

**Long-Term Vegetation Monitoring Data:
Mt. Mansfield, Vermont**

**Research Supported by
The Vermont Monitoring Cooperative**

Completion Report

**to the
Vermont Department of Forests, Parks and Recreation**

**under
Cooperative Grant Agreement
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Abstract

Four long-term vegetation monitoring sites have been established in the summit area of Mt. Mansfield and located with reference to cadastral survey monuments. At each site a restricted random array of 10 permanent 1-meter quadrats was located, within which base-line vegetation data were acquired. Survey was done with a 5-second laser theodolite and recorded in a form to enable sites to be retrieved and re-examined in the future. Frequency and cover data were gathered for both higher vascular and cryptogamic taxa within forty 1-meter quadrats, and a comprehensive species list prepared. Soil depth, character, pH and surface morphology (slope and aspect) were recorded at each long-term site. Vegetation of the western slopes of Mt. Mansfield was also assessed, by trailside sampling at approximately 200 foot elevations. Vegetation data include a species list for twenty-five belt transects of 1 x 25 meters, and a frequency data within fifty 1-meter quadrats at random locations, two per belt transect.

Introduction

The Green Mountains of Vermont rest in the middle of the Northern Appalachian Mountain System and support a well known flora having strong affinities with that of montane habitats throughout New England, northern New York and the Gaspé region of Quebec. The summit of Mt. Mansfield, Vermont's highest peak, is blanketed with subalpine and alpine tundra; the lower slopes support boreal and mixed deciduous forest. Considering the long and active history of collections from the upper elevations of Mt. Mansfield (from Pringle, 1876 to Zika, 1991), surprisingly little is known of contemporary vegetation in the boreal, subalpine and alpine areas of the mountain.

Vogelmann, et. al. (1969) presented a summary description of the unique and vulnerable character of high elevation ecosystems in Vermont, including a brief description of montane vegetation. Countryman (1980) and Thompson (1989) have documented the threatened or endangered status of several species presently found on the mountain. Cogbill and White (1991) have reported on the boreal forest biogeography of the Appalachian mountain system, with many observations of direct relevance to the plant communities of the flanks of Mt. Mansfield. Zika (1991) has thoroughly reviewed the historical collections from the alpine zone and searched their contemporary populations. Zika (1992a) provides a current higher vascular species list for the mountain.

In recent years, a significant increase has occurred in the use of Mt. Mansfield by hikers crossing the summit on the Long Trail, from 40,000 per year (Pect, 1979), to an estimated 50,000 per year (Paradis, 1994). This heavy trail usage has inevitably increased the anthropogenic disturbance of the fragile plant communities of the alpine tundra zone. In addition, the eastern slopes of the mountain are managed extensively by a local ski area, and the middle peak (the 'Nose') supports several large communications towers, buildings and roadways. Finally, there is observational and anecdotal evidence that off-trail snowboarding occurs on the eastern side of the Chin, with attendant physical impact on vegetation that is particularly vulnerable and brittle in its frozen state.

Other regional contemporary anthropogenic impacts include acid precipitation and dry deposition (Bormann, 1985), with which Vogelmann et al. (1985) associated red spruce dieback on nearby Camels Hump. Changes in global climate associated with atmospheric CO₂ loading are also thought to contribute, through regional weather manifestations, to changing habitat conditions; an hypothesis relating historical declines in red spruce to climate change is examined by Hamburg and Cogbill (1988). Experimental research examining the recovery of disturbed sites on the summit ridge and the effects of nutrient treatments on

revegetation vigor in selected alpine plant communities was reported by Vogelmann and Leonard (1982).

Insect predation and plant pathogens of significance to forest health are now monitored in the New England Region (Eager, et al. 1992) and on Mt. Mansfield by forest ecologists working in conjunction with the Vermont Monitoring Cooperative (Wilmot et al. 1994). Recent attention has focused on pathogenic and weather-induced stress in the spruce-fir forests of the northeast, that could well drive regional changes in species composition in montane plant communities (for example Burkman, et al., 1993; Cox and Miller-Weeks, 1991). Many studies have addressed the response of forest species to seasonal climatic stress (eg. DeHayes et al. 1989, 1990). Yet most of these important efforts attend primarily to the health of individuals or populations in species of direct economic importance, rather than to the condition or character of the natural vegetation as a whole.

Little research has treated natural vegetation patterns in the higher elevations of the Green Mountains, despite the steep environmental gradients and the attendant compression of ecotones that makes these places well suited to studies of natural and anthropogenic change. Consequently, at a time when it would be most useful, historical vegetation data for these sites is unavailable. There seems little prospect for the systematic recognition of either natural or anthropogenic changes in the vegetation of upper elevations in the Green Mountains until the associated base-line data are acquired and reported.

The present study has addressed this specific need by establishing several long-term study sites in the summit area of Mt. Mansfield, tabulating vegetation data within these sites, and also by acquiring vegetation data along the elevation gradient of the western slopes of the mountain. This completion report presents these data to the Vermont Department of Forests, Parks and Recreation which has supported the final field season of the study.

Objectives

This research program has addressed two objectives in assessing vegetation in the summit area and on the western slopes of Mt. Mansfield.

Part 1

The first objective was to establish four long term vegetation monitoring sites characteristic of the alpine tundra in the summit area of Mt. Mansfield, and to sample vegetation within each site. Specifically, under the terms of the Cooperative Grant Agreement, the work in each long term site was to include a characterization of soils, detailed location data for each sample site, and vegetation sample data characteristic of each, including a list of plant species identified.

Part 2

The second objective was to survey vegetation changes with elevation on the western slopes of Mt. Mansfield, through sampling along certain trails which provide access to the area, and including a list of plant species identified.

Methodology

Part 1 - Long-term Sites: Alpine Tundra, the Summit Area

Four long-term research sites were established for vegetation sampling, with adequate location control so that the sample quadrats within each site may be accurately relocated for re-study in future years for comparative purposes.

Spatial Sampling Method

The number of long-term sites to establish in the summit area reflects the scope of resources available for this project rather than an analytical optimum. The location and size (20 x 30m) of long-term sites in the summit area was made subjectively in consultation with the UVM Natural Areas Manager, to reflect the common sense requirements that they be off-trail to minimize visitor disturbance, and be characteristic of the more horizontally inclined slopes.

The alpine tundra vegetation within each long-term site in the summit area was examined in a restricted randomized array of ten one-meter squared quadrats.

Each 20 x 30 meter sample site was subdivided into a 10 by 10 grid of one hundred intersections, spaced 2 x 3 meters apart, as shown in the Site Maps (Figures 2 - 5). A random number array determined the x, y coordinates of grid intersections to be sampled for vegetation. The site stratification assured adequate distribution of samples; the random selection of sample locations within the stratification provided the component of objectivity required for many ecological analytic procedures.

Location Control

After long-term sites were generally located, one corner was selected as a geographic origin and a local point of reference for a subsequent site survey. For these corners, in each case on an outcropping of rock, a hole was drilled in the bedrock or a small paint mark was placed for reference through the survey period. Survey data were generated with respect to these local 'origin' locations, and the site was roughly set out with a tape and Brunton compass survey to ensure that it did not intersect trails or extend substantially off the cliffs in the area.

For the more demanding measurements required to establish sample locations, a laser theodolite (a Nikon DTM-5 Total Survey System) was used to survey each 20 x 30 meter site, and also each of ten randomized sample quadrats located within sites. Similarly, laser theodolite survey provided a linkage between samples sites and various permanent survey monuments in the summit area from previous cadastral surveys. Associated data are presented in Tables 1 - 5.

To locate 1-meter sample quadrats, coordinate pairs were specified by random numbers to identify ten grid intersections within each long-term site, with reference to a local grid survey origin. The chosen intersections determined the corner of the 1-meter sample quadrat frame closest to the survey origin of each long term site. For each long-term site, the survey origins are shown as the upper left corner (0,0) on Figures 2 - 5, and the approximate locations of each 1-meter sample quadrat are indicated by numbered squares distributed throughout.

After the field survey identified the nearest corner of the 1-meter sample, that corner and the opposite corner were marked with aluminum tags (or corresponding scratches in rock) for quadrat location reference through the vegetation analysis. Quadrat frame orientation was controlled by Brunton compass bearing, to make parallel the sides of the frame with the sides of the 20 x 30m sites. Tags marking corners were removed in two of the sites, and the balance of tags will be removed during the summer of 1995.

Floristic Sampling Method

A one-meter squared quadrat frame, divided by elastic cords into a 10-centimeter grid, provided the visual reference for generating frequency and cover scores for all species. Frequency was determined as the number of grid cells in which any parts of each taxon could be recognized. Cover was determined as the spatial extent of the plant canopy for each taxon, estimated with visual reference to the 1% area grid cells of the quadrat frame. Frequency and cover data were gathered in this way for ten fixed quadrats within each of four long-term sites. General observations of soil properties, local geomorphology, slope angle and aspect were also recorded at several quadrat locations within each long-term site.

Determinations of most cryptogams and several higher vascular plant vouchers from were obtained from regional botanical authorities. Selected voucher plant collections were prepared as herbarium specimens and catalogued.

Part 2 - Western Slopes Below Treeline

The sampling design for the investigation of the floristic composition of vegetation of the western slopes of Mt. Mansfield follows a random sampling scheme stratified by elevation.

Spatial Sampling Scheme

The number of sample sites examined on the western slopes reflects the scope of resources available for this project rather than an analytical optimum. Sample sites were restricted to areas adjacent to the existing trail network (which provided ease of access to the western slopes of the mountain) and located at approximately 200 foot elevation intervals, by altimetric survey.

Location Control

Hand-held analog aneroid Peet and digital Avocet altimeters were used at various times to locate sampling sites. Altimeters were reset on each field excursion at the trail-heads or other elevation control points, to compensate for local atmospheric conditions. Usually calibrations were made early in the day but sometimes corrections were made at the end of the day.

The use of topographic maps as trailhead elevation controls suggests that an absolute accuracy of measurements of plus or minus one 200-foot interval is realistic, although the relative elevation measurements for any particular trail should

be considerably more accurate. No analysis of accuracy or precision of elevation measurements was attempted.

At nominal 200 foot elevation intervals on various trails, belt transects were oriented normal to the trail and extending away from the trail at an azimuth recorded as 'transect azimuth'. Transects were extended on the upslope side of trails to avoid confounding the local vegetation conditions with the direct environmental effects of trail disturbance (which mostly occurs downslope from the trail). The origin of each belt transect was located off the trailside by five meters on the upslope side in order to avoid invading ruderal species sometimes associated with trailside disturbance.

Floristic Sampling Method

Twenty-five belt transects of twenty-five meters in length and one meter in width were positioned upslope from and normal to the chosen locations on each sampled trail. Within each belt transect, comprehensive presence/absence data were collected for all visible species of the higher vascular flora, and also for the most abundant visible cryptogams.

At two random locations along each belt transect, additional vegetation sample quadrats of one square meter were positioned to survey the herb-level flora. Within each quadrat frame frequency and cover data for all visible species were gathered; 50 quadrats were assessed in this manner. For sampling conducted in 1994, a third random site was located on the belt transect, a ten-meter diameter area for sampling tall shrubs and trees was positioned. The data acquired in these samples included stem counts in two dbh classes: less than 2cm dbh and greater than 2cm dbh, by species.

Determinations of most cryptogams and several higher vascular plant vouchers were obtained from regional botanical authorities. Selected voucher plant collections were prepared as herbarium specimens and catalogued.

Results

Part 1 - Long-term Sites in the Summit Area

Site Location Data

Four long-term study sites have been established in the summit area by laser theodolite survey. They include one near the summit of the Chin, one on the highest part of the West Chin, and two between the base of the cliff at the West Chin and the trail junctions at Thunderbolt Gap (see Figure 1). All long-term sites except the West Chin Top site, (which is the most easily referenced to existing local survey monuments) have been informally monumented in one or more corners with small drilled holes in bedrock, into several of which were cemented steel bolts.

Ten vegetation sampling quadrats within each long-term sites were arrayed in a random scheme and mapped using Adobe software. A field survey of sample quadrats was done with the laser theodolite, following the radial coordinates calculated for each (see Tables 1 - 5). Because the terrain is not flat, the unpredictable vertical coordinates were measured in the field, and are tabulated either as X,Y,Z coordinates with reference to the Long-term site map or as angles and distances from the local coordinate origin of the site.

Vegetation Data

Vegetation sampling (species list, frequency and cover scores) was completed at 40 quadrats in the four long-term sites. The average field time required (on-site) to evaluate the vegetation of a quadrat is 3 hours, most of this time being in the examination of cryptogams. Determinations of cryptogams and a few of the higher vascular vouchers from were completed in early 1995. Several cryptogams species, while visually differentiable in the field, were subsequently not identifiable, due to the small amount of material collected or the sterile or obscure state of the collection.

Several cryptogams display such plasticity or morphological variations through various stages in their life history that they were scored and collected in the field as potentially separable taxa, and their scores were later combined following determination to the same species. This difficulty seems unavoidable, as the identification of many cryptogamic taxa requires laboratory analyses, mainly microscopic study and chemical tests. Consequently, the cryptogamic data do reflect revisions following determinations. For cases in which two sets of scores were found to represent a single taxon, the larger of the two frequency scores has been retained as the frequency datum, but the corresponding two cover scores were added to yield a combined cover score. This method results in conservative frequency scores but

will avoid errors of overestimation. The corresponding errors of omission, in which two or more taxa were combined in the field and scored as a single taxon, remain unrecognized in this study; however, it is a virtual certainty that such errors have occurred despite efforts to avoid them.

Physical Site Data are presented in Table 15. The slope and aspect measurements are consistent with the apparent highly irregular surface in the summit area. Soil pH data indicate that the mountain soils are strongly acidic and that a similar soil series mantles the entire summit area; variations are minor. Data in Table 15 include mean pH scores to characterize alpha-type variations, in view of a single soil series being sampled, and median pH scores in view of the possibility of beta-type variations that would occur with more than one soil type in the area. The similarities of mean (as log mean antilog) and median scores suggest a limited variation in soil acidity in the summit area.

Part 2 - The Western Slopes

Site Location Data

Sample site location data are presented in Tables 10 - 14 together with the respective vegetation data.

Vegetation Data

Vegetation sampling (species list, frequency and cover scores) was completed at 50 quadrats in 25 belt transects on the Western Slopes. Determinations of cryptogams and a few of the higher vascular vouchers from were completed in early 1995. Several cryptogams and a few of the higher vascular plants were not identifiable due to the small amount of material collected or the sterile or obscure state of the collection. In Part 2 of the study especially, errors of omission are to be expected in the species list, as some ephemeral species may not have been visible among the ground flora of the montane forest at various sampling times.

Tables 10 - 14 list the taxonomic identity and associated presence data (belt transects) and frequency data (quadrat samples) by sample site, trail, and elevation. In these tables, the list of species without numeric scores (indicated **Pr**) comprise presence/absence data within the 25 x 1 meter belt transect.

Discussion

Vegetation of the Summit Area

This Cooperative Grant Agreement concerns the acquisition and transfer of data in the context of monitoring, and does not include a plant community analysis or gradient analysis *per se*. Nonetheless, it is clear that the tundra vegetation of Mt. Mansfield is characterized by two predominant vegetation types with variations from place to place. Moreover, the plant communities of the alpine zone of Mt. Mansfield appear to be rather different from those of peaks in either the adjacent White Mountains or the Adirondacks, particularly with regard to the following two plant associations.

Vaccinium - Cetraria - Carex Association.

Characterized in a general way by Bowley (1978) in the report of his research on lichen distributions in the area, the association of the Ericaceous shrub *Vaccinium uliginosum* and the lichen *Cetraria islandica* is apparent in the data from each site. These two taxa are generally found together, the lichen intertwined with the stems of the heath. Other frequent associates are *Carex Bigelowii* and *Vaccinium boreale*. In many areas adjacent to *V. uliginosum* colonies, *Polytrichum juniperinum* is prominent. The resulting association is characteristic of parts of the alpine zone in which organic soils are found to be relatively stable.

Rhizocarpon - Arctoparmelia - Lecanora - Mycoblastus Association

A second association of plant species in the alpine area is comprised of four common crustose lichen taxa, and predominates exposed rocky surfaces. Within this group, however, the distribution of each is not identical; they appear to be subtly controlled by the microclimatic conditions associated with microtopography

Rhizocarpon geographicum is typically found in the most exposed locations, associated by Bowley (1978) with typically less than 6-inches of snow in winter. *Lecanora* thrives in much the same conditions as *R. geographicum*. Conversely, *Arctoparmelia centrifuga* appears to be characteristic of sheltered rock facets offering some protection from the combined effects of wind and sun. *Mycoblastus sanguinarius* seems to thrive in a wide range of intermediate site conditions.

The rocky terrain of the summit area displays a microtopography in which rock facets of windward or otherwise extreme exposure, suitable for *Rhizocarpon*, are coupled with adjacent more protected facets, suitable for *Arctoparmelia*, and also microsites that are of intermediate exposure. Consequently, these four lichen taxa do actually form a characteristic association, despite the subtle differences in the habitat requirements of each. It is important to note that many other species of lichens are widely mixed throughout this association of four characteristic genera.

Soils of the Summit Area

A general characterization of soils in the long-term sites indicates that there is relatively little variation in soil properties within the summit area of Mt. Mansfield. Bowley (1978:13) discussed the parent rock in the study area and speculated on the related mineralogy of the alpine soils, especially with regard to vegetation responses. Little other information is available from the literature.

The schist which comprises the local bedrock (Christman, 1959) throughout the summit area is extensively weathered into boulders and cobbles which protrude from the thin veneer of soils, resulting in a rough microtopography. These boulders and adjacent outcroppings tend to be extensively colonized by crustose lichens except where there is a recent history of anthropogenic disturbance. Weathering has also reduced the local rock into platy particles and fragments which comprise the mineral component of soils.

The soils of the summit area are predominately organic in character, uniformly acidic, azonal in structure and dark in color. Soil pH data presented in Table indicates that acidic soils are the norm in the summit area. Characteristically, the organic soil overlies mineral fragments but the components are not well mixed, indicating an early stage in pedogenesis.

Soils are anything but uniform in depth in the four long-term sites. The deepest soils were found in microtopographic depressions, and often were immediately adjacent to windswept and soil-free rocky surfaces. In areas where soils are unvegetated due to visitor traffic, there is a tendency for desiccation and surface cracking in dry periods.

