FIREWEED SURVEY URBRAE BLOCK

by J. Gillard

INTRODUCTION

The fireweed survey took place at Urbrae Block north of the South Dandalup Dam in the Dwellingup area. North East Road was used as a base line to establish a grid of survey lines fifty metres apart. A total of 39 lines were run with sample points 50 metres apart and each sample point being 1 metre square. The number of legumes in each sample point were counted, topography, soil type and estimated fire intensity (from known scorch levels) were also recorded. Results indicate a relatively good stocking of legumes over the area although Acacia pulchella was not as widely distributed as first hoped for.

AIM

To count the number of fireweeds on a 50 metre square grid and to determine the numbers of each species in relation to fire intensity, topography and soil type, and the frequency and relative densities of each species.

LOCATION

The burn was carried out at Urbrae Block, map reference (Dwellingup 80) CO 63-64, comprising an area of approximately 150 hectares situated 12 kilometres north of Dwellingup and 3 kilometres north of the South Dandalup Dam. The main access road is North East Road which runs along the northern edge of the burn. Appendix I shows a map of the area.

DESCRIPTION OF AREA, PRE-BURN

(i) Topography

The area has a southerly aspect with a creek and an area of swamp running northwest to southeast through the centre of the area. Ridge tops comprise 25% of the area along the northern edge and southwestern corner. The rest of the area is made up of midslope areas comprising 50% of the area. Appendix II shows a map of topography.

(ii) Soils

The majority of the area comes under the broad category of gravels being found on ridge tops and midslopes. Other soil types present were loam, sand and clay being found in the low-lying areas. Some cap rock was also found on the ridge tops. Cap rock was defined as cap rock underlying a shallow soil profile or protruding floaters. Appendix III shows a map of soil types.

(iii) Overstorey

The overstorey is predominantly jarrah poles and jarrah-marri types with some Casuarina on the upper slopes with blackbutt and bullich in the lower areas.

(iv) Understorey

The understorey was mainly composed of blackboys, zamia palms Persoonia spp., Banksia spp., and Acacia spp. Only some 20% of the understorey was made up

legumes or Phytophthora resistant species while 80% was composed of Phytophthora susceptible species.

The entire area of the burn has been classed as non-protectable from Phytophthora. The small area on the map (Appendix IV) shown as "Doubtful Protectable" has since been classed as non-protectable.

(v) Logging History

The area of the burn has been uniform and selectively logged since 1969 under Bunnings saw-milling permit. This was prior to the area being assessed for Phytophthora infection. Since then the area has been surveyed and found to be infected. Since the area is non-protectable it was clean cut in 1975 where all merchantable timber was removed.

It should be noted that the area is to be mined by ALCOA in the near future and they have an intensive drilling grid set up over the area.

DETAILS OF THE BURN

(i) The burn was carried out on April 5, 1977. Lighting up commenced at 1420 hours on the eastern boundary moving westwards in north-south lines to the swamp. Once completed the area to the south of the swamp was lit up.

(ii) The fuel was generally in the six year old range approximating 10-11 tonnes per hectare of leaf litter. There was also an area of dense tops in the western half and scattered tops in the east and southern half resulting from the logging operations.

(iii) Weather data - maximum temperature 21.5°C, relative humidity 33.5%, the winds were variable from south-south-west to west-south-west and from 5 km to 30 km/hr with no cloud cover.

(iv) Fire behaviour - flame height varied from 0.8 to 2.0 metres in the areas between tops and from 2.0 to 7.0 metres in the tops. The rate of spread varied from 24 m/hr at 1425, to 60 m/hr at 1600 hours. Some spotting over North East Road took place in the area of tops.

(v) Fire intensity - varied from 600 kw/m in areas of half crown scorch, through 1200 kw/m; this was full crown scorch to 2,500 kw/m which resulted in total defoliation. The areas of high intensity 1200-2500 were those with a concentration of tops. Approximately 24% of the area was covered by fire of 600 kw/m, 68% by 1200 kw/m and 7% by 2500 kw/m with 1% being unburnt. Appendix V shows a map of estimated fire intensity.

(vi) The fire was monitored by Dwellingup Research Branch. Fifty asbestos tags were placed throughout the fire area to monitor heat penetration and duration. The probes were placed at depths of 2, 4 and 8 cm and checked at intervals for four hours. In the area of intensity 600 kw/m temperatures at 2, 4 and 8 cm never exceeded 25°C. After one hour the 2 cm probe that reached 30°C and the 4 and 8 cm probes were below 25°C. After two hours the 2 cm probe had reached 80°C, the 4 cm probe 50°C and the 8 cm probe was still below 25°C. After three hours the temperature at 2 cm was 155°C, at 4 cm 70°C and at 8 cm 24°C. After four hours the temperature at 2 cm was peaking at 190°C, at 4 cm 70°C and at 8 cm 40°C.

