COMPOSITION, STRUCTURE, AND DISTRIBUTION OF THE ECOSYSTEMS OF THE THREE SISTERS BIOSPHERE RESERVE/WILDERNESS AREA

Charles B. Halpern and Bradley G. Smith,
Department of Botany and Plant Pathology and Department of Forest Science, Oregon State University,
Corvallis, Oregon,

and

Jerry F. Franklin,
U.S.D.A. Forest Service, Corvallis, Oregon

October 1984

Final Report to the U.S. Department of Agriculture

TABLE OF CONTENTS

Page

ACKNOWLEDGEMENTS i

INTRODUCTION 1

METHODS 4

1. Forest Sampling 4

2. Meadow Sampling 5

3. Forest - Meadow Ecotone Sampling 6

4. Analytical Methods 8

RESULTS AND DISCUSSION 9

1. Forest Community Classification and Ordination 9

2. Forest Community Descriptions 19

Tsuga heterophylla Series 19

Tsuga heterophylla-*Abies amabilis* Series 27

Abies amabilis-*Tsuga mertensiana* Series 30

Tsuga mertensiana Series 35

3. Forest Ages and Disturbance History 39

4. Meadow Community Classification and Ordination 46

5. Meadow Community Descriptions 56

Montane Meadows 56

A. Hydric Series 56

B. Mesic Series 67

C. Xeric Series 76

Subalpine Meadows 80

Page

6. Similar Forest Types of Oregon, Washington, and British Columbia 94

Tsuga heterophylla Series 94

Tsuga heterophylla-Abies amabilis Series 97

Abies amabilis-Tsuga mertensiana Series 98

Tsuga mertensiana Series 100

7. Similar Meadow Types of Oregon, Washington, and British Columbia 102

Montane Meadows 102

A. Hydric Series 102

B. Mesic Series 103

C. Xeric Series 105

Subalpine Meadows 105

8. Forest - Meadow Ecotone Transects 112

PLANS FOR PUBLICATION 128

ARCHIVING OF INFORMATION 129

ADDITIONAL REASEARCH NEEDS 130

LITERATURE CITED 133

APPENDICES

Appendix A. Separation Creek Drainage Forest Community Ordinations (Figures A1 - A6)

Appendix B. Separation Creek Drainage Forest Communities: Ordination Position vs. Environmental Characteristics (Figures B1 - B5)

Appendix C. Separation Creek Drainage Forest Communities:

1. Plant Association Tables
2. Overstory Parameters and Vegetation Structure Table (Table C1)
3. Species Counts Table (Table C2)
4. N1 and N2 Diversity Table (Table C3)
5. Environmental Characteristics Table (Table C4)
6. Soil Surface and Profile Variable Table (Table C5)

Appendix D. Three Sisters Wilderness Area Meadow Community Ordinations (Figures D1 - D4)

Appendix E. Three Sisters Wilderness Area Meadow Communities: Ordination Position vs. Elevation (Figures E1 - E3)

Appendix F. Three Sisters Wilderness Area Meadow Communities:

1. Plant Association Tables
2. Vegetation Structure Table (Table F1)
3. Species Richness Table (Table F2)
4. N1 and N2 Diversity Table (Table F3)
5. Environmental Characteristics Table (Table F4)
6. Soil Surface and Profile Variable Table (Table F5)

Appendix G. Three Sisters Wilderness Area Permanent Forest - Meadow Transects #1-21:

1. Site and Soil Characteristics Summary Tables
2. Tree Age and Spatial Distribution Figures
3. Vegetation Composition Figures

Appendix H. A Key to Forest Communities in the Separation Creek Drainage, Three Sisters Wilderness Area/Biosphere Reserve

Appendix I. Species Lists with Acronyms for Separation Creek Drainage Forest Communities and Meadow Communities of the Three Sisters Wilderness Area/Biosphere Reserve

ACKNOWLEDGEMENTS

We would like to thank our field assistants--Teresa Magee for help with the meadow sampling, Dan Luoma for both the forest and ecotone transect sampling, Dean Stevens for the forest sampling, and Denise Fidel for the ecotone transect sampling.

The McKenzie River Ranger District and Arthur McKee of the H. J. Andrews Experimental Forest were generous in providing logistic support as well as aerial photos of the Three Sisters Wilderness and adjacent areas. Esther McEvoy prepared many of the figures.

Finally Dr. Robert E. Frenkel has shown continued support for this study, providing many interesting ideas and encouraging numerous enlightening discussions.

The study was supported by a grant from the United States Department of Agriculture as part of the U.S. Man and the Biosphere Program.

INTRODUCTION

The Three Sisters Wilderness Area is a Biosphere Reserve that represents the northern half of the Sierra-Cascade Province (Franklin, 1977). It encompasses 98,760 hectares of essentially undisturbed landscape straddling the central crest of the Oregon Cascade Range. The major component of the vegetation is a coniferous forest variously comprised of such species as Douglas-fir, western and mountain hemlock, true firs, cedars, and lodgepole and other pines. There are also numerous montane and subalpine meadows, alpine communities, barren lava flows, varied wetlands, unvegetated rock and ice, ponds, lakes, and an array of streams and rivers.

Environmental conditions vary markedly as topography and climate interact to produce changes in temperature, precipitation, and snowpack along elevational gradients and on slopes of contrasting aspect and steepness. Climate is maritime with long, cool, wet winters and warm, dry summers. A large portion of the total precipitation falls as snow, producing winter snowpacks as deep as four to eight meters at higher elevations. The soils are variable in physical properties, relatively young, and have developed primarily from recent volcanic and colluvial deposits (see Franklin and Dyrness, 1973 for a review of environment and soils of the central western Cascade Range).

The Three Sisters area was given Wilderness status in 1957 and incorporated into the National Wilderness System by Congress in 1964. In 1974 it was selected as a Biosphere Reserve and represents a control area for the nearby H.J. Andrews Biosphere Reserve (Franklin, 1977).

As a Forest Service Wilderness, the Three Sisters is unique among U.S. Biosphere Reserves; the area has no directly associated research unit as is the case with Experimental Forests or National Parks. Understandably, basic ecological research in the Three Sisters Biosphere Reserve has therefore been limited; in terms of its ecosystems the area is less well described than most other U.S. Biosphere Reserves. Yet an important part of the establishment of a Biosphere Reserve is documentation of the existing ecosystems with baseline data (U.S. MAB Task Force on Project 8, 1974).

To date, most existing information comes from doctoral theses by Van Vechten (1960) and Pechanec (1961). Van Vechten provides a general description of the ecology of timberline and alpine vegetation above 1960 m elevation. Broad vegetation groups on a variety of landform types are reported. Pechanec (1961) studied the bryophytes of the area; in the process she developed nine classification units of forest stands broadly based on dominant tree species and topography. Extensive data on the forest communities was collected under the auspices of a National Science Foundation grant to Henry P. Hansen of Oregon State University but has never been analyzed or reported; this grant also provided much of the support for Van Vechten and Pechanec. In addition, an unpublished data set on mountain hemlock communities resides with Fred Hall and Leonard Volland of the U.S. Forest Service, PNW Station, Portland. Ninety-four plots were sampled on both sides of the Cascade crest during the mid-1960's. Finally, Ireland (1968) compiled a flora for the Three Sisters Wilderness, which is, unfortunately, incomplete, and has a number of nomenclatural problems.

Our basic research on plant communities describes the existing vegetation and is essential for monitoring both natural vegetation change and the effect of man's activities on these systems. Three major objectives of this study are to provide baseline data on:

1. composition, structure, and distribution of plant communities, both forested and non-forested;
2. relevant environmental controlling features; and
3. information concerning maintenance of the landscape mosaic of ecosystems through time.

This final report is structured as follows: sampling methods are considered first, followed by discussion of the forest vegetation and brief descriptions of each of the defined communities and phases. This is followed by a brief analysis of large scale natural disturbance as pertains to forest systems in the Wilderness. Next is a discussion of the meadow vegetation and brief descriptions of each of the defined communities and phases. A section then identifies and briefly compares the Three Sisters communities with forest and meadow vegetation reported in the literature for Oregon, Washington and British Columbia. We then discuss the baseline data collected during installation of the permanent forest-meadow ecotone transects. The final sections contain plans for publication and archiving of data and results, and suggest further needs for research. Appendices contain tables of plant associations, soil and environmental characteristics, summaries of vegetation structure and diversity measures, results of ordination analyses, summaries of the ecotone transects, a key to forest communities in the Separation Creek drainage, and species lists.

METHODS

Forest Sampling

We sampled forest ecosystems during the summer of 1981 using the reconnaissance method of Franklin, et al. (1970), with modifications developed in vegetation and fire history studies of the H.J. Andrews Biosphere Reserve, Mt. Rainier, Olympic National Parks and the forest vegetation of southwest Oregon. This method permits sampling over a broad area in a time frame which would not be practical for detailed, repetitive plot work.

As with the releve' method (Westhoff and van der Maarel, 1978) plot size and shape can vary to fit the requirements of the vegetation being sampled and plot boundaries are not explicitly marked. Each of the 162 forest plots were subjectively located in large, visually homogeneous stands. Previous experience suggested that each plot approximate a 500 m^2 circle and that is the shape and size used in training personnel. Compositional characteristics were recorded through estimates of projected canopy cover for each vascular species. Structural characteristics were assessed through the identification of size class distributions for trees and by age and height measurements. Environmental features such as elevation, slope, aspect, landform and topographic character were recorded. A soil pit was dug, particle size distribution determined, pH tested, and litter composition described.

Finally, descriptive notes were taken on adjacent plant communities, structural and compositional characteristics otherwise not recorded, fire and geomorphic disturbance characteristics, and other distinctive features not addressed in the reconnaissance data.

Meadow Sampling

We sampled meadow ecosystems during the summer of 1982, using a reconnaissance technique comparable to that used in the forest vegetation. Initially, we identified meadow areas from U.S.G.S. topographic maps and aerial photos. A total of 152 variable-sized plots were sampled in the Wilderness and in adjacent areas. Where more than one vegetation type was apparent in a meadow, more than one plot was often taken.

We sampled meadows totally void of any tree reproduction, as well those with individual trees scattered across the entire expanse. Composition, size class distribution and approximate age of trees were carefully described in the notes section of each plot form. We gave special attention to the mosaic of vegetation types, noting surrounding meadow vegetation and forest composition. Color and black and white photos were taken of each plot and of the entire meadow expanse at each site. Voucher specimens of species were collected and are being deposited in the Oregon State University Herbarium, OSC, Corvallis. Nomenclature follows Hitchcock and Cronquist (1973).

Forest - Meadow Ecotone Sampling

We installed and documented 21 permanent forest-meadow ecotone transects during the summer of 1983. We selected transects to represent the complete variation of forest and meadow vegetation as well as the variation in tree invasion patterns. Sites were established in many areas of the Wilderness on both the west and east sides of the crest. To characterize ecotone structure and tree invasion patterns on the backdrop of environmental and vegetation gradients, we had four major data collection tasks.

First, in each meadow we subjectively located a transect to characterize the pattern of tree invasion. End points and midpoints were fixed with reinforcing bar. The transect was two meters wide, beginning from well within the forest, encompassing the range of meadow vegetation types, and usually extending well beyond the boundaries of any tree invasion. On alternating sides of the transect square meter plots for plant abundance and frequency were read. Projected crown cover for all vascular plant species were recorded; five size classes were delineated for each tree species and each class was assessed for cover.

Second, all trees falling within the 2 m belt transects, and larger than 10 cm DBH were individually tagged and cored as close to the ground as possible for age determination. Trees smaller than 10 cm DBH but large enough to be cored were also aged. Locations of all cored trees were noted as a permanent record of the spatial age distribution.

