HABITAT STUDY

Prescribed Burn

Talbot Arm, Kluane Lake

Yukon

1984 VEGETATION ASSESSMENT

Prepared for: Dr. Manfred Hoefs
Chief of Wildlife Management
Fish and Wildlife Branch

Prepared by: Habitat/Land Use Section
Land, Parks and Resources Branch

Department of Renewable Resources

Government of Yukon

February 1985

Replace : Table of Contents
Acknowledgements

Add : Appendix II - Plates

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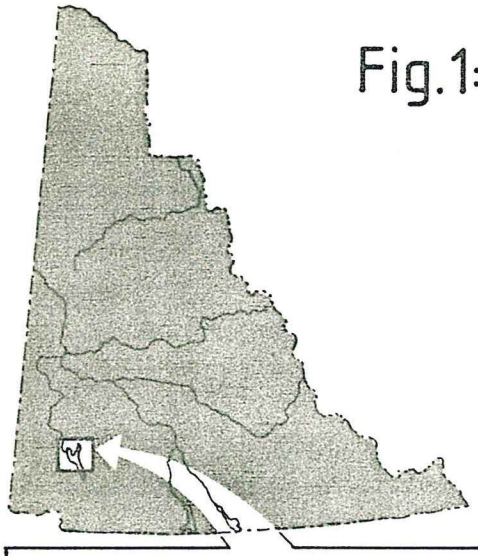
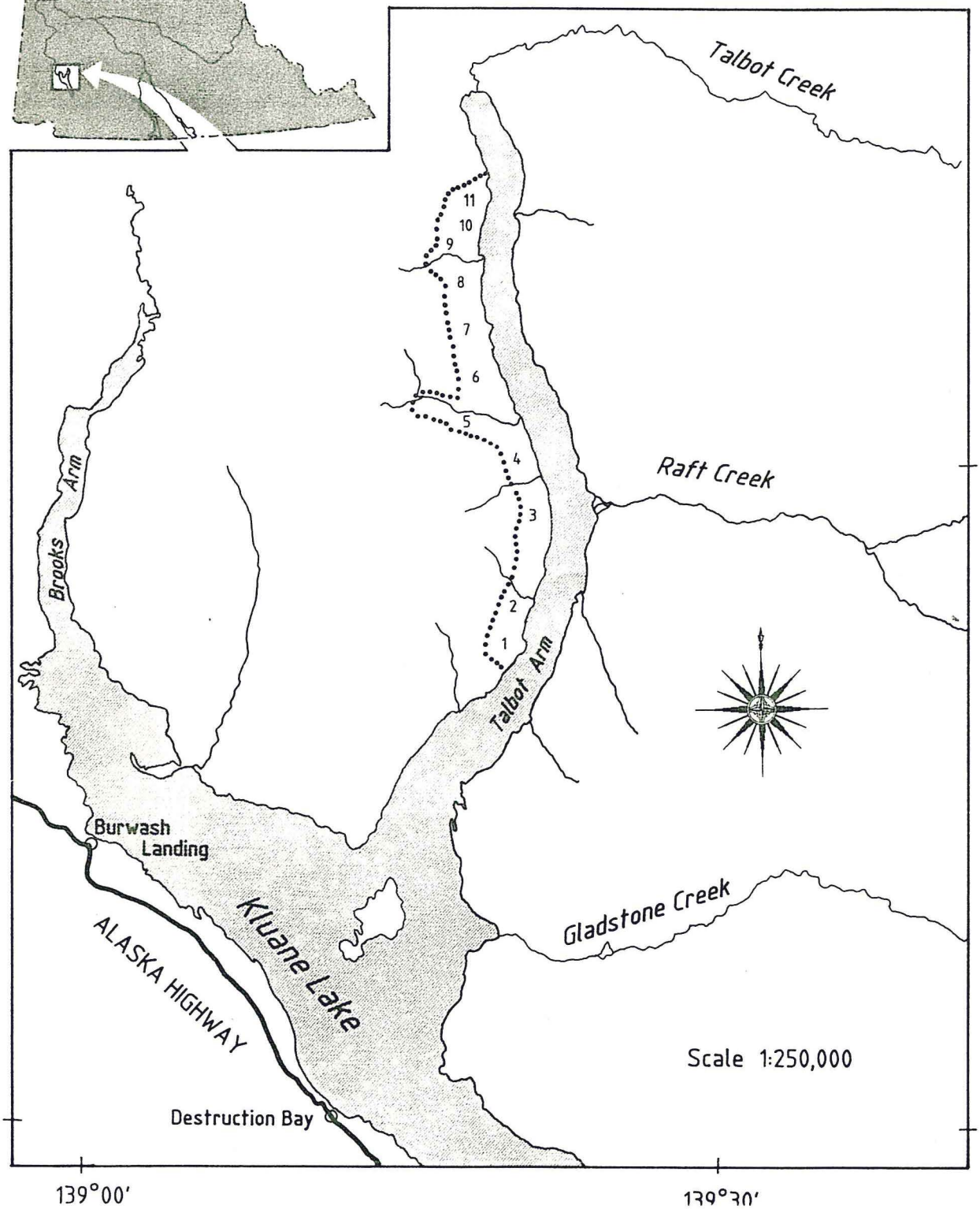


Fig.1: Study Area ⬭ Prescribed Burn Talbot Arm, Kluane Lake, Yukon

Draws within Study Area are indicated by numbers.



1.0 INTRODUCTION

Prescribed burning has been widely used in southwestern Canada and the United States to increase the quantity and quality of forage available for bighorn sheep, Ovis canadensis (Bentz, 1981). In these locations, extensive grasslands, previously maintained by wildfires, have commonly been invaded by coniferous forest through natural processes of succesion, due to the current practice of fire suppression.

However, fire has received limited use as a range management tool for thinhorn sheep, Ovis dalli, which inhabit northwestern Canada and Alaska. A study of Stone sheep (Ovis dalli stonei) on prescribed burn and unburned ranges has been carried out in a forested subalpine region of northeastern British Columbia (Seip, 1983). Although forage quantity was greater on burned slopes, forage quality was similar on both range types. The burn on Talbot Arm, Kluane Lake constitutes the first study of prescribed burning as a management tool for Dall sheep (Ovis dalli dalli)[1].

FISH AND WILDLIFE BRANCH
Prescribed Burn - Talbot Arm, Kluane Lake

Objective: To improve the quality and quantity of the winter range of a population of about 400 Dall sheep by burning plant species that have little or no value as forage plants but which, through the process of succession, displace desirable herbs and grasses.

LAND, PARKS AND RESOURCES BRANCH component
Habitat Study - 1984 Vegetation Assessment

Objective: To monitor the initial impact of the prescribed burn on the sheep winter range by reassessment of the permanent vegetation plots. Changes expected to occur include a decrease in the shrub and tree strata cover, indicating death of existing woody species and ideally, a halt in the successional invasion of these woody species. An increase in the graminoid and forb strata may or may not be evident so soon after the burn.

2.0 STUDY AREA

The study area is located in the Ruby Range, on the north end of Kluane Lake, in southwestern Yukon (Figure 1). The prescribed burn took place in May 1983 on the west side of Talbot Arm. The specific sites under study are comprised of patches of land of various sizes, totalling approximately 12 square kilometers. The patches are primarily situated on the south-facing of creeks and draws; one patch is located on an east facing slope facing Talbot Arm.

The study area includes sites that were burned, partially burned and not burned.

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[1]To date no prescribed burning has been implemented for range enhancement of thinhorn sheep in Alaska (Heimer, W. pers. comm.)

3.0 METHODS

3.1 Site Establisment

In August of 1982 (i.e. prior to the prescribed burning) preliminary typing of vegetation communities was carried out using black and white air photos and observations of the study area made from a boat on Talbot Arm.

Representative sampling sites were tentatively selected from air photos and topographic maps. Final site selection was made on the ground within homogeneous stands of vegetation. Sampling sites were accessed primarily by foot and boat; helicopter access was used in some instances.

Thirty-two permanent vegetation plots (numbers 1 to 32) were established in 1982 in eight different vegetation types for purposes of post-burn vegetation monitoring and assessment.

Another six non-permanent plots (numbers 90 to 95) were sampled to enable description of vegetation types not expected to burn. These plots are not being monitored and are not included in the vegetation assessment.

In August 1984, nine additional permanent plots (numbers 33 to 41) were established on burned or partially burned sites. These plots will be monitored in future years and have been included in the 1984 vegetation assessment.

3.2 Vegetation Site Sampling

Vegetation ground sampling plots measured 100 square metres (10 metres x 10 metres) and were permanently marked with rebar or steel pins. Physical site data was recorded at each plot, and included elevation, slope, aspect, ecological moisture and plot position. A burn level indicator was added to the physical plot description after the fire.

Plot position is indicated by two variables, draw position and meso position. Draw position is a modification of the more commonly used term macro position, meaning position of the plot in the landscape extending from the tops of the mountains to the floors of the main valleys. Draw position (position of the plot in the landscape extending from the tops of the draws to the shores of Kluane Lake) is a more applicable term for a study of sheep winter range in which sheep use south and southeast facing draws on either side of north/south oriented Talbot Arm. Most vegetation plots occur in the lower section of each draw; however, several were established in 1984 in the mid and upper sections with the aid of a helicopter. Draw position is not applicable for those plots occuring on the east facing sides of Talbot Arm, including "Draw" 3 and lower "Draw" 2.

At all draw positions, a variety of meso positions are represented. Meso position is defined as the relative position of a plot within a catchment or one of the major draw segments described under draw position.

Species composition was recorded by strata. Percent cover of each species in each strata was visually estimated (Figure 2)[1]. The area covered by non-vegetated ground was also noted. The percent cover comprised by dead vegetation (either standing or ground cover) was recorded both pre- and post-burn.

3.3 Vegetation Analysis

The 1984 percent cover estimates were converted to cover classes for comparison with the pre-burn (1982) data. In turn, the midpoints of the eight cover classes were calculated for graphic purposes. Percent cover estimates will be recorded in all subsequent field work; conversion to cover class will occur only for comparison with the pre-burn data.

The physical description and vegetation data for each permanent vegetation plot were entered into the Yukon Government computer system for storage and analysis.

The pre-burn and post-burn vegetation assessments were compared with the aid of the computer. Simple SAS and SAS/Graph programs enabled trends to be recognized and initial conclusions to be drawn. The data does not lend itself to statistical analysis; the sample sizes are small and the percent cover estimates are qualitative.

4.0 RESULTS AND DISCUSSION

Plot elevation ranges from 783 meters (approximately lake level) to 1525 meters and slope ranges from 8 percent to 43 percent (Table 1). Plot aspect is most typically southeast and has a range of 50 to 230 degrees.

Examination of the plot descriptions by plot type (Table 1) indicates that the Calamagrostis/Gramineae and three Populus types exhibit a variety of positions, elevations, slopes and aspects, and that the former are considerably drier than the latter. The Salix/Betula plots generally occur at the higher elevations and are more south facing. Ecological moisture was not recorded for many of these plots. The Picea glauca plots are typical of mature coniferous forests and exhibit higher ecological moisture than all others. The Alnus/Salix plots occur on the slopes facing east over Talbot Arm. Plots 19 and 90 to 95 in the "Other" category are non-permanent plots established in 1982 to enable description of vegetation types too wet or with insufficient fuel to burn.