In the area of intensity 1200 kw/m - 2500 kw/m the following resulted. After one hour the temperature at 2 cm was 205°C and decreasing after a peak of 230°C, at 4 cm 100°C and at 8 cm 50°C. After two hours the temperature at 2 cm was 150°C, at 4 cm 110°C and at 8 cm 75°C. After three hours the temperature at 2 cm was 160°C, at 4 cm 190°C and at 8 cm 90°C. After four hours the temperature at 2 cm was 120°C, at 4 cm 215°C and peaking, and at 8 cm 105°C.

METHOD

Three months after the burn in August, 1977 the first fireweed assessment was carried out by the Cadets. A 50m square grid was set up over the area with lines running north and south from North East Road at intervals of 50 m. The lines were identified by numbered pegs being placed on the southern edge of North East Road. In each line the first sampling point was 50 m from the road and identified by placing ribbon on a nearby tree or log. A wire metre square was then placed on the ground and a wire peg placed in the northwest corner of the assessment frame as a means of identifying the sampling point in later surveys. The presence of Bossiaea aquifolium and Acacia spp., within the frame was then recorded. The soil type and topographical position of the sample point were recorded along with the overstorey and understorey types of the area. Fire damage, scorch height and the presence of an ashbed were also recorded.

Cadets again assessed the area in October, 1977. This assessment was mainly concerned with the survival of the fireweeds in the sample squares. However, the germinants were still too small to allow positive identification so they were placed into the broad categories used in the first survey. They were Bossiaea aquifolium and Acacia spp. The numbers of each type were recorded as individuals or clumps. Apps VI, VII, VIII show distribution of 3 species.

A third survey was carried out by Cadets in March, 1978. In this survey the species were accurately identified and the numbers present in the assessment frame were recorded. During this survey another wire peg was placed in the southeast corner of the assessment frame to make locating the sample point easier. The species counted were: Acacia pulchella, Acacia extensa, Acacia strigosa, Acacia urophylla, Bossiaea aquifolium, Hakea amplexicaulis, Adenanthos barbigera, Leucopogon verticillatus, Dryandra nivea, Clematis aristata and Lasiopetalum floribundum. The three species which this report is concerned with are Acacia pulchella, Acacia strigosa and Bossiaea aquifolium.

Acacia divergens was extremely abundant in swampy areas but was not included in the survey because it occurred in a E. megacarpa swamp and the survey was not concerned with this area.

RESULTS

Based on the March, 1978 survey

(i) The abundance of the three main species was calculated by means of the following equation:

$$\text{ABUNDANCE } (\bar{x} \text{ No/QUADRAT}) = \frac{\text{TOTAL NO. OF INDIVIDUALS}}{\text{TOTAL NO. OF QUADRATS}}$$

The total number of quadrants for the area was 527 and the number of individuals found was as follows:

Acacia pulchella	=	79
A. strigosa	=	1256
Bossiaea aquifolium	=	636

Table No. 1 shows the mean number of individuals per metre square of the block.

TABLE 1

ABUNDANCE OF SPECIES FOR COMPLETE BLOCK

Species	A. pulchella	A. strigosa	B. aquifolium
$\bar{x}$ No/M^2	0.15	2.38	1.21

(ii) The abundance of the species was calculated for fire intensity also; the figures were calculated using the same equation as in (i) above for the three different intensities.

LESS THAN HALF SCORCH

Total number of quadrats was 133
Number of individuals was:-

Acacia pulchella	=	12
A. strigosa	=	246
B. aquifolium	=	112

FULL SCORCH

Total number of quadrats was 357
Number of individuals was:-

Acacia pulchella	=	65
A. strigosa	=	966
B. aquifolium	=	482

TOTAL DEFOLIATION

Total number of quadrats was 37
Number of individuals was:-

Acacia pulchella	=	2
A. strigosa	=	49
B. aquifolium	=	62

Table No. 2 shows the number of individuals per metre square of the three different intensities.

TABLE 2

ABUNDANCE OF SPECIES FOR FIRE INTENSITY

Species	A. pulchella	A. strigosa	B. aquifolium	Type
$\bar{x}$ No/m^2	0.09	1.85	0.84	Less than half scorch
	0.18	2.71	1.35	Full scorch
	0.05	1.32	1.67	Defoliation

(iii) The abundance of the species was calculated for topography using the same equation as in (i) for the three topographic areas.

RIDGE TOPS AND UPPER SLOPES

Total number of quadrats 134
Number of individuals:-

Acacia pulchella	=	39
A. strigosa	=	134
Bossiaea aquifolium	=	44

MID SLOPES

Total number of quadrats 311
Number of individuals:-

Acacia pulchella	=	38
A. strigosa	=	615
B. aquifolium	=	531

LOWER SLOPES AND VALLEY BOTTOMS

Total number of quadrats 82
Number of individuals:-

Acacia pulchella	=	1
A. strigosa	=	498
B. aquifolium	=	76

Table No. 3 shows the number of individuals per metre square of the three different topographical areas.