Third, all trees greater than 1 year old were located by plot number, identified to species, measured for height and basal diameter and aged using terminal bud scar or annual ring counts. All ring counts from cores were done in the laboratory under a dissecting microscope. With mountain hemlock, bud scar counts were not possible. Initially, at one site, one hundred mountain hemlocks, too small to core, were cut down and sectioned; annual ring counts were then made in the laboratory. With this sample we tested the feasibility of using a regression of mountain hemlock basal diameter and height with age. At all other sites, only several trees were destructively sampled to get an estimate of age for the smaller size class trees.

Fourth, we dug soil pits adjacent to the transect, subjectively located along the gradient of vegetation types. In each pit we made a description of soil particle size distribution, horizon characteristics, fine and coarse root distributions and any other unique characteristic such as presence of charcoal. Depth of litter was noted also. At each soil pit site a characterization of environmental features was made--elevation, slope, aspect, and landform and topography were noted.

Numerous permanent photopoints were established and documented to record long-term changes. We described transect locations in detail, often using sketch maps. We also described locations of reinforcing bar and copper pin endpoints and mid points. Finally we made detailed descriptions of otherwise unrecorded information such as human or animal disturbance, fire or geomorphic disturbance, and surrounding forest and meadow composition and structure.

Analytical Methods

The analysis of the vegetation was conducted using two complementary approaches: cluster analysis and ordination analysis. Cluster analysis, the search for discrete pattern, was accomplished by use of indicator species analysis (Hill, et al., 1975) as implemented by the computer program TWINSPAN (Hill, 1979b) and by manual table sorting techniques (Mueller - Dombois and Ellenberg, 1974; Westhoff and van der Maarel, 1978). Ordination analysis, the search for gradients, was conducted by correspondence analysis (Hill, 1973; 1974) as implemented by the program DECORANA (Hill, 1979a; Hill and Gauch, 1980). TWINSPAN and DECORANA are a part of the Cornell Ecology Program Series; other programs were developed locally.

The basic strategy of the analytical procedure was to start with a whole data set (either forest or non-forest) and then, with results from clustering and ordination, split the data into smaller parts. Each part was then analyzed in a similar manner.

Analysis of ecotone transect data was limited, for this report, to a descriptive natural history approach. We feel this is appropriate at the current time because these data are intended as permanent baseline data that are to be remeasured.

RESULTS AND DISCUSSION

Forest Community Classification and Ordination

We concentrated sampling of forest ecosystems of the Three Sisters Biosphere Reserve in the Separation Creek Drainage; available resources did not permit a sampling of the entire Wilderness. This study area was bounded by the Wilderness area boundary on the west; Foley Ridge to Proxy Point, the Husband and thence to the western most Chamber Lakes on the north; the crest of the Cascades (Willamette--Deschutes National Forest boundary) to Sisters Mirror Lake on the east; and a line along Burnt Top, Cedar Swamp and the southern ridge above Rooney Creek on the south. Plot elevations ranged from 500 to 2200 m (1640 to 7218 ft).

The data set consists of 162 plots which contain a total of 162 species. Douglas-fir (*Pseudotsuga menziesii*) is both the most common and most abundant species in the data set (Tables 1 and 2, below), reflecting the seral nature of most forest stands in the Three Sisters Wilderness. *Vaccinium membranaceum* is the most common shrub species, *Berberis nervosa* and *Chimaphila umbellata* are the most common of the low shrub/sub-shrub group, and *Rubus ursinus* and *Linnaea borealis* are the most frequent herb species.

Table 1. The twenty most common forest species, ranked by constancy in the entire data set.

Species	Growth * Form	Constancy (%)
Pseudotsuga menziesii	T	72
Vaccinium membranaceum	S	67
Chimaphila umbellata	L	62
Abies amabilis	T	59
Berberis nervosa	L	56
Tsuga heterophylla	T	53
Rubus ursinus	L	49
Tsuga mertensiana	T	48
Linnaea borealis	L	46
Rubus lasiococcus	L	44
Pachistima myrsinites	S, L	41
Achlys triphylla	H	40
Goodyera oblongifolia	H	40
Anemone deltoidea	H	38
Pyrola secunda	H	38
Viola sempervirens	H	38
Pteridium aquilinum	H	36
Rhododendron macrophyllum	S	35
Trillium ovatum	H	35
Vaccinium parvifolium	S, L	34

* H - herb; L - low shrub (<50 cm); S - shrub (>50 cm); T - trees

Thuja plicata	T	6
Acer circinatum	S	6
Xerophyllum tenax	H	5
Vaccinium membranaceum	S, L	4
Gaultheria shallon	L, S	3
Abies concolor	T	3
Linnaea borealis	L	2
Cornus canadensis	L	2
Vaccinium scoparium	L	1
Chimaphila umbellata	L	1
Achlys triphylla	H	1
Pinus monticola	T	1
Abies lasiocarpa	T	1

---

* H - herb; L - low shrub (<50 cm); S - shrub (>50 cm); T - tree

** Average cover based only on those samples in which species occurs.

Interpretation of the ordination axes as environmental gradients are possible if we consider species autecology, stand composition, and environmental information. The initial DCA ordination of the data yielded the first four eigenvalues of .70, .37, .22, and .18. The first eigenvector (or axis of the ordination) is a complex gradient best represented by elevation. The lack of a simple interpretation is inherent in the factors associated with an increase in elevation: decreasing temperature, increasing precipitation, greater winter snowpack, and shorter growing season. Beta diversity associated with this gradient is 5.1 standard deviations or approximately 5 half-changes in species composition. This is a typical value for similar elevational changes in the Olympic and Cascade Mountain Ranges.

By manually sorting the samples based on indicated climax tree species (Table 3, below) we can delineate four major groups or series of plant communities: *Tsuga heterophylla* Series, *Tsuga heterophylla* - *Abies amabilis* Series, *Abies amabilis* - *Tsuga mertensiana* Series, and *Tsuga mertensiana* Series. These segregate fairly well along the elevational gradient of Axis 1 in the initial ordination (Figure A1, Appendix A). The Series are more easily visualized in the ordinations produced after splitting the data into two sets (Figure A2 and A3, Appendix A). The first set contains data assigned to the *Tsuga heterophylla* Series and *Tsuga heterophylla* - *Abies amabilis* Series. The second set contains the higher elevation *Abies amabilis* - *Tsuga mertensiana* Series and the *Tsuga mertensiana* Series.

Table 3. Forest Series found in the Separation Creek Drainage of the Three Sisters Wilderness, Oregon.

Series	Number of Plots
Tsuga heterophylla	69
Tsuga heterophylla - *Abies amabilis*	32
Abies amabilis - *Tsuga mertensiana*	45
Tsuga mertensiana	15

We superimposed the groups defined by the TWINSPAN clustering on both the initial and secondary ordination diagrams. The cluster integrity and arrangement are fairly consistent spatially (Figures A4-A6, Appendix A). Based upon the correspondence of TWINSPAN clusters with DECORANA ordinations and the subjective elimination of some ecotone and outlier stands we were able to develop a classification system for forest communities in the Separation Creek Drainage.

The forest communities are listed below in Table 4. Each series is named after the indicated climax tree species. Community type (C.T.) names reflect the diagnostic understory species and Phase names represent recognizable variation in a community, attributed to the presence of one or more important species.

Table 4. Forest Communities of the Separation Creek Drainage, Three Sisters Wilderness, Oregon.

Tsuga heterophylla Series:

1. Pseudotsuga menziesii-Calocedrus decurrens/Symphoricarpos mollis C.T. (PSME-CADE3/SYMO C.T.)
2. Acer circinatum/Polystichum munitum C.T. (ACCI/POMU C.T.)
3. Acer circinatum/Berberis nervosa C.T. (ACCI/BENE C.T.)

4a. Berberis nervosa C.T. (BENE C.T.)

4b. Berberis nervosa C.T.-Herb Rich Phase (BENE C.T.-Herb Rich Phase)

5. Rhododendron macrophyllum/Gaultheria shallon C.T. (RHMA/GASH C.T.)
6. Rhododendron macrophyllum/Berberis nervosa C.T. (RHMA/BENE C.T.)
7. Rhododendron macrophyllum/Linnaea borealis C.T. (RHMA/LIBO2 C.T.)

Tsuga heterophylla - Abies amabilis Series:

8. Mixed Herb C.T. (Mixed Herb C.T.)
9. Rhododendron macrophyllum/Xerophyllum tenax C.T. (RHMA/XETE C.T.)
10. Xerophyllum tenax C.T. (XETE C.T.)

Abies amabilis - Tsuga mertensiana Series:

11a. Vaccinium membranaceum C.T. (VAME C.T.)

11b. Vaccinium membranaceum C.T./Xerophyllum tenax Phase (VAME C.T.-XETE Phase)

12. Vaccinium scoparium-Vaccinium membranaceum C.T. (VASC-VAME C.T.)
13. Rubus lasiococcus C.T. (RULA C.T.)
14. Achlys triphylla C.T. (ACTR C.T.)

Tsuga mertensiana Series:

15a. Xerophyllum tenax C.T. (XETE C.T.)

15b. Xerophyllum tenax C.T./Pinus contorta Phase (XETE C.T./PICO Phase)

16. Vaccinium scoparium C.T. (VASC C.T.)

The relationship of community type position along Axis 1 in the initial ordination with mean elevation is displayed in Figure B1 in Appendix B . This reinforces the interpretation of this axis as an elevation gradient. Figures B2-B5 (Appendix B) display the relationships of community position along Axis 1 with mean aspect, slope, insolation index and moisture index, respectively. These correlations are poor, and the ranges extreme; understandably, simple single environmental parameters such as these cannot completely account for all plant community distribution patterns.

Within each of the four forest series, secondary gradients are apparent which influence species distribution and therefore, community composition. Within the Tsuga heterophylla series moisture apparently is an important gradient, although the variability in Figure B5 is too large to confirm this. At one end of this gradient are forest stands common to the drier interior valleys of the western edge. These stands contain Calocedrus decurrens, Arbutus menziesii, and Symphoricarpos mollis and characterize the PSME-CADE3/SYMO C.T. At the other more mesic end are stands dominated by either an herb-rich understory with Anemone deltoidea, Achlys triphylla, and Tiarella trifoliata var. unifoliata, or a lush herb layer dominated by Polystichum munitum. These species characterize the BENE C.T.-Herb Rich Phase, and the ACCI/POMU C.T., respectively. Modal sites in this series are dominated by Berberis nervosa, along with abundant Rhododendron macrophyllum, Acer circinatum and Gaultheria shallon. These modal types are represented by the ACCI/BENE, BENE, RHMA/BENE, RHMA/GASH, and RHMA/LIBO2 communities.

The Tsuga heterophylla Series has a relatively warm climate with ephemeral snowpacks. Forests belonging to the Abies amabilis - Tsuga mertensiana or Tsuga mertensiana Series are generally colder and experience heavy, persistent snowpacks. Stands within the Tsuga heterophylla - Abies amabilis Series are transitional in nature. A moisture gradient is evident in the Tsuga heterophylla - Abies amabilis Series, as expressed by the vegetation. Trends in the moisture and insolation indices, and aspect, (Figures B5, B4, and B2 respectively, in Appendix B) emphasize this pattern. Stands on mid slope positions and generally northwest aspects typify the mesic end. The Mixed Herb C.T. characterizes these herb-rich sites (though individual species cover is generally low). Mesic herbs such as Tiarella trifoliata var. unifoliata, Trillium ovatum, Cornus canadensis, Goodyera oblongifolia, Linnaea borealis, Viola sempervirens, and Pyrola picta are typical species. Colder, more xeric communities, which generally occur on flatter terrain with a southwest aspect, are dominated by Xerophyllum tenax. Modal communities in this series are dominated by Rhododendron macrophyllum mixed with Xerophyllum. The latter two communities are, respectively typified by the XETE and RHMA/XETE C.T.