Data Character

While neither analysis of plant communities and associations nor gradient analyses are an intended part of this report, it is, however, important to note that the data herein are appropriate for that use. All data presented are suitable for direct gradient analysis, ordination techniques (as reviewed by Gaugh, 1985) and analytic routines to reveal relationships between species or vegetation types and

environmental conditions. Floristic data, recorded as frequency and percent cover, provide importance values for each species in each sample quadrat. All vegetation sample data were acquired through a stratified random sampling method designed to satisfy that parametric requirement.

Location Control

As the purpose of carefully surveying long-term sites and the randomized quadrats that each contains was to ensure that future studies could retrieve the same locations, a partial resurvey of one site was conducted. The average variation between surveys for several quadrats was about 4 mm, and no error was greater than 1.0 cm.

Future Research

This study has generated biogeographic and ecological data which enable a better understanding of the character of the vegetation on the summit and western slopes of Mt. Mansfield. The data included in this report provide base-line research greatly needed both to recognize the existing vegetation and to enable an assessment of future changes should they occur. These data are expected to be widely applicable to conditions at similar elevations in many adjacent parts of the Green Mountains, for which there is also a paucity of data.

While the data presented in this study describe the vegetation of the long-term sites effectively and may prove to be very useful in future monitoring studies, they do concern only a very small part of the diverse tundra plant communities of the summit of Mt. Mansfield. In order to effectively monitor the status of the entire alpine zone of the mountain, a far more extensive sampling program is required. It is hoped that this study may be of benefit in the design of future efforts expanding vegetation research and monitoring into other parts of the unique Mt. Mansfield Alpine zone.

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Cooperative Grant Deliverables

Deliverables under this Cooperative Grant Agreement include:

Part 1

1. Vegetation Tables for each of four Long-term Vegetation Quadrats
Hard Copy and EXCEL spreadsheet on disk
2. General Soils Characterization for each Long-term Vegetation Quadrat
Hard Copy and EXCEL spreadsheet on disk
3. A Map of Sampling Points within each Long-term Vegetation Quadrat
Hard Copy
4. Detailed Location of Sample Sites
Hard Copy and EXCEL spreadsheet on disk.

Part 2

1. Vegetation Data for sample sites arrayed on an elevation gradient along the western slopes of Mt. Mansfield.
Hard Copy and EXCEL spreadsheet on disk.

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Figure 1 General Map of the Study Area

A section of the Green Mountain Club Map of the Mt. Mansfield Area and the Long Trail. Published by the Green Mountain Club, Waterbury, Vermont.

Approximate locations of long-term sites in the summit area are indicated in red.

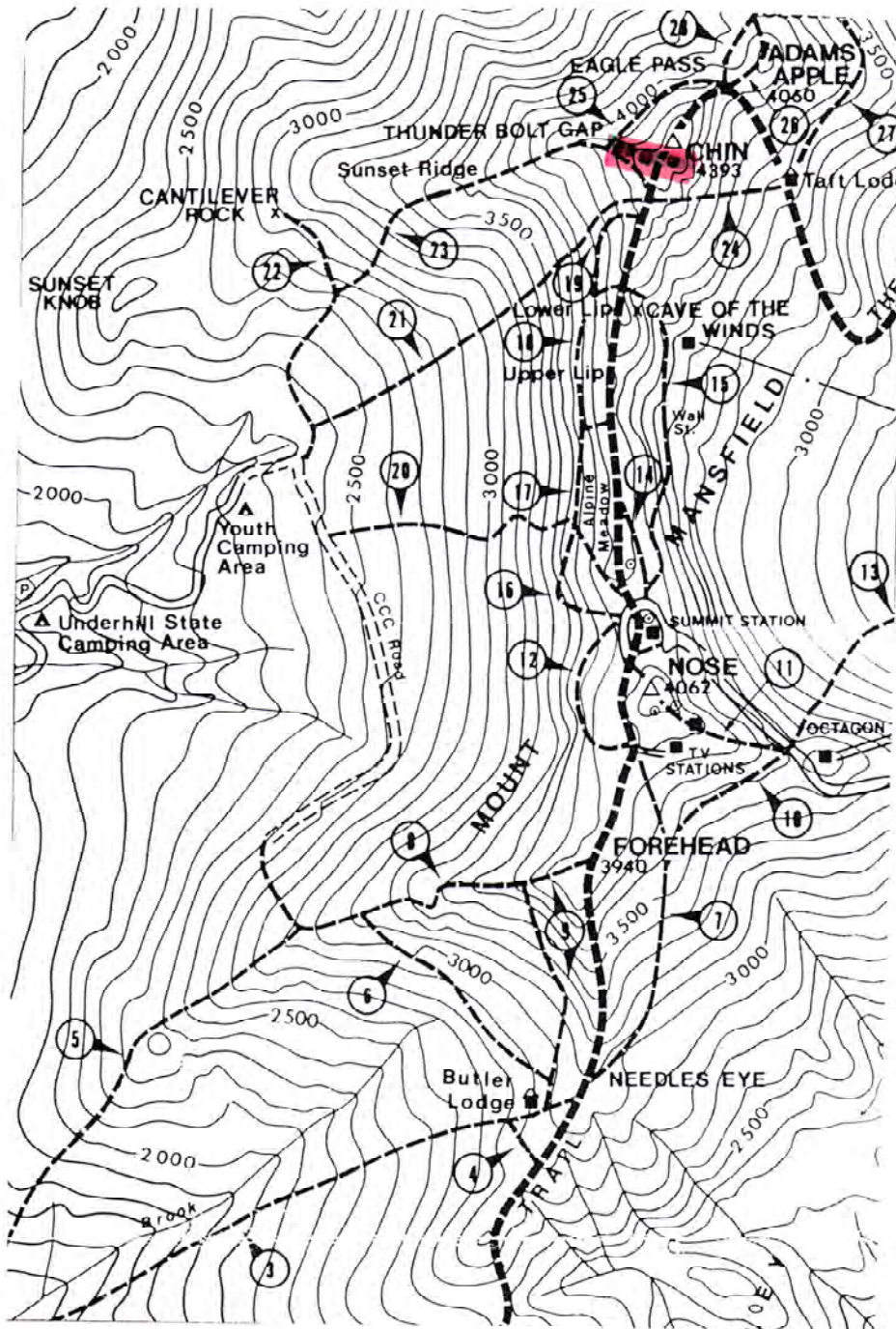


Figure 2
Summit Saddle Site - Quadrat Locations

-----> Azimuth 134°
0 2 4 6 8 10 12 14 16 18 20 meters

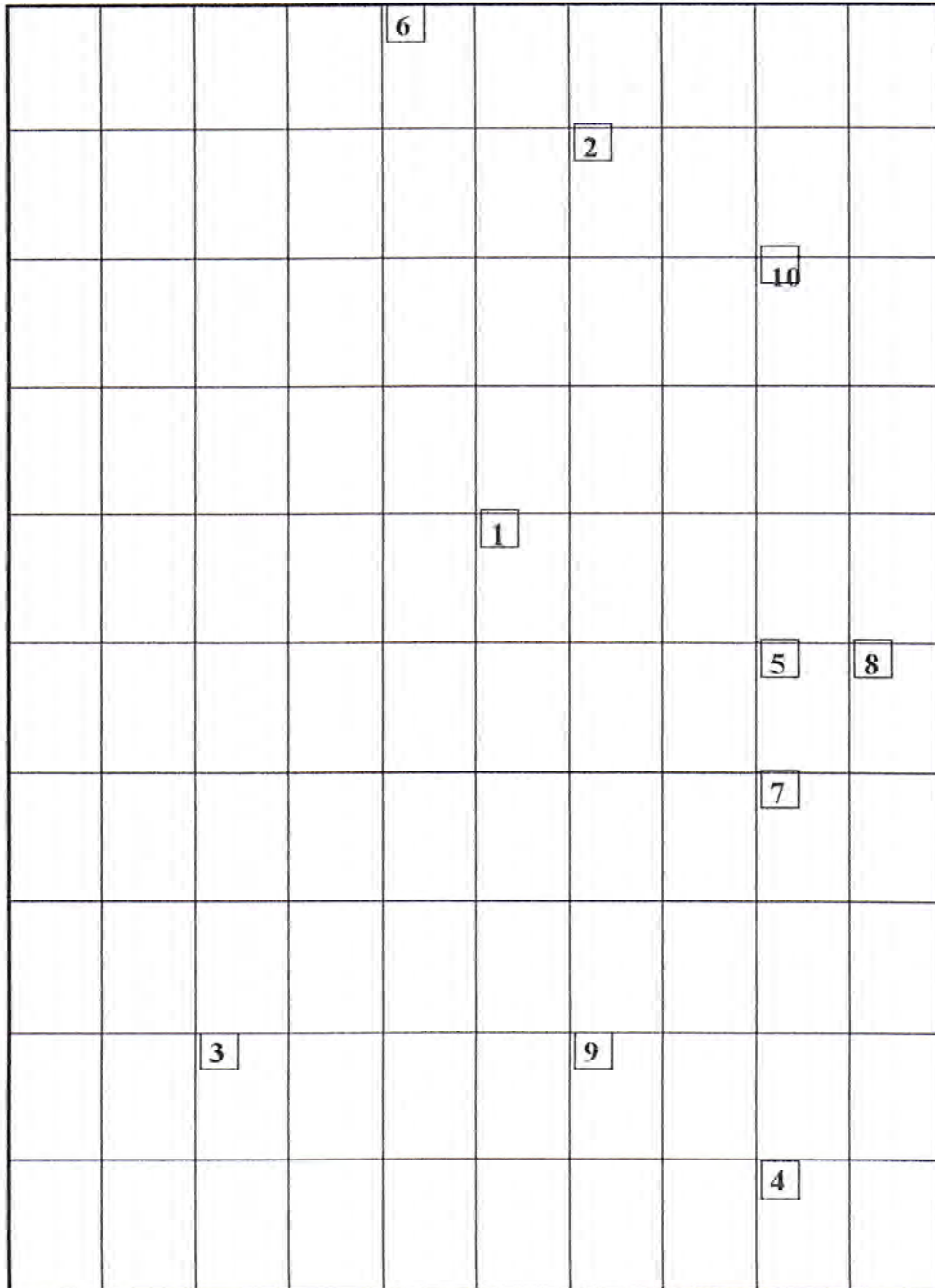


Figure 3
West Chin Top Site - Quadrat Locations

-----> Azimuth 34°
0 2 4 6 8 10 12 14 16 18 20 meters

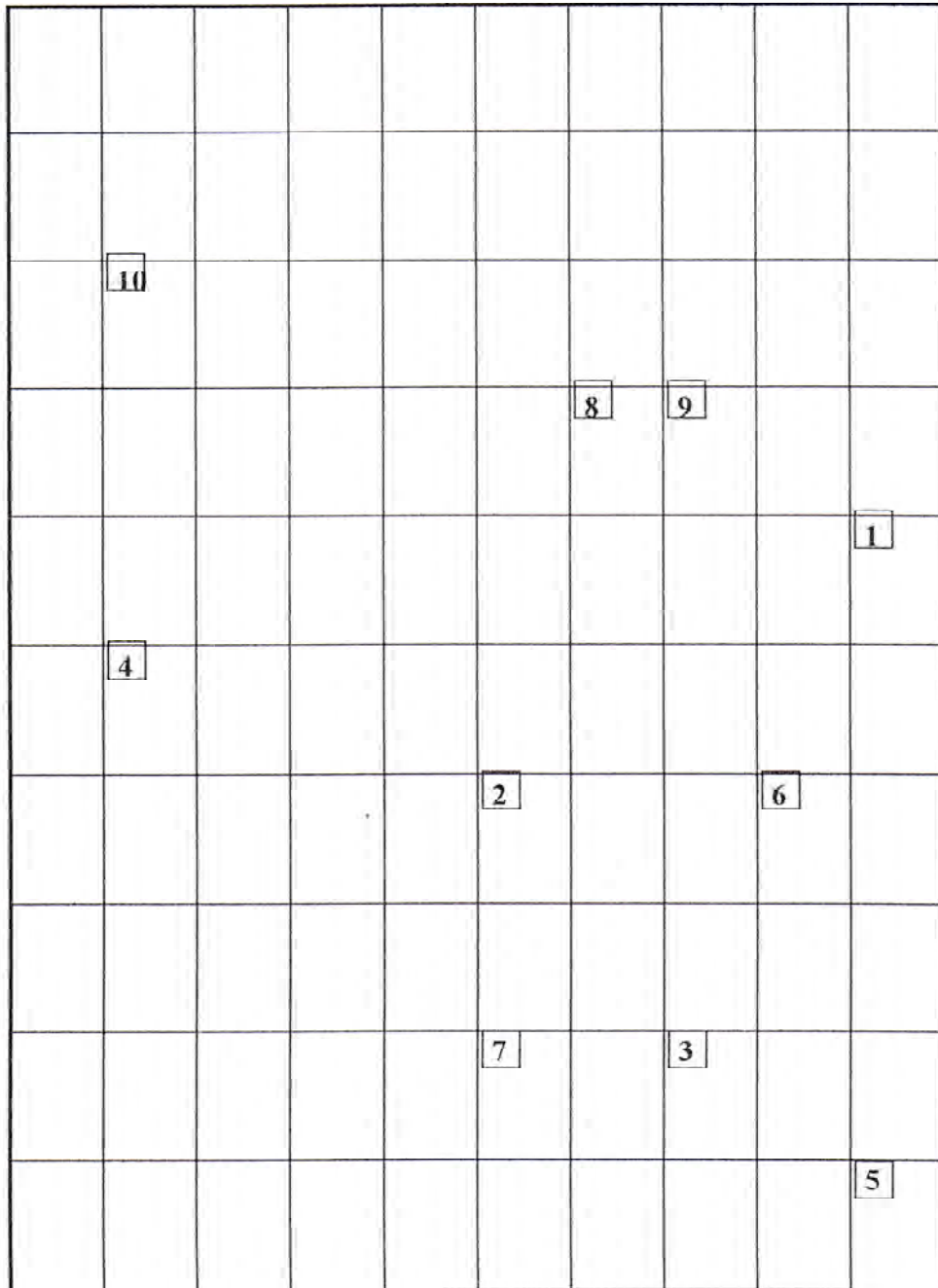


Figure 4
West Chin Low Site - Quadrat Locations

-----> Azimuth 201°
0 2 4 6 8 10 12 14 16 18 20 meters

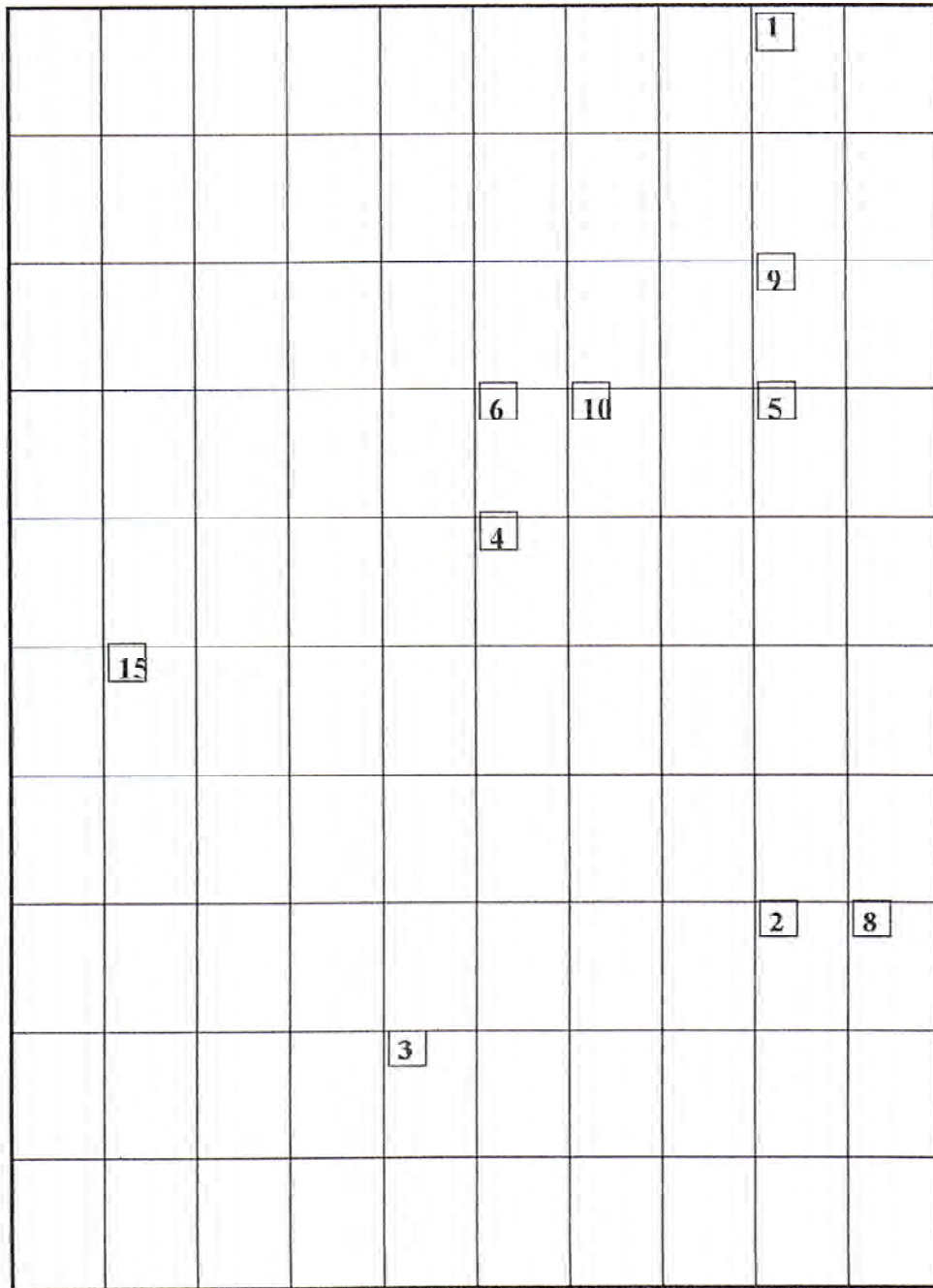
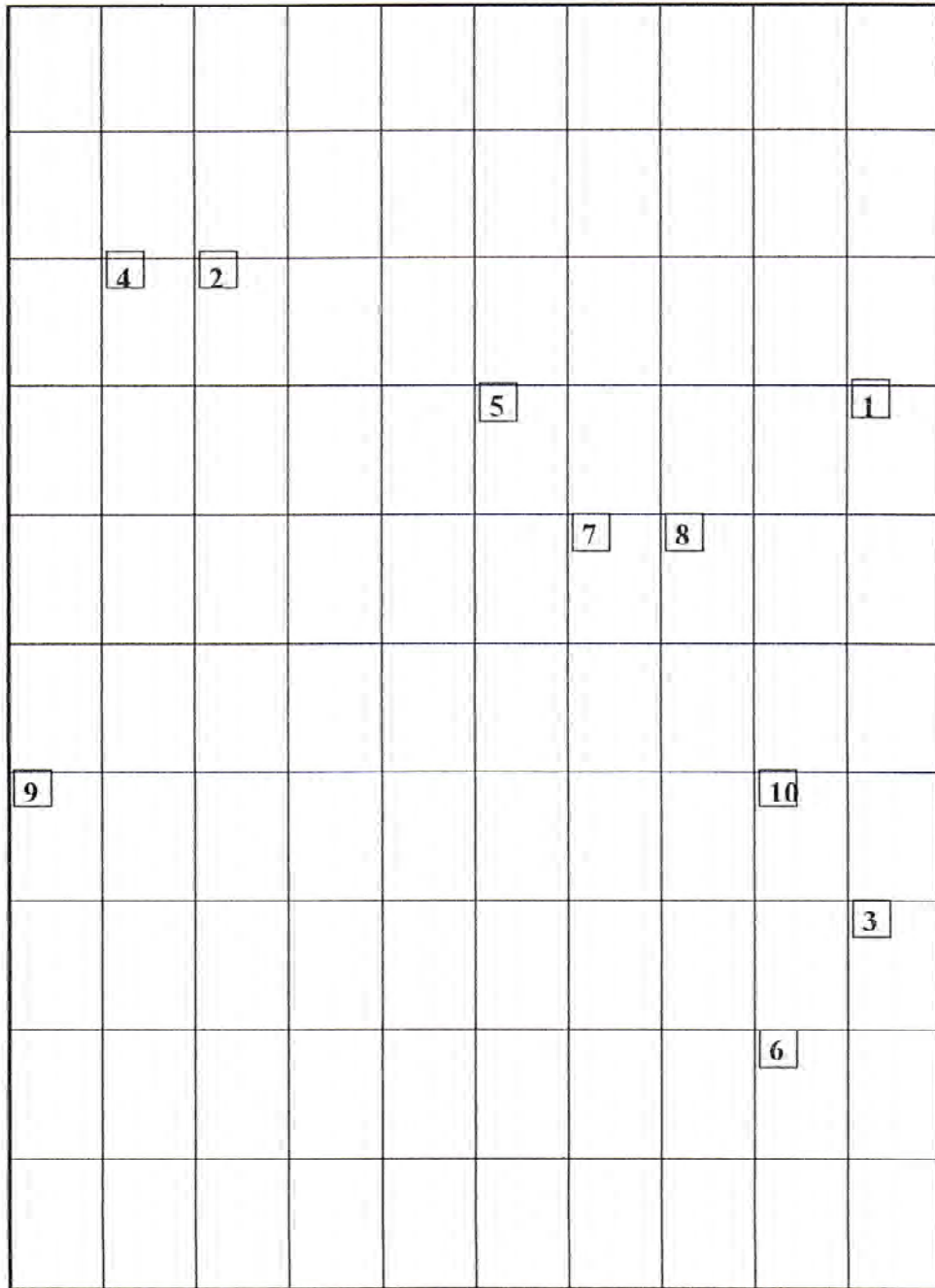