TABLE 3

ABUNDANCE OF SPECIES FOR TOPOGRAPHY

Species	A. pulchella	A. strigosa	B. aquifolium	Type
$\bar{x}$ No/m^2	0.29	1.00	0.33	Ridge tops Upper slopes
	0.12	1.98	1.71	Mid slopes
	0.01	6.07	0.93	Lower slopes Valley Bottoms

(iv) The abundance of the species was also calculated for soil type using the same equation as in (i) for the three main soil types. Sand, clay and swamp were deleted from the results because they were poorly represented.

CAP ROCK

Total number of quadrats 27
Number of individuals:-

Acacia pulchella	=	7
A. strigosa	=	28
Bossiaea aquifolium	=	8

LOAM

Total number of quadrats 51
Number of individuals:-

Acacia pulchella	=	2
A. strigosa	=	462
B. aquifolium	=	63

GRAVEL

Total number of quadrats 415
Number of individuals:-

Acacia pulchella	=	70
A. strigosa	=	682
B. aquifolium	=	547

Table No. 4 shows the number of individuals per metre square of the three main soil types.

TABLE 4

ABUNDANCE OF SPECIES FOR SOIL TYPE

Species	A. pulchella	A. strigosa	B. aquifolium	Type
$\bar{x}$ No/m^2	0.26	1.04	0.30	Caprock
	0.04	9.06	1.24	Loam
	0.17	1.64	1.32	Gravel

(v) The frequency or percent distribution for the species was calculated by means of the following equation:

$$\text{FREQUENCY} = \frac{\text{NO. QUADRATS IN WHICH SPECIES OCCURRED}}{\text{TOTAL NO. QUADRATS}} \times \frac{100}{1}$$

Total number of quadrats 527
Number quadrats:

A. pulchella	=	41
A. strigosa	=	174
B. aquifolium	=	68

Table No. 5 shows the frequency for the three species.

TABLE 5

FREQUENCY

Species	A. pulchella	A. strigosa	B. aquifolium
% Distribution	7.8	33.0	13.0

(vi) The relative density - percent contribution for the species was also calculated by means of the following equation -

$$\text{RELATIVE DENSITY} = \frac{\text{TOTAL NO. INDIVIDUALS OF SPECIES}}{\text{TOTAL NO INDIVIDUALS}}$$

Total number individuals 1971
Number A. pulchella = 79
Number A. strigosa = 1256
Number B. aquifolium = 636

Table No. 6 shows the relative density for the three species

TABLE 6

RELATIVE DENSITY

Species	A. pulchella	A. strigosa	B. aquifolium
% Contribution	4.0	63.7	32.3

DISCUSSION

The distribution and abundance of the species was examined to obtain an overall picture of the effectiveness of the burn.

Acacia pulchella: had a lower abundance than was first hoped for, showing a lower mean number of individuals than expected.

The reasons why Acacia pulchella never showed up in the survey could have been -

(i) the individuals were subject to browsing. Acacia pulchella is particularly susceptible to browsing because it is rich in nitrogen.

(ii) there was a lack of seed in the area or a lower quantity of seed than first estimated.

Good stocking was obtained in areas of full scorch which covered sixty eight percent of the area. At both lower and higher fire intensities the abundance rapidly decreased.

The ridge tops and upper slopes were well stocked with A. pulchella with the number of individuals decreasing going down the mid-slopes and into the

valley bottoms. This is closely related to the soil types where A. pulchella preferred the caprock areas and gravels with a very poor stocking on the loams.

Acacia strigosa: is very widely distributed over the area and showed a preference to the areas of full scorch and less than half scorch rather than those areas that were totally defoliated. The number of individuals increased going down slope toward the valley bottoms with a large proportion of the total number found on the lower slopes and valley bottoms. This is consistent with the soil types where A. strigosa showed a strong preference for the loams than the gravels with some individuals in the caprock areas.