Occasional stands in the Mixed Herb C.T. are dominated or codominated in the overstory by Abies concolor. These stands apparently represent the northern limits of A. concolor on the western side of the Cascades and these populations show introgression with Abies grandis. Zobel (1973, 1974, 1975) provides a complete discussion of the introgression.

Stands co-dominated by Tsuga mertensiana and Pinus contorta can occur within the elevational range normally occupied by the Tsuga heterophylla - Abies amabilis Series. We have classified these as belonging to the Tsuga mertensiana Series as Tsuga is the indicated climax species. These communities, represented by the TSME/XETE C.T. and the TSME/XETE C.T./PICO Phase are found on xeric sites with deep, coarse pumice soils. Xerophyllum tenax dominates the sparse understory, and on less harsh sites Rhododendron macrophyllum and Gaultheria ovatifolia can also occur.

The secondary gradients in the Abies amabilis - Tsuga mertensiana Series are functions of both moisture and temperature (Figure A6, Appendix A). The coldest, driest community (the VASC-VAME C.T.) is dominated by Vaccinium scoparium with lesser amounts of Vaccinium membranaceum. The XETE Phase of the VAME C.T. occurs on drier and warmer sites and is dominated by Xerophyllum tenax with persistent but smaller amounts of Vaccinium membranaceum. The modal sites in this series are extensive and are dominated by Vaccinium membranaceum. In addition, these stands may have an abundant herbaceous component including such species as Rubus lasiococcus, Pyrola secunda, Clintonia uniflora, and Viola orbiculata. Mesic, but cold sites are typified by the Rubus lasiococcus C.T., where Rubus dominates the understory with little or no shrub cover. Finally, the relatively warm, mesic portion of the gradient is occupied by herb rich stands of the Achlys triphylla C.T. Here the Abies grandis X A. concolor hybrids can again occur. Shrubs are a minor component of the understory which is dominated by a relatively lush layer of

Achlys triphylla, Chimaphila umbellata, and Rubus lasiococcus, and includes small amounts of Trillium ovatum, Anemone deltoidea, Viola orbiculata, Pyrola secunda, Tiarella trifoliata var. unifoliata and Hieracium albiflorum.

Stands in the Tsuga mertensiana Series represent the coldest communities. The Vaccinium scoparium C.T. represents the most widespread type of vegetation. Here Vaccinium dominates the understory and Abies amabilis is noticeably absent in most stands. Luzula hitchcockii can be more prominent than the Vaccinium. Stands located in subalpine parklands also have a component of meadow species which can include Phyllodoce empetriformis, Cassiope mertensiana, Juncus parryi, Luetkea pectinata, Vaccinium deliciosum, and Carex nigricans. Abies lasiocarpa occurs in the overstory of more than half of these stands.

Descriptions of the forest communities of the Separation Creek Drainage of the Three Sisters Biosphere Reserve follow. Plant association tables for each community as well as comparative summary tables of environmental characteristics, soil characteristics, and vegetation structure and diversity measures for all community types are located in Appendix C.

Forest Community Descriptions

Tsuga heterophylla Series:

1. *Pseudotsuga menziesii-Calocedrus decurrens/Symphoricarpos mollis* C.T.

This community is representative of forests on the warmest and driest sites in the Separation Creek Drainage. The overstory is dominated by *Pseudotsuga menziesii*. Mature trees (>3 dm DBH) average 69 % cover. *Calocedrus decurrens*, consistently occurs as reproduction size trees, and *Arbutus menziesii*, is frequent in the pole size class (1-3 dm DBH).

Although these stands are relatively open, the shrub and herb layers are not well developed. *Corylus cornuta*, *Acer circinatum* and *Rosa gymnocarpa* are constant shrub components with average cover of two, one, and one percent, respectively. *Symphoricarpos mollis* is a characteristic low shrub with an average of three percent cover. The herb layer is relatively rich but individual species cover is very low. *Goodyera oblongifolia*, *Hieracium albiflorum* and *Fragaria vesca* are the most common herbs. In fact, the combination of a species-rich overstory and understory makes this community the most diverse of any in the Separation Creek Drainage, with an average species richness of 33.5 (Table C2, Appendix C).

The PSME-CADE3/SYMO C.T. is a relatively young forest type; the stands sampled have an average age of 85 years and an average basal area of 88 m^2/ha. Due to the dominance of Douglas-fir in the pole size class it appears as if this community will be Douglas-fir climax. Sites occur between 880 and 940 m elevation on mid- to upper-slopes with south to southwest aspects. Exposed bedrock and loose rock are more pronounced in this community than in any other described for Separation Creek.

2. Tsuga heterophylla/Acer circinatum/Polystichum munitum C.T.

Only one sample plot was taken in this warm, moist type, yet it is common enough to recognize as a distinct community. Douglas-fir dominates the overstory in pole through mature size trees, with a total overstory cover of 65%. Thuja plicata, exists mainly as pole size trees (1-3 dm DBH) and has a total overstory cover of 15%. Cornus nuttallii, and Acer macrophyllum, are minor tree components.

The ACCI/POMU C.T. is particularly rich in shrub species though not equitably so. Acer circinatum dominates the tall shrub layer with a cover of 25%; Rhododendron macrophyllum is a minor component with 5% cover, and a few individuals of Rubus parviflorus and Vaccinium parvifolium also occur. Polystichum munitum dominates the herb layer with a cover of 35%; other mesic sub-shrubs and herbs include Linnaea borealis, Achlys triphylla, Cornus canadensis, Smilacina racemosa, and Vancouveria hexandra.

The one sample site occurred at 690 m elevation, on a steep (62%) midslope with a north aspect. Lower toe slopes with northerly aspects also may have similar vegetation. The basal area of this stand was 60 m^2/ha.

3. Tsuga heterophylla/Acer circinatum/Berberis nervosa C.T.

This common, modal community type is represented by 17 stands. Douglas-fir dominates the overstory with an average cover of 70%. These forests are relatively young so few trees exceed one meter DBH. Douglas-fir dominates the pole size class with average cover of 16%, and western hemlock is poorly represented in the reproduction and pole size classes. Cornus nuttallii is common lower in the tree canopy with an average cover of four percent.

Acer circinatum dominates the dense shrub layer with an average cover of 42%. Corylus cornuta var. californica can be a major component of the shrub layer while Rosa gymnocarpa is frequent but of low abundance. Berberis nervosa dominates the low shrub component of these forests with an average cover of 32%, while Gaultheria shallon occurs on approximately half the sites, with average cover of 17%. Other common sub-shrubs are Rubus ursinus and Symphoricarpos mollis. Polystichum munitum, Pteridium aquilinum, Anemone deltoidea, Goodyera oblongifloia, Viola sempervirens, Trientalis latifolia, and Achlys triphylla are common herbaceous species, but with low abundance.

These sites support moderately productive stands in the Tsuga heterophylla Series; for forests of average age 85 years (58 to 123 year range) the basal

area averages 68 m^2/ha, but can be as large as 101 m^2/ha. The ACCI/BENE C.T. occurs on all slope positions with primarily southwest to west aspects at elevations of 690 to 1060 m. Soils are sandy clay loams, yet gravel and cobble sized particles may be important both in the profile and at the surface.

4a. Tsuga heterophylla/Berberis nervosa C.T.

This modal community type is very common in the Separation Creek drainage where 15 stands were sampled. As with the ACCI/BENE C.T. the BENE type has a Douglas-fir overstory with total average cover of 59%. Mature trees (greater than 3 dm DBH) are primarily Douglas-fir while pole size trees are a mixture of western hemlock, Douglas-fir, and western redcedar. Reproduction size trees are primarily western hemlock and western redcedar.

The tall shrub layer is not well developed. Rhododendron macrophyllum, Vaccinium parvifolium, and Acer circinatum occur in more than 70% of the samples yet average only seven, one, and three percent cover respectively. The herb layer is dominated by Berberis nervosa (25% average cover) and Gaultheria shallon (18% average cover). Other frequent, but less abundant herbs and sub-shrubs include Rubus ursinus, Linnaea borealis, Chimaphila umbellata, Viola sempervirens and Pteridium aquilinum.

These stands are slightly more productive than stands on the ACCI/BENE sites; basal area averages 72 m^2/ha, although it can be as large as 124 m^2/ha. The average age of these forests is 144 years, and they range from 83 to 335

years. The BENE C.T. occurs on lower and mid-slopes with southwest to northwest aspects at elevations from 640 to 1070 m. The gravelly soils are sandy clay loams developed in a mixture of colluvium and residuum.

4b. Tsuga heterophylla/Berberis nervosa C.T. - Herb-Rich Phase

The overstory composition of this phase of the Berberis nervosa C.T. is very similar to the typical phase. Mature trees are mainly Douglas-fir and pole and reproduction size trees are a mix of western hemlock, Douglas-fir, and grand fir. The grand fir component, together with a richer understory, distinguishes this as a variant of the somewhat more common Berberis nervosa C.T. The tall shrub layer is very poorly developed. The most common shrub, Vaccinium parvifolium, has an average cover of only one percent. Berberis nervosa is the dominant herb layer species though its abundance is lower than in the Berberis nervosa type. Rubus ursinus, Linnaea borealis, Chimaphila umbellata, Pteridium aquilinum, and Viola sempervirens are common associates as is the case with the Berberis nervosa community type. However, the herb-rich phase has additional mesic species such as Anemone deltoidea, Achlys triphylla, Trillium ovatum, and Tiarella trifoliata var. unifoliata. Cornus canadensis exhibits 60% constancy, and in some stands may be a codominant understory species.

The herb-rich Phase represents relatively productive sites in the Tsuga heterophylla Series. Basal area averages 93 m^2/ha for forests of average age 199 years. The range of ages for the stands sampled was 69 to 539 years. The elevational range of the Phase extends from 660 to 1620 m, somewhat higher than the BENE C.T. Soils are similar to the previous type: sandy clay loams to loams developed in a colluvial and residual base.

5. Tsuga heterophylla/Rhododendron macrophyllum/Gaultheria shallon C.T.

This plant community is not as extensive as others in the Tsuga heterophylla series. The overstory is dominated by western hemlock with a total average cover of 49% with lesser amounts of Douglas-fir and western redcedar (average covers of 23 and 17%, respectively). Pole and reproduction size class trees are western hemlock and western redcedar.

The tall shrub layer is primarily Rhododendron macrophyllum with average cover of 26%. Gaultheria shallon is the dominant low shrub (21% cover), while Berberis nervosa, Chimaphila umbellata, and Goodyera oblongifolia are frequent but low cover associates. The community is relatively species poor for the Tsuga heterophylla series; average species richness is only 16.8 (Table C2, Appendix C).

The RHMA/GASH forests are less productive than those of the BENE and RHMA/BENE community types; average basal area is only 73 m^2/ha (maximum of 90 m^2/ha) for stands of average age 375 years. The Rhododendron macrophyllum/Gaultheria shallon community type occurs along gentle bottom slopes, between 610 and 640 m elevation in our sampled sites. Aspect ranges from west through north to northeast. Soils are generally sandy clays developed in colluvium, or alluvium in drainage bottoms.

6. Tsuga heterophylla/Rhododendron macrophyllum/Berberis nervosa C.T.

The Rhododendron macrophyllum/Berberis nervosa C.T. represents a fairly common young forest type in our sample. Douglas-fir dominates the mature class of trees with an average total overstory cover of 51%. Western hemlock occurs in approximately 60% of the stands in the 3 - 10 dm DBH size class. It codominates in the pole size class with Douglas-fir and western redcedar. Reproduction size trees are primarily western hemlock and the broadleaf Chrysolepis chrysophylla.