Figure 5
Thunderbolt Gap Site - Quadrat Locations

-----> Azimuth 190°
0 2 4 6 8 10 12 14 16 18 20 meters



Long-term Sites to Local Monuments
Reference Survey

Theodolite Location		Target Location	Distance Meters	Vertical Angle DMS	Horiz. Angle DMS	H-Angle Reference DMS	UVM/VCS Northing Meters	UVM/VCS Easting Meters	UVM Trig Elevation	VCS Northing Meters	VCS Easting Meters
Table 1 -General Location Control Data Based on NAD 1927											
		CHIN (UVM - Triangle hole)					745144.191	417937.917	4393.35		
		Chin-USCGS Monument							4393.349	745143.691	417937.917
Chin-USCGS Monument		MACBETH	94.09	352.18.25	123.03.05	W-Chin Pass Point					
Chin-USCGS Monument		SUNSET (monument hole)	154.085	356.23.20	336.16.55	W-Chin Pass Point					
Chin-USCGS Monument		W-Chin Pass Point	195.301	347.38.55	00.00.00	W-Chin Pass Point					
Chin-USCGS Monument		CHIN - UVM triangle/hole	0.5	0	180 magn	magnetic north					
		TERRYBETHS (UVM)					744737.883	417766.3	4359.6	744737.883	417766.3
		SUNSET (UVM)					744873.552	417472.865	4359.99	744873.552	417472.865
		MACBETH (UVM)					744874.695	417472.807	4351.2	744874.695	417472.807
W-Chin Pass Point		Origin West Chin Low	32.617		00.00.00	W. Chin Quad origin					
W-Chin Pass Point		Tower left			54.26.15	W. Chin Quad origin					
W-Chin Pass Point		Tower middle			55.14.45	W. Chin Quad origin					
W-Chin Pass Point		Tower right			55.46.40	W. Chin Quad origin					
W-Chin Pass Point		Origin Thunderbolt Gap Quad	43.283		156.33.00	W. Chin Quad origin					

Summit Saddle - Long-term Site
Reference Survey

Theodolite Location		Target Location		Based on NAD 1927			X-Coord	Y-Coord	Z-Coord	Rod H - Theo M
		Distance Meters	Vertical Angle DMS	Horiz. Angle DMS	H-Angle Reference DMS					
Chin-USCGS Monument	MACBETH	94.09	352.18.25	123.03.05	W-Chin Pass Point				0	
Chin-USCGS Monument	SUNSET (monument hole)	164.085	356.23.20	336.16.55	W-Chin Pass Point				0	
Chin-USCGS Monument	W-Chin Pass Point	195.301	347.38.55	00.00.00	W-Chin Pass Point				0	
Chin-USCGS Monument	CHIN - UVM triangle/hole	0.5	0	180 magn	magnetic north				0	
	TERRYBETHS (UVM)									
	SUNSET (UVM)									
	MACBETH (UVM)									
SUNSET (UVM, 1977)	Summit Saddle NW Corner	107.745	0.26.20	00.00.00	0				0.4	
SUNSET (UVM, 1977)	SW corner Summit Saddle Quadrat	87.596	0.14.25	13.01.05	0				0.4	
SUNSET (UVM, 1977)	Chin Brass Monument	164.662	3.42	337.21.10	0				0.4	
SUNSET (UVM, 1977)	TERRYBETHS (UVM)	98.739	0.11.55	32.31.10	0				0.4	
SUNSET (UVM, 1977)	Base of microwave tower		354.36.50	99.57.45	0				0.4	
SUNSET (UVM, 1977)	Summit Station Tower			97.20.45	0				0.4	
SUNSET (UVM, 1977)	Nose Tower (tallest)			96.37.00	0				0.4	
Summit Saddle Origin	NorthEast Corner from Origin	20	6.21.00	00.00.00	00.00.00	0	19.98	2.225	0.37	
Summit Saddle Origin	meter quad 1 - No-West Corner	15.621	355.13.00	50.11.40	20-meter 0-line	11.968	9.95	-1.301	0.37	
Summit Saddle Origin	meter quad 2 - No-West Corner	12.369	1.44.25	14.02.10	20-meter 0-line	3.006	11.992	0.376	0.37	
Summit Saddle Origin	meter quad 3 - No-West Corner	24.331	359.34.50	80.32.15	20-meter 0-line	24.249	4.03	-0.175	0.37	
Summit Saddle Origin	meter quad 4 - No-West Corner	31.384	2.2625	59.21.00	20-meter 0-line	26.989	15.96	1.336	0.37	
Summit Saddle Origin	meter quad 5 - No-West Corner	21.932	357.51.30	43.09.10	20-meter 0-line	15.287	16.275	-0.835	0.37	
Summit Saddle Origin	meter quad 6 - No-West Corner	8	5.51.40	00.00.00	20-meter 0-line	0	7.958	0.817	0.37	
Summit Saddle Origin	meter quad 7 - No-West Corner	24.083	358.52.15	48.22.00	20-meter 0-line	17.954	15.95	-0.474	0.37	
Summit Saddle Origin	meter quad 8 - No-West Corner	23.431	356.56.30	39.46.20	20-meter 0-line	15.162	18.201	-0.438	0.37	
Summit Saddle Origin	meter quad 9 - No-West Corner	26.833	1.44.00	63.26.05	20-meter 0-line	24	11.989	0.811	0.37	
Summit Saddle Origin	meter quad 10 - No-West Corner	17.088	2.07.10	20.33.20	20-meter 0-line	6.111	15.874	0.629	0.37	
Summit Saddle Origin	SUNSET 1970 (UVM, 1977)	107.745	359.57.40	129.33.00	20-meter 0-line	83.079	-68.608	-0.071	0.37	

West Chin Top - Long-term Site
Reference Survey

Theodolite Location		Target Location		Based on NAD 1927				X-Coord	Y-Coord	Z-Coord	Rod H - Theo M
Distance Meters	Vertical Angle DMS	Horiz. Angle DMS	H-Angle Reference DMS	X-Coord	Y-Coord	Z-Coord	Rod H - Theo M				
Chin-USCGS Monument	94.09	352 18.25	W-Chin Pass Point				0			0	
Chin-USCGS Monument	184.055	356 23.20	W-Chin Pass Point				0			0	
Chin-USCGS Monument	0.5	0	magnetic north				0			0	
SUNSET (UVM, 1977)	107.745	0 26.20	00.00.00	0	0	0	0.4			0.4	
SUNSET (UVM, 1977)	87.596	0 14.25	13.01.05				0.4			0.4	
SUNSET (UVM, 1977)	184.652	3.42	337.21.10				0.4			0.4	
SUNSET (UVM, 1977)	98.739	0 11.55	32.31.10				0.4			0.4	
SUNSET (UVM, 1977)		354 36.50	99.57.45				0.4			0.4	
SUNSET (UVM, 1977)			97.20.45				0.4			0.4	
SUNSET (UVM, 1977)			96.37.00				0.4			0.4	
W-Chin Top Origin	20	00.00.00	Corner	0	20						
W-Chin Top Origin	2.427	315.08.50	20-meter 0-line	-1.692	1.698	-0.336	0			0	
W-Chin Top Origin	16.778	262.23.20	20-meter 0-line	-18.622	-2.438	0.347	0			0	
W-Chin Top Origin	78.85	86.22.50	20-meter 0-line	78.705	fog	fog	0			0	
W-Chin Top Origin	152.94	3.58.05	20-meter 0-line	63.857	fog	fog	0.02			0.02	
W-Chin Top Origin	90.923	0 31.30	20-meter 0-line	66.55	61.785	0.833	0			0	
W-Chin Top Origin	22.016		20-meter 0-line	12	18.14	-3.468	0			0	
W-Chin Top Origin	22.709	60.56.55	20-meter 0-line	19.667	10.928	-3.061	0			0	
W-Chin Top Origin	27.912	59.44.40	20-meter 0-line	23.909	13.942	-3.521	0			0	
W-Chin Top Origin	15.11	84.24.20	20-meter 0-line	14.745	1.967	-2.626	0			0	
W-Chin Top Origin	32.504	56.18.35	20-meter 0-line	26.888	17.929	-3.498	0			0	
W-Chin Top Origin	24.083	48.21.60	20-meter 0-line	17.819	15.838	-2.694	0			0	
W-Chin Top Origin	25.902	67.22.50	20-meter 0-line	23.688	9.87	-3.548	0			0	
W-Chin Top Origin	15.069	36.52.10	20-meter 0-line	8.975	11.972	-1.802	0			0	
W-Chin Top Origin	16.623	32.44.10	20-meter 0-line	8.962	13.886	-1.887	0			0	
W-Chin Top Origin	6.325	71.33.55	20-meter 0-line	5.752	1.924	-1.78	0			0	

West Chin Low - Long-term Site
Reference Survey

Table 4 - West Chin Low Survey Data		Based on NAD 1927							
Theodolite Location	Target Location	Distance Meters	Vertical Angle DMS	Horiz. Angle DMS	H-Angle Reference DMS	X-Coord	Y-Coord	Z-Coord	Rod H - Theo M
	CHIN (UVM- Triangle hole) Chin-USCGS Monument								
Chin-USCGS Monument	MACBETH	94.09	352.18.25	123.03.05	W-Chin Pass Point				0
Chin-USCGS Monument	SUNSET (monument hole)	164.085	356.23.20	336.16.55	W-Chin Pass Point				0
Chin-USCGS Monument	W-Chin Pass Point	195.301	347.38.55	00.00.00	W-Chin Pass Point				0
Chin-USCGS Monument	CHIN - UVM triangle/hole	0.5	0	180 magn	magnetic north				0
W-Chin Pass Point	Origin West Chin Lower Quad	32.617		00.00.00	W. Chin Quad origin				0
W-Chin Pass Point	Tower/left			54.28.15	W. Chin Quad origin				
W-Chin Pass Point	Tower/middle			55.14.45	W. Chin Quad origin				
W-Chin Pass Point	Tower/right			55.48.40	W. Chin Quad origin				
W-Chin Pass Point	Origin Thunderbolt Gap Quad	43.283		156.33.00	W. Chin Quad origin				
West Chin Low Origin	SouthEast Corner from Origin	20	351.31.10	00.00.00	0				0
West Chin Low	NorthWest Corner from Origin	30	334.42.30	90.00.00	0				0
West Chin Low	meter quad 1- No-East Corner	16	351.42.55	00.00.00	0				0
West Chin Low	meter quad 2- No-East Corner	26.401	333.59.35	52.41.45	0				0
West Chin Low	meter quad 3- No-East Corner	25.298	333.40.40	71.33.55	0				0
West Chin Low	meter quad 4- No-East Corner	15.621	335.12.25	50.11.40	0				0
West Chin Low	meter quad 5- No-East Corner	18.358	336.27.05	29.21.30	0				0
West Chin Low	meter quad 6- No-East Corner	13.454	333.48.20	41.59.15	0				0
West Chin Low	meter quad 7- No-East Corner	15.133	332.26.50	82.24.20	0				0
West Chin Low	meter quad 8- No-East Corner	27.659	334.19.15	49.23.55	0				0
West Chin Low	meter quad 9- No-East Corner	17.088	342.09.55	20.33.20	0				0
West Chin Low	meter quad 10- No-East Corner	15	336.27.10	36.52.10	0				0

Thunderbolt Gap - Long-term Site
Reference Survey

Theodolite Location		Target Location		Based on NAD 1927				X-Coord	Y-Coord	Z-Coord	Rod H - Theo M
		Distance Meters	Vertical Angle DMS	Horiz. Angle DMS	H-Angle Reference DMS						
	CHIN (UVM - Triangle hole)										
	Chin-USCGS Monument										
	MACBETH	94.09	352.18.25	123.03.05	W-Chin Pass Point:					0	
	SUNSET (monument hole)	164.085	356.23.20	336.16.55	W-Chin Pass Point:					0	
	W-Chin Pass Point	195.301	347.38.55	00.00.00	W-Chin Pass Point					0	
	CHIN - UVM triangle/hole	0.5	0	180 magn	magnetic north					0	
	Origin West Chin Lower Quad	32.617		00.00.00	W. Chin Quad origin					0	
	Tower left			54.28.15	W. Chin Quad origin						
	Tower middle			55.14.45	W. Chin Quad origin						
	Tower right			55.48.40	W. Chin Quad origin						
	Origin Thunderbolt Gap Quad	43.283		156.33.00	W. Chin Quad origin						
	Thunderbolt Gap Origin	20		00.00.00	Corner		0	20			
	West Chin Bottom Origin	75.485	25.47.40	279.53.40	20-meter O-line					0	
	meter quad 1 - No-East Corner	20.125	342.35.00	26.33.55	20-meter O-line		8.596	17.193		0.3	
	meter quad 2 - No-East Corner	7.211	338.41.50	82.47.20	20-meter O-line		5.594	3.729	-2.662	0.3	
	meter quad 3 - No-East Corner	27.65	340.18.30	49.23.55	20-meter O-line		19.766	16.943	-9.32	0	
	meter quad 4 - No-East Corner	6.325	337.13.30	71.33.55	20-meter O-line		5.521	1.84	-2.444	0.3	
	meter quad 5 - No-East Corner	13.454	338.14.30	41.59.15	20-meter O-line		8.347	9.275		0.3	
	meter quad 6 - No-East Corner	28.884	340.21.15	56.18.35	20-meter O-line		22.64	15.093	-9.714	0.3	
	meter quad 7 - No-East Corner	16.971	337.56.35	45.00.00	20-meter O-line		11.12	11.12		0.3	
	meter quad 8 - No-East Corner	17.63	338.46.25	36.36.05	20-meter O-line		11.145	13.096		0	
	meter quad 9 - No-East Corner	18	335.57.35	90.00.00	20-meter O-line		16.441	0		0.3	
	meter quad 10 - No-East Corner	24.8	339.47.40	48.21.60	20-meter O-line		16.914	15.035	-8.329	0	