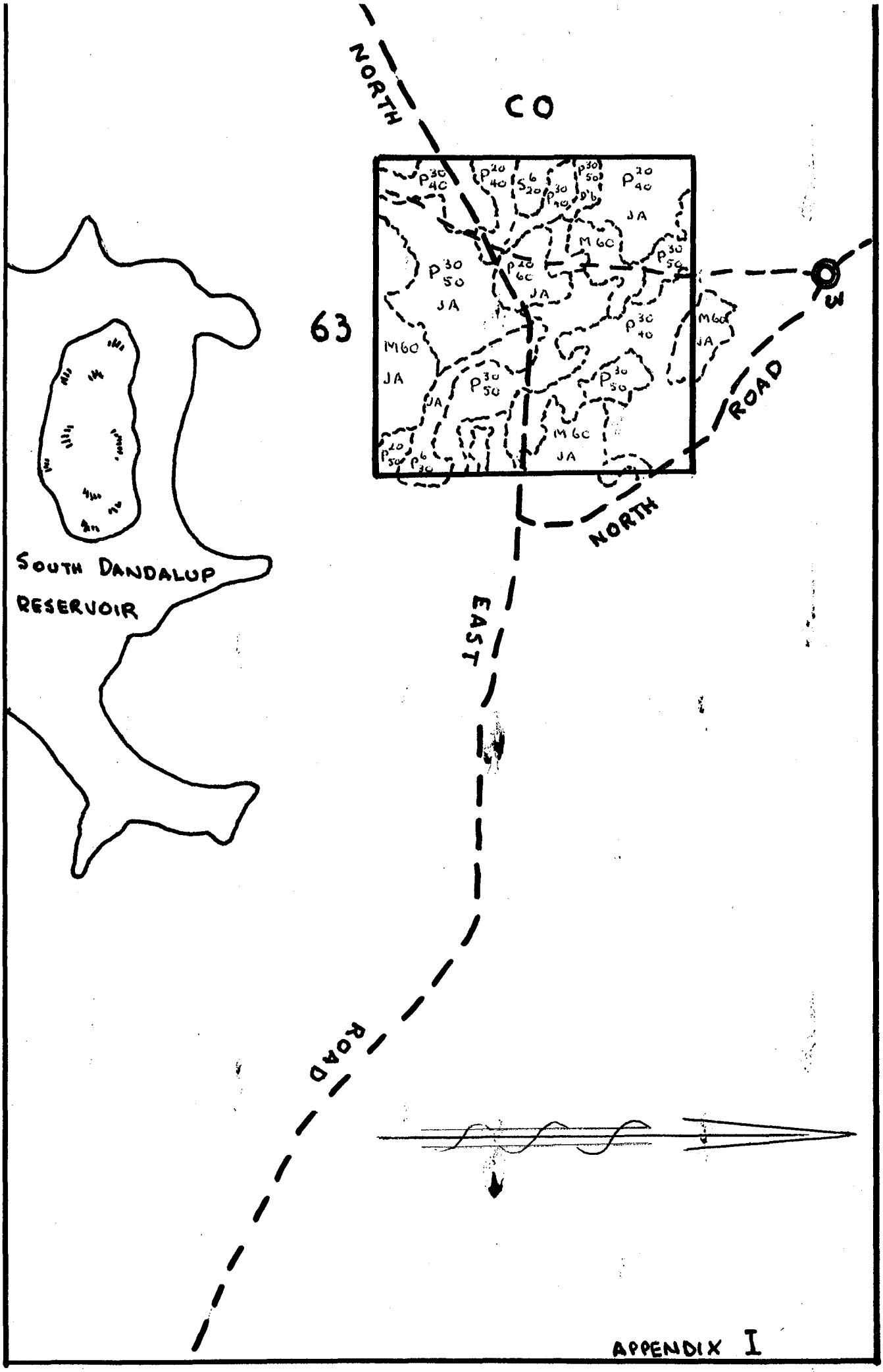
Bossiaea aquifolium: was present in large numbers with the abundance increasing as the intensity of the fire increased. The deep distribution of the seed is most likely the reason for this pattern. The species was poorly represented on the upper slopes and ridge tops with large numbers being found on the mid-slopes and to a lesser degree the lower slopes and valley bottoms. This is consistent with the soil types where B. aquifolium was poorly represented on the caprock areas and showed a strong preference to the gravels and loams.

Acacia strigosa was the more widely distributed of the three with Bossiaea aquifolium being reasonably widely distributed and Acacia pulchella being confined to the ridge tops and upper slopes.

In actual numbers of individuals found A. strigosa was the dominant species making up nearly two thirds of the population with A. pulchella more poorly represented and making up only four percent of the population.

Further surveys are to be carried out in the spring of this year and they will include an assessment of crown recovery and bole damage. Also, a more in-depth analysis of the data will be made after these surveys with particular attention to the interactions such as fire intensity and slope in relation to the abundance of the three species.

In conclusion, the burn was successful in obtaining a good stocking of the fireweed species. It has also shown that burns of the intensity of 1200 kw/hr (that is full crown scorch but no defoliation) produce the best results in relation to the number of fireweeds germinating.