Rhododendron macrophyllum averages 50% cover in the tall shrub layer while Vaccinium membranaceum, more common in higher elevation forests, is a frequent but low coverage associate. Berberis nervosa dominates the low shrub/herb layer with an average cover of 20%. Chimaphila umbellata, Linnaea borealis, Rubus ursinus, Pachistima myrsinities, Pteridium aquilinum, and Pyrola asarifolia are frequent associates. Cornus canadensis often codominates the herb layer.

These sites are relatively productive, but not quite as productive as those of the Berberis nervosa C.T. - Herb-Rich Phase. Basal area averages 75 m^2/ha with a maximum of 102 m^2/ha. The average age for these stands is 117 years with a range from 93 to 168 years. The elevational range is 1000 to 1520 m. Stands occur primarily on mid-slopes with aspects between north and west. Soils are gravelly sandy clay loams developed in mixed colluvium and residuum.

7. Tsuga heterophylla/Rhododendron macrophyllum/Linnaea borealis C.T.

The Rhododendron macrophyllum/Linnaea borealis C.T. occurs in relatively young stands dominated by Douglas-fir. Here, Douglas-fir dominates the pole through mature tree size classes with an average total cover of 41%. Reproduction size trees exhibit low canopy cover; the primary species are western hemlock, grand fir, and western white pine (all with 1% average cover).

Rhododendron dominates the tall shrub layer with an average of 44% cover. The herb layer is relatively rich in species -- Linnaea borealis, Chimaphila umbellata, Rubus ursinus, Pachistima myrsinites and Cornus canadensis have 100% constancy. Linnaea borealis exhibits an average cover of 13%, Chimaphila umbellata, 3%, and Cornus canadensis, 3%. Gaultheria ovatifolia occurs in 80% of the stands.

These forest communities are some of the least productive in the Tsuga heterophylla series. Basal area averages 44 m^2/ha for stands with an

average age of 88 years. The maximum basal area is only 60 m^2/ha. Forest stands occur between 1160 and 1190 m elevation on gentle (0-9% slope) mid to bottom slopes with aspects ranging from northwest to northeast. No information is available concerning soil composition.

Tsuga heterophylla - Abies amabilis Series:

8. Tsuga heterophylla/Mixed Herb C.T.

The Tsuga heterophylla/Mixed Herb C.T. is common; 17 stands were sampled in the Separation Creek Drainage. In the overstory Douglas-fir has 100% constancy with 37% average total overstory cover. However, western hemlock, with 94% constancy has an average cover of 45%. Western redcedar has 88% constancy and 24% average cover. Other associated tree species with constancies lower than 60% include Taxus brevifolia, Abies amabilis, Pinus monticola, and Chrysolepis chrysophylla. Douglas-fir dominates the mature size class trees (>3 dm DBH), and western hemlock and western redcedar are fairly prominent in the 3-10 dm DBH size class (approximately 75% constancy and 20% cover for each). Pole size trees (1-3 dm DBH) are western hemlock with minor amounts of Douglas-fir and western redcedar. Western hemlock and western redcedar are the primary reproduction size trees.

This community is varied in terms of characteristic understory species. However, the tall shrub layer is essentially absent. Chimaphila umbellata is the most frequent species in the herb layer while Berberis nervosa and Rubus ursinus are fairly frequent (82, 71, and 71% constancy, respectively). All

have cover of two percent or less though. Other occasional mesic herbs include Tiarella trifoliata, Trillium ovatum, Cornus canadensis, Goodyera oblongifolia, Linnaea borealis, Viola sempervirens, and Pyrola picta.

The Mixed Herb C.T. occurs on the most mesic and productive sites in the transitional Tsuga heterophylla - Abies amabilis series. Basal area averages 105 m^2/ha for stands with average age 304 years. The range of stand ages is 82 to 721 years for our samples. One mature stand exhibits a basal area of 174 m^2/ha. The Mixed Herb C.T. occurs over a broad range of elevations and aspects--from 640 to 1710 m on all but southeast exposures. Soils are gravelly to cobbly sandy clay loams developed on mid to lower slope colluvium and residuum. With more intensive sampling, the Mixed Herb C.T. may be divisible into smaller discrete units restricted to more uniform topographic settings.

9. Abies amabilis/Rhododendron macrophyllum/Xerophyllum tenax C.T.

This community is not as common as others of the Tsuga heterophylla - Abies amabilis series. Four stands were sampled. Douglas-fir and western hemlock codominate the overstory with average total cover of 29 and 24% respectively. Pacific silver fir and mountain hemlock are consistent associates, but with total covers of only seven and five percent, respectively. There are no trees larger than 1 m DBH. Pole size and reproduction trees are generally western hemlock and Pacific silver fir in most stands; golden chinquapin is a common broadleaf associate.

Rhododendron macrophyllum dominates the tall shrub layer with an average cover of 43%; Vaccinium membranaceum occurs in trace amounts. Xerophyllum tenax is the dominant herb with an average cover of 36%. Intermixed are Gaultheria ovatifolia, Chimaphila umbellata and Pachistima myrsinites. The Rhododendron macrophyllum/Xerophyllum tenax C.T. is species poor and moderately unproductive. Average basal area is 65 m^2/ha, although it can exhibit basal areas as high as 96 m^2/ha. The average age for our sample stands is 117 years, the range 106 to 130 years. The ABAM/RHMA/XETE C.T. occurs on mid-slopes with west to northeast aspects on moderate terrain between 1320 and 1360 m elevation. Soils are sandy clay loams derived from colluvium and residuum.

10. Abies amabilis/Xerophyllum tenax C.T.

The Xerophyllum tenax C.T. is dominated by western hemlock in the overstory with 70% average total cover. Douglas-fir, Pacific silver fir and mountain hemlock are consistent associates with average covers of 19, 12, and 4%, respectively. Western hemlock dominates the pole and mature tree size classes (no trees exceed 1 m DBH). Pacific silver fir is the most important reproduction size tree, although average cover is low.

Tall shrubs are unimportant in this type, although Vaccinium membranaceum is always present in minor amounts. Xerophyllum tenax is very abundant in the herb layer (42% average cover). Berberis nervosa, Chimaphila umbellata, Linnaea borealis, Gaultheria ovatifolia, Rubus lasiococcus, Pachistima myrsinites and Cornus canadensis are consistent associates.

The ABAM/XETE C.T. represents the xeric end of the Tsuga heterophylla - Abies amabilis Series. The sites are moderately productive with basal areas averaging 83 m^2/ha for stands averaging 145 years. The community occurs between 1320 and 1430 m elevation on relatively gentle slopes with southwest to west aspects. Soils can be sandy to sandy clay loams developed on colluvium and residuum.

Abies amabilis - Tsuga mertensiana Series:

11a. Abies amabilis/Vaccinium membranaceum C.T.

The Abies amabilis/Vaccinium membranaceum C.T. is the most extensive type within the Pacific Silver Fir - Mountain Hemlock Series. It is also the modal type. Pacific silver fir and mountain hemlock dominate the canopy with average total covers of 40 and 26%, respectively. Similarly they are the most important species in all size classes, with Pacific silver fir more common than mountain hemlock.

Vaccinium membranaceum dominates the tall shrub layer with an average of 32% cover, while Rubus lasiococcus and Pyrola secunda are the most constant of the herb species. Other herbs found with low frequency are Clintonia uniflora, Xerophyllum tenax, and Viola orbiculata.

These are relatively unproductive sites, but are better than many in the Abies amabilis - Tsuga mertensiana Series. Average basal area is 78 m^2/ha for stands of average age 323 years; the maximum is 126 m^2/ha. The Vaccinium membranaceum C.T. occurs between 1430 and 1890 m elevation on a variety of landform positions, exposures, and slopes. Soils are sandy loams to loamy sands developed on a mixture of colluvium and residuum.

11b. Abies amabilis/Vaccinium membranaceum C.T. - Xerophyllum tenax Phase

The Xerophyllum tenax Phase of the Abies amabilis/Vaccinium membranaceum C.T. is quite extensive in the Pacific Silver Fir - Mountain Hemlock Series. The tree canopy structure is similar to that of the ABAM/VAME C.T. The dominant species in all size classes are Pacific silver fir and mountain hemlock. Mountain hemlock dominates the mature size class (3 - 10 dm DBH) most frequently, while Pacific silver fir is more prominent in the reproduction and pole size trees. Douglas-fir, grand fir, western white pine, Engelmann spruce and subalpine fir can play a minor role in these forests.

Vaccinium membranaceum cover is relatively lower in this phase when compared to the typical ABAM/VAME C.T. Though it occurs in all stands, the average cover is only 7% and does not exceed 25%. Xerophyllum tenax averages 34% cover and Rubus lasiococcus is a consistent associate with 1% average cover. Chimaphila umbellata is quite common, yet no other herb species are characteristic of this phase.

The ABAM/VAME C.T. - XETE Phase represents the dry but relatively warm portion of the Abies amabilis - Tsuga mertensiana series. Productivity is relatively low for that series. Average basal area is 72 m^2/ha in stands of average age 268 years. The maximum basal area is 96 m^2/ha and the range of ages is 88 to 540 years. The XETE Phase of the ABAM/VAME C.T. occurs between 1410 and 1680 m elevation on generally moderate mid-slopes most often with southwest to northwest exposures. Soils are primarily sandy loams with little stony material, developed in colluvium.

12. Abies amabilis/Vaccinium scoparium - Vaccinium membranaceum C.T.

This community type is fairly extensive in the Abies amabilis - Tsuga mertensiana Series, and displays characteristics of both the ABAM/VAME C.T. of the Abies amabilis - Tsuga mertensiana Series, and the TSME/VASC C.T. of the Tsuga mertensiana Series. Mountain hemlock dominates the mature and pole size class trees with occasional individuals exceeding 1 m DBH. Average total overstory cover is 56 and 8 percent for mountain hemlock and Pacific silver fir. Both species are important in the scattered reproduction although Pacific silver fir occurs more consistently than mountain hemlock (approximately 95 versus 56% constancy).

The only shrubs are Vaccinium scoparium and V. membranaceum with 100% constancy each and with two and six percent average cover, respectively. The herb layer is generally poorly developed. Rubus lasiococcus and Pyrola secunda are the only common herbs.

The ABAM/VASC - VAME C.T. occurs on the coldest, driest sites within the Abies amabilis - Tsuga mertensiana Series. Productivity is relatively poor; basal area averages 85 m^2/ha with a maximum of 138 m^2/ha for mature stands of average age 337 years (range of 208 to 574 years). Stands occur between 1590 and 1890 m elevation primarily on relatively gentle mid-slopes with southeast to west aspects. Soils are gravelly sandy loams developed on colluvium and residuum.

13. Abies amabilis/Rubus lasiococcus C.T.

The Abies amabilis/Rubus lasiococcus C.T. is a community relatively rich in herbs and with affinities to the ABAM/VASC - VAME C.T. Pacific silver fir and mountain hemlock are the dominant overstory species with average total covers of 39 and 30%, respectively. Mountain hemlock is the primary tree in the mature size class and occasionally exceeds 1 m DBH. Pacific silver fir most consistently dominates the pole tree size class, although mountain hemlock may be present. The two species occur with subalpine fir in the reproduction size class with average covers of less than three percent each.

The shrub layer is poorly developed. Vaccinium membranaceum is the only constant tall shrub. Rubus lasiococcus is an abundant herb with an average cover of 22%. Other common but lower coverage herbaceous associates in the relatively rich herb layer include Mitella breweri and Anemone deltoidea.

