Average
pH	3.4	3.5	3.4	3.43
P(avaliable)	7.6	9.2	6.5	7.77
K	130	126	137	131.00
Mg	49	65	56	56.67
P(reserve)	12	15	9	12.00
Al	9	7	8	8.00
Ca	180	135	257	190.67

910m	A	B	C	Average
pH	4	3.9	3.7	3.87
P(avaliable)	2.6	2.8	2	2.47
K	180	98	103	127.00
Mg	41	49	57	49.00
P(reserve)	22	6	13	13.67
Al	194	207	96	165.67
Ca	69	64	113	82.00

1000m	A	B	C	Average
pH	3.6	4.2	3.5	3.77
P(avaliable)	4.4	5.9	5.4	5.23
K	93	90	83	88.67
Mg	36	130	40	68.67
P(reserve)	23	23	25	23.67
Al	53	16	19	29.33
Ca	66	303	91	153.33

730m	A	B	C	Average
pH	3.8	3.6	3.8	3.733333
P(avaliable)	9.9	17.3	2.3	9.833333
K	182	150	122	151.3333
Mg	57	51	39	49
P(reserve)	27	24	28	26.33333
Al	15	8	239	87.33333
Ca	265	266	116	215.6667

820m	A	B	C	Average
pH	3.4	3.5	3.4	3.433333
P(avaliable)	7.6	9.2	6.5	7.766667
K	130	126	137	131
Mg	49	65	56	56.66667
P(reserve)	12	15	9	12
Al	9	7	8	[illegible]

Botany 160 Fall 1996 Birch data

Botany 160 Fall 1996 Birch data

	C1	C2	C3	C4	C5