APPENDIX I

APPENDIX II

LEGUME FIREWEED SURVEY

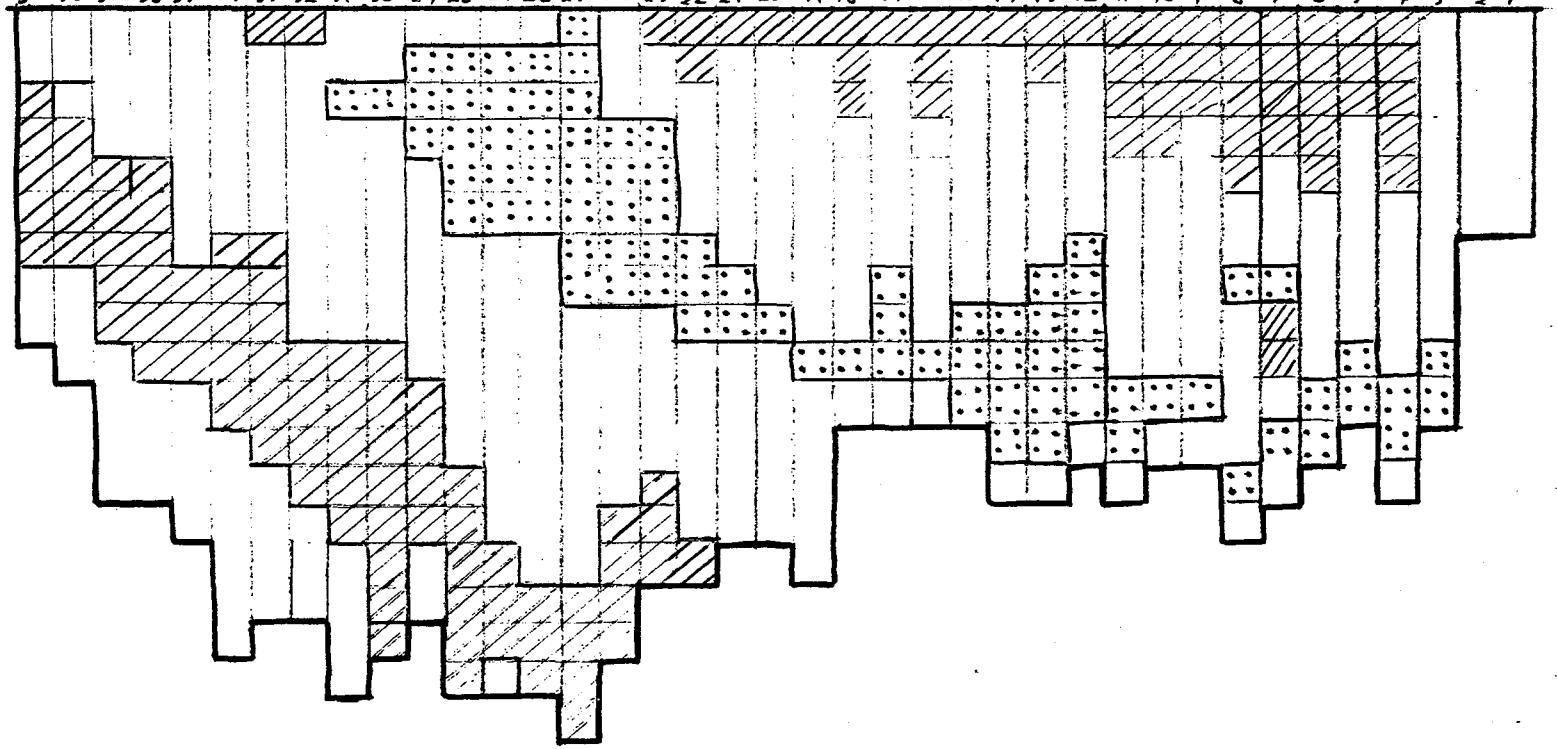
URBRAE BLOCK

TOPOGRAPHY

KEY: Ridge tops; Mid-slopes; Valley bottoms

N.E. Road

Line No. 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1