The ABAM/RULA C.T. occurs on cold but mesic sites of the Abies amabilis - Tsuga mertensiana Series. Productivity is moderate for the Series; basal area averages 82 m^2/ha (maximum of 96 m^2/ha) for stands of average age 253 years. Our samples range in age from 189 to 315 years. Forests of the ABAM/RULA C.T. occur at elevations between 1490 and 1950 m, on gentle to moderate slopes with a variety of aspects. Soils are sandy loams derived from colluvium and residuum.

14. Abies amabilis/Achlys triphylla C.T.

The Abies amabilis/Achlys triphylla C.T. represents the warm and mesic end of the Abies amabilis - Tsuga mertensiana Series. Douglas-fir dominates the overstory in most stands, although Pacific silver fir, mountain hemlock, and western hemlock can be important. Douglas-fir, grand fir, and western hemlock individuals rarely exceed 1 meter DBH. Mature trees are primarily Douglas-fir (80% constancy, 23% average cover) with lesser amounts of mountain hemlock. Pacific silver fir, and mountain hemlock to a lesser extent, are characteristic reproduction and pole size trees.

Tall shrubs are a minor component of this type -- Vaccinium membranaceum occurs in trace amounts. The herb layer is rich in species with 11% average cover for Achlys triphylla, 7% for Chimaphila umbellata, 4% for Rubus lasiococcus, and trace amounts of Trillium ovatum, Anemone deltoidea, Viola orbiculata, Pyrola secunda, Tiarella trifoliata var. unifoliata and Hieracium albiflorum.

These are relatively productive sites in the Abies amabilis - Tsuga mertensiana Series. Our forest samples display an average basal area of 85 m^2/ha for stands of average age 284 years. The maximum basal area is 108 m^2/ha and the range of sample forest ages is 157 to 732 years. Stands occur between 1280 and 1580 m elevation primarily on gentle lower to mid-slopes with southwest to northwest aspects. Soils are gravelly sandy loams to loams, developed on a mixture of colluvium and residuum.

Tsuga mertensiana Series:

15a. Tsuga mertensiana/Xerophyllum tenax C.T.

The Tsuga mertensiana/Xerophyllum tenax C.T. occupies sites within the elevational range normally occupied by forests of the Tsuga heterophylla - Abies amabilis Series. It occurs on xeric sites with deep, coarse pumice soils.

Mountain hemlock, western white pine, and Douglas-fir can be important in the pole and mature size classes. A diversity of species can occur in the reproductive classes--western white pine, Pacific silver fir, Douglas-fir, mountain hemlock, and western hemlock.

Xerophyllum tenax dominates the herb layer with an average cover of 28%. Gaultheria ovatifolia reaches its greatest abundance in this community with an

average cover of 8%. Rhododendron macrophyllum can be found in the tall shrub layer (four percent average cover). Vaccinium membranaceum, Pachistima myrsinites, Chimaphila umbellata, and Linnaea borealis are all minor associated species.

This community is extremely unproductive as average basal area is only 49 m^2/ha for stands of average age 268 years. The maximum is only 66 m^2/ha. Unfortunately only two sites were sampled which represent this type. They occur at 1280 and 1370 m elevation, on gentle slopes and flats. Soils are loamy sands of a pumiceous derivation.

15b. Tsuga mertensiana/Xerophyllum tenax C.T./Pinus contorta Phase

The Pinus contorta Phase (lodgepole pine Phase) of the Tsuga mertensiana/Xerophyllum tenax C.T. is quite common throughout the Three Sisters Wilderness, but it is not well represented in the Separation Creek data set. It is similar to the XETE C.T. in occupying deep, coarse pumice soils on sites within the elevational range normally occupied by forests of the Tsuga heterophylla - Abies amabilis Series. Characteristically, lodgepole pine dominates the mature and pole size classes while mountain hemlock is the important reproduction species. The tree canopy is very open; total lodgepole pine cover averages 28% while mountain hemlock averages 16%. Subalpine fir, western white pine, and Pacific silver fir are minor components of this community.

The Pinus contorta Phase of Xerophyllum tenax community type is quite species poor; low constancy and abundance are characteristic of the remaining species. Trace amounts of Vaccinium scoparium and V. membranaceum occur in the shrub layer while Xerophyllum tenax averages 23% cover in the herb layer. Chimaphila umbellata is consistently present.

As with the Xerophyllum tenax C.T., this community phase has poor productivity. Average basal area is only 30 m^2/ha for stands of average age 89 years.

The Phase occurs primarily on gentle slopes and flats with southwest exposures, at elevations (1300 to 1650 m) slightly greater than the Xerophyllum tenax C.T. Soils are sandy loams developed on deep pumice, which may account for the low productivity of these forests.

16. Tsuga mertensiana/Vaccinium scoparium C.T.

The Tsuga mertensiana/Vaccinium scoparium C.T. is the forest community on the highest and coldest sites in the Separation Creek drainage. It is widespread through the Wilderness and represented by 10 stands in our sample. Pacific silver fir is noticeably absent or very minor in the tree overstory. Mountain hemlock dominates the pole through mature size class trees; individuals can exceed 1 m DBH. Subalpine fir and whitebark pine, Pinus albicaulis, may occur as pole and regeneration size trees. Whitebark pine does not occur in the other forest communities of the drainage.

Vaccinium scoparium dominates the shrub layer with an average cover of 14%, though it can be absent in situations where the subalpine woodrush, Luzula hitchcockii, is prominent. Several subalpine meadow or pumice barren herbs and graminoids occasionally occur in the Vaccinium scoparium type. These include Luetkea pectinata, the two heath species, Phyllodoce empetriformis and Cassiope mertensiana, Vaccinium deliciosum, Juncus parryi, Spraguea umbellata, Polygonum newberryi, Potentilla gracilis var. flabelliformis, Penstemon davidsonii, and Carex nigricans.

These cold, high elevation sites are low in productivity. Although average basal area is 101 m^2/ha for stands of average age 370 years, mature mountain hemlocks often exhibit extreme taper and broken crowns, especially in the higher elevation stands. The maximum basal area is 150 m^2/ha and the range of sample forest ages is 65 to 549 years.

These forests occur between 1740 and 2240 m elevation on moderate terrain. Aspect is not restrictive although it is most commonly westerly. Soils are loamy sands to sandy loams with some gravel, developed in a mixture of colluvium and residuum.

Forest Ages and Disturbance History

A major objective of the study was to look at the history of forest disturbances in the Three Sisters Wilderness. Information on the current successional states of the vegetation, rate and direction of change, and natural disturbance regimes is very important to an understanding of the ecology of the area and to selection of appropriate management programs. We concentrated on aging stands as reflected in dominant seral trees. Ages of 144 trees were successfully estimated using increment borings and adjustment procedures used by Hemstrom and Franklin (1982). Most were Douglas-fir at the lower and middle elevations and mountain hemlock at higher elevations. A few western hemlock, western redcedar, and grand fir were aged at lower elevations and western white pine and lodgepole pine at higher elevations.

Forests in the Seperation Creek drainage of the Three Sisters Wilderness are relatively young with a mean and median age of 231 and 176 years, respectively. Forests increase in average age with elevation. This can be seen in the contrasting age distributions of Douglas-fir and mountain hemlock (Fig. 1, below); aged Douglas-fir averaged 186 years while mountain hemlock averaged 359 years. The trend is also reflected in the distribution of ages by community type (Fig. 2, below) with the *Tsuga heterophylla* Series having significantly lower mean ages than the *Abies amabilis-Tsuga mertensiana* and *Tsuga mertensiana* Series.

Figure 1. Age distribution of Douglas-fir (Pseudotsuga menziesii) and mountain hemlock (Tsuga mertensiana) in stands sampled within the Separation Creek Drainage, Three Sisters Wilderness Area. Based on age of largest tree in sample plot.

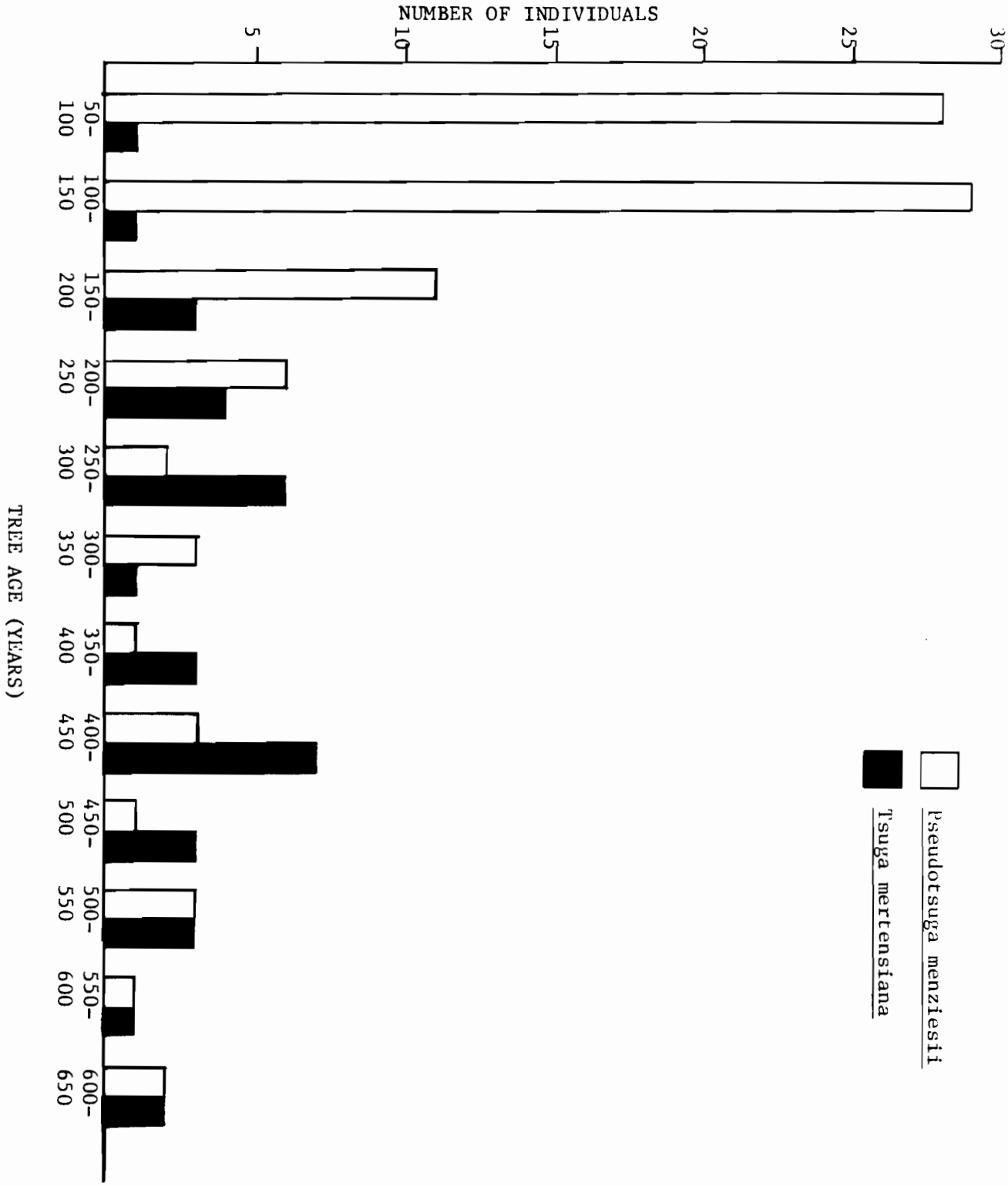
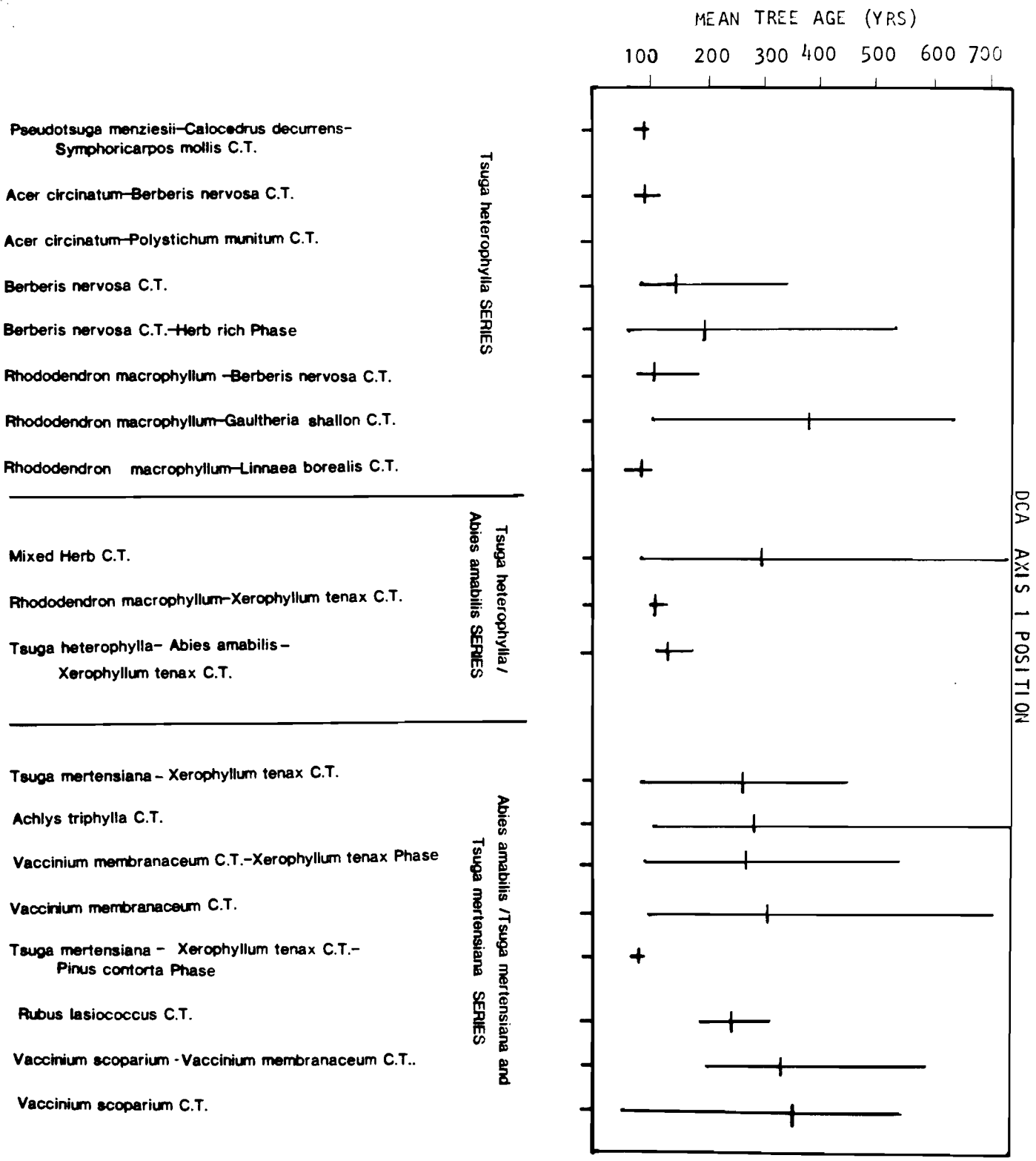