Table 6	Summit Saddle Site		Quadrat #		Field Study Year		Q1		Q2		Q3		Q4		Q5		Q6		Q7		Q8		Q9		Q10		Sum							
	Sum	% Fr	Sum	% C	Sum	% Fr	Sum	% C	Sum	% Fr	Sum	% C	Sum	% Fr	Sum	% C	Sum	% Fr	Sum	% C	Sum	% Fr	Sum	% C	Sum	% Fr	Sum	% C	Sum	% Fr	Sum	% C		
<i>Arenaria groenlandica</i>						2	0.3																											
<i>Carex Bigelovii</i>	100	21	94	37	25	3	70	8	80	8	42	17	97	12	37	3	96	15	65	26														
<i>Vaccinium uliginosum</i>	100	77	51	35	40	21	1	0.3	46	11	11	2	100	33	6	57	14	73	27															
<i>Vaccinium Vitis-Idaea</i>																																		
<i>Lycopodium selago</i>			9	0.5	3	0.1																												
<i>Arctoparmelia centrifuga</i>			17	2	38	10	15	0.5	18	1	19	2	4	0.8	3	0.3	3	0.3	1	0.1														
<i>Ceratodon purpureus</i>							19	0.5																										
<i>Cetraria islandica</i>	77	13			35	14	64	14	25	4	44	11	93	20																				
<i>Cladina rangiferina</i>							5	0.1																										
<i>Cladonia cocciferu</i>					2	0.1																												
<i>Cladonia gracilis</i>									13	0.8																								
<i>Cladonia pleurota</i>			32	0.3	10	0.3	33	0.5	61	1	20	1	22	0.3																				
<i>Cladonia squamosa</i> var. <i>squamosa</i>					2	0.1																												
<i>Cladonia uncialis</i>					8	0.3																												
<i>Fuscidia kochiana</i>					34	6	12	0.3	11	0.5																								
<i>Lecanora intricata</i>					7	0.3	9	0.4	3	3.3																								
<i>Lecidea platycarpa</i>																																		
<i>Mycoblastus sanguinarius</i>																																		
<i>Ophioparma lapponica</i>																																		
<i>Rhizocarpon geographicum</i>			9	1	64	13	14	0.3	11	2	72	50	1	0.1	36	3	5	0.3	21	3														
<i>Rhizocarpon hochstetteri</i>			8	0.3							56	3																						
<i>Umbilicaria hypoborea</i>			6	0.3			3	0.1			55	3																						
<i>Umbilicaria deusta</i>					42	NA			4	0.3																								
<i>Porpidia macrocarpa</i>									2	0.3																								

Summit Saddle Site - Page 2		Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
Quadrat #		Q 1	Q 2	Q 3	Q 4	Q 5	Q 6	Q 7	Q 8	Q 9	Q 10	Fr	Fr	Fr	Fr	Fr	Fr	Fr
SPECIES LIST		% C	% C	% Fr	% C	% Fr	% C	% Fr	% C	% Fr	% C	% Fr	% C	% Fr	% C	% Fr	% C	% Fr
	<i>Stereocaulon glaucescens</i>			2														
	<i>Stereocaulon paschale</i>			7											1			
	Crustose lichens - undetermined			30	6	1		4	55	10		4	0.3			1		
	<i>Dicranella sp.</i>															14		1
	<i>Dicranium fuscescens</i>	20	2															
	<i>Pleurozium schreberi</i>	6	0										2	0.1				
	<i>Polytrichastrum alpinum</i>			8				1										
	<i>Polytrichum formosum</i>												62	2				
	<i>Polytrichum juniperinum</i>		47	23	84	33			9	3.5		57	6		29	2	86	38
	Moss - undetermined			2				0.1				78	4					

Table 7		WCT		WCT		WCT		WCT		WCT		WCT		WCT		WCT		WCT		WCT		WCT		WCT		WCT		WCT		WCT		WCT		WCT		WCT		
West Chin Top		Q1	Q1	Q2	Q2	Q3	Q3	Q4	Q4	Q5	Q5	Q6	Q6	Q7	Q7	Q8	Q8	Q9	Q9	Q10	Q10	WCT		WCT		WCT		WCT		WCT		WCT		WCT		WCT		
Quadrat #		%Fr	%C	%Fr	%C	%Fr	%C	%Fr	%C	%Fr	%C	%Fr	%C	%Fr	%C	%Fr	%C	%Fr	%C	%Fr	%C	%Fr	%C	%Fr	%C	%Fr	%C	%Fr	%C	%Fr	%C	%Fr	%C	%Fr	%C			
SPECIES LIST		94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94		
Field Study Year																																						
<i>Arenaria groenlandica</i>		7	0.5	2	0.1							3	0.25			17	0.5	2	0.13																			
<i>Betula papyrifera</i>						3	0.5																															
<i>Carex Bigelowii</i>				23	1	99	15	64	14	44	4.5			95	11	71	4	62	6																			
<i>Ledum groenlandicum</i>						1	0.13	1	0.1																													
<i>Vaccinium boreale</i>				63	21			31	1.5																													
<i>Vaccinium uliginosum</i>		60	38	32	15	49	23	76	54	97	73	9	4	56	31	64	42	75	69																			
<i>Juncus trifidus</i>		12	1.75	16	4							12	2			24	8																					
<i>Picea rubens</i>				2	2																																	
<i>Lycopodium selago</i>																																						
<i>Lophozia</i> sp.																																						
<i>Arcioparmelia centrifuga</i>		32	3	6	0.5	1	0.1			4	0.13	2	0.33			4	0.13	28	4																			
<i>Cetraria cucullata</i>				2	0.1																																	
<i>Cetraria islandica</i>		46	13	38	7	43	4.5	51	15.5	88	31	12	2.5	19	2	33	8	65	42																			
<i>Cladina rangiferina</i>		35	10					13	1	1	0.1																											
<i>Cladonia coccifera</i>		15	0.25			41	4	21	1	10	0.5			4	0.1																							
<i>Cladonia pleurota</i>												11	0.1																									
<i>Cladonia pocillum</i>																																						
<i>Cladonia uncialis</i>		30	8	2	0.1	2	0.1	7	1	20	1	1	0.1	2	0.1	8	0.5	1	0.13																			
<i>Fuscidia kochiana</i>		4	0.06									18	0.75			5	0.25	8	0.25																			
<i>Lecanora intricata</i>				26	1			3	0.1	12	1	40	2	6	0.25	13	0.6	3	0.1	14	1																	
<i>Lecidea platycarpa</i>						2	0.1									21	0.5																					
<i>Mycoblastus sanguinarius</i>		5	0.33	28	3					12	1	15	2	11	2																							
<i>Normandina pulchella</i>								11	0.25																													
<i>Ophioparma lapponica</i>												6	1																									

West Chin Top - Page 2		WCT		WCT		WCT		WCT		WCT		WCT		WCT		WCT		WCT		WCT		WCT	
		Q1	Q1	Q2	Q2	Q3	Q3	Q4	Q4	Q5	Q5	Q6	Q6	Q7	Q7	Q8	Q8	Q9	Q9	Q10	Q10	WCT	WCT
SPECIES LIST		WCT	%Fr	WCT	%Fr	WCT	%Fr	WCT	%Fr	WCT	%Fr	WCT	%Fr	WCT	%Fr	WCT	%Fr	WCT	%Fr	WCT	%Fr	WCT	%Fr
Quadrat #																							
<i>Orphniospora moriopsis</i>											48	8					9	0.5					
<i>Porpidia macrocarpa</i>											1	0.1											
<i>Rhizocarpon geographicum</i>	30	3	28	1		4	0.25			6	0.25	90	17	4	0.1	17	1.5	35	4	36	5.5		
<i>Stereocaulon glaucescens</i>	1	0.1	6	0.33		1	0.06					7	0.5			1	0.13						
<i>Trapeliopsis gelatinosa</i>												1	0.33										
<i>Trapeliopsis granulosa</i>																							
<i>Umbilicaria hyperboria</i>												10	0.5										
<i>Umbilicaria deusta</i>	10	0.1	14	0.25								45	2	4	0.1	20	0.06	18	0.25	5	0.1		
Crustose lichens Undetermined	13	1	7	0.33						7	0.25	22	1.5	6	0.25			8	0.13	40	2.5		
<i>Andraea rupestris</i>												5	1										
<i>Dicranella heteromalla</i> cf.																						7	0.25
<i>Dicranella</i> sp.																						1	0.1
<i>Dicranum fuscescens</i>	7	0.25																					
<i>Dicranum montanum</i> (?)	5	0.1																					
<i>Dirichum</i> sp.																							
<i>Pleurozium schreberi</i>																						5	0.1
<i>Polytrichum formosum</i>			17	2																		16	0.5
<i>Polytrichum juniperinum</i>	13	0.06	15	9	88	37															70	41	
<i>Polytrichum pallidisetum</i>																						2	0.06
Moss undetermined																							

West Chin Low Long-term Site
Vegetation Data

Table 8 West Chin Low Quadrat # SPECIES LIST	Wes		Wes		Wes		Wes		Wes		Wes		Wes		Wes		Wes		Wes		Wes		Wes	
	Q1	Q1	Q2	Q2	Q3	Q3	Q4	Q4	Q5	Q5	Q6	Q6	Q7	Q7	Q8	Q8	Q9	Q9	Q10	Q10	Fr % C	Fr % C	Fr % C	Fr % C
Field Study Year	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92
<i>Arenaria groenlandica</i>	21	3											3	0.13			1	0.05						
<i>Beula papyrifera</i> var. <i>cordifolia</i>								1	0.1															
<i>Carex Bigelowii</i>	97	23	21	0.75			38	9	14	1			87	15	65	3								17
<i>Carex</i> sp.											1	0.13												
<i>Juncus trifidus</i>	3	0.33	11	0.75			15	0.5			1	0.13			45	2								
<i>Ledum groenlandicum</i>																								
<i>Potentilla tridentata</i>	10	0.5																						
<i>Trientalis borealis</i>	1	0.06											1	0.1										
<i>Vaccinium angustifolium</i> .																								
<i>Vaccinium uliginosum</i>	27	13	88	58	3	0.5	82	39	100	95	17	3			98	12								2
<i>Vaccinium Vitis-Idaea</i>	9	0.25	66	4					92	4	96	80	73	40	21	5								87
<i>Lycopodium selago</i>											52	9	52	3.5	96	9								54
<i>Andraea rupestris</i>							1	0.25																
<i>Arctoparmelia centrifuga</i>																								
<i>Cetraria islandica</i>																								
<i>Cladonia rangiferina</i>																								
<i>Cladonia coccifera</i>																								
<i>Cladonia pleurota</i>																								
<i>Cladonia pocillum</i>																								
<i>Cladonia uncialis</i>	0.1	0.1							4	0.1														
<i>Fuscidea kochiana</i>			8	0.08	26	3																		
<i>Lecanora intricata</i>			22	2	29	0.5	18	0.1																
<i>Mycoblastus sanguinarius</i>			11	0.1	10	1	11	0.06																
<i>Ophioparma lapponica</i>					2	0.1																		8
																								0.1

Table 9 Thunderbolt Gap Site SPECIES LIST	Thur		Thur		Thur		Thur		Thur		Thur		Thur		Thur		Thur		Thur		Thur	
	Q 1	Q 1	Q 2	Q 2	Q 3	Q 3	Q 4	Q 4	Q 5	Q 5	Q 6	Q 6	Q 7	Q 7	Q 8	Q 8	Q 9	Q 9	Q 10	Q 10	Q 10	Q 10
Field Study Year	% F	% C	% F	% C	% F	% C	% F	% C	% F	% C	% F	% C	% F	% C	% F	% C	% F	% C	% F	% C	% F	% C
<i>Abies balsamea</i>	100	91	1	0.1					3	0.5					41	36						
<i>Arenaria groenlandica</i>			4	0.1			20	2	11	0.3	6	0.1					15	0.5				
<i>Betula papyrifera</i>			2	0.3					9	1												
<i>Betula papyrifera</i> var. <i>cordifolia</i>	29	15					2	0.3					4	1								
<i>Carex Bigelowii</i>			43	4			27	3					22	1			5	0.5				
<i>Carex brunnescens</i>									23	3							7	1				
<i>Juncus trifidus</i>			25	1									7	0.5								
<i>Ledum groenlandicum</i>	3	0.1																		100	23	
<i>Vaccinium boreale</i>			12	0.5	90	33			32	3			70	5	80	10				91	25	
<i>Vaccinium uliginosum</i>	41	9	100	21	53	28	54	24	59	13	13	4.5	98	31	74	36	34	8	100	37		
<i>Vaccinium Vitis-Idaea</i>			19	0.5	18	1	8	0.3					28	1.5					50	3		
<i>Lycopodium annotinum</i>	16	1											70	11	82	21			90	28		
<i>Lycopodium selago</i>			9	0.3			20	2	16	0.3							2	0.1				
<i>Bazzania trilobata</i>													2	0.1								
<i>Arctoparmelia centrifuga</i>							15	1	12	1	42	4	9	1			9	2.5				
<i>Ceratodon purpureus</i>							2	0.3									35	6				
<i>Cetraria islandica</i>	1	0.1	58	21	82	34	30	19	36	7	30	1	78	36	71	55	22	6	28	6		
<i>Cladonia coccifera</i>													2	0.1			26	0.5				
<i>Cladonia pleurota</i>			22	0.1			14	0.1	13	0.5			20	1								
<i>Cladonia squamosa</i>													1	0.1								
<i>Cladonia uncialis</i>											4	0.1										
<i>Cladonia rangiferina</i>					82	34			8	1			20	1	45	4			28	6		
<i>Fuscidea recensa</i>									7	0.3												
<i>Hypogymnia physodes</i>	5	0.1																				
<i>Lasallia papulosa</i>											2	0.1										
<i>Lecanora intricata</i>			5	0.1			21	1.3	8	0.3	17	1	9	0.5			32	5				
<i>Lecidea platycarpa</i>			9	0.5			24	2														
<i>Mycoblastus sanguinarius</i>			2	0.1			3	0.1			19	2					32	5				
<i>Orphniospora moriopsis</i>											7	0.3										
<i>Propidia macrocarpa</i>									16	1.5												
<i>Protoparmelia badia</i>											19	1										

Thunderbolt Gap - Page 2

SPEIES LIST	Thur		Thur		Thur		Thur		Thur		Thur		Thur		Thur		Thur		Thur		Thur	
	Q 1	Q 1	Q 2	Q 2	Q 3	Q 3	Q 4	Q 4	Q 5	Q 5	Q 6	Q 6	Q 7	Q 7	Q 8	Q 8	Q 9	Q 9	Q 10	Q 10	Q 10	Q 10
Quadrat #	% F	% C	% F	% C	% F	% C	% F	% C	% F	% C	% F	% C	% F	% C	% F	% C	% F	% C	% F	% C	% F	% C
Crustose lichens - undetermined			1	0.1			10	0.5	14	1.5			13	1.8								
<i>Rhizocarpon geographicum</i>			2	0.1			22	2.5	20	3	72	13	33	4			21	3				
<i>Rhizocarpon badioatrum</i>																	25	0.5				
<i>Rhizocarpon hochstetteri</i>							20	2	14	0.3	7	1	8	0.1								
<i>Stereocaulon paschale</i>							4	0.3					2	0.1								
<i>Umbilicaria deusta</i>							32	1.5	22	0.5	46	6	8	0.3			7	1				
<i>Umbilicaria hyperborea</i>							10	1					2	0.3								
<i>Umbilicaria proboscidea</i>																	1	0.1				
<i>Dicranella</i> sp.									27	1												
<i>Dicranum montanum</i>											26	1										
<i>Dicranella heteromalla</i>											6	0.3										
<i>Pholia</i> sp.																	12	1			16	3
<i>Pleurozium schreberi</i>																						
<i>Pogonatum dentatum</i>			5	0.1																		
<i>Polytrichum alpinum</i>																						
<i>Polytrichum juniperinum</i>					19	1											24	5				
Mushroom - undetermined																	1	0.1				

Sample Site Number	1			2			3			4			5		
Trail	Sunset Ridge			Sunset Ridge			Sunset Ridge			Sunset Ridge			Sunset Ridge		
Elevation AMSL	2500ft			2700ft			2900ft			3000ft			3300ft		
Date	1-Jul-91*			1-Jul-91*			1-Jul-91*			2-Jul-91*			2-Jul-91*		
Taxon	P/A	Q1	Q2	P/A	Q1	Q2	P/A	Q1	Q2	P/A	Q1	Q2	P/A	Q1	Q2
<i>Azimuth Rnd#1 Rnd#2</i>	57	24	20	123	11	5	167	2	19	95	13	5	140	25	22
<i>Abies balsamea</i>	Pr			Pr		18	Pr	2		Pr			Pr		15
<i>Acer pensylvanicum</i>	Pr									Pr					
<i>Acer rubrum</i>	Pr														
<i>Acer spicatum</i>	Pr		14	Pr			Pr			Pr	22	3			
<i>Aralia nudicaulis</i>													Pr		
<i>Betula alleghaniensis</i>	Pr			Pr		6									
<i>Betula papyrifera</i>				Pr			Pr			Pr			Pr		
<i>Carex intumescens</i>										Pr					
<i>Cladonia squamosa</i>															
<i>Clintonia borealis</i>	Pr		26	Pr			Pr			Pr	16	12	Pr	6	24
<i>Cornus alternifolia</i>				Pr		10									
<i>Dennstaedtia punctilobula</i>							Pr			Pr	100	48			
<i>Dryopteris spinulosa</i>	Pr	6	16	Pr	23	17	Pr	20	15	Pr	4		Pr	74	81
<i>var. intermedia</i>										Pr					
<i>Juncus</i>													Pr		
<i>Lycopodium lucidulum</i>	Pr	96	55	Pr	41		Pr								
<i>Maianthemum canadense</i>	Pr		52	Pr	26		Pr	72	64				Pr		59
<i>Oxalis montana</i>	Pr	27	87	Pr	39		Pr						Pr	90	8
<i>Picea mariana</i>				Pr			Pr						Pr		
<i>Polypodium vulgare</i>				Pr		1									
<i>Prunus serotina</i>										Pr		25			
<i>Pteridium aquilinum</i>				Pr											
<i>Ribes cynosbati</i>				Pr		35									
<i>Rhus typhina</i>				Pr											
<i>Rubus allegheniensis</i>	Pr														
<i>Smilacina racemosa</i>				Pr											
<i>Solidago macrophylla</i>				Pr	10		Pr			Pr			Pr		
<i>Sorbus americana</i>										Pr			Pr	2	
<i>Sorbus decora</i>										Pr		23	Pr		
<i>Streptopus amplexifolius</i>	Pr	3		Pr											
<i>Thalictrum polygamum</i>				Pr											
<i>Tiarella cordifolia</i>				Pr											
<i>Trientalis borealis</i>	Pr		4												
<i>Trillium cernuum</i>				Pr			Pr			Pr					
<i>Trillium grandiflorum</i>	Pr														
<i>Tsuga canadensis</i>	Pr														
<i>Veratrum viride</i>				Pr						Pr		9			
<i>Viburnum alnifolium</i>	Pr	20		Pr	14		Pr								