1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

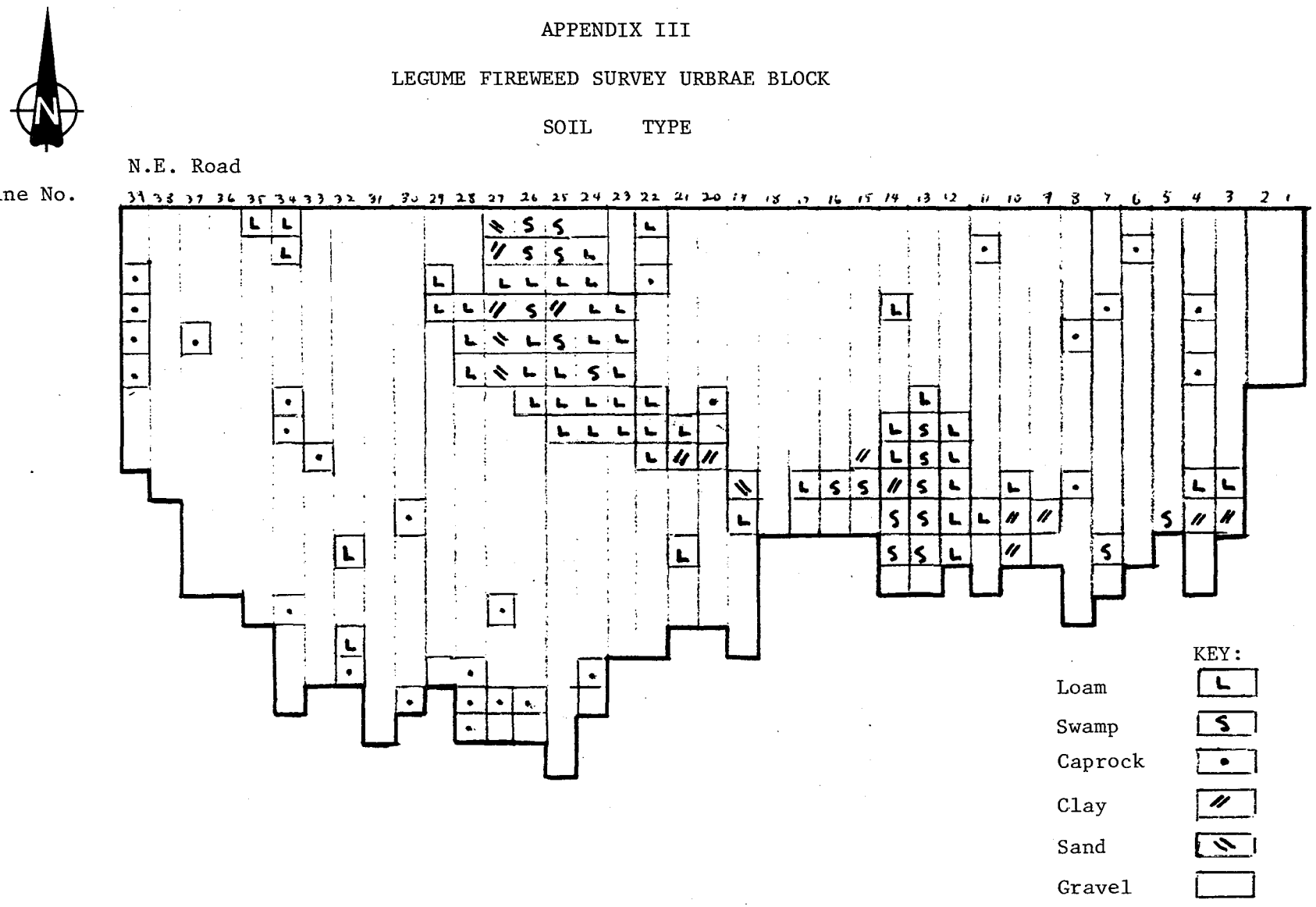
Plot No.

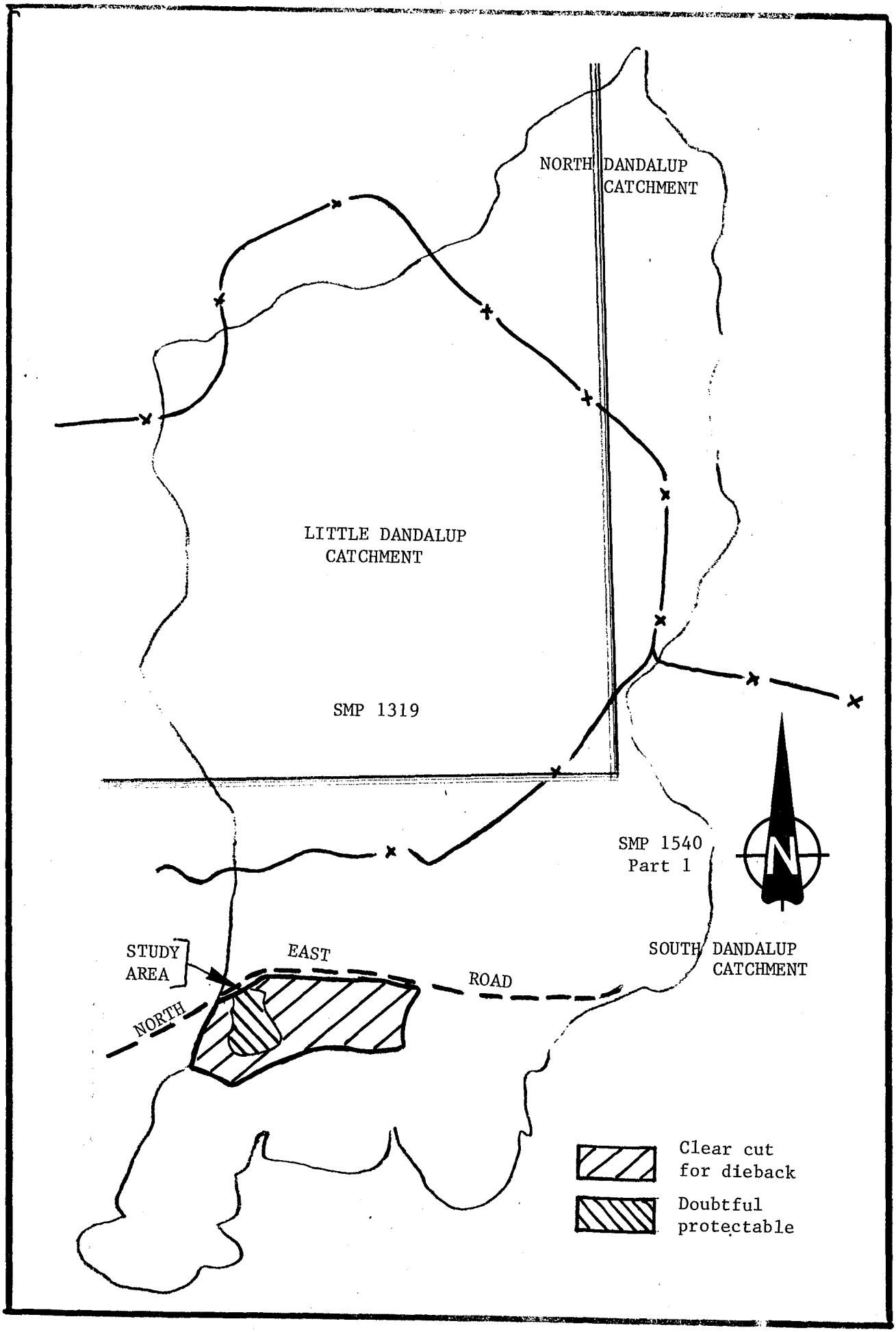
Valley bottoms	15.78%
Mid-slopes	58.82%
Ridge tops	25.43%