Figure 2. Mean age distribution of stands by community type within the Separation Creek Drainage, Three Sisters Wilderness Area. Based on age of largest tree in sample plot.



Periods of forest establishment within various portions of the study area also reflect the contrast between high and low elevations:

Locale	Periods of Establishment	
	Major	Minor
Mouth of Separation Creek		
South slopes	1890	
Other exposures	1840-1890	1450-1580
Rooney Creek	1840-1890	
Western Separation Creek	1840-1890	1350-1480, 1800
Foley Ridge	1840	1460-1580
Tokatee Lakes	1840-1890	1770-1800
Harvey Creek	1800	
Proxy - Substitute Points		
Douglas-fir	1770	
Mountain hemlock	1440-1580	
Sphinx Creek		
Douglas-fir	1730-1780	
Mountain hemlock	1380-1480	

These are, of course, approximate values based upon the bulk of the samples within each of these geographical areas. The primary disturbing agent has been wildfire. This is apparent in the abundant charcoal and burned logs and snags, from fire scars and from the age classes of forest that are present.

The bulk of the study area apparently has burned during the last 250 years; most of the western (lower elevation) half has burned one or more times since the 1840's. There are very few old-growth trees and most of these occur as scattered individuals rather than forming stands. These individuals are most common in protected locations, such as along Separation Creek, and on Foley Ridge near the north boundary of the Wilderness.

Forest stands 70 to 130 years-of-age completely dominate the landscape in the western half of the study area. These young forests characterize lower Separation Creek to Tokatee Lakes, Rooney Creek, Foley Ridge, and western portions of Harvey Creek. These areas appear to have burned in the late 1840's or 1850's with many of the sites reburned one or more times, probably in the 1890's. Reburns appear to have been more common at the lowest and most western locations and on drier slopes. There do appear to be remnants of 400 to 550-year-old forests in a few locations, as already mentioned. Although the young stands are most characteristic of the Douglas-fir communities similar age forests of lodgepole pine and mountain hemlock are encountered at higher elevations and are common in other parts of the Wilderness (e.g., Horse Creek drainage).

Stands 175 to 260 years-of-age occur at middle elevations within the Separation Creek drainage. Stands of that type are encountered in the vicinities of Proxy Point, Substitute Point, Tokatee Lakes, and upper Harvey Creek. Portions of the high country in Sphinx Creek also appear to have forests of similar vintage. This age class of forest may be related to

extensive forests of 260-years-age found in the Clackamas River and Brietenbush River drainages north of the Wilderness. Remnants of old-growth forest stands and individuals are found in a few locations, especially along creeks.

Old-growth forests are found mainly in the highest elevations -- along the divide from Proxy and Substitute Points to The Husband, around Nash Lake, and in upper Sphinx Creek. These are mostly subalpine forests dominated by mountain hemlock and Pacific silver fir. There is little evidence for old-growth trees greater than 600-years-old although two individuals each of Douglas-fir and mountain hemlock were estimated to exceed this age.

We attempted to do a more detailed analysis of fire history during the last two centuries based upon the Douglas-fir age classes but the data are insufficient to provide precise indications of major fire episodes. Klopsch (personal communication) was able to recognize two wildfires in a nearby area. The initial burn occurred in 1855 and the resulting stand was partially reburned in 1890. There is a suggestion of a similar sequence in our Douglas-fir age class distribution. Further, the younger (reburn) ages are most common at the lower elevations and on drier sites.

On the whole, the forest ages encountered in the Separation Creek area appear to be similar to regional values as reflected in studies in and around the H. J. Andrews Experimental Forest. A major fire episode seems to have affected the area in the 1840's with significant reburns of segments up until

about 1900. These age classes are abundant. Forests that date back to 175 to 260 years B.P. are indicated and the older stands could be related to the episode that established extensive stands elsewhere in northern Oregon. The old-growth trees have ages scattered from about 350 to 550 years, with a mean for Douglas-fir of about 460 years. This relates well to a common old-growth age class in southern Washington and northern Oregon, including the H. J. Andrews Experimental Forest.

In summary, the forests of the Separation Creek drainage in the Three Sisters Wilderness are relatively young and have been subject to significant wildfire during the last two centuries. Despite the fact that we searched for mature and old-growth stands, over half the plots were in forests less than 150 years-of-age. Old-growth trees are uncommon except in the upper *Abies amabilis* and in the *Tsuga mertensiana* Zones; old-growth stands are essentially nonexistent at lower elevations.

Meadow Community Classification and Ordination

Our classification of meadow communities is based primarily on sites from within the boundaries of the Three Sisters Wilderness Area and west of the Cascade Crest. However, we did sample adjacent areas in the Western Cascades and on the east side of the Cascade Crest, including meadows which complimented the main data set. These areas included Lookout, Carpenter, and Frissel Mountain areas of the H.J. Andrews Biosphere Reserve; Wildcat Mountain Research National Area; Horsepasture Mountain, Taylor Castle, and English Mountain bordering the north central portion of the west side of the Wilderness; the Sparks and Lava Lake areas on the southeast side of the crest along the Century Drive Highway (State Highway 46); and several sites outside the northeast edge of the Wilderness, including the Three Creek Lake and Trout Creek Swamp areas.

We use the term meadow broadly, for we sampled bog and fen (or more generally, mire) habitats as well as "rock garden" ridgetop sites and pumice flats. Non-forested vegetation would be too inclusive a term as we did not sample exposed bedrock communities, lava flows, alder or vine maple thickets, avalanche track communities, or alpine scree. Hydric habitats with emergent vegetation were sampled unless the water table exceeded approximately one half a meter late in the growing season.

The data set consists of 152 samples with a total of 384 species. Plot elevations range from 1240 to 2050 m (4068 to 6726 ft.) encompassing the

montane and subalpine zones. Over this range, topography and climate interact to produce changes in temperature, precipitation, snowpack, soil development, water table depth, and water movement. The diversity in species composition and physiognomy of non-forest vegetation reflects the broad range of environmental conditions.

Field observtions and measurements suggest that the first axis of the initial, entire samples ordination is a complex gradient best represented by topographic position or landform character. This gradient is not simple to interpret due to the complexity of environmental factors which are associated with changes in topography and landform. Basically, within Figure D1 (Appendix D), samples falling along the left side of Axis 1 are sites occurring on relatively level terrain: (1) along lake shores or in wetland depressions, (2) on open flats in high country of the Wilderness, or (3) on flats and benches within the subalpine terrain. Samples which fall along the right side of Axis 1 are sites which occur on sloping landforms from lower slopes and sloping margins of basins, to mid-slopes, upper slopes, and ridgetops. These meadow types occur primarily in the more highly-dissected Western Cascade portion of the Wilderness. Those samples which fall in the middle portion of the first axis are sites which occur along gentle slopes of subalpine benches and flats, and on the rolling pumice plains along the western base of the Three Sisters peaks.

Associated with those communities occurring on level portions of the landform gradient are wetter soil conditions. Sites vary from those with standing water at or above the surface all year to those with deep and persistent snowpacks so that water availability is relatively good through the growing season. Associated with those communities occuring on sloping portions of the landform gradient are sites with longer snow free periods, greater soil drainage, and, on some sites, possible drought stress during middle to late summer.

The second axis of the initial ordination represents a complex elevation and water table gradient. Important environmental variables associated with an increase in elevation include decreasing temperature, increasing precipitation, greater winter snowpack and a shorter growing season. Concomitant with an increase in mean elevation of the communities in this portion of the landform gradient is a lowering of the water table. This aspect of the gradient will be discussed in more detail later. For both the left and the right portions of the initial ordination we plotted graphically, the average elevation (with range bars) versus the position of the plant community (as defined by the classification, below in Table 5) along Axis 2, (Figure E1, Appendix E). Both portions of the landform gradient exhibit a general increase in elevation from the top to bottom of Axis 2.