Table 1 also indicates the effect of the May 1983 prescribed burning on each vegetation plot. Burn level has one of four values: burned, partially burned, not burned or no attempt to burn. "Not burned" is applied to plots that could have burned; "no attempt to burn" is for plots located in areas where no prescribed burning took place. Field indications of burned plots included charred ground, roots and stumps and dead trees. Table 2 is a

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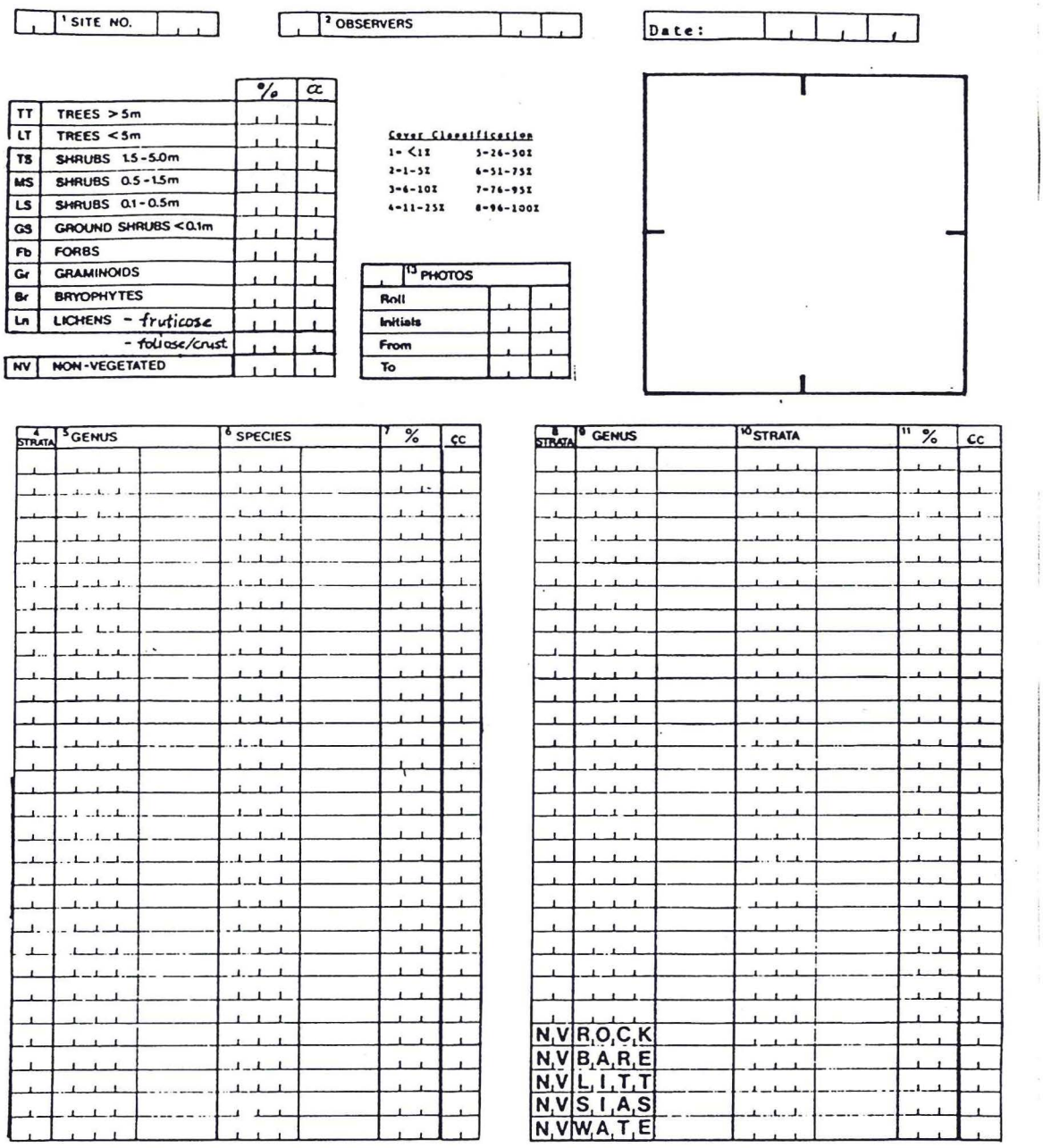
[1] In the pre-burn data, percent cover was recorded by cover class; in post-burn data, data was recorded by actual percent cover values.



Comments:

Figure 2 - Vegetation Site Sampling Form

HABITAT STUDY
PRESCRIBED BURN - TALBOT ARM , KLUANE LAKE , YUKON

TABLE 1 - PHYSICAL DESCRIPTION OF VEGETATION PLOTS

PLOT TYPE=CALAMAGROSTIS / GRAMINEAE

PLOT NUMBER	DRAW NUMBER	DRAW POSITION	MESO POSITION	ELEVATION (M)	SLOPE (%)	ASPECT (DEG)	ECOLOGICAL MOISTURE	BURN LEVEL
1	2	NOT APPLICABLE	LOWER SLOPE	846	25	100	SUBMESIC	BURNED
6	5	LOWER DRAW	MID SLOPE	916	20	92	SUBXERIC	NOT BURNED
8	5	LOWER DRAW	UPPER SLOPE	981	22	132	SUBXERIC	BURNED
14	7	LOWER DRAW	UPPER SLOPE	1056	28	116	XERIC	PARTIALLY BURNED
23	3	NOT APPLICABLE	LOWER SLOPE	941	33	70	XERIC	BURNED
29	6	UPPER DRAW	UPPER SLOPE	1521	23	100	XERIC	BURNED

PLOT TYPE=POPULUS TREMULOIDES

PLOT NUMBER	DRAW NUMBER	DRAW POSITION	MESO POSITION	ELEVATION (M)	SLOPE (%)	ASPECT (DEG)	ECOLOGICAL MOISTURE	BURN LEVEL
2	2	NOT APPLICABLE	LOWER SLOPE	851	16	125	SUBMESIC	BURNED
4	2	LOWER DRAW	MID SLOPE	1141	31	159	SUBMESIC	PARTIALLY BURNED
7	5	LOWER DRAW	MID SLOPE	921	26	109	SUBMESIC	NOT BURNED
10	5	LOWER DRAW	UPPER SLOPE	990	16	132	MESIC	PARTIALLY BURNED
24	3	NOT APPLICABLE	LOWER SLOPE	941	33	70	SUBMESIC	BURNED
33	7	LOWER DRAW	UPPER SLOPE	.	.	.	.	PARTIALLY BURNED

PLOT TYPE=POPULUS BALSAMIFERA

PLOT NUMBER	DRAW NUMBER	DRAW POSITION	MESO POSITION	ELEVATION (M)	SLOPE (%)	ASPECT (DEG)	ECOLOGICAL MOISTURE	BURN LEVEL
5	2	LOWER DRAW	MID SLOPE	1101	25	183	SUBHYGRIC	NOT BURNED
12	5	MID DRAW	UPPER SLOPE	1156	26	100	SUBMESIC	NOT BURNED
15	7	LOWER DRAW	UPPER SLOPE	1056	28	116	SUBMESIC	PARTIALLY BURNED

PLOT TYPE=MIXED POPULUS

PLOT NUMBER	DRAW NUMBER	DRAW POSITION	MESO POSITION	ELEVATION (M)	SLOPE (%)	ASPECT (DEG)	ECOLOGICAL MOISTURE	BURN LEVEL
9	5	LOWER DRAW	UPPER SLOPE	981	22	132	MESIC	PARTIALLY BURNED
17	7	LOWER DRAW	UPPER SLOPE	1146	32	120	MESIC	BURNED
22	3	NOT APPLICABLE	MID SLOPE	1161	33	80	.	NOT BURNED
25	6	LOWER DRAW	MID SLOPE	1161	28	98	SUBXERIC	NOT BURNED
38	9	LOWER DRAW	LOWER SLOPE	1311	42	230	.	PARTIALLY BURNED

HABITAT STUDY
PRESCRIBED BURN - TALBOT ARM , KLUANE LAKE , YUKON

TABLE 1 - PHYSICAL DESCRIPTION OF VEGETATION PLOTS

PLOT TYPE=JUNIPERUS

PLOT NUMBER	DRAW NUMBER	DRAW POSITION	MESO POSITION	ELEVATION (M)	SLOPE (%)	ASPECT (DEG)	ECOLOGICAL MOISTURE	BURN LEVEL
3	2	LOWER DRAW	MID SLOPE	1109	32	134	XERIC	PARTIALLY BURNED
11	5	MID DRAW	UPPER SLOPE	1156	26	100	SUBXERIC	NOT BURNED
16	7	LOWER DRAW	UPPER SLOPE	1146	32	120	SUBMESIC	BURNED
27	6	MID DRAW	UPPER SLOPE	1351	35	50	MESIC	NOT BURNED

PLOT TYPE=PICEA GLAUCA

PLOT NUMBER	DRAW NUMBER	DRAW POSITION	MESO POSITION	ELEVATION (M)	SLOPE (%)	ASPECT (DEG)	ECOLOGICAL MOISTURE	BURN LEVEL
13	5	LOWER DRAW	MID SLOPE	1062	8	.	SUBHYGRIC	NOT BURNED
18	7	LOWER DRAW	CREST	926	21	54	SUBHYGRIC	NO ATTEMPT TO BURN
20	3	NOT APPLICABLE	LOWER SLOPE	831	13	140	SUBHYGRIC	NO ATTEMPT TO BURN
26	6	LOWER DRAW	MID SLOPE	1171	18	80	SUBMESIC	NOT BURNED
32	.	NOT APPLICABLE	LOWER SLOPE	784	25	50	SUBHYGRIC	NO ATTEMPT TO BURN

PLOT TYPE=SALIX / BETULA

PLOT NUMBER	DRAW NUMBER	DRAW POSITION	MESO POSITION	ELEVATION (M)	SLOPE (%)	ASPECT (DEG)	ECOLOGICAL MOISTURE	BURN LEVEL
30	6	UPPER DRAW	UPPER SLOPE	1521	23	100	.	BURNED
31	.	NOT APPLICABLE	LOWER SLOPE	783	15	50	MESIC	NO ATTEMPT TO BURN
34	12	MID DRAW	UPPER SLOPE	1291	43	170	.	BURNED
36	9	MID DRAW	CREST	1451	26	210	.	PARTIALLY BURNED
37	9	MID DRAW	MID SLOPE	1431	36	120	.	BURNED
39	5	UPPER DRAW	UPPER SLOPE	1531	38	210	.	BURNED
40	5	UPPER DRAW	MID SLOPE	1421	36	220	.	BURNED
94	6	NOT APPLICABLE	MID SLOPE	1181	35	70	MESIC	NO ATTEMPT TO BURN

PLOT TYPE=ALNUS / SALIX

PLOT NUMBER	DRAW NUMBER	DRAW POSITION	MESO POSITION	ELEVATION (M)	SLOPE (%)	ASPECT (DEG)	ECOLOGICAL MOISTURE	BURN LEVEL
21	3	NOT APPLICABLE	MID SLOPE	1161	35	70	MESIC	NOT BURNED
28	6	MID DRAW	UPPER SLOPE	1351	35	50	MESIC	NOT BURNED

PLOT TYPE=OTHER

PLOT NUMBER	DRAW NUMBER	DRAW POSITION	MESO POSITION	ELEVATION (M)	SLOPE (%)	ASPECT (DEG)	ECOLOGICAL MOISTURE	BURN LEVEL
19	3	NOT APPLICABLE	LOWER SLOPE	791	20	80	SUBHYGRIC	NO ATTEMPT TO BURN
35	11	UPPER DRAW	UPPER SLOPE	1561	75	156	.	BURNED
41	5	UPPER DRAW	LOWER SLOPE	1291	16	170	.	PARTIALLY BURNED
90	2	LOWER DRAW	MID SLOPE	921	35	.	XERIC	NO ATTEMPT TO BURN
91	5	LOWER DRAW	MID SLOPE	946	20	106	XERIC	NO ATTEMPT TO BURN
92	5	MID DRAW	UPPER SLOPE	1213	16	.	XERIC	NO ATTEMPT TO BURN
93	5	LOWER DRAW	MID SLOPE	.	.	.	SUBHYGRIC	NO ATTEMPT TO BURN
95	6	MID DRAW	CREST	1421	.	.	XERIC	NO ATTEMPT TO BURN

frequency table showing the effect of the May 1983 burning on each plot type. The Calamagrostis/Gramineae, Populus, Juniperus and Salix/Betula plot types have an assortment of burn levels and so lend themselves to further examination. The Picea glauca, Alnus/Salix and "Other" plot types did not burn or were not meant to burn, and are not important to sheep. They will therefore be excluded from the following discussion.