APPENDIX III

LEGUME FIREWEED SURVEY URBRAE BLOCK

SOIL TYPE

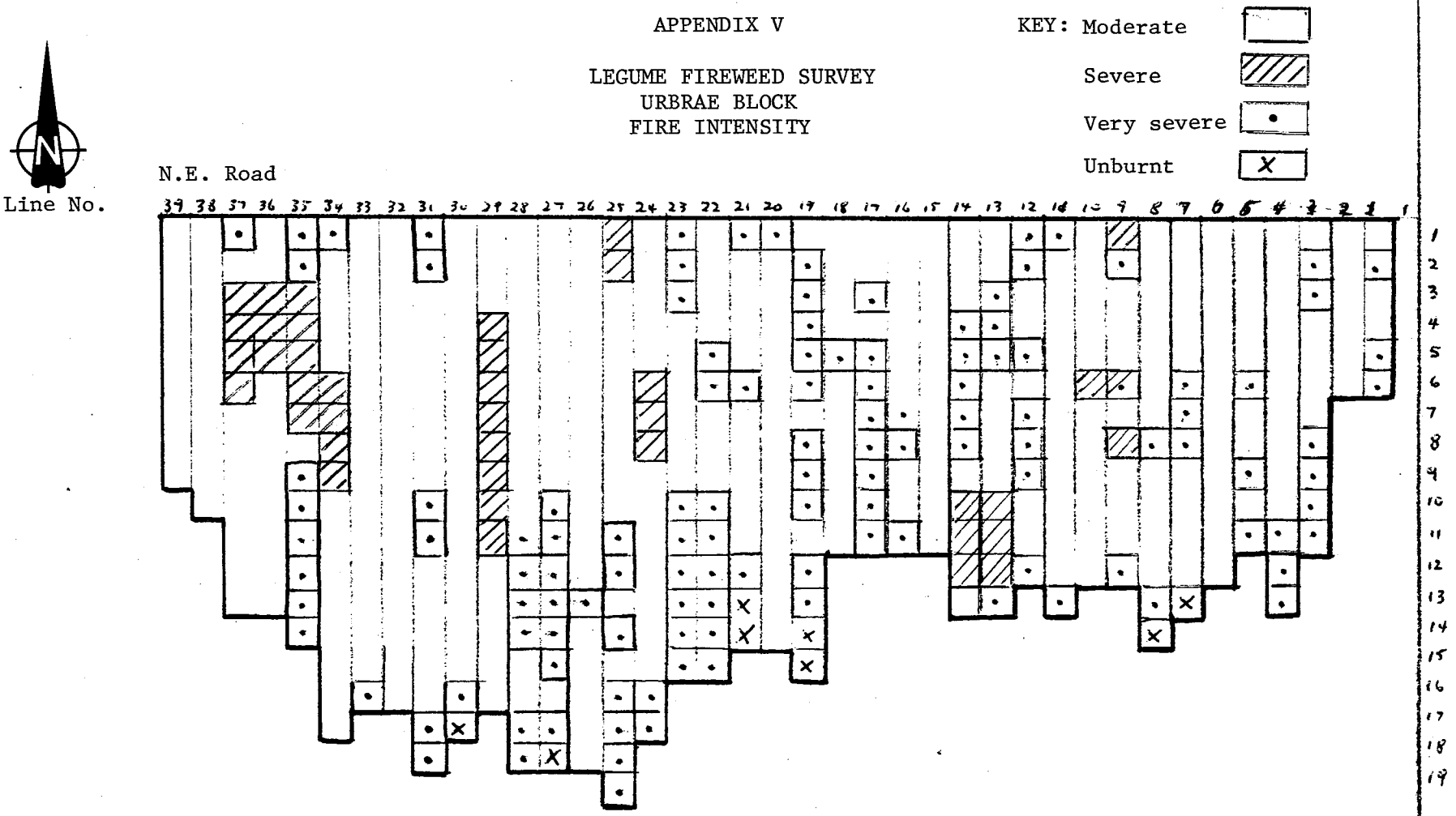



NORTH DANDALUP CATCHMENT
LITTLE DANDALUP CATCHMENT
SMP 1319
SMP 1540 Part 1
N
STUDY AREA
EAST
ROAD
NORTH
SOUTH DANDALUP CATCHMENT
Clear cut for dieback
Doubtful protectable