Table 11 - Sites 6 - 10
Western Slopes of Mt. Mansfield

Sample Site Number	6			7			8			9			10		
Trail,	Sunset Ridge			Sunset Ridge			Sunset Ridge			L.Mansfield			LongTrail		
Elevation AMSL,	3500ft			3490ft			3700ft			1840ft			1900ft		
Date	2-Jul-91*			9-Jul-91*			9-Jul-91*			16-Jul-91*			16-Jul-91*		
Taxon	Pr/A	Q1	Q2	Pr/A	Q1	Q2	Pr/A	Q1	Q2	Pr/A	Q1	Q2	Pr/A	Q1	Q2
<i>Abies balsamea</i>	Pr	84	100	Pr	27	100	Pr			Pr					
<i>Acer pensylvanicum</i>										Pr	1		Pr		
<i>Acer rubrum</i>										Pr					
<i>Acer spicatum</i>										Pr			Pr		
<i>Arenaria groenlandica</i>							Pr								
<i>Betula alleghaniensis</i>										Pr	3		Pr		
<i>Betula papyrifera</i>	Pr	12		Pr											
<i>Brotherella recurvans</i>													Pr		
<i>Calamagrostis canadensis</i>							Pr								
<i>Carex sp.</i>	Pr														
<i>Cladonia coniocraea</i>														Pr	
<i>Cladonia cristatella</i>				Pr											
<i>Cladonia sp</i>							Pr	2							
<i>Clintonia borealis</i>	Pr			Pr	6	7	Pr			Pr	16	10	Pr		17
<i>Coptis groenlandica</i>	Pr			Pr	18	8				Pr					
<i>Cornus canadensis</i>	Pr			Pr			Pr								
<i>Dennstaedtia punctilobula</i>	Pr														
<i>Dryopteris spinulosa</i>						14									
<i>var. americana</i>				Pr											
<i>var. intermedia</i>										Pr	32	9	Pr	91	45
<i>Gaultheria hispidula</i>	Pr														
<i>Hypnum pallescens</i>													Pr		
<i>Hylocomium splendens</i>													Pr		3
Lichen - undetermined				Pr	19		Pr	66							
<i>Lycopodium annotinum</i>				Pr			Pr	3	24						
<i>Lycopodium lucidulum</i>										Pr	75	100	Pr	13	41
<i>Maianthemum canadense</i>	Pr			Pr		27				Pr	65	91			
<i>Monotropa uniflora</i>										Pr		1			
Moss - undetermined				Pr	85	82									
<i>Nemopanthus mucronata</i>				Pr		16									
<i>Oxalis montana</i>				Pr						Pr	62	74	Pr	12	74
<i>Picea mariana</i>															
<i>Picea rubens</i>										Pr					
<i>Plagiothecium laetum</i>													Pr		

Table 11 - Sites 6 - 10
Western Slopes of Mt. Mansfield

Sample Site Number	6			7			8			9			10		
Trail,	Sunset Ridge			Sunset Ridge			Sunset Ridge			L.Mansfield			LongTrail		
Elevation AMSL,	3500ft			3490ft			3700ft			1840ft			1900ft		
Date	2-Jul-91*			9-Jul-91*			9-Jul-91*			16-Jul-91*			16-Jul-91*		
Taxon	Pr/A	Q1	Q2	Pr/A	Q1	Q2	Pr/A	Q1	Q2	Pr/A	Q1	Q2	Pr/A	Q1	Q2
<i>Potentilla tridentata</i>							Pr								
<i>Salix sp.</i>	Pr														
<i>Sorbus americana</i>	Pr			Pr	2										
<i>Spirea latifolia</i>							Pr								
<i>Streptopus amplexifolius</i>													Pr	4	24
<i>var. perspectus</i>										Pr					
<i>Thelypteris Phegopteris</i>													Pr	2	
<i>Thuidium delicatulum</i>													Pr		
<i>Trientalis borealis</i>				Pr						Pr					
<i>Trillium cernuum</i>										Pr			Pr	11	
<i>Trillium undulatum</i>													Pr		
<i>Vaccinium angustifolium</i>	Pr														
<i>var. angustifolium</i>				Pr			Pr	94	100						
<i>var. laevifolium</i>				Pr		100									
<i>Vaccinium uliginosum</i>							Pr		33						
<i>Vaccinium vitis-idaea</i>							Pr								
<i>Viburnum alnifolium</i>										Pr			Pr	1	1

Sample Site Number	12			13			14			15		
Trail,	Halfway House			Halfway House			Halfway House			Halfway House		
Elevation AMSL,	3800ft			3600ft			3400ft			3200ft		
Date	17-Jul-91*			17-Jul-91*			18-Jul-91*			18-Jul-91*		
Taxon	Pr/Ab	Q1	Q2	Pr/Ab	Q1	Q2	Pr/Ab	Q1	Q2	Pr/Ab	Q1	Q2
Azimuth Rnd#1 Rnd#2	163	15	8	204	16	6	185	25	22	33	17	23
<i>Abies balsamea</i>	Pr	31	25	Pr	16		Pr			Pr	7	1
<i>Aster acuminatus</i>				Pr		6	Pr			Pr		
<i>Aulacomnium palustre</i>												
<i>Bazzania trilobata</i>							Pr					
<i>Betula papyrifera</i>	Pr			Pr	30		Pr			Pr		
<i>Brotherella recurvans</i>	Pr			Pr		13	Pr	8	14	Pr	50	57
<i>Carex intumescens</i>				Pr								
<i>Carex trisperma</i>				Pr								
<i>Cladonia chlorophaea</i>	Pr	37										
<i>Cladonia coniocraea</i>							Pr					
<i>Cladonia macilenta</i>	Pr											
<i>Cladonia squamosa</i>	Pr		9				Pr					
<i>Clintonia borealis</i>	Pr	21	59	Pr		54	Pr	63	23	Pr	8	4
<i>Coptis groenlandica</i>	Pr		25									
<i>Cornus canadensis</i>	Pr			Pr		21						
<i>Dennstaedtia punctilobula</i>										Pr		
<i>Dicranum fuscescens</i>							Pr			Pr	24	
<i>Dicranum montanum</i>							Pr					
<i>Dicranum scoparium</i>	Pr		80				Pr	4				
<i>Ditricum pallidum</i>							Pr	3				
var. americana	Pr		23	Pr		60	Pr	79	53	Pr	11	
<i>Eupatorium maculatum</i>												
Grass - sterile				Pr	61							
<i>Hypogymnia physodes</i>	Pr	4					Pr					
<i>Lycopodium lucidulum</i>	Pr			Pr		18	Pr	22	15	Pr	2	32
<i>Brotherella recurvans</i>	Pr	2										
<i>Polytrichum commune</i>				Pr	64							
<i>Nemopanthus mucronata</i>	Pr											
<i>Nowellia curvifolia</i>										Pr	13	
<i>Oxalis montana</i>	Pr	27	4	Pr	3	84	Pr	93	80	Pr	66	98
<i>Picea rubens</i>										Pr		
<i>Pleurozium schreberi</i>							Pr					
<i>Polytrichum commune</i>				Pr								

Sample Site Number	12			13			14			15		
Trail, Elevation AMSL	Halfway House			Halfway House			Halfway House			Halfway House		
	3800ft			3600ft			3400ft			3200ft		
Page 2 - Date	17-Jul-91*			17-Jul-91*			18-Jul-91*			18-Jul-91*		
Taxon	Pr/Ab	Q1	Q2	Pr/Ab	Q1	Q2	Pr/Ab	Q1	Q2	Pr/Ab	Q1	Q2
Azimuth Rnd#1 Rnd#2	163	15	8	204	16	6	185	25	22	33	17	23
<i>Polytrichum ohioense</i>	Pr			Pr		18	Pr	4	6			
<i>Prunus pennsylvanica</i>	Pr											
<i>Ribes glandulosum</i>				Pr						Pr		
<i>Rubus allegheniensis</i>	Pr	11										
<i>Scapania nemorosa</i>				Pr								
<i>Solidago mucronata</i>	Pr		1									
<i>Sorbus americana</i>	Pr	8		Pr	25		Pr			Pr	5	1
<i>Sphagnum girgensohnii</i>	Pr	73		Pr	67	20	Pr					
<i>Sphagnum russowii</i>				Pr			Pr					
<i>Sphagnum squarrosum</i>				Pr								
<i>Thelypteris Phegopteris</i>				Pr						Pr		
<i>Trientalis borealis</i>	Pr		81									
<i>Trillium undulatum</i>							Pr					

Table 13 - Areas 16 - 20
Western Slopes of Mt. Mansfield

Sample Site Number	16			17			18			19			20		
Trail,	Sunset Rdg			Butler Lodge			Proctor Ctr			Proctor Ctr			Maple Rdg		
Elevation AMSL,	3910ft			2800ft			1400ft			1400ft			3600ft		
Date	31-Jul-91*			1-Aug-91*			2-Aug-91*			2-Aug-91*			12-Aug-91*		
Taxon	Pr/A	Q1	Q2	Pr/A	Q1	Q2	Pr/A	Q1	Q2	Pr/A	Q1	Q2	Pr/A	Q1	Q2
<i>Azimuth</i> Rnd#1 Rnd#2	45	12	18	183	11	17	101	19	23	54	5	17	225	5	13
<i>Abies balsamea</i>	Pr	65	37	Pr			Pr			Pr			Pr	66	100
<i>Acer pensylvanicum</i>				Pr	4	3	Pr								
<i>Acer saccharum</i>							Pr		4	Pr					
<i>Acer spicatum</i>				Pr			Pr		3						
<i>Aralia nudicaulis</i>				Pr											
<i>Arenaria groenlandica</i>	Pr														
<i>Aster acuminatus</i>				Pr									Pr		
<i>Athyrium Filix-femina</i>							Pr		96	Pr					
<i>Athyrium thelypteroides</i>							Pr			Pr					
<i>Betula alleghaniensis</i>				Pr			Pr			Pr		1			
<i>Betula papyrifera</i>	Pr			Pr			Pr			Pr			Pr		
<i>Brotherella recurvans</i>				Pr	8								Pr		6
<i>Calamagrostis canadensis</i>							Pr								
<i>Carex intumescens</i>				Pr											
<i>Cetraria islandica</i>	Pr	25	95												
<i>Cichorium intybus</i>										Pr					
<i>Cladina rangiferina</i>	Pr	25	95										Pr		
<i>Cladonia alpestris</i>	Pr														
<i>Clintonia borealis</i>				Pr	15	94									
<i>Cornus canadensis</i>	Pr														
<i>Deschampsia flexuosa</i>	Pr														
<i>Dicranum fuscescens</i>													Pr		100
<i>Dicranum scoparium</i>													Pr	20	
<i>Dryopteris spinulosa</i>										Pr		27			
<i>var. americana</i>				Pr	73	23									
<i>Fagus grandifolia</i>				Pr			Pr			Pr					
<i>Impatiens capensis</i>							Pr			Pr					
<i>Juncus trifidus</i>	Pr	6													
<i>Lycopodium annotinum</i>	Pr														
<i>Lycopodium lucidulum</i>	Pr			Pr	26	13									
<i>Lycopodium obscurum</i>										Pr					
<i>Lycopus uniflorus</i>							Pr			Pr					
<i>Maianthemum canadense</i>				Pr	95	88	Pr			Pr		1			
<i>Mitchella repens</i>										Pr	4				
<i>Onoclea sensibilis</i>							Pr	I		Pr					

<i>Osmunda Claytoniana</i>							Pr	48							
PAGE 2	16			17			18			19			20		
Trail,	Sunset Rdg			Butler Lodge			Proctor Ctr			Proctor Ctr			Maple Rdg		
Elevation AMSL,	3910ft			2800ft			1400ft			1400ft			3600ft		
Date	31-Jul-91*			1-Aug-91*			2-Aug-91*			2-Aug-91*			12-Aug-91*		
Taxon	Pr/A	Q1	Q2	Pr/A	Q1	Q2	Pr/A	Q1	Q2	Pr/A	Q1	Q2	Pr/A	Q1	Q2
<i>Azimuth</i> <i>Rnd#1</i> <i>Rnd#2</i>	45	12	18	183	11	17	101	19	23	54	5	17	225	5	13
<i>Oxalis montana</i>				Pr	46	74									
<i>Picea rubens</i>				Pr			Pr			Pr					
<i>Pleurozium schreberi</i>													Pr		100
<i>Polytrichum juniperinum</i>				Pr											
<i>Polytrichum ohioense</i>				Pr	8										
<i>Potentilla tridentata</i>	Pr														
<i>Ptilidium ciliare</i>													Pr	14	
<i>Rhizocarpon geographicum</i>	Pr														
<i>Solidago macrophylla</i>				Pr		6	Pr								
<i>Sorbus americana</i>				Pr											
<i>Sphagnum squarrosum</i>				Pr		17									
<i>Streptopus roseus</i>				Pr			Pr								
<i>Thelypteris Phegopteris</i>				Pr						Pr					
<i>Tiarella cordifolia</i>							Pr		46						
<i>Trillium cernuum</i>							Pr								
<i>Trillium undulatum</i>				Pr		7									
<i>Uvularia sessifolia</i>										Pr					
<i>Vaccinium angustifolium</i>	Pr	2											Pr	1	
<i>var. angustifolium</i>													Pr		
<i>var. laevifolium</i>													Pr		
<i>Vaccinium uliginosum</i>	Pr	72	85												
<i>Viburnum alnifolium</i>				Pr											

Table 14 - Areas 21 - 26
Western Slopes of Mt. Mansfield

Sample Site Number	21	22	23	24	25	26
Trail, Elevation AMSL, Date	Maple Rdg 3400ft 12-Aug-91* Pr/A Q1 Q2	Halfway House 2600ft 25-Jul-94* Pr/A Q1 Q2 >2 <2	Halfway House 2800ft 14-Sept-94* Pr/A Q1 Q2 >2 <2	Maple Rdg 3200ft 15-Sept-1994* Pr/A Q1 Q2 >2 <2	Maple Rdg 3000ft 12-Aug-91* Pr/A Q1 Q2 >2 <2	Maple Rdg 3800ft 19-Sept-94* Pr/A Q1 Q2 >2 <2
Taxon						
Azimuth Rnd#1Rnd#2 Rnd#3	0 5 20	24 22 24	0 2 9 3	335 3 18 19	30 9 17 7	110 7 10 25
<i>Abies balsamea</i>	Pr 6 47	2 1	1 10 4	Pr 2 5 22	Pr	Pr 7 9 14 7
<i>Acer pensylvanicum</i>		Pr 1	3 2			
<i>Acer spicatum</i>		Pr	Pr 2 1 1 8			
<i>Aralia nudicaulis</i>		Pr	Pr	Pr 1		Pr
<i>Aster acuminatus</i>		Pr 1				
<i>Athyrium Filix-femina</i>		Pr				
<i>Bazzania trilobata</i>					Pr 10	
<i>Betula alleghaniensis</i>		Pr 1 3 4	Pr 1 1			
<i>Betula papyrifera</i>	Pr 3 30	Pr 5	Pr 3	Pr 13		1 Pr 2 2 2
<i>Brotherella recurvans</i>	Pr 15					
<i>Carex inflata</i>		Pr 7				
<i>Cladonia grayi</i>					Pr 28	
<i>Cladonia rangiferina</i>	Pr 12				Pr 2	
<i>Cladonia alpestris</i>	Pr 5					Pr 98
<i>Cladonia chlorophaea</i>						
<i>Cladonia cristatella</i>		Pr 1				
<i>Cladonia furcata</i>						
<i>Cladonia merochlorophaea</i>					Pr 4	Pr 12
<i>Cladonia ochrochlora</i>		2		Pr 6		Pr 4
<i>Cladonia pleurota</i>	Pr 8					
<i>Cladonia squamosa</i>					Pr 8	
<i>Clintonia borealis</i>	Pr	Pr 9 27	Pr 16 1	Pr 5 12		Pr 26
<i>Copis groenlandica</i>	Pr			Pr		Pr
<i>Cornus canadensis</i>	Pr 2			Pr 8		1
<i>Demstaedia puntilobula</i>						
<i>Dicranum fuscescens</i>	Pr 79	Pr 4 3				
<i>Dicranum montanum</i>	Pr 5	Pr 4 11				

Table 14 - Areas 21 - 26
Western Slopes of Mt. Mansfield

PAGE 2		21	22	23	24	25	26
Trail, Elevation AMSL	MRT 3400ft	HHT 2600ft	HHT 2800ft	MRT 3200ft	MRT 3000ft	LCT 3800ft	
Elevation AMSL,	Maple Rdg	Halfway House	Halfway House	Maple Rdg	Maple Rdg	Laura Cowles	
TAXON	3400ft	2600ft	2800ft	3200ft	3000ft	3800ft	
	Pr/A Q1 Q2	Pr/A Q1 Q2 >2 <2	Pr/A Q1 Q2 >2 <2	Pr/A Q1 Q2 >2 <2	Pr/A Q1 Q2 >2 <2	Pr/A Q1 Q2 >2 <2	
<i>Dicranum polysetum</i>					Pr 27		
<i>Dicranum scoparium</i>		Pr 1		Pr	Pr 12 26		
<i>Gaultheria hispida</i>	Pr 5				Pr 1		
<i>Lycopodium lucidulum</i>		Pr 7 85	Pr 91 85	Pr			
<i>Maianthemum canadense</i>	Pr	Pr 58 26		Pr			
<i>Monotropa uniflora</i>		Pr 1		Pr			
<i>Nemophanthus mucronata</i>				Pr 2			
<i>Oxalis montana</i>		Pr 32	Pr 88	Pr			Pr 2
<i>Paraleucobryum longifolium</i>		Pr					
<i>Picea rubens</i>	Pr	Pr 2 1	Pr 1 1 2	Pr 3 6 21	Pr 2 10 37		
<i>Plagiothecium laetum</i>				Pr 20			
<i>Pleurozium schreberi</i>	Pr						
<i>Polytrichum pallidisetum</i>		Pr					
<i>Prilidium ciliare</i>	Pr 7						2 2
<i>Sambucus pubens</i>							
<i>Sorbus americana</i>	Pr	Pr 2 5	Pr 3	Pr 3 2 5 13	Pr 1	Pr 91	
<i>Sphagnum girgensohnii</i>							
<i>Streptopus amplexifolius</i>	Pr						
<i>Thelypteris Phegopteris</i>	Pr						
<i>Trientalis borealis</i>	Pr 1			Pr			Pr
<i>Trillium erectum</i>	Pr						
<i>Trillium undulatum</i>			Pr				
<i>Vaccinium angustifolium</i>	Pr 31						
<i>Vaccinium myrtilloides</i>	Pr 17				Pr 1 1		
<i>Viburnum alnifolium</i>		Pr 1 6 20	Pr 11 3				
<i>sphagnum</i> sp.				Pr 2			
moss - undetermined					Pr 33		

Table 15
Physical Site Conditions

Quadrat #	Summit Saddle		Summit Saddle		Summit Saddle		West Chin Top		West Chin Top		West Chin Top	
	Measured Soil pH	Max soil depth - cm	Slope Angle	Slope Aspect	Measured Soil pH	Max soil depth - cm	Slope Angle	Slope Aspect	Measured Soil pH	Max soil depth - cm	Slope Angle	Slope Aspect
1												
2	3.86	12	8	285	3.96	100	18	115				
3		12.5	20	340	3.57	130	4	220				
4	3.93	17	66	11	3.72	70	15	250				
5	3.82	16.5	9	340		116	4	15				
6	3.93	30	18	255		80	15	45				
7	3.87	12	4	10	3.76	125	0	0				
8		8.5	variable	variable		115	4	30				
9	3.82	18	11	25	4.32	9	15	30				
10	3.92	12	24	278		1.4	variable	variable				
Log Mean pH Antilog												
3.88												
Median pH												
3.87												
Quadrat #	Thunder-bolt Gap		Thunder-bolt Gap		Thunder-bolt Gap		West Chin Low		West Chin Low		West Chin Low	
	Measured Soil pH	Max soil depth - cm	Slope Angle	Slope Aspect	Measured Soil pH	Max soil depth - cm	Slope Angle	Slope Aspect	Measured Soil pH	Max soil depth - cm	Slope Angle	Slope Aspect
1	4.22	25	25	272	3.74	20	8	290				
2	4.14	12	26	265	3.89	10	15	252				
3		9	4	254		0	15	280				
4	3.9	10	24	307	4	21	39	255				
5		20	24	280	4.13	28	37	265				
6		10	4	254	3.65	10	6	285				
7	4.57	15	13	190		13	16	275				
8	4.1	18	23	237		17	20	250				
9		13	19	290	3.79	0	27	280				
10	4.05	26	8	280	4.48	15	10	270				
Log Mean pH Antilog												
4.12												
Median pH												
4.09												

Note: Plate of Summit Saddle Site - Quadrat 1 is unavailable.