The post-burn (1984) field work was influenced by the burn levels of plots established prior to the burn in 1982. Except for three control plots (Plots 6, 7 and 22), vegetation plots known not to have burned were not reassessed in 1984. Conversely, plots were added in 1984 for plot types that burned well but were not sampled adequately in the pre-burn field work (Salix/Betula in particular). Table 3 summarizes the dates and observers involved in the two field seasons.

Comparison of the pre-burn and post-burn vegetation assessments shows the May 1983 prescribed burn to be only partially successful thus far. Block charts depicting the percent cover of each strata by plot and plot type are particularly useful for trend recognition. Figure 3 includes the strata block charts for the Calamagrostis/Gramineae, Populus, Juniperus and Salix/Betula plot types. The coloured legend is consistent for ease of comparison.

In general, the expected decrease in the tree and shrub strata cover has occurred. The tall tree, low tree and tall shrub strata are totally suppressed in burned plots in all treed plot types (plots 2, 24 - Fig.3B; 17 - Fig.3D; 16 - Fig.3E; 30 - Fig.3F). Only snags or standing dead trees and shrubs remain[1]. In the partially burned plots, the results are more variable. Consistently the total tree and shrub strata cover has decreased and snags are evident, however, those woody plants that survived the fire continue to grow and in some cases move into the taller strata. Individual strata therefore show variable cover changes. The treed control plots (7,22) show similar strata cover changes; some tall shrubs grow to low tree height, some low trees to tall tree height. It is important to note that a small number of snags also occur in the control plots. This fact suggests some natural death of woody species.

The effect of the prescribed burn on the low shrub strata was unanticipated. A successful burn was expected to kill existing woody plants and halt the invasion of new woody plants. The low shrub strata cover has decreased in some burned plots, but remains unchanged or even increased in others. A closer examination of the percent cover of the low shrub strata by species (Figure 4) indicates considerable change in species composition[2]. In all

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[1]In Figure 3, the percent cover values for snags have been subtracted from the individual strata and grouped to show a single snag cover value.

[2]In Figure 4, snags are included as a valid low shrub species. The "tree" species (P. tremuloides, P. balsamifera, Salix, Betula glandulosa and Picea glauca) are depicted by consistent, solid colours so that they stand out.

HABITAT STUDY
PRESCRIBED BURN - TALBOT ARM , KLUANE LAKE , YUKON

TABLE 2 - EFFECT OF MAY 1983 BURNING ON VEGETATION PLOTS

TABLE OF PLOTTYPE BY BURNIND

PLOTTYPE / BURNIND / BURN LEVEL FREQUENCY	BURNED	PARTIAL BURNED	NOT BURNED	NO BURN ATTEMPT	TOTAL
GRAMINEAE	4	1	1	0	6
POPULUS TREM.	2	3	1	0	6
POPULUS BALS.	0	1	2	0	3
MIXED POPULUS	1	2	2	0	5
JUNIPERUS	1	1	2	0	4
PICEA GLAUCA	0	0	2	3	5
SALIX/BETULA	5	1	0	2	8
ALNUS/SALIX	0	0	2	0	2
OTHER	1	1	0	6	8
TOTAL	14	10	12	11	47

HABITAT STUDY
PRESCRIBED BURN - TALBOT ARM , KLUANE LAKE , YUKON

TABLE 3 - SUMMARY OF DATES AND OBSERVERS INVOLVED IN PRE-BURN (1982) AND POST-BURN (1984) FIELDWORK

BE=BETH EREAUX MH=MANFRED HOEFS RM=RHONDA MARKEL
PH=PAUL HENSTRIDGE CK=CATHERINE KENNEDY GB=GEORGE BALMER

PLOT NUMBER	DRAW NUMBER	FIELD DATES (1982)	OBSERVERS (1982)	FIELD DATES (1984)	OBSERVERS (1984)
1	2	82-08-25	MH RM BE	84-08-21	CK BE
2	2	82-08-25	MH RM BE	84-08-21	CK BE GB
3	2	82-08-25	MH RM BE	84-08-21	CK BE GB
4	2	82-08-25	MH RM BE	84-08-21	CK BE
5	2	82-08-25	MH RM BE	.	
6	5	82-08-26	MH RM BE	84-08-22	CK BE
7	5	82-08-26	MH RM BE	84-08-22	CK BE
8	5	82-08-26	MH RM BE	84-08-22	CK BE
9	5	82-08-26	MH RM BE	84-08-22	CK BE
10	5	82-08-26	RM BE	84-08-22	CK BE
11	5	82-08-26	RM BE	.	
12	5	82-08-26	RM BE	.	
13	5	82-08-26	MH RM BE	.	
14	7	82-08-27	RM BE	84-08-23	CK BE
15	7	82-08-27	RM BE	84-08-23	CK BE
16	7	82-08-27	RM BE	84-08-23	CK BE
17	7	82-08-27	RM BE	84-08-23	CK BE
18	7	82-08-27	RM BE	.	
19	3	82-08-28	RM BE	.	
20	3	82-08-28	RM BE PH	.	
21	3	82-08-28	RM BE PH	.	
22	3	82-08-28	RM BE PH	84-08-25	CK BE
23	3	82-08-28	RM BE PH	84-08-25	CK BE
24	3	82-08-28	RM BE PH	84-08-25	CK BE
25	6	82-08-30	RM BE PH	.	
26	6	82-08-30	RM BE PH	.	
27	6	82-08-30	RM BE PH	.	
28	6	82-08-30	RM BE PH	.	
29	6	82-08-30	RM BE PH	84-08-24	CK BE
30	6	82-08-30	RM BE PH	84-08-24	CK BE
31	.	82-08-31	RM BE PH	.	
32	.	82-08-31	RM BE PH	.	
33	7	.		84-08-23	CK BE
34	12	.		84-08-24	CK BE GB
35	11	.		84-08-24	CK BE
36	9	.		84-08-24	CK BE
37	9	.		84-08-24	CK BE
38	9	.		84-08-24	CK BE
39	5	.		84-08-24	CK BE
40	5	.		84-08-24	CK BE
41	5	.		84-08-24	CK BE
90	2	82-08-25	MH RM BE	.	
91	5	82-08-26	MH RM BE	.	
92	5	82-08-26	MH RM BE	.	
93	5	82-08-26	MH RM BE	.	
94	6	82-08-28	MH BE	.	
95	6	82-08-30	MH BE	.	

burned plots, young Populus tremuloides, Populus balsamifera or Salix spp. are present in 1984 whether or not present in 1982. Likewise, the partially burned plots have young "tree" species in the low shrub strata (Plot 9 Fig.4D is an exception). Even the Calamagrostis/Gramineae plots show this trend. Field observations indicate that these "tree" species represent both invasion of new plants and suckering of existing plants that were affected by the fire. In either case, the low shrub "tree" species are healthy and thriving. Whether the total low shrub strata cover has increased or decreased depends on the composition of the rest of the strata. Wherever Juniperus communis was present prior to the burn, it is totally or nearly totally absent afterwards. The elimination or severe reduction of Juniper in plots 4 - Fig.4B; 15 - Fig. 4C; 17 - Fig.4D; 16 - Fig.4E and 30 - Fig.4F is notable; charred, dead roots (recorded in the slash strata) are all that remain. In contrast, Rosa acicularis, Sheperdia canadensis, Fragaria spp. and the other low woody species are only minimally affected by the burn in all plot types. Rosa especially appears to maintain its cover even in heavily burned plots.

The literature documents similar results after light or variable burns. In her discussion of shrub sprouting after fire, Miller (1979) states that sprouts originate from root crowns, the mass of woody tissue at the base of plants such as willow, or from rhizomes, plant parts which are anatomically underground stems (i.e. Rosa, Vaccinium spp.). Sprouting is triggered by removal of aboveground stems which contain the source of the inhibition on growth. Depth of burn is important in an ecosystem where much revegetation is from underground plant parts (Miller, 1979; Viereck and Schandelmeier, 1980). A heavy burn that penetrates below the depth at which root crowns and rhizomes are located usually kills all plant material and sprouting will not occur. On the other hand, a light burn that kills plants at or just above ground level leaves the underground plant parts of the shrubs and many herbs intact. Shrub sprouts will readily revegetate as has occurred on Talbot Arm. Viereck and Schandelmeier (1980) discuss the fire-adaptive characteristics of various deciduous trees and shrubs. Populus tremuloides comes back quickly after fire from vegetative reproduction and seed germination. Populus balsamifera reproduces prolifically by root and branch suckers and stump sprouts following logging so it is likely fire may produce the same results. Likewise, Salix spp., Vaccinium spp., Ledum spp. and Rosa acicularis all exhibit revegetative characteristics depending on the depth of burn.

Trends in the forb and graminoid strata are much more difficult to determine (Figure 3). The forb strata is minimal in all but the Calamagrostis/Gramineae plots where percent covers of 20-40% are common. Figure 3A shows no change or a slight increase in forb strata cover in the burned and partially burned plots and a slight decrease in the control (Plot 6), which was not burned. The other plot types have variable forb cover changes at each burn level.

The graminoid strata is most significant in the Calamagrostis/Gramineae plots and to a lesser degree in the Juniperus and Salix/Betula plots. Cover changes in this strata are inconsistent across the plot types and burn levels. The total strata cover and Calamagrostis spp. cover has decreased in all Gramineae plots (Figure 3A) including the control. A number of factors could account for this: an actual decrease in graminoid cover (possibly temporary); over or under estimation of graminoids by different observers; or misidentification or inconsistent identification of difficult graminoid species. In any case,

percent cover estimates of graminoids are very difficult to accomplish accurately and a more appropriate method for measuring the effect of the burn on graminoids is required. Biomass sampling (clipping and weighing) or point sampling have been suggested for the next field season.

According to Viereck and Schandelmeier (1980), herb species have many of the same fire-adaptive reproduction mechanisms as shrubs. Two common herb species following fire are Epilobium angustifolium and Calamagrostis canadensis. The latter produces many rhizomes after light to moderate burning and is also a prolific seed producer.

The bryophyte and lichen strata comprise very minimal cover in all plots. These strata exhibit little or no change pre-and post-burn, and so have been excluded from the analysis.

The non-vegetation strata have been affected in different ways. As discussed earlier, snags occur in most burned or partially burned plots following the burn. Likewise, bare ground has usually increased in percent cover from 1982 to 1984. This increase, however, cannot necessarily be attributed to the burn. Bare ground is that ground not covered by vegetation or litter, and litter cover can vary from year to year independent of burning.

5.0 CONCLUSIONS

The May 1983 prescribed burn was relatively light and the effect on the vegetation plots variable; 14 plots were burned, 10 were partially burned and the remaining 23 did not or were not meant to burn. Snags and charred ground and roots were good field indicators of burned plots.

Thirty-seven vegetation plots, comprising the Calamagrostis/Gramineae, Populus tremuloides, Populus balsamifera, mixed Populus, Juniperus and Salix/Betula plot types, were examined further to assess the initial impact of the prescribed burn on the sheep winter range. Comparision of the pre-burn (1982) and post-burn (1984) vegetation assessments for each plot shows several trends. As expected, a decrease in the tall tree, low tree and tall shrub strata cover is evident in the burned treed plots, indicating death of the taller existing woody species. In contrast, the desired halt in the successional invasion of these woody species (as shown by a decrease in the low shrub strata) did not occur. Changes in the low shrub strata cover are variable but in all burned and partially burned plots, low shrub species composition is affected. Young Populus or Salix spp. are present in 1984 whether or not present in 1982, representing both invasion of new woody plants and suckering of existing plants that were affected by fire. These results are consistent with other studies involving light burns. Juniperus communis is totally or nearly totally eliminated by the fire and the remaining low woody species are only minimally affected.