APPENDIX V

LEGUME FIREWEED SURVEY
URBRAE BLOCK
FIRE INTENSITY

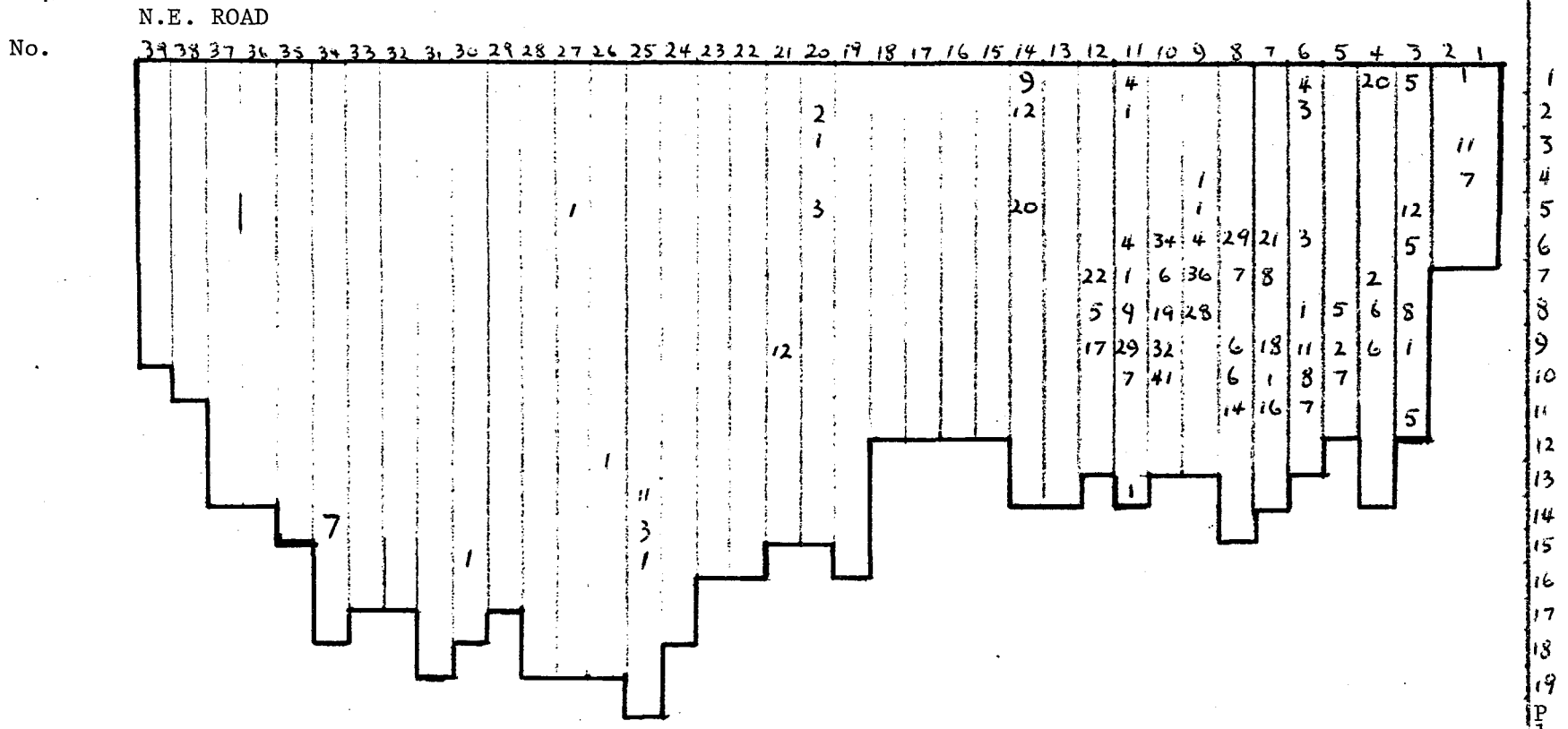
KEY: Moderate
Severe
Very severe
Unburnt



% Moderate	23.95%
% Severe	67.69%
% Very severe	7.03%
% Unburnt	1.33%

APPENDIX VII

LEGUME FIREWEED SURVEY URBRAE BLOCK
NO OF INDIVIDUALS PRESENT
BOSSIAEA AQUIFOLIUM - MARCH 1978



APPENDIX VIII

LEGUME FIREWEED SURVEY URBRAE BLOCK
NO OF INDIVIDUALS PRESENT
ACACIA STRIGOSA - MARCH 1978

N.E. ROAD

Line No