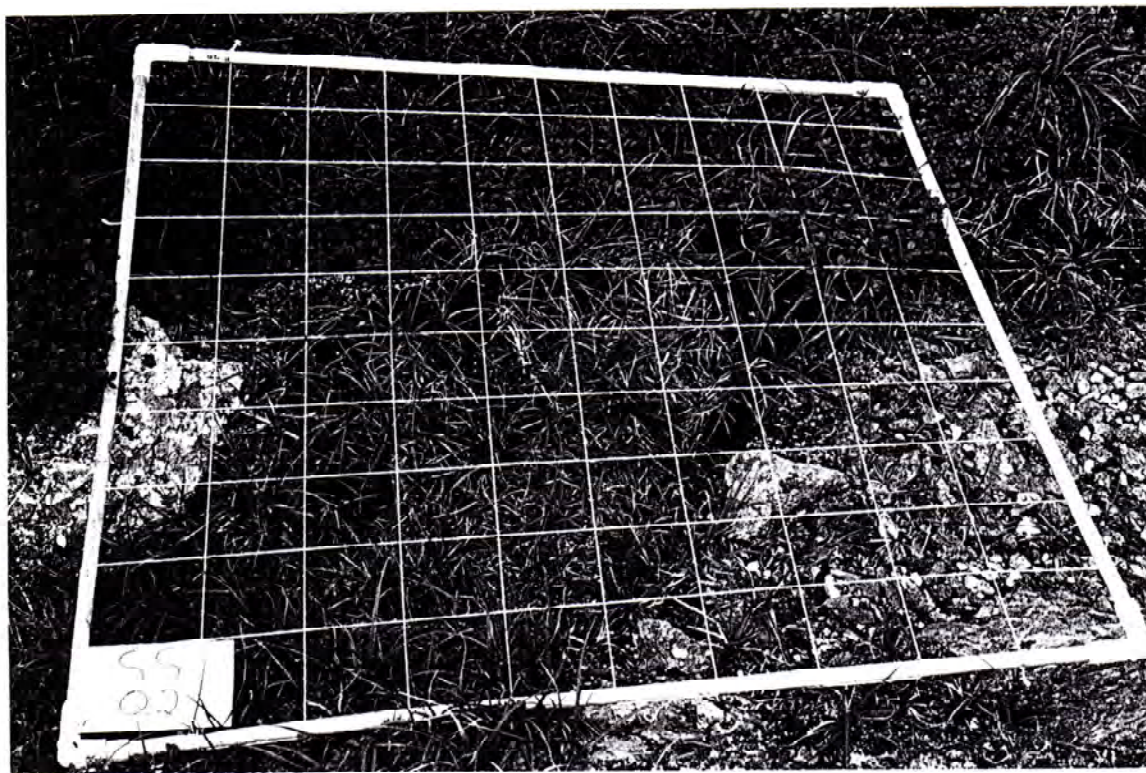


Plate 2 - Summit Saddle: Quadrat 2

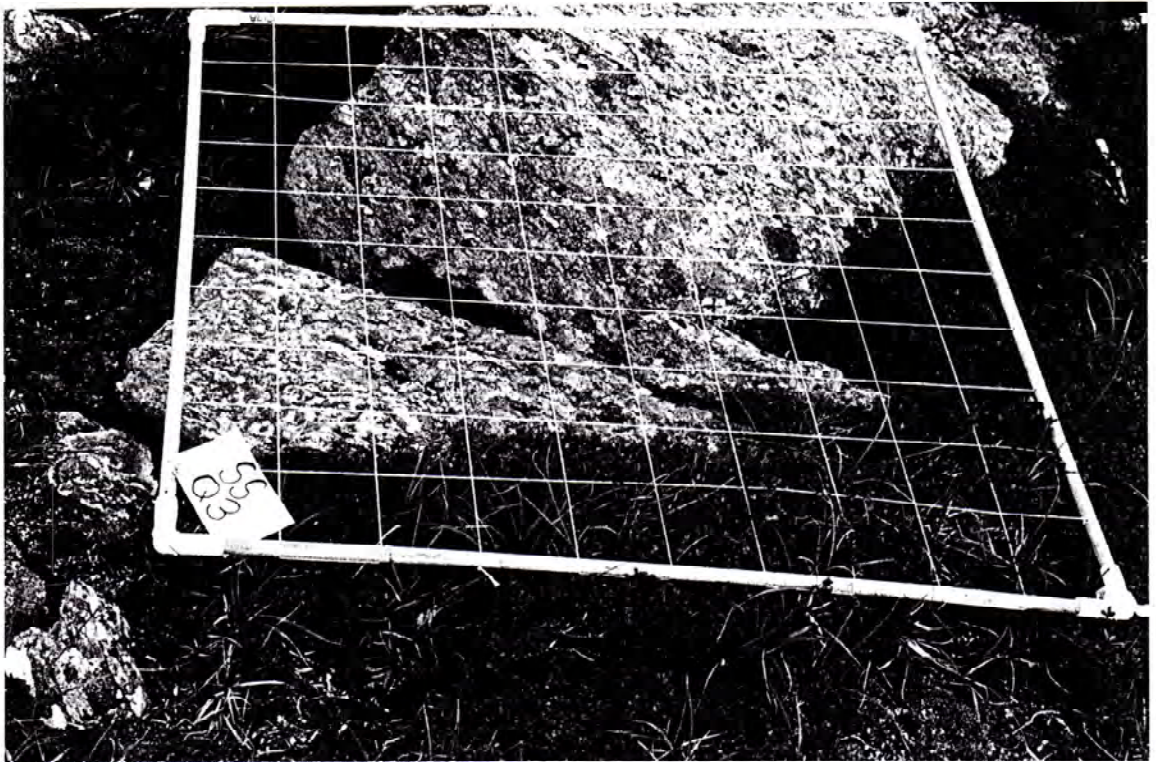


Plate 3 - Summit Saddle: Quadrat 3

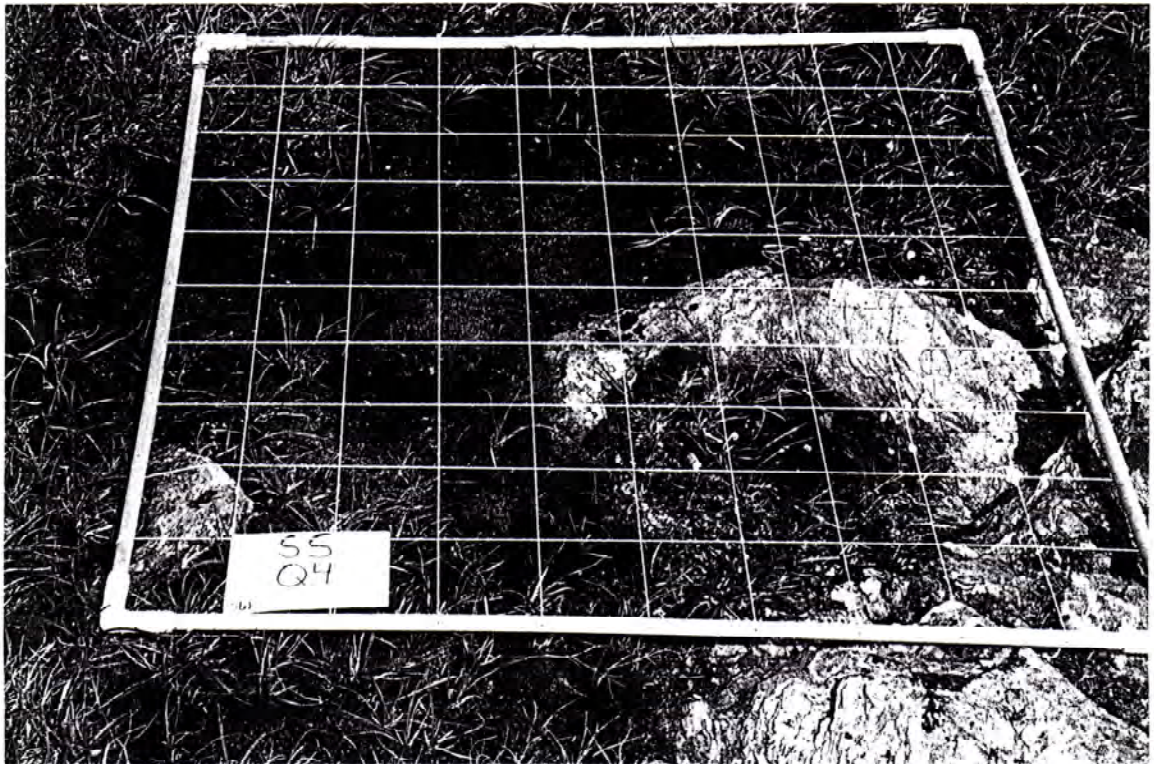


Plate 4 - Summit Saddle: Quadrat 4

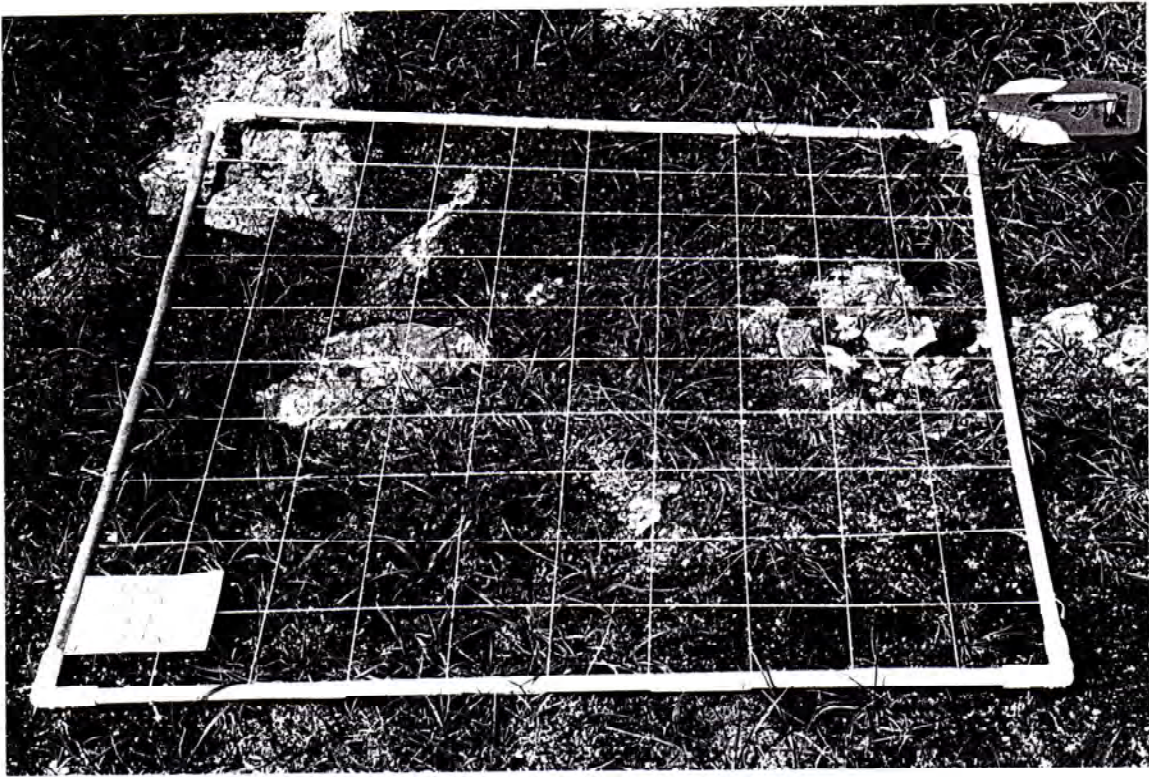


Plate 5 - Summit Saddle: Quadrat 5

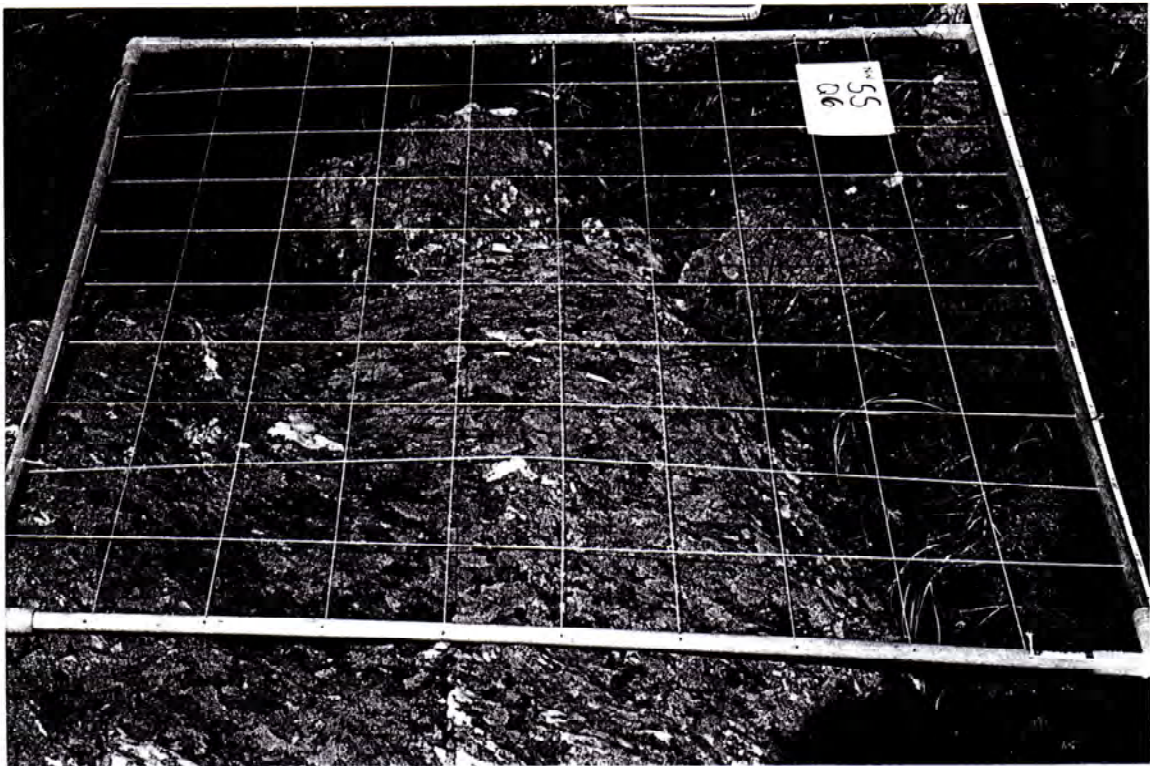


Plate 6 - Summit Saddle: Quadrat 6

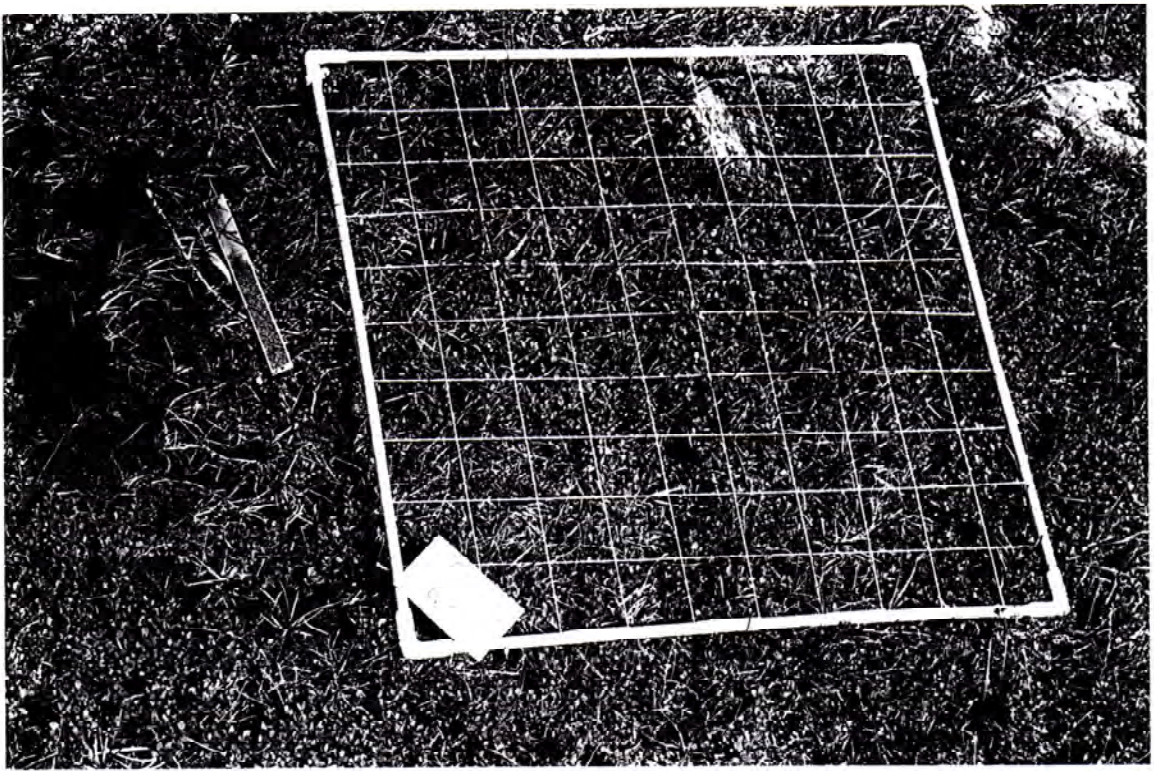


Plate 7 - Summit Saddle: Quadrat 7