The low shrub strata cover will likely increase over time. If this invasion of woody plants is to be halted, a second hotter and deeper burn may be required. Since fire heat penetration is determined by an interaction between the amount of heat produced by the fire and the amount of moisture which is available in the "forest" floor (Miller, 1979), a second burn on Talbot Arm should likely occur later in May or even June. Better fuel will

also be provided with successive growing seasons. However, it is essential to note that a hot burn may affect the desirable herbaceous ground cover in detrimental ways. More literature review is required as inconsistencies have been noted in the review to date.

In this study, cover changes in the forb and graminoid strata are inconsistent across the plot types and burn levels. A more appropriate method than visual estimation is required for measuring the effect of the burn on these strata.

Recommendations:

1. The vegetation plots should continue to be monitored every second year and the data entered into the computer system for similar storage and analysis.

2. Other methods for measuring changes in the graminoid strata should be investigated.

3. The implications of the burn for sheep management should be reviewed and the feasibility of a second burn be examined. Land, Parks and Resources Branch has budgeted to assist in such a feasibility study in 1985/86.

6.0 LITERATURE CITED

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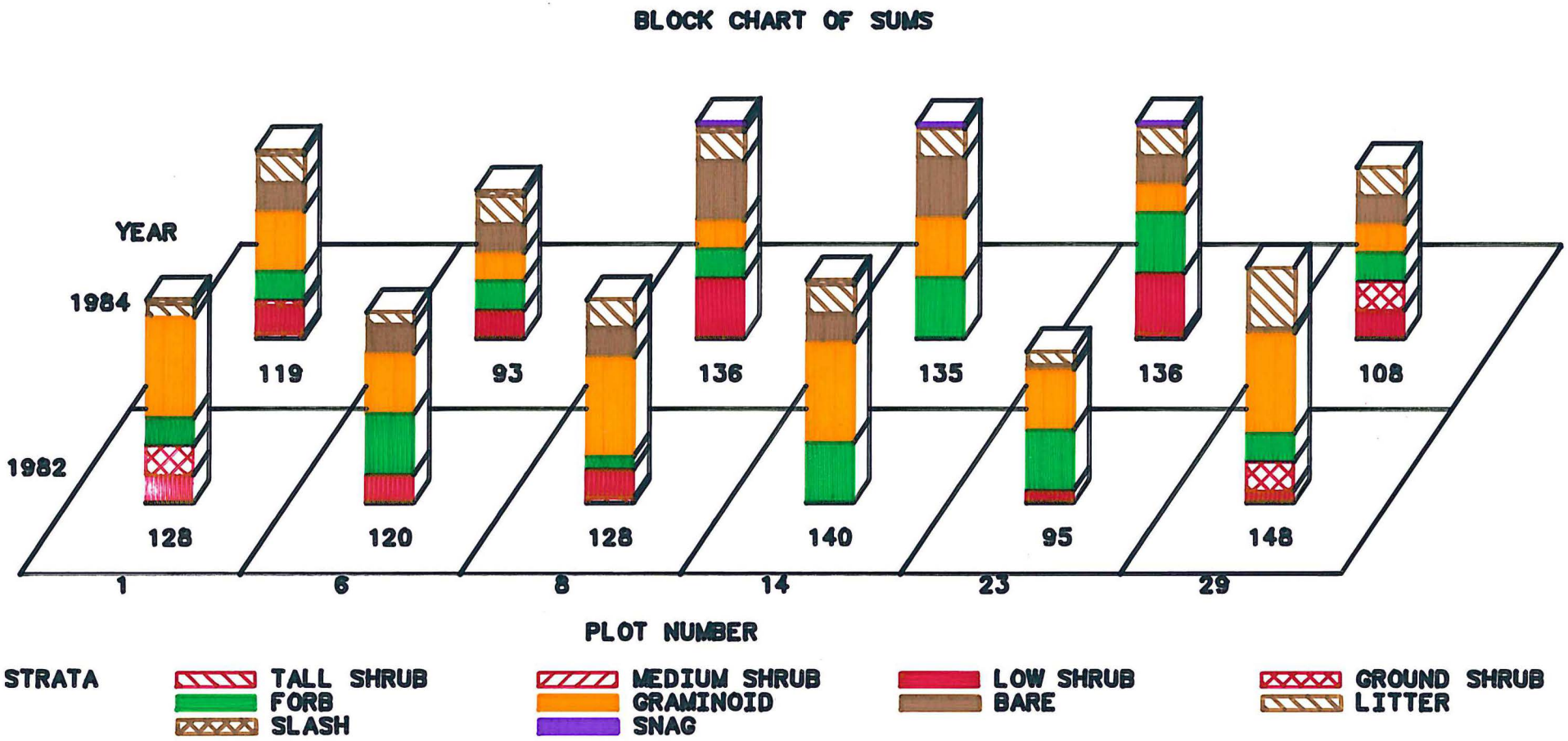
BLOCK CHARTS OF SUMS OF PERCENT COVERS

HABITAT STUDY – PRESCRIBED BURN

TALBOT ARM , KLUANE LAKE , YUKON

FIG 3A – PERCENT COVER BY STRATA
PLOT TYPE = CALAMAGROSTIS / GRAMINEAE



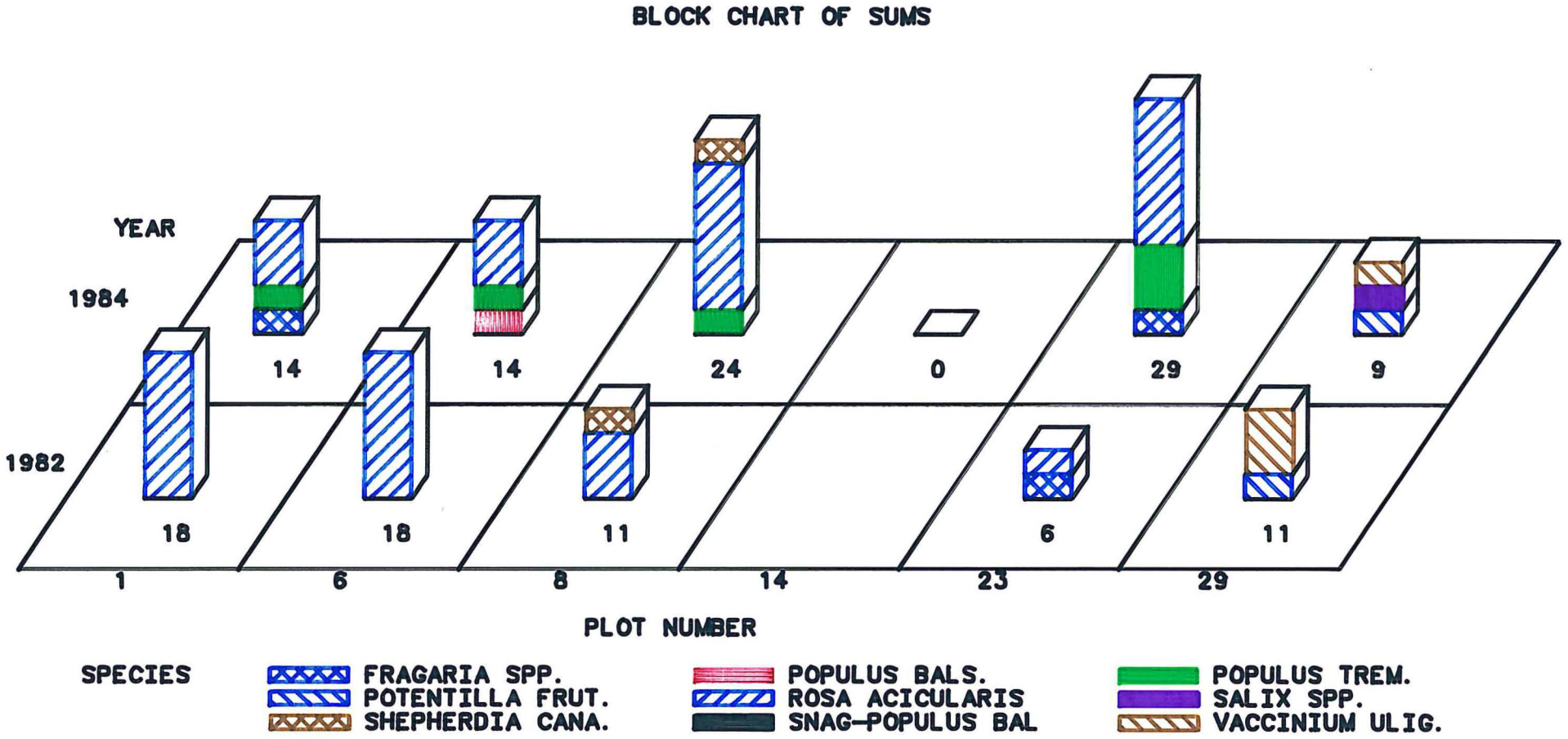
PLOTS 1, 8, 23, 29 BURNED PLOT 14 PARTIALLY BURNED
PLOT 6 NOT BURNED(CONTROL)

NOTE – BRYOPHYTE, LICHEN AND ROCK STRATA NOT SHOWN

HABITAT STUDY – PRESCRIBED BURN

TALBOT ARM . KLUANE LAKE . YUKON

FIG 4A– PERCENT COVER OF LOW SHRUB STRATA BY SPECIES
PLOT TYPE = CALAMAGROSTIS / GRAMINEAE

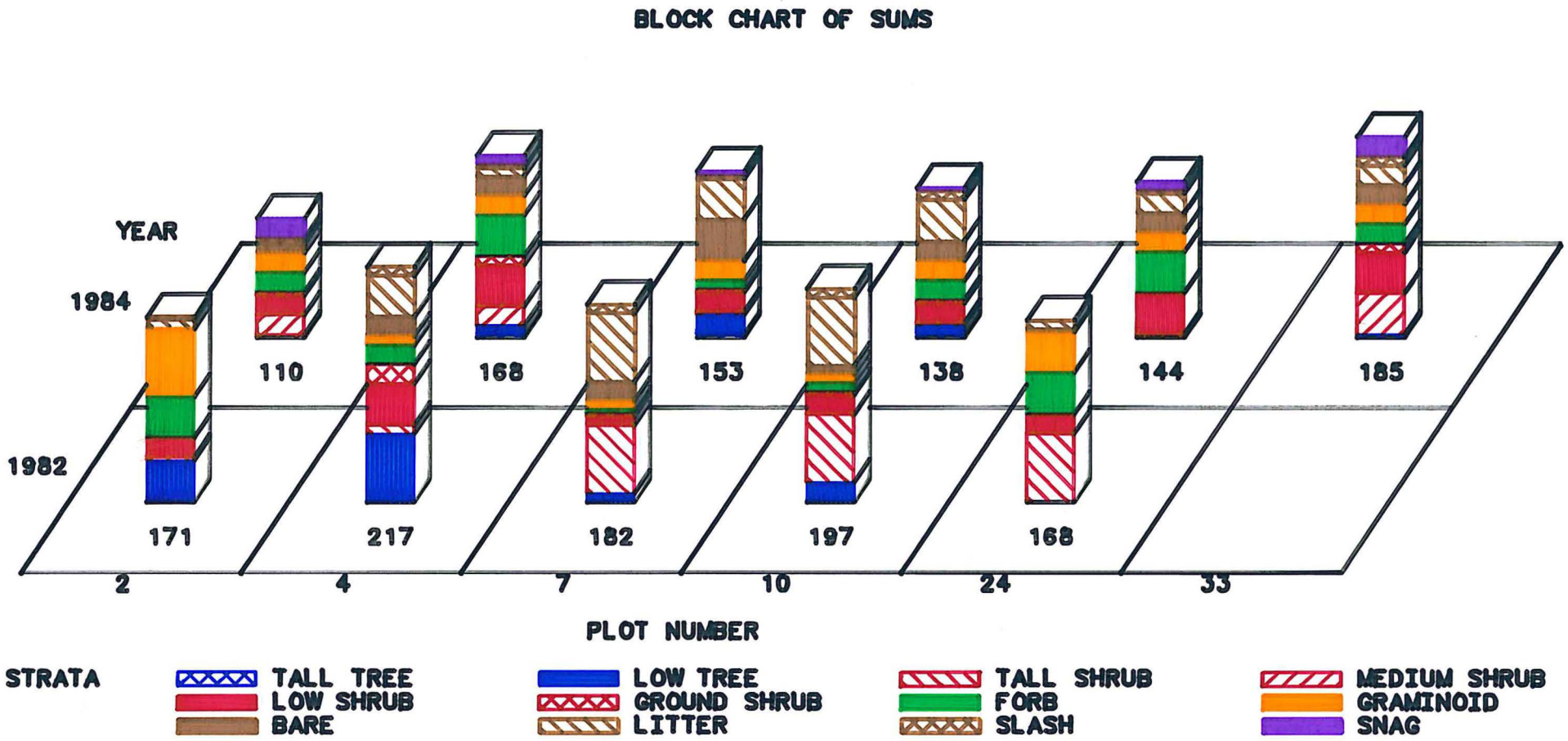


PLOTS 1, 8, 23, 29 BURNED PLOT 14 PARTIALLY BURNED
PLOT 6 NOT BURNED (CONTROL)