We imposed the groups defined by the TWINSPAN clustering on the ordination diagrams. This was somewhat subjective as some groups were maintained at a

higher level of the hierarchy if it was thought their component groups were not different enough to merit distinct community or phase classification. Figure D2 (Appendix D) displays the overlay of cluster designation on the ordination. The cluster integrity and arrangement are fairly consistent spatially though there are areas of overlap and inclusion of one group within another, especially within the level landform-high water table-low elevation portion of the ordination space (mid to upper left portion).

To gain better resolution in the separation of community types and to more clearly visualize their positions along environmental gradients the stands were divided into two groups. One group consists of all those samples from the right side of the initial ordination (the sloping landforms and gentle slopes and rolling pumice plains of Figure D1, Appendix D) and the Carex nigricans stands from the lower portion of the left side of the ordination diagram. None of the communities here (except perhaps the Carex nigricans - Carex scopulorum community type) has a surface or standing water table during the latter part of the growing season. The second group consists of hydric to hydric-mesic meadows (the level landforms portion of Figure D1, Appendix D), dominated primarily by Carex sitchensis, Deschampsia caespitosa, and Eleocharis pauciflora.

The greater resolution using the two subsets is evident in the clearer separation of the community groups (Figures D3 and D4 in Appendix D). The first axis in the ordination of each subset corresponds to the complex

elevation-water table gradient of Axis 2 in the original ordination of all samples. Graphical displays of the relationship between community type position along Axis 1 of the new ordinations and mean elevation (Figures E2 and E3 in Appendix E) reinforce the notion of elevation as an important component in the relationships between meadow communities.

A classification system for meadow plant communities within the Three Sisters Wilderness Area and adjacent lands is outlined in Table 5, below. It is based upon the correspondence of TWINSPAN clusters with DECORANA ordinations, and subjective consideration of ecotone or outlier stands. Community type names reflect the diagnostic, and often dominant, species; Phase names represent recognizable variation in a community, attributed to the presence of one or more additional species.

Table 5. Meadow Communities of the Three Sisters Wilderness, Oregon.

I. Montane Meadows:

A. Hydric Series:

1. *Carex sitchensis* Types:

1a. *Carex sitchensis* C.T. (CASI3 C.T.)

1b. *Carex sitchensis* C.T. - *Lysichitum americanum* Phase (CASI3 C.T. - LYAM Phase)

1c. *Carex sitchensis* C.T. - *Salix* Phase (CASI3 C.T. - Salix Phase)

2. *Eleocharis pauciflora* C.T. (ELPA2 C.T.)

3. *Deschampsia caespitosa* Types:

3a. *Deschampsia caespitosa* - *Hypericum anagalloides* - *Muhlenbergia filiformis* C.T. (DECA - HYAN - MUFI C.T.)

3b. *Deschampsia caespitosa* C.T. - *Carex vesicaria* Phase (DECA C.T. - CAVE Phase)

3c. *Deschampsia caespitosa* C.T. - *Juncus balticus* Phase (DECA C.T. - JUBA Phase)

3d. *Deschampsia caespitosa* C.T. - *Carex aquatilis*/*Carex buxbaumii* Phase (DECA C.T. - CAAQ/CABU3 Phase)

3e. *Deschampsia caespitosa* C.T. - *Carex buxbaumii*/*Carex lanuginosa* Phase (DECA C.T. - CABU3/CALA3 Phase)

3f. *Deschampsia caespitosa* - *Trifolium longipes* C.T. (DECA - TRLO C.T.)

3g. *Deschampsia caespitosa* - *Trifolium longipes* C.T. - *Ranunculus gormanii* Phase (DECA - TRLO C.T. - RAGO Phase)

B. Mesic Series:

4. *Veratrum* Types:

4a. *Veratrum* - *Senecio triangularis* C.T. (VERAT - SETR C.T.)

4b. *Veratrum* - *Senecio triangularis* C.T. - *Elymus glaucus* Phase (VERAT - SETR C.T. - ELGL Phase)

5. *Rudbeckia occidentalis* C.T. (RUOC C.T.)

6. *Rubus parviflorus* C.T. (RUPA C.T.)

7. *Pteridium aquilinum* - *Elymus glaucus* C.T. (PTAG - ELGL C.T.)

8. *Carex pensylvanica* Types:

3a. *Carex pensylvanica* - *Bromus* C.T. (CAPE5 - BROMU C.T.)

8b. *Carex pensylvanica* - *Bromus* C.T. - *Haplopappus greenii* Phase (CAPE5 - BROMU C.T. - HAGR Phase)

9. *Arenaria capillaris* C.T. (ARCA2 C.T.)

Table 5. Continued.

C. Xeric Series:

10. Festuca idahoensis - Agrostis diegoensis C.T. (FEID - AGDI C.T.)
11. Eriophyllum lanatum - Gilia capitata C.T. (ERLA - GICA C.T.)
12. Penstemon procerus - Sanicula graveolens C.T. (PEPR - SAGR C.T.)

II. Subalpine Meadows:

13. Festuca viridula C.T. (FEVI C.T.)
14. Deschampsia caespitosa - Carex spectabilis C.T. (DECA - CASP C.T.)
15. Carex spectabilis - Lupinus latifolius C.T. (CASP - LULA C.T.)
16. Polygonum newberryi C.T. (PONE4 C.T.)
17. Juncus parryi C.T. (JUPA C.T.)
18. Luetkea pectinata C.T. (LUPE C.T.)
19. Phyllodoce empetriformis - Cassiope mertensiana C.T. (PHEM - CAME C.T.)
20. Carex scopulorum Types:
    - 20a. Carex scopulorum C.T. (CASC5 C.T.)
    - 20b. Carex scopulorum C.T. - Deschampsia caespitosa Phase (CASC5 C.T. - DECA Phase)
21. Carex nigricans Types:
    - 21a. Carex nigricans C.T. - Carex scopulorum Phase (CANI2 C.T. - CASC5 Phase)
    - 21b. Carex nigricans C.T. - Aster alpigenus Phase (CANI2 C.T. - ASAL Phase)
    - 21c. Carex nigricans C.T. - Potentilla flabellifolia Phase (CANI2 C.T. - POFL Phase)
    - 21d. Carex nigricans C.T. - Kalmia microphylla Phase (CANI2 C.T. - KAMI Phase)

The stands dominated by Deschampsia caespitosa, Carex sitchensis, and Eleocharis pauciflora are ordinated in Figure D4 (Appendix D). Although the first axis relates well to changes in elevation there is also a tendency for sites to exhibit a higher water table throughout the growing season from left to right in the ordination; it is likely that the water table is of greater importance than elevation in determining community compositional changes. The Deschampsia caespitosa - Trifolium longipes community represents the dry extreme as the water table is well below the surface in most sites by August. Salix and Lysichitum americanum Phases of the Carex sitchensis C.T. represent the high water extreme as the water table resides at or well above the surface throughout the growing season. The only community to deviate from this pattern is the Carex buxbaumii - Carex lanuginosa Phase of the Deschampsia caespitosa community type. It is displaced to the upper left corner of the ordination diagram although water is well above the soil surface in August.

The second ordination axis (Figure D4, Appendix D) appears to represent an elevational gradient. It separates the Deschampsia sites better than it separates the Carex sitchensis sites as the latter are elevationally similar. Sites increase in elevation from top to bottom along Axis 2. The compositional changes reflect colder temperatures, deeper and more persistent snowpacks, and a shorter growing season. The lower elevation extreme is represented by the lakeside Carex buxbaumii/Carex lanuginosa and Carex aquatilis/Carex buxbaumii Phases of the Deschampsia caespitosa community type. The upper elevation extreme is represented by the subalpine Deschampsia caespitosa - Carex spectabilis and Carex scopulorum community types. The

modal communities include the Deschampsia caespitosa - Trifolium longipes C.T., the Ranunculus gormanii Phase, and the Juncus balticus and Carex vesicaria Phases of the Deschampsia caespitosa C.T.

The first axis of the second subset of samples, those occurring on sloping landforms, also represents an elevational gradient (Figure D3 of Appendix D). It is similar to the second axis of the original full sample ordination. The low elevation extreme is represented by the montane meadow community types: the Rubus parviflorus C.T., Veratrum - Senecio triangularis C.T., and Festuca idahoensis - Agrostis diegoensis C.T. The upper elevation extreme is represented by the late snowmelt Carex nigricans community and its Phases. Modal sites are represented by the Festuca viridula and Polygonum newberryi communities. These exhibit intermediate snowpack depths and lengthening growing seasons.

The second axis of the ordination represents a topographic position gradient in these meadows. It separates the montane meadows types better than it separates the subalpine types as the latter occur on topographically similar landforms. Changes in soil depth, bedrock depth, stoniness, soil moisture and nutrients, soil movement, and wind exposure are associated with the change in position from lower and toe-slope sites to upper and ridgetop sites. From the top to bottom of Axis 2, sites are progressively higher on the topographic profile. The lower extreme is represented by the Veratrum - Senecio triangularis community and the Elymus glaucus Phase of that type. These occur

on the gentle, sloping edges of large, hydric meadows as well as at the bases of open montane slopes. The upper slope and ridgetop extreme are represented by the Festuca idahoensis - Agrostis diegoensis, Eriophyllum lanatum - Gilia capitata, and Penstemon procerus - Sanicula graveolens community types. The latter two represent the exposed rock garden communities found along ridgetops throughout the western portion of the Wilderness. The modal or mid slope sites contain Rubus parviflorus, Pteridium aquilinum - Elymus glaucus, and Rudbeckia occidentalis communities. These are lush, herbaceous communities which occur in an extensive forest - meadow mosaic along slopes beneath Lowder, Tipsoo, Yankee and Pyramid Mountains and in the Rebel Rock area, all in the French Pete portion of the Wilderness.

The topographic gradient is not apparent in the upper elevation portion of the ordination space. For the most part, the communities here occur in similar positions on a macrotopographic scale. Microtopographic differences not discernible in the ordination play an important role in the structuring of community composition in subalpine meadows.

Below are descriptions of the meadow communities of the Three Sisters Biosphere Reserve and adjacent areas. Appendix F contains plant association tables and summaries of the environmental characteristics, soil characteristics, vegetation structure, and diversity measures for each community.

Meadow Community Descriptions

Montane Meadows

A. Hydric Series:

1. *Carex sitchensis* Types:

1a. *Carex sitchensis* C.T.

The *Carex sitchensis* community type typifies the high water table extreme of montane hydric meadow types. Dense and often tall swards of *Carex sitchensis* dominate the lush herbaceous layer, as it averages 76% and always exceeds 50% cover. *Dodecatheon jeffreyi* and *Hypericum anagalloides* are frequent associate herbs. *Polygonum bistortoides*, *Caltha biflora*, *Pedicularis groenlandica*, and *Habenaria dilatata* are occasional herbs with low abundance. *Carex rostrata* occurs in approximately half the stands yet averages 21% cover in these. *Eleocharis pauciflora* averages 10% cover, again occurring in half the stands. Moss forms an important understory. The moss category is lumped under *Sphagnum* in the plant association tables (Appendix F) but consists of the genera *Sphagnum*, *Aulacomnium*, and *Philonotis*. Moss occurred in all but one of the nine stands with an average cover of 27%. *Vaccinium occidentale* and *Salix myrtillifolia* are notable shrubs in about half the stands though their occurrence is patchy and often more important along small stream channels. In general this community is relatively species poor with an average species richness of 15.0 (Table F2, Appendix F).

The Carex sitchensis C.T. is a common fen vegetation type in hydric montane meadows of the Three Sisters Wilderness. Our samples occur between 1292 and 1655 m, in large mire complexes such as Quaking Aspen Swamp and Cabin Meadow but also as lakeside assemblages in the Mink Lake Basin and at Sparks Lake. Soils are generally silty loams to silty clay loams and highly organic. The water table can be at the surface or several decimeters above the surface through the growing season.