Plate 8 - Summit Saddle: Quadrat 8

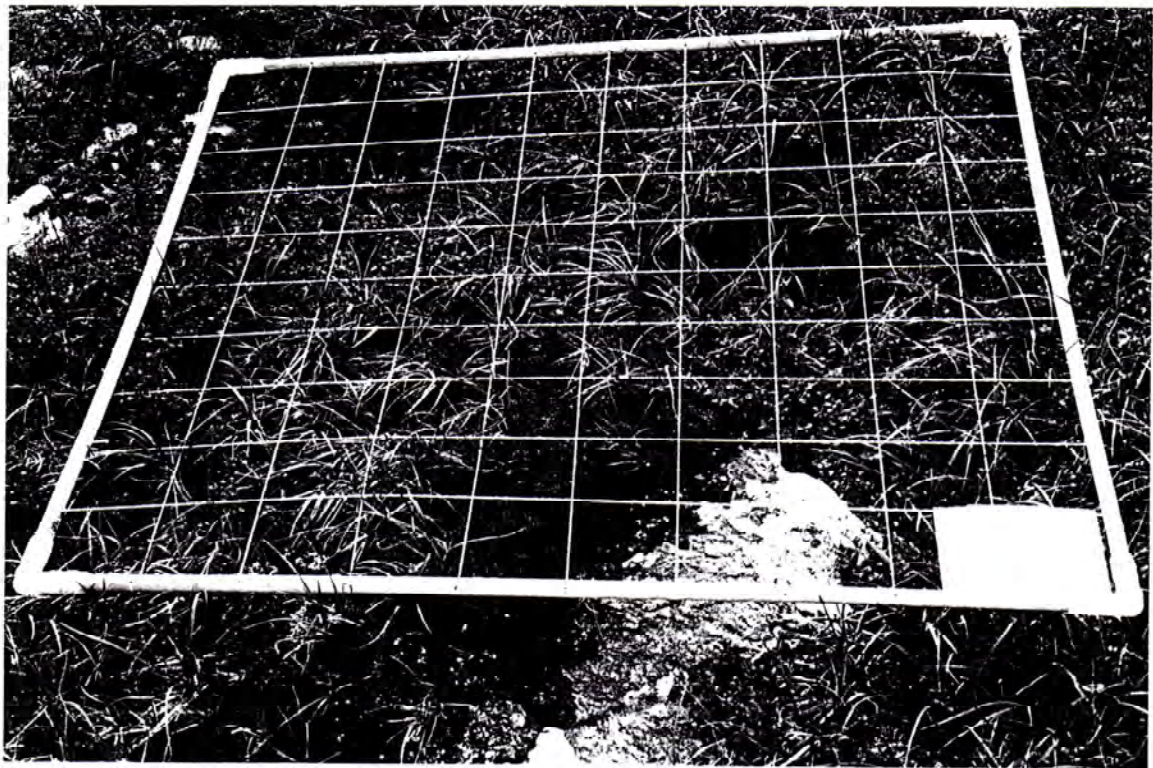


Plate 9 - Summit Saddle: Quadrat 9

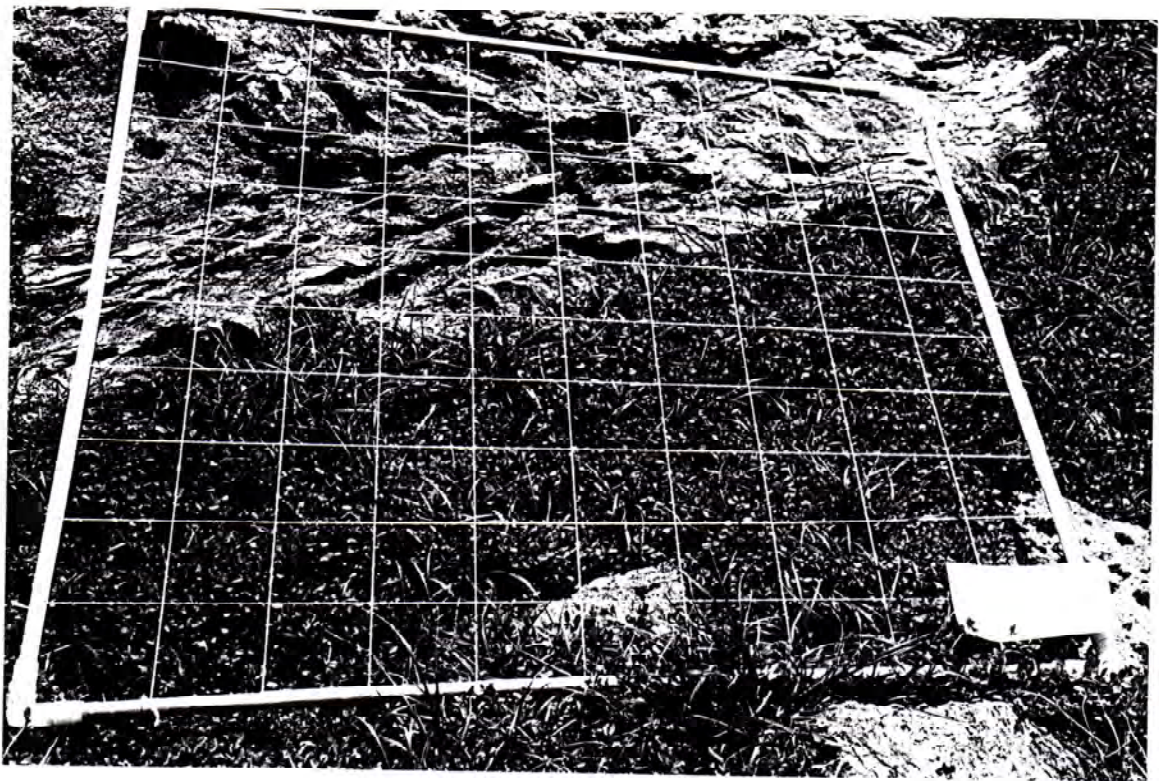


Plate 10 - Summit Saddle: Quadrat 10

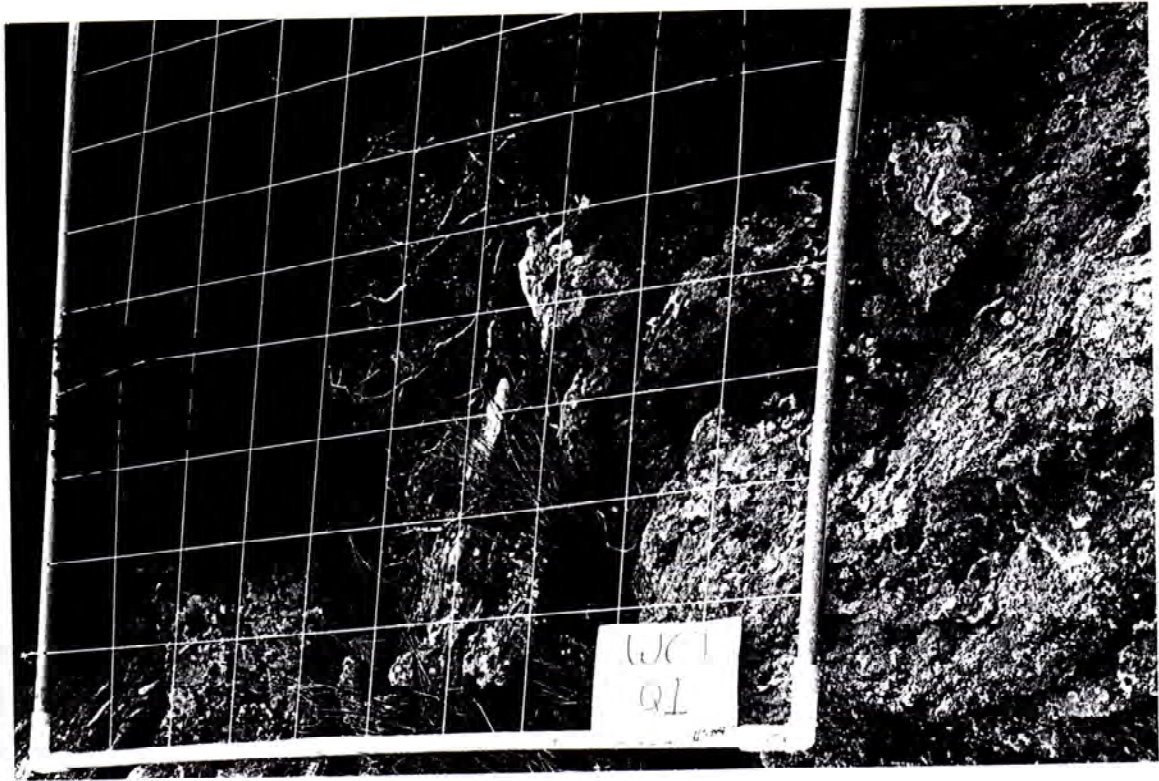


Plate 11 - West Chin Top: Quadrat 1

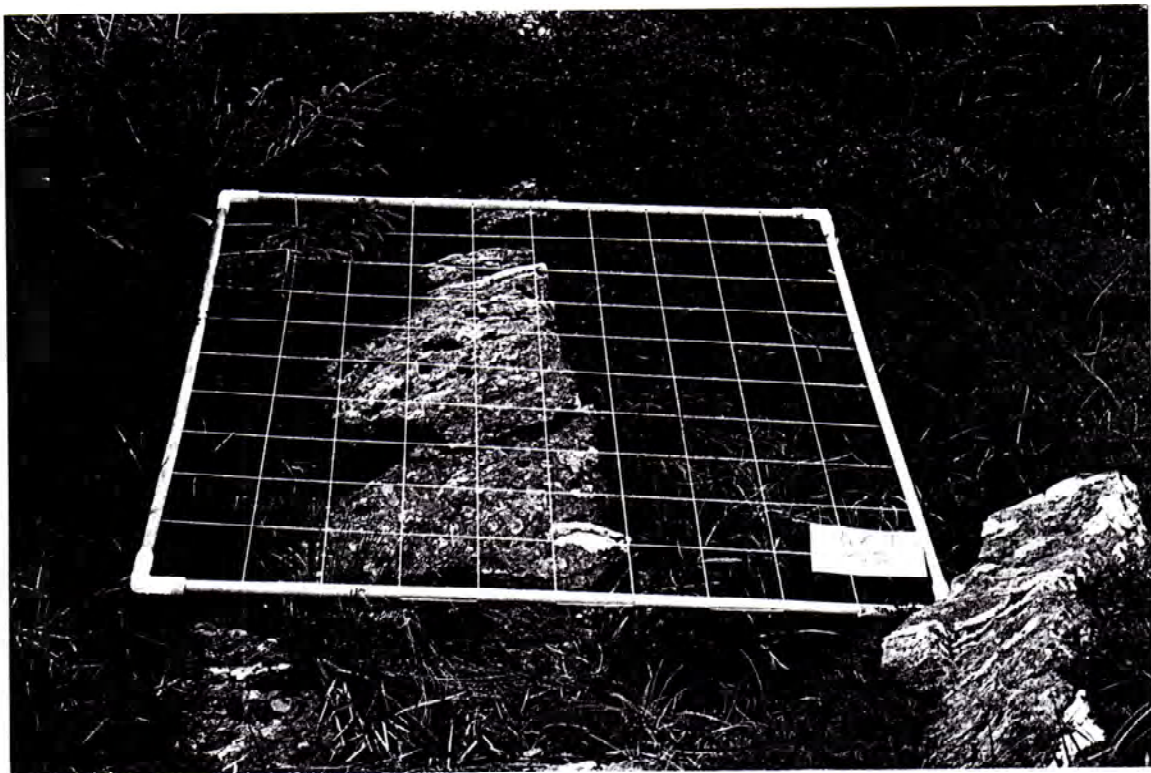


Plate 12 - West Chin Top: Quadrat 2

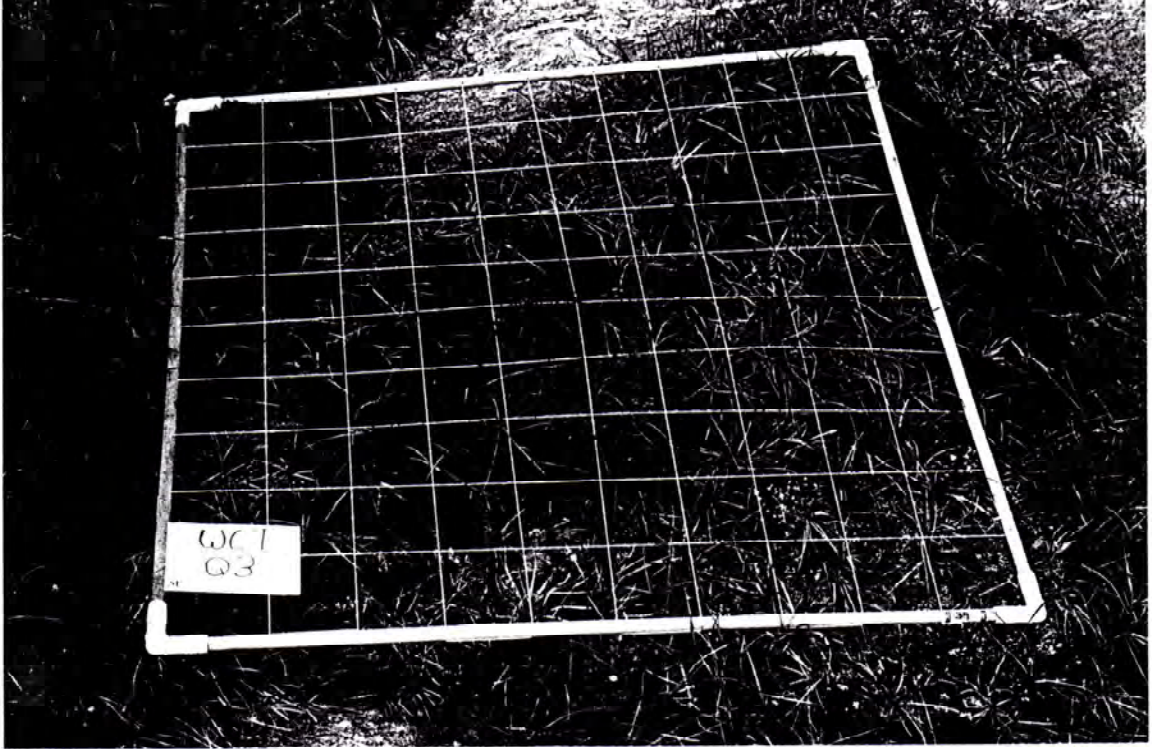


Plate 13 - West Chin Top: Quadrat 3

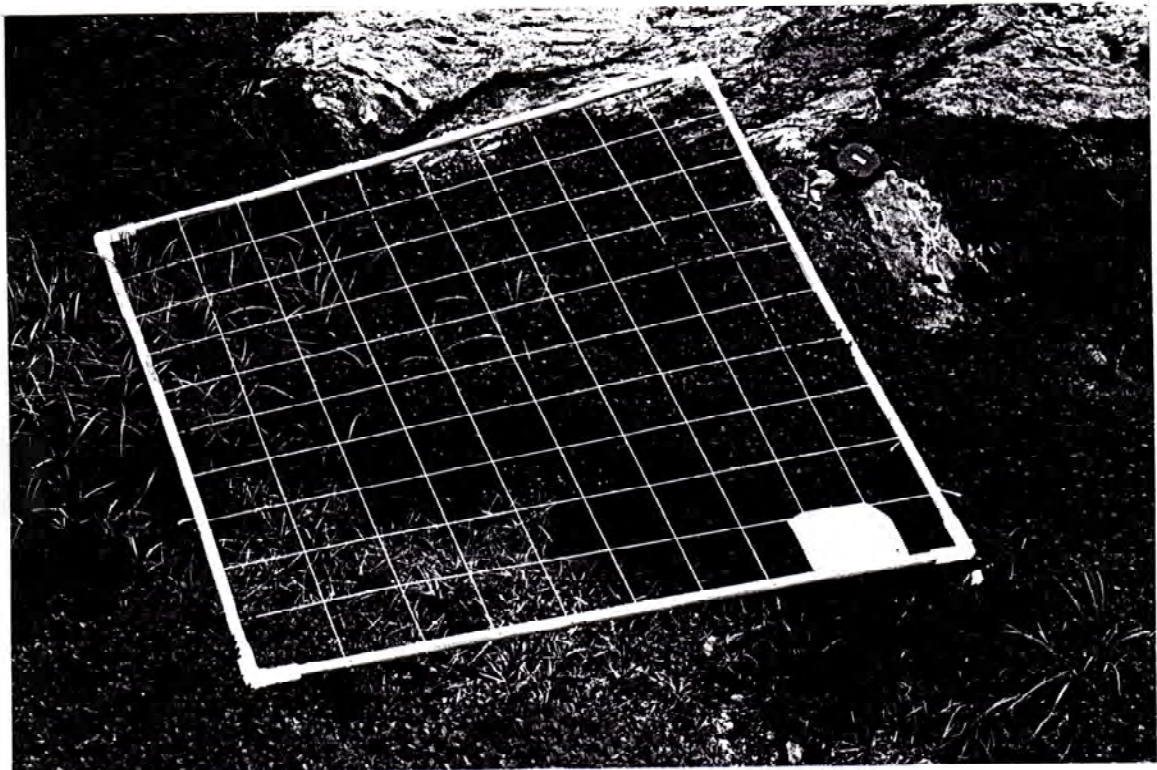


Plate 14 - West Chin Top: Quadrat 4