HABITAT STUDY – PRESCRIBED BURN

TALBOT ARM . KLUANE LAKE . YUKON

FIG 3B – PERCENT COVER BY STRATA
PLOT TYPE = POPULUS TREMULOIDES



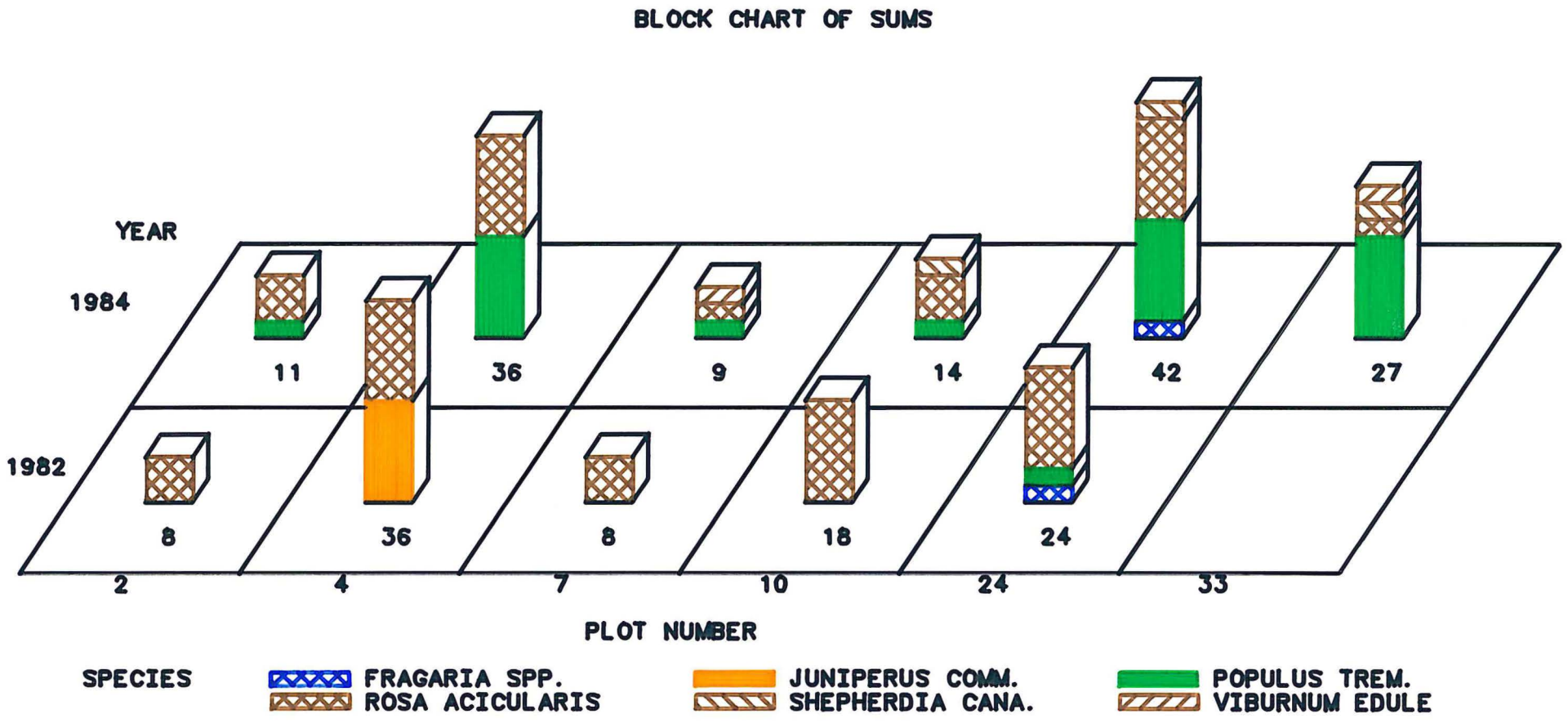
PLOTS 2, 24 BURNED PLOTS 4, 10, 33 PARTIALLY BURNED
PLOT 7 NOT BURNED (CONTROL)

NOTE – BRYOPHYTE, LICHEN AND ROCK STRATA NOT SHOWN

HABITAT STUDY – PRESCRIBED BURN

TALBOT ARM . KLUANE LAKE . YUKON

FIG 4B – PERCENT COVER OF LOW SHRUB STRATA BY SPECIES
PLOT TYPE = POPULUS TREMULOIDES



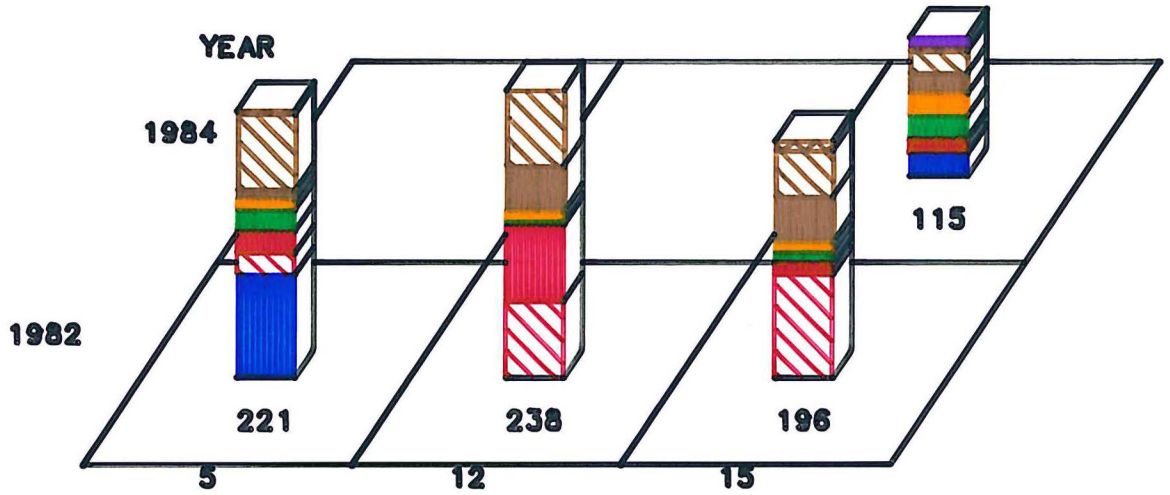
PLOTS 2, 24 BURNED PLOTS 4, 10, 33 PARTIALLY BURNED
PLOT 7 NOT BURNED (CONTROL)

HABITAT STUDY – PRESCRIBED BURN

TALBOT ARM . KLUANE LAKE . YUKON

FIG 3C – PERCENT COVER BY STRATA
PLOT TYPE = POPULUS BALSAMIFERA

BLOCK CHART OF SUMS



STRATA

- LOW TREE
- FORB
- SLASH
- TALL SHRUB
- GRAMINOID
- SNAG
- LOW SHRUB
- BARE
- GROUND SHRUB
- LITTER

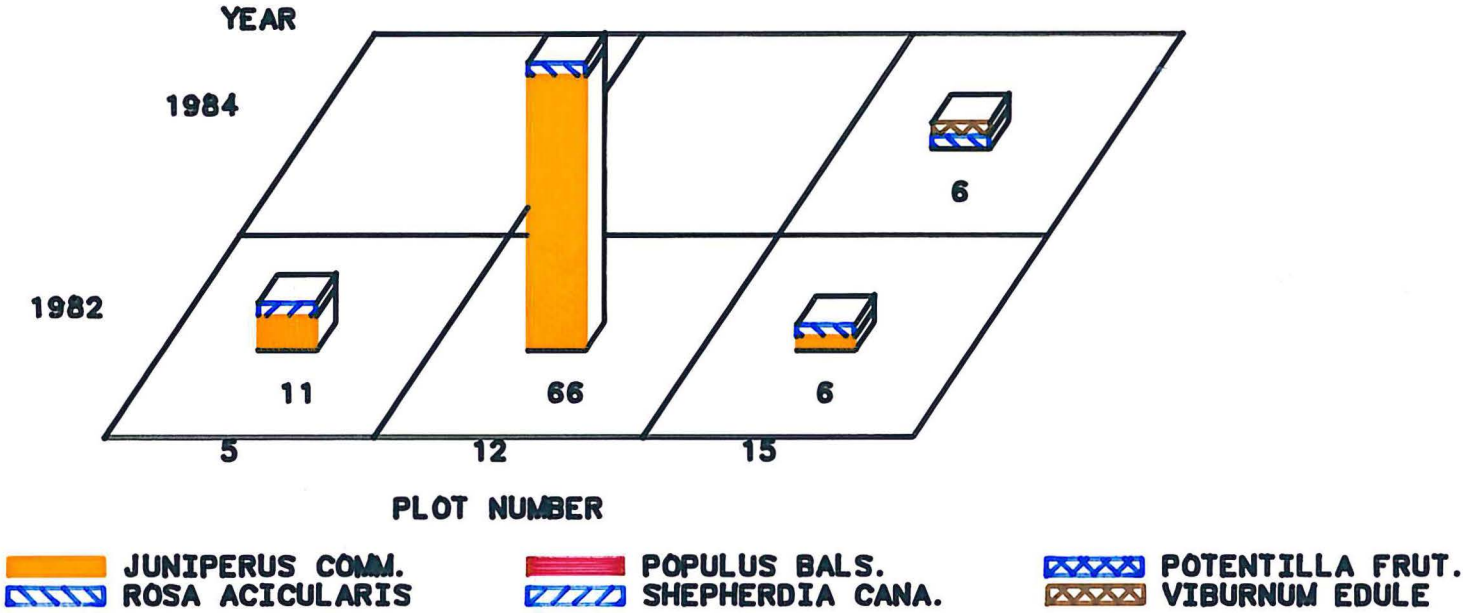
PLOT 15 PARTIALLY BURNED PLOTS 5, 12 NOT BURNED