1b. Carex sitchensis C.T. - Lysichitum americanum Phase

The Lysichitum americanum Phase of the Carex sitchensis community type is not common but is distinct in its composition. Lysichitum americanum, Senecio triangularis, Mimulus guttatus, Angelica arguta, and Epilobium watsonii are the tall herbs which characterize this phase. Carex sitchensis averages 77% cover, Calamagrostis inexpansa averages 15% cover, and moss may be important in the understory. This phase is richer in herbaceous species than the typical community with an average species richness value of 19.0 (Table F2, Appendix F).

The Lysichitum americanum phase of the Carex sitchensis C.T. is a fen community which is limited in area. It often occurs in small bands bordering the Carex sitchensis C.T. and interfingers with the Salix Phase of the same community. It occurs at elevations similar to the Carex sitchensis C.T. and has similar silty clay loam organic soils.

This phase is commonly associated with areas of more rapid water movement, adjacent to small stream channels or within shallow overland flow areas.

1c. Carex sitchensis C.T. - Salix Phase

The Salix Phase of the Carex sitchensis community type is quite similar to the Lysichitum americanum Phase in the herbaceous layer. However, one or all of three relatively common Salix species--Salix geyeriana, Salix myrtillifolia, and Salix sitchensis--may occur. Salix geyeriana occurs in all 3 stands sampled with 38% average cover, Salix myrtillifolia occurs in two stands with 10% average cover, and Salix sitchensis occurs once with 40% cover. Alnus sinuata and Spiraea densiflora may also be present in the tall shrub layer. In a pattern similar to the Lysichitum Phase, Lysichitum americanum, Angelica arguta, and Epilobium watsonii have 100% presence in the Salix Phase but Senecio triangularis is absent and Mimulus guttatus and Polygonum bistortoides are infrequent. Diversity is intermediate between typical and Lysichitum Phases of the Carex sitchensis C.T. with an average species richness of 17.0 (Table F2, Appendix F).

Our samples of the Salix Phase of the Carex sitchensis community occurred between 1292 and 1364 m. The Phase often borders forest edges of a fen-carr hydric system or occurs in slightly elevated or streamside locations within meadow interiors. Occasionally the Salix Phase forms mosaics with Spiraea and Alnus thickets along meadow edges. Soils are silty clay loams and the water table usually stands at the surface through the growing season.

2. Eleocharis pauciflora C.T.

The Eleocharis pauciflora C.T. is a common mire type in the hydric series. A water table at or several centimeters above the surface through the growing season typifies these sites. Eleocharis pauciflora, a spike rush of diminutive stature, is the dominant species in a relatively open herbaceous layer. It may appear to cover the entire meadow surface, but due to its thin, reed like form, averages only 58% cover.

Mosses, including Philonotis, Sphagnum, and Aulacomnium, are important on the ground surface, averaging 34% cover and occasionally forming an uninterrupted carpet. Vaccinium occidentale has 100% presence in the shrub layer with average cover of 8%. Dodecatheon jeffreyi and Pedicularis groenlandica have 100% presence in the herb layer. Other important associates include Muhlenbergia filiformis, Carex rostrata, Ranunculus gormanii, Hypericum anagalloides, Tofieldia glutinosa, Microseris boreale, Habenaria dilatata, and Epilobium alpinum. Occasionaly seedling or sapling size trees of Picea englemanii, Abies lasiocarpa, Tsuga mertensiana, or Pinus contorta are established on mounds. The Eleocharis pauciflora C.T. is an extremely diverse community; species richness averages 34.8 but reaches as high as 49 in one stand (Table F2, Appendix F).

The Eleocharis pauciflora C.T. is a widespread vegetation type typified by a persistent surface water table and a moss carpet. It occurs in low flats and concavities in large hydric meadow complexes such as Quaking Aspen Swamp, Wire Meadow, The Potholes, Cow Swamp, Cabin Meadow and along Horse Lake. It often borders sedge-dominated vegetation such as the Carex sitchensis type, or is interwoven into hydric Deschampsia communities such as the Deschampsia caespitosa - Hypericum anagalloides - Muhlenbergia filiformis community type. Our samples of the Eleocharis pauciflora community type occur between elevations of 1342 and 1554 m. Soils are organic silty clay loams.

3. Deschampsia caespitosa Types:

3a. Deschampsia caespitosa - Hypercium anagalloides - Muhlenbergia filiformis C.T.

This community is a common hydric meadow type and is probably most closely tied to the Eleocharis pauciflora C.T. Here the water table is usually at or immediately beneath the soil surface during the entire growing season. Deschampsia caespitosa dominates the dense but relatively low stature herb layer with an average cover of 36%. Eleocharis pauciflora occurs in most stands but averages only 16% cover. Muhlenbergia filiformis and Hypericum anagalloides, both relatively prostrate species, codominate the ground layer between Deschampsia tufts, with 10% average cover each. Other frequent herbs and graminoids include Carex sitchensis, Carex luzulina, Dodecatheon jeffreyi, Ranunculus gormanii, and Tofieldia glutinosa. This is a diverse community with average species richness of 25.4 (Table F2, Appendix F).

The Deschampsia caespitosa - Hypericum anagalloides - Muhlenbergia filiformis community occurs between elevations of at least 1244 and 1655 m in hydric flats, shallow concavities or on very gentle slopes. Water usually stands at the surface or immediately below; in the gently sloping forms, water usually seeps across the surface. Soils are typically organic silty clay loams with dense root masses from the dominant Deschampsia.

The Deschampsia caespitosa - Hypericum anagalloides - Muhlenbergia filiformis C.T. occurs adjacent to somewhat similar vegetation types in large hydric meadow complexes such as Wire Meadow, Quaking Aspen Swamp, Trout Creek Swamp, and Goose Lake; Eleocharis pauciflora and Carex sitchensis communities are usually the bordering vegetation types.

3b. Deschampsia caespitosa C.T. - Carex vesicaria Phase

The Carex vesicaria Phase of the Deschampsia caespitosa community type is an uncommon phase of the widespread Deschampsia caespitosa meadow type in the Three Sisters Wilderness. It occurs at the extremes of high water tables for the Deschampsia types. Deschampsia caespitosa dominates a species-poor herb layer with an average of 80% cover while Carex vesicaria exhibits 28% cover; Spiraea douglasii and Vaccinium occidentale are constant shrub associates with low abundance. Unfortunately there are only two samples from this phase. Juncus balticus occurs in both with an average cover of six percent. Its presence in a dense Deschampsia matrix ties it closely to the Deschampsia caespitosa C.T. - Juncus balticus Phase which is also quite uncommon and

poorly sampled. The relationship is unclear but it appears as if both Phases inhabit moderately disturbed hydric sites, such as areas where packstock encroachment may have once been important.

The Carex vesicaria Phase of the Deschampsia caespitosa community is found in small meadow openings south of Cow Swamp in the southwest portion of the Wilderness, west of the Mink Lake Basin. Our plots occurred at elevations of 1426 and 1433 m. The soils were silty loams and loams. Borders of these sites typically are being invaded by Pinus contorta and Picea engelmanii and have stands of Spiraea douglasii and Vaccinium occidentale. This encroachment may reflect a changing hydrologic regime or the disturbance suggested earlier.

3c. Dechampsia caespitosa C.T. - Juncus balticus Phase

The Juncus balticus Phase of the Dechampsia caespitosa C.T. occurs in hydric sites with a surface water table through the growing season. As with the Carex vesicaria Phase, Deschampsia cover averages 80% and forms a tall dense herbaceous layer. Juncus balticus averages 30% cover and can be as great as 50%. Common associated herbs include Aster alpigenus, Ranunculus alismaefolius, Aster foliaceus, and Trifolium longipes, all with 1 to 3% cover. Similar to the Carex vesicaria Phase, the Juncus balticus Phase appears to typify hydric Deschampsia communities which have undergone recent sheep and packstock disturbance or are presently experiencing it.

The three sites we sampled, two of which occur outside the Wilderness Area, are widely disjunct. One site occurs off the McKenzie Highway, near Hand Lake, the second near Three Creek Lake on the east side of the crest, and the third in Cow Swamp, west of the Mink Lake Basin. All three sites are characterized by Pinus contorta invasion and the Three Creek Lake site has had several trees cut in the recent past. Cow Swamp is probably the only one of the three meadows not currently experiencing human or horse disturbance.

Juncus balticus appears to be a vigorous species, tolerant of physical disturbance due to extensive coarse rhizomes and strong stems. Compared with Dechampsia and sedge species such as Carex sitchensis, it is probably also less preferred forage.

3d. Deschampsia caespitosa C.T. - Carex aquatilis/Carex buxbaumii Phase

This Phase of the Deschampsia caespitosa community is probably more extensive than the samples indicate. Deschampsia exhibits an average of 45% cover, Carex aquatilis, 33%, and Carex buxbaumii, 25%. Carex rostrata, Scirpus congdonii, and Trifolium longipes also have 100% presence. Vaccinium occidentale and Spiraea densiflora are characteristic shrubs. Diversity is moderate as the average species richness is 18.0 (Table F2, Appendix F). The two sample sites were lakeside communities in the southern portion of the Mink Lake Basin. This phase may typify other marshy lakeside sites, where the

water table starts above ground level early in the summer and slowly recedes during the growing season. Plot elevations were 1508 and 1530 m. Soils were silty loams to silty clay loams with a high organic content.

3e. Dechampsia caespitosa C.T. - Carex buxbaumii/Carex lanuginosa Phase

This plant association appears to be restricted to the broad marshy edges of the Lava Lake area, east of the Wilderness. The plant community zonation here is distinct, and the Carex buxbaumii - Carex lanuginosa Phase occupies that area most distant from the free water. The water table, however, is high; up to a decimeter of standing water was present, though 1982 may have been an especially wet year. Dechampsia caespitosa averages 63% cover, Carex buxbaumii 28% cover, and Carex lanuginosa 19% cover. Another indicator of deep standing water is Eleocharis palustris, the tall robust relative of E. pauciflora; it averages 11% cover here. Eleocharis palustris in this area seems to be distributed in high water communities in the Sparks, Hosmer, and Lava Lake areas. Muhlenbergia filiformis can be found prostrate in the ground layer with an average cover of 8%. Species diversity of this tall but open plant association is relatively low with an average species richness of 8.0 (Table F2, Appendix F). The Lava Lake site occurs at an elevation of 1448 m. Soils are organic in nature with a thick binding root mass.

3f. Deschampsia caespitosa - Trifolium longipes C.T.

The Deschampsia caespitosa - Trifolium longipes C.T. is the most common of the upper montane, level landform, meadow types. Though it has been grouped within the Hydric Meadow Series it falls between the Hydric and Mesic Series as well between the Montane and Subalpine Zones.

The Deschampsia caespitosa - Trifolium longipes C.T. is typified by a relatively low, dense Deschampsia layer with a ground surface mosaic of Trifolium longipes and other low growing herbs. Deschampsia averages 65% cover and Trifolium, 25%. Since this community occurs over a broad elevational range, and a broad moisture spectrum, many species can be associated. Common associates include Aster foliaceus and Potentilla drummondii each with 9% cover and 89 and 70% percent constancy, respectively. On the wetter sites Aster alpigenus and Pedicularis attolens may be present; on the drier and perhaps more disturbed sites, Penstemon procerus and Danthonia californica may be present. During the middle to latter part of the growing season the water table is below the surface on all sites. It is moderately poor in herbs with an average species richness of 16.0 (Table F2, Appendix F).

Our plots of the Deschampsia caespitosa - Trifolium longipes C.T. occurred between 1342 and 2023 m elevation on level terrain. It is a widespread vegetation type throughout the Wilderness, scattered through the