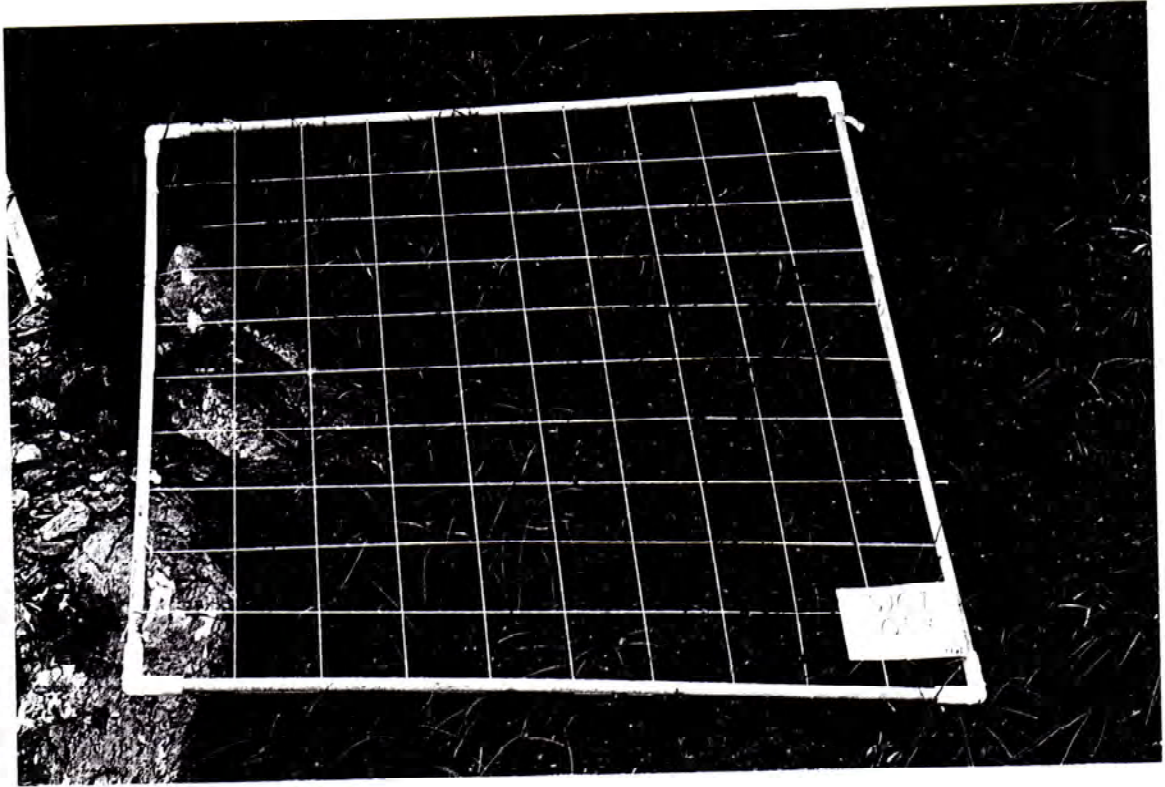


Plate 15 - West Chin Top: Quadrat 5

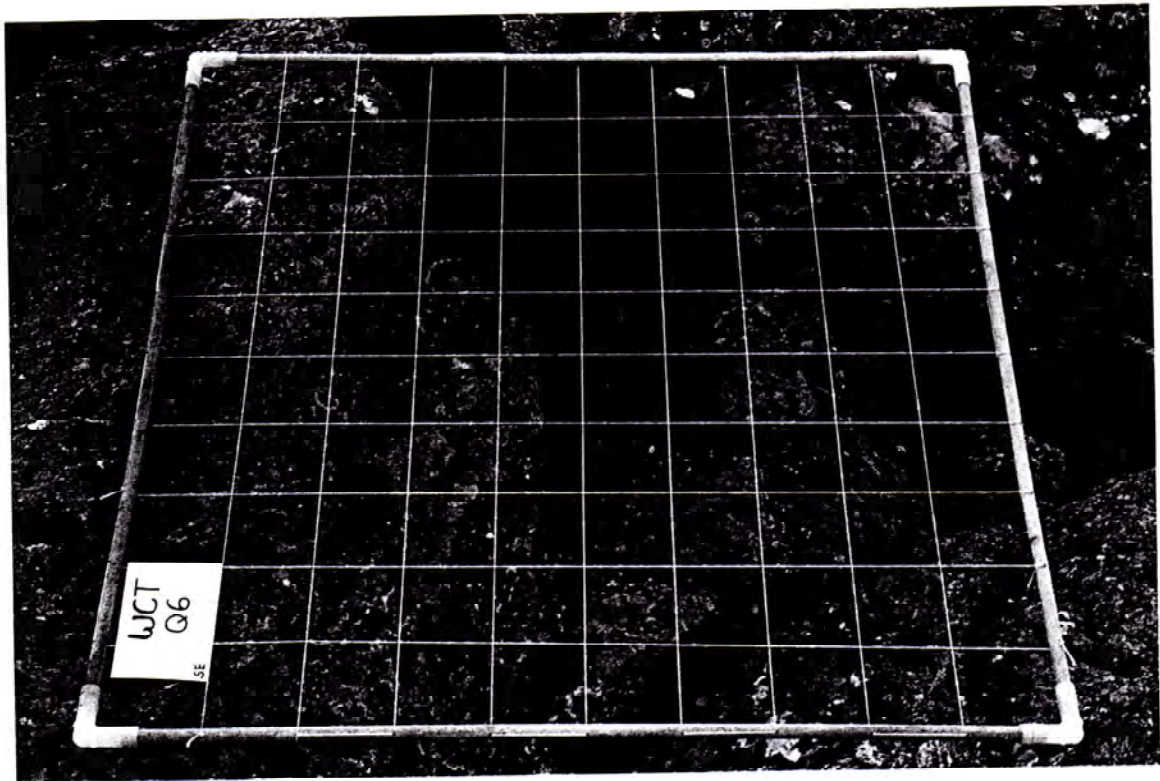


Plate 16 - West Chin Top: Quadrat 6

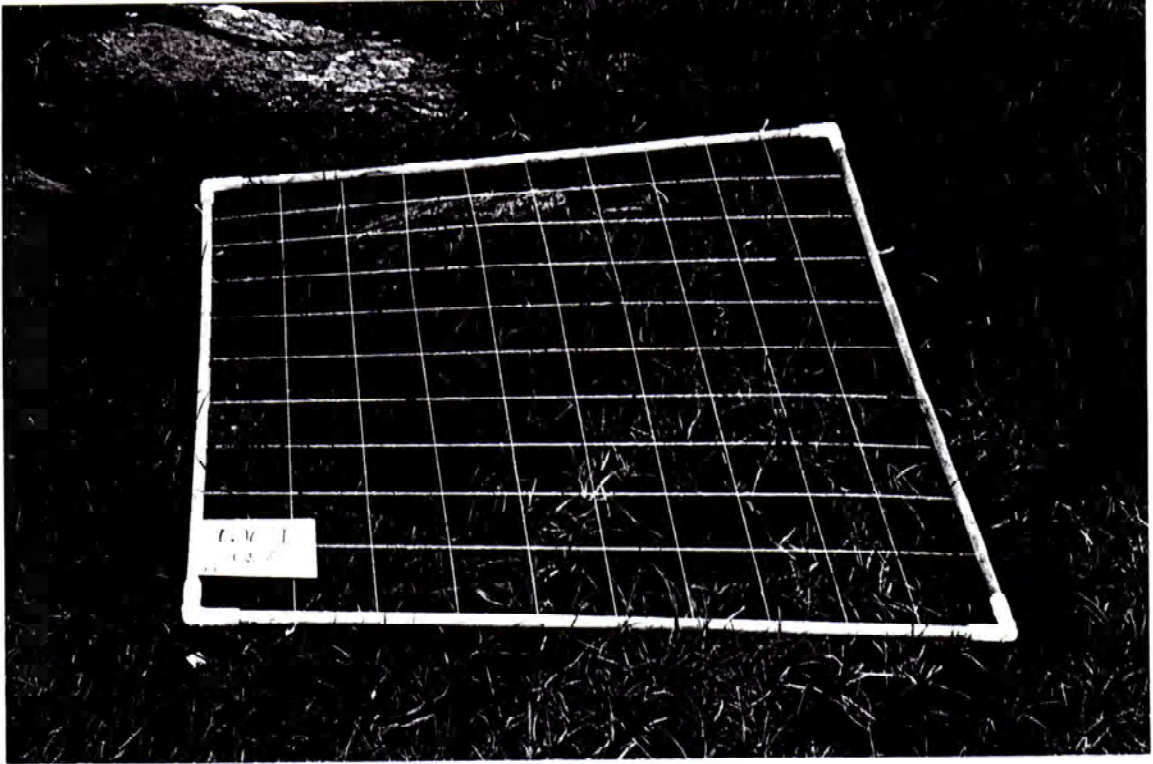


Plate 17 - West Chin Top: Quadrat 7

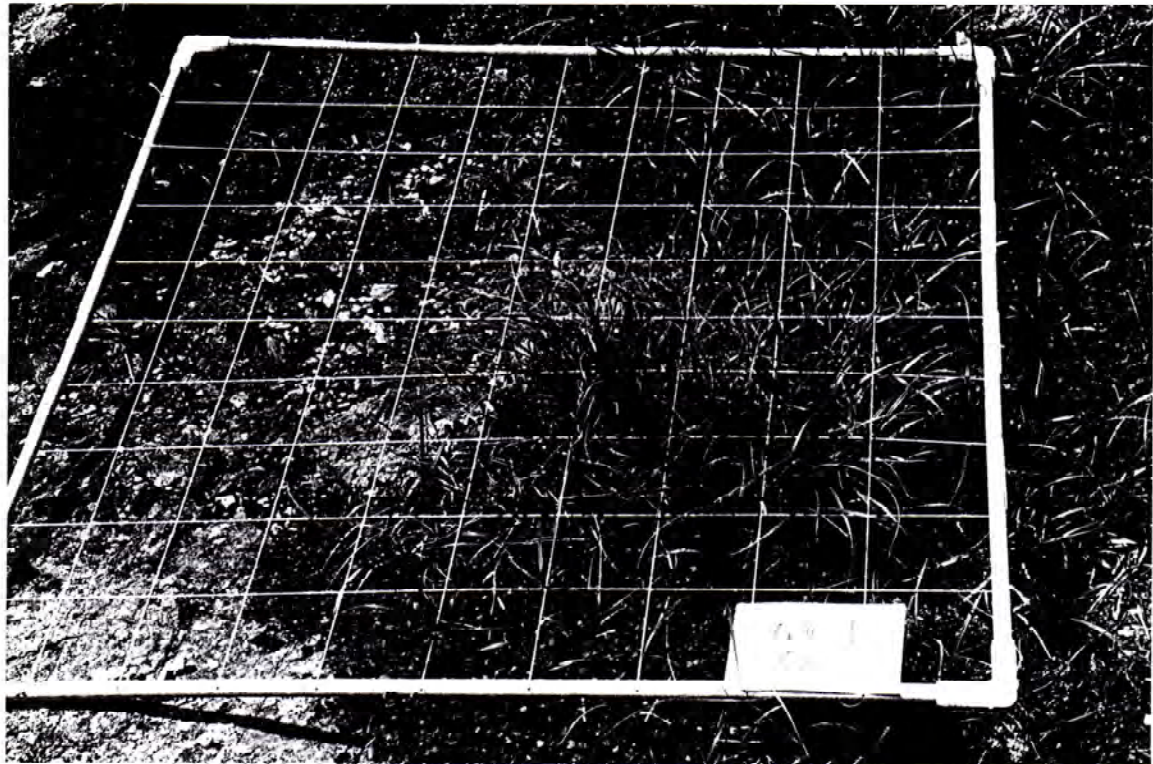


Plate 18 - West Chin Top: Quadrat 8

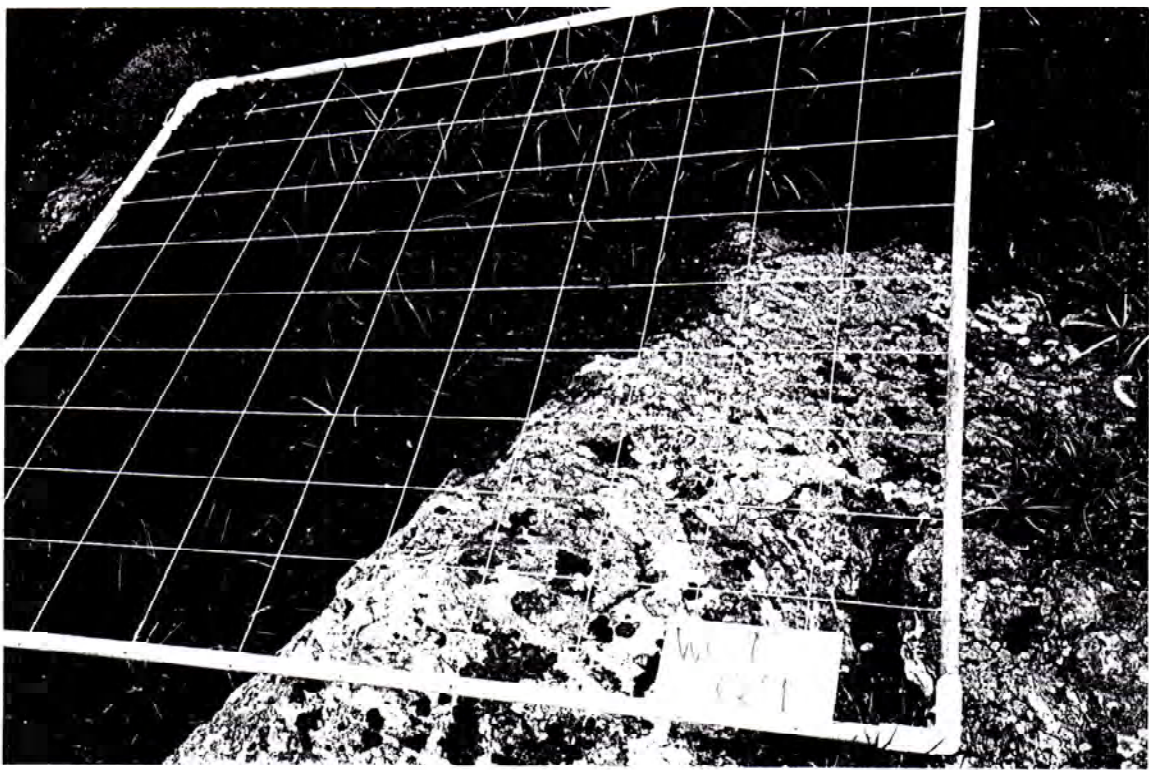


Plate 19 - West Chin Top: Quadrat 9

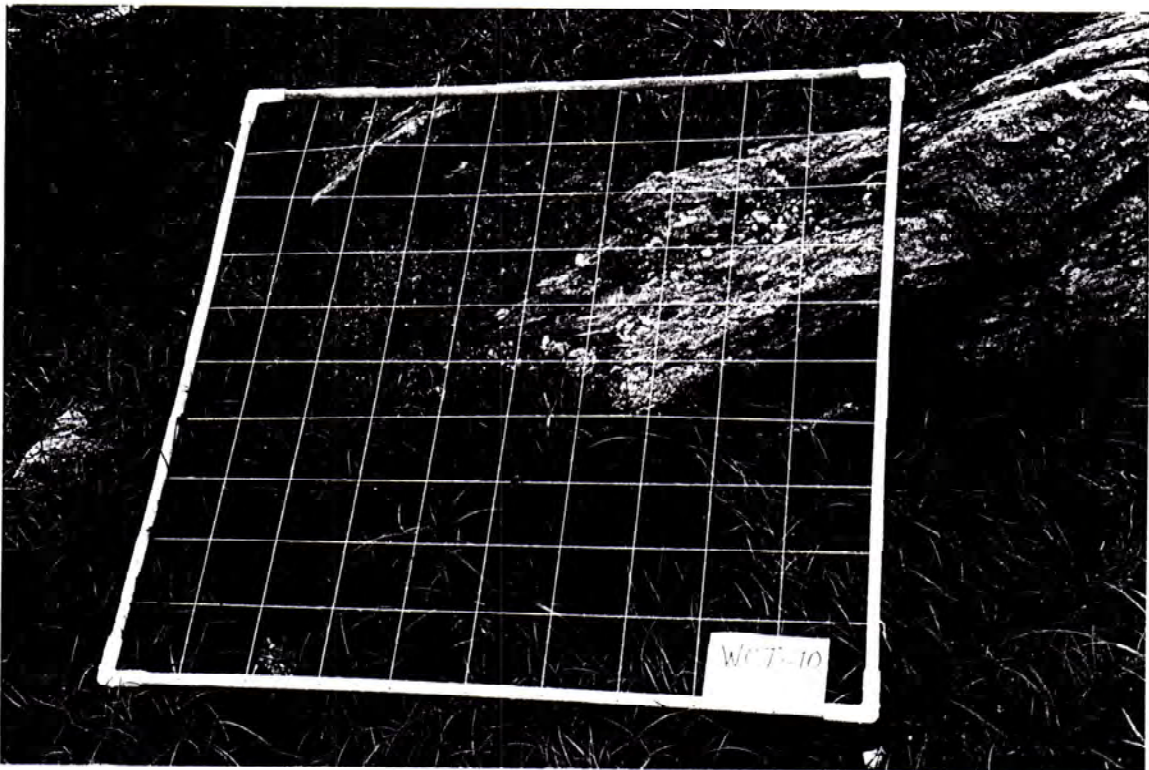


Plate 20 - West Chin Top: Quadrat 10