NOTE – BRYOPHYTE, LICHEN AND ROCK STRATA NOT SHOWN

HABITAT STUDY – PRESCRIBED BURN

TALBOT ARM . KLUANE LAKE . YUKON

FIG 4C – PERCENT COVER OF LOW SHRUB STRATA BY SPECIES
PLOT TYPE = POPULUS BALSAMIFERA



PLOT 15 PARTIALLY BURNED

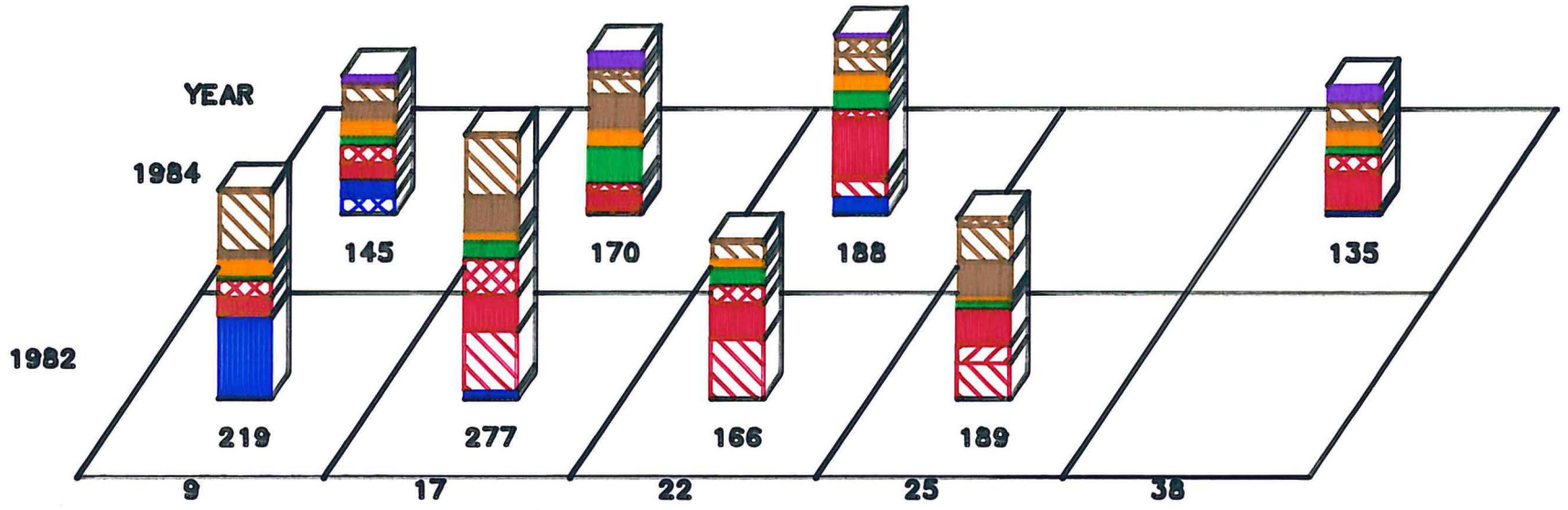
PLOTS 5, 12 NOT BURNED

HABITAT STUDY – PRESCRIBED BURN

TALBOT ARM . KLUANE LAKE . YUKON

FIG 3D – PERCENT COVER BY STRATA
PLOT TYPE = MIXED POPULUS

BLOCK CHART OF SUMS



STRATA

- TALL TREE
- LOW TREE
- TALL SHRUB
- MEDIUM SHRUB
- LOW SHRUB
- GROUND SHRUB
- FORB
- GRAMINOID
- BARE
- LITTER
- SLASH
- SNAG

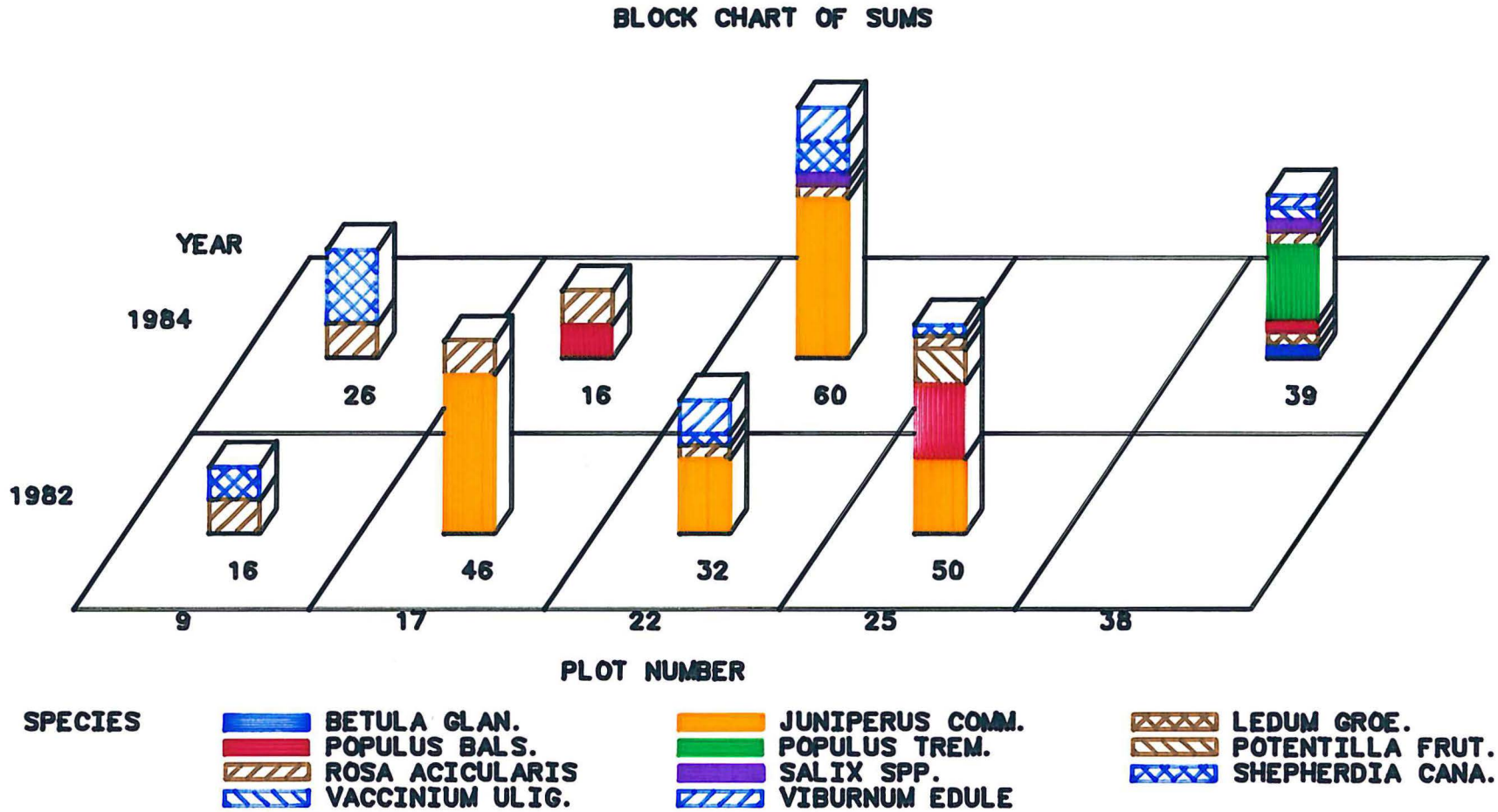
PLOT 17 BURNED PLOTS 9, 38 PARTIALLY BURNED
PLOT 22 NOT BURNED (CONTROL) PLOT 25 NOT BURNED

NOTE – BRYOPHYTE, LICHEN AND ROCK STRATA NOT SHOWN

HABITAT STUDY – PRESCRIBED BURN

TALBOT ARM . KLUANE LAKE . YUKON

FIG 4D– PERCENT COVER OF LOW SHRUB STRATA BY SPECIES
PLOT TYPE = MIXED POPULUS



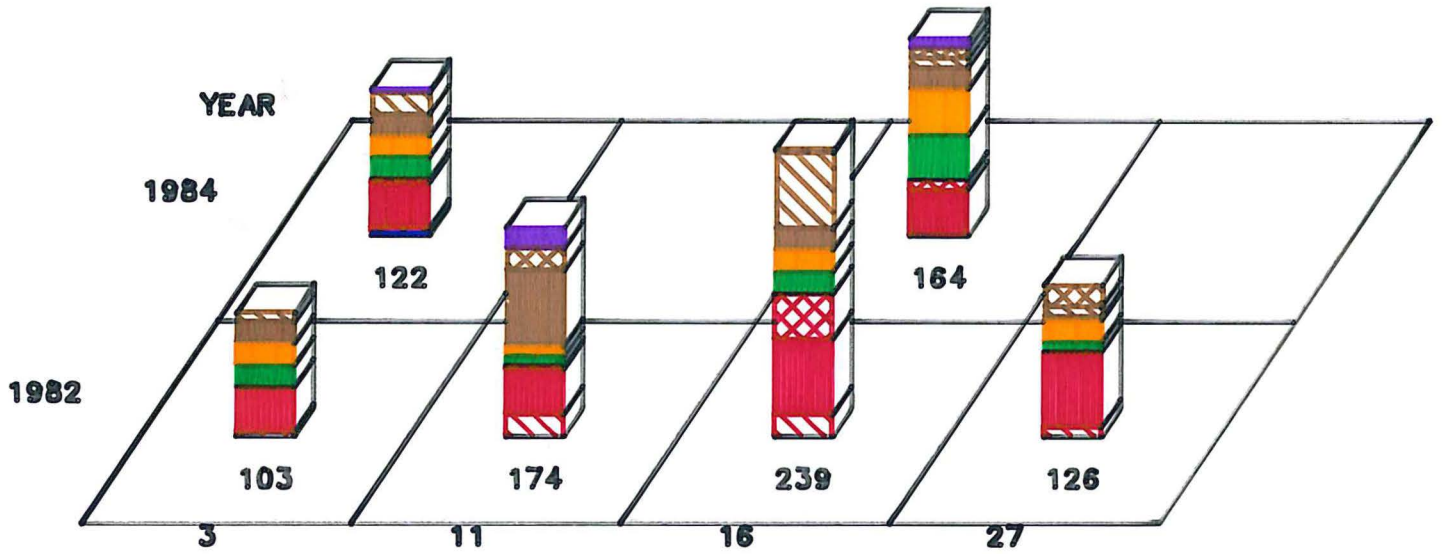
PLOT 17 BURNED
PLOT 22 NOT BURNED(CONTROL)
PLOTS 9, 38 PARTIALLY BURNED
PLOT 25 NOT BURNED

HABITAT STUDY – PRESCRIBED BURN

TALBOT ARM . KLUANE LAKE . YUKON

FIG 3E – PERCENT COVER BY STRATA
PLOT TYPE = JUNIPERUS

BLOCK CHART OF SUMS



STRATA

- LOW TREE
- GROUND SHRUB
- LITTER
- TALL SHRUB
- FORB
- SLASH
- MEDIUM SHRUB
- GRAMINOID
- SNAG
- LOW SHRUB
- BARE

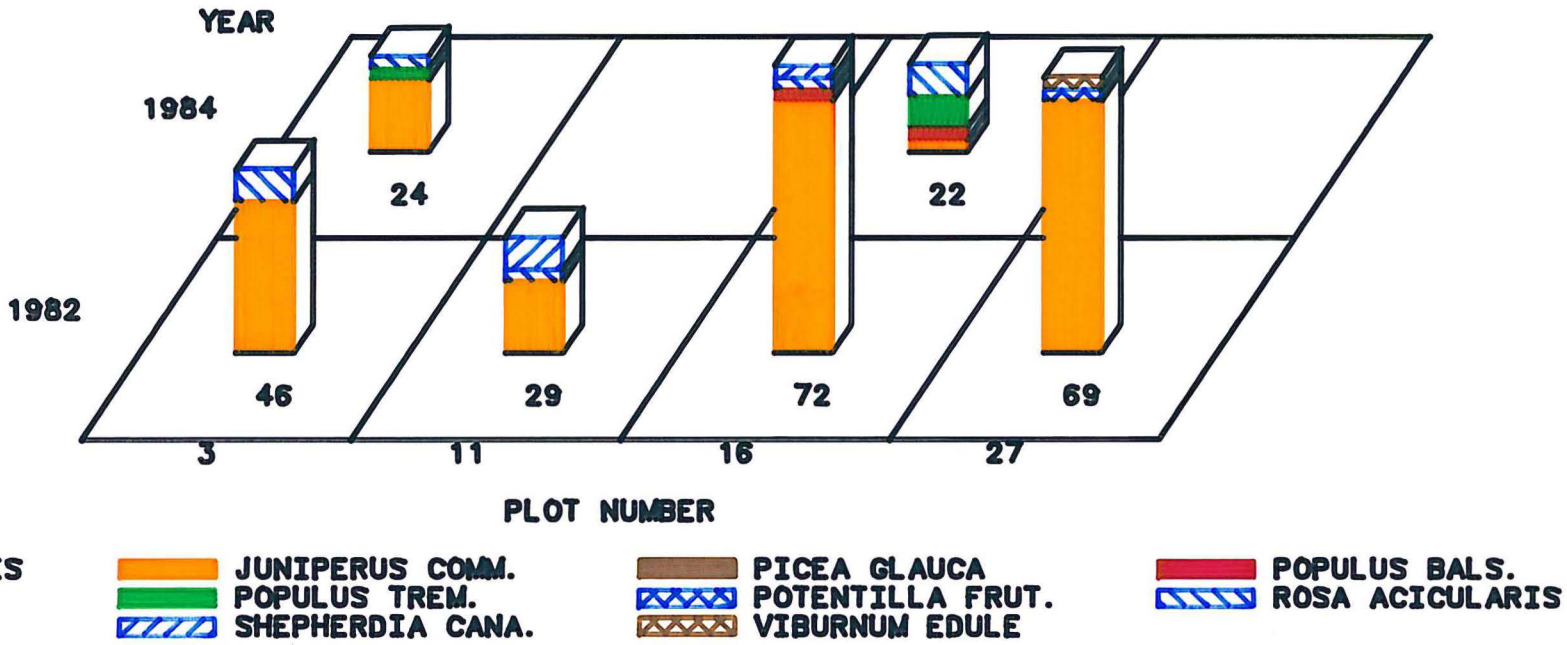
PLOT 16 BURNED PLOT 3 PARTIALLY BURNED
PLOTS 11, 27 NOT BURNED

NOTE – BRYOPHYTE. LICHEN AND ROCK STRATA NOT SHOWN

HABITAT STUDY – PRESCRIBED BURN

TALBOT ARM . KLUANE LAKE . YUKON

FIG 4E – PERCENT COVER OF LOW SHRUB STRATA BY SPECIES
PLOT TYPE = JUNIPERUS

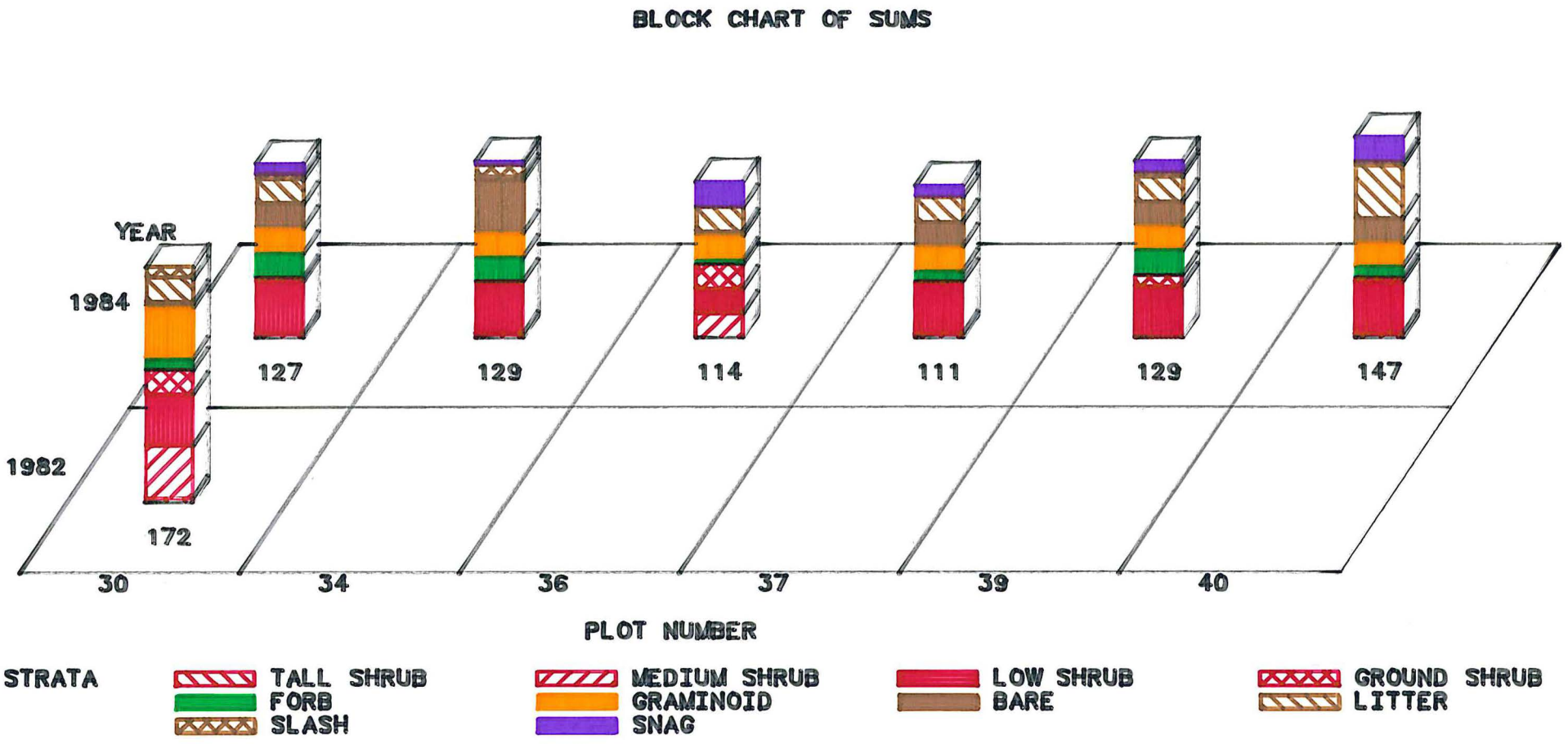


PLOT 16 BURNED PLOT 3 PARTIALLY BURNED
PLOTS 11, 27 NOT BURNED

HABITAT STUDY – PRESCRIBED BURN

TALBOT ARM . KLUANE LAKE . YUKON

FIG 3F – PERCENT COVER BY STRATA
PLOT TYPE = SALIX / BETULA



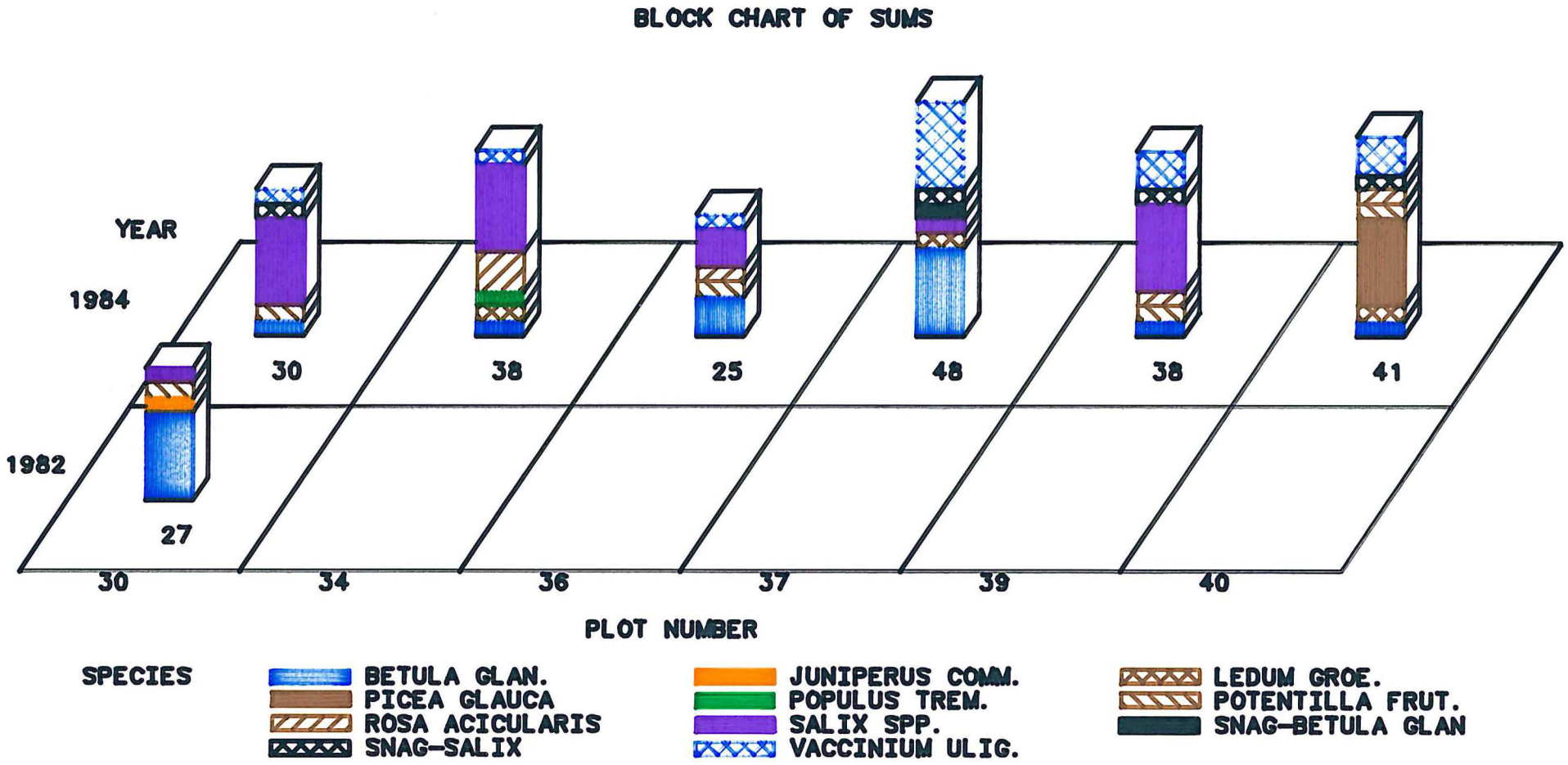
PLOTS 30, 34, 37, 39, 40 BURNED PLOT 36 PARTIALLY BURNED
PLOT 31 NOT SHOWN(NO ATTEMPT TO BURN)

NOTE – BRYOPHYTE, LICHEN AND ROCK STRATA NOT SHOWN

HABITAT STUDY – PRESCRIBED BURN

TALBOT ARM , KLUANE LAKE , YUKON

FIG 4F – PERCENT COVER OF LOW SHRUB STRATA BY SPECIES
PLOT TYPE = SALIX / BETULA



PLOTS 30, 34, 37, 39, 40 BURNED PLOT 36 PARTIALLY BURNED
PLOT 31 NOT SHOWN(NO ATTEMPT TO BURN)

APPENDIX 1

Species List of Vascular Plants

APPENDIX I

Species List of Vascular Plants[1]

	Common Name
POLYPODIACEAE - Fern Family	
Dryopteris fragans(L.) Schott.	fragrant shield fern
Cystopteris fragilis(L.) Bernh.	fragile fern
EQUISETACEAE - Horsetail Family	
Equisetum arvense L.	common horsetail
GRAMINEAE - Grass Family	
Agropyron trachycaulum (Link) Malte var. *unilaterale* (Cassidy) Malte	wheat grass
Bromus pumpellianus Scribn.	brome-grass
Calamagrostis lapponica (Wahlenb.) Hartm.	reed-bentgrass
Calamagrostis purpurascens R. Br.	purple reedgrass
Festuca altaica Trin.	rough fescue
Festuca saximontana Rydb.	fescue
Poa glauca M. Vahl	blue grass
Poa pratensis L.	blue grass
CYPERACEAE - Sedge Family	
Carex consimilis Holm	sedge
Carex scirpoides Michx.	sedge
Carex stenophylla Wahlenb.ssp. *Eleocharis* (Bailey) Hult.	sedge
Carex supina Wahlenb. ssp. *spaniocarpa* (Steud.) Hult.	sedge
Kobresia myosuroides (Vill.) Fiori & Paol.	scirpus
JUNCACEAE - Rush Family	
Luzula multiflora (Retz.) Lej.	wood rush
LILIACEAE - Lily Family	
Smilacina stellata (L.) Desf.	false Solomon's seal
SALICACEAE - Willow Family	
Salix glauca L.	diamond willow

CARYOPHYLLACEAE - Pink Family	
Minuartia obtusiloba (Rydb.) House	sandwort
Stellaria longipes Goldie	chickweed
RANUNCULACEAE - Crowfoot Family	
Anemone parviflora Michx.	anemone
CRUCIFERAE - Mustard Family	
Draba aurea M. Vahl	golden draba
Draba fladnizensis Wulfen	
SAXIFRAGACEAE - Saxifrage Family	
Parnassia palustris L. var. *neogaea* Fern.	wideworld parnassia, bog star
Saxifraga hieracifolia Waldst. & Kit.	stiff stemmed saxifrage
Saxifraga reflexa Hook.	saxifrage
Saxifraga tricuspidata Rottb.	prickly saxifrage
ROSACEAE - Rose Family	
Chamaerodos erecta (L.) Bunge ssp. *Nuttalli* (T.&G.)Hult	
Dryas octopetala L.	mountain avens
Potentilla fruticosa L.	shrubby cinquefoil
Potentilla nivea L.	cinquefoil
Potentilla pennsylvanica L.	cinquefoil
LEGUMINOSAE - Pea Family	
Oxytropis ? borealis DC.	
UMBELLIFERAE - Parsley Family	
Bupleurum americanum Coult. & Rose	
PRIMULACEAE - Primose Family	
Androsace chamaejasme Host. var.*arctica*Knuth	rock-jasmine
BORAGINACEAE - Borage Family	
Myosotis alpestris Schm. ssp.*asiatica* Vestergr.	forget-me-not

SCROPHULARIACEAE - Figwort Family	
Pentstemon gormanii Greene	beard-tongue, pentstemon
VALERIANACEAE - Valerian Family	
Valeriana capitata Pall.	valerian
COMPOSITAE - Composite Family	
Achillea nigrescens (E. Mey.) Rydb.	yarrow
Antennaria sp. Gaertn.	pussytoes
Artemisia alaskana Rydb.	sagewort
Artemisia arctica Less.	sagewort
Artemisia frigida Willd.	prairie sagewort
Artemisia furcata Bieb. (also called *Artemisia hyperborea* Rydb.)	sagewort
Aster alpinus L.	aster
Aster sibiricus L.	Siberian aster
Petasites hyperboreus Rydb.	coltsfoot
Senecio conterminus Greenm.	groundsel, ragwort
Solidago decumbens Greene var. *oreophila* (Rydb.) Fern	goldenrod
Solidago multiradiata Ait.	goldenrod

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[1] This is a representative list of the vascular plants which occur in the study area. Most species were collected at ground sampling sites in 1984 and submitted to the Herbarium of the National Museum of Canada, Ottawa. Identification of these specimens was by W.J. Cody, Curator of Vascular Plants.

Specimens not submitted to the Herbarium were identified by the field crew.

Authorities used are those cited by Porsild and Cody, 1980.

APPENDIX II

Plates

Plate 1 - Aerial view of Talbot Arm, looking north. Prescribed burn study area extends along the west shore, on left of photo. Raft Creek enters into Talbot Arm on bottom right. Photo taken Sept/82 (pre-burn).

Plate 2 - A portion of the prescribed burn study area; draw 6 visible in left centre, draw 7 visible toward right. Photo taken Sept/82 (pre-burn).

Plate 3 - Dall sheep on southeast - facing slope of draw 2. Three vegetation plots types are visible in this photo: Juniperus; Calamagrostis/Gramineae and Populus tremuloides.

Plate 4 - Mineral lick on south-facing slope of draw 5.

Plate 5 - Vegetation Plot Type A - Calamagrostis/Gramineae

Plate 6 - Vegetation Plot Type B - Populus tremuloides

Plate 7 - Vegetation Plot Type C - Populus balsamifera

Plate 8 - Vegetation Plot Type D - Mixed Populus

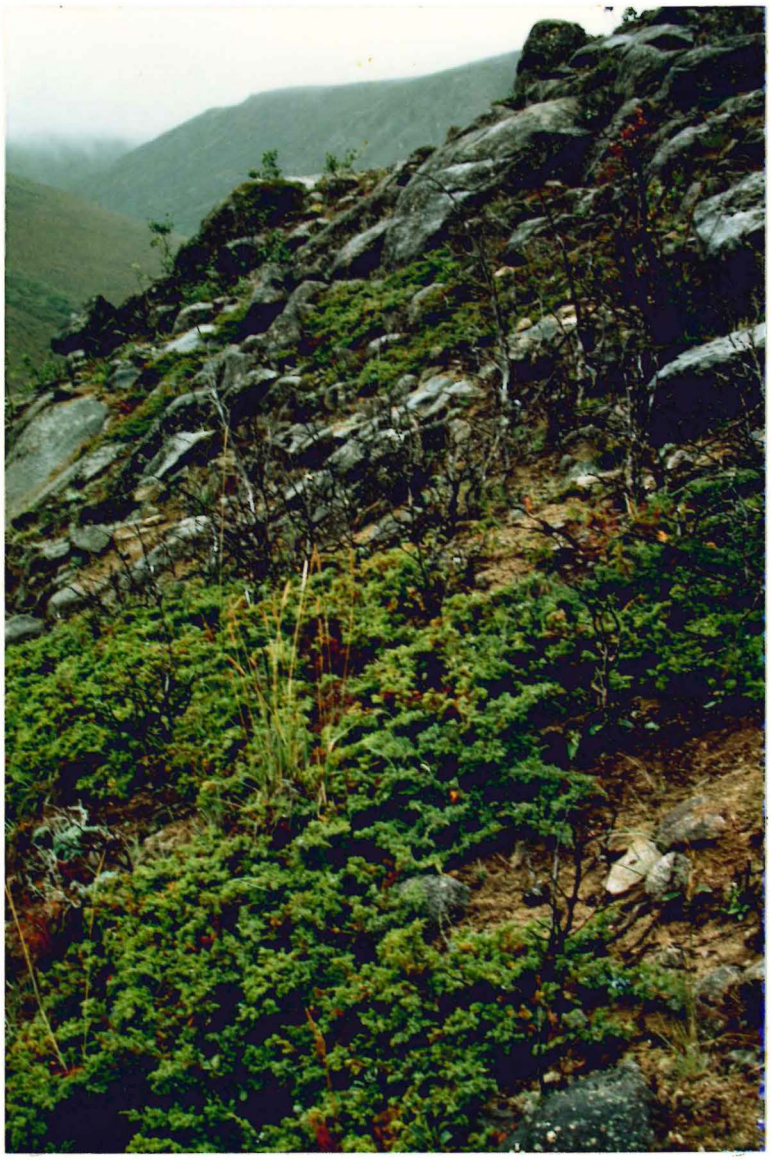

Plate 9 - Vegetation Plot Type E - Juniperus

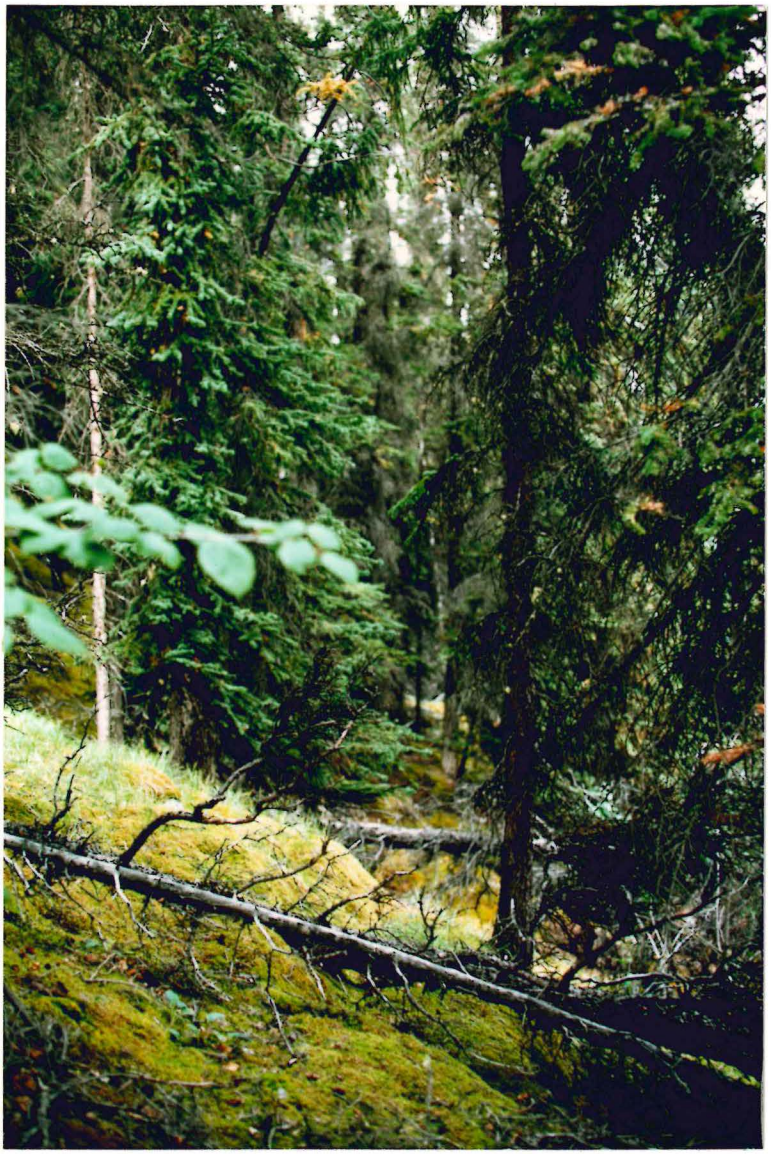

Plate 10 - Vegetation Plot Type - Picea glauca

Plate 11 - Vegetation Plot Type F - Salix/Betula

Plate 12 - Vegetation Plot Type - Alnus/Salix

Plate 13 - Low shrub suckering of Populus tremuloides on Plot 33; photo taken Aug/84, one year post-burn.

Plate 14 - Burned roots of Juniperus sp. visible in foreground, surrounded by recent proliferation of Rosa acicularis. Photo take Aug/84, one year post-burn.

Plate 15 - Plot 41 situated in the valley of upper Draw 5. Burned snags of Picea glauca are interspersed throughout a Salix/Betula shrubland, which exhibits suckering. Photo taken Aug/84, one year post-burn.

Plate 16 - An example of suckering of Betula glandulosa. Photo taken Aug/84, one year post-burn.

Plate 17 - An example of suckering of Salix sp.; photo taken one year post-burn.

Plate 18 - An example of suckering of Populus balsamifera. Photo taken Aug/84, one year post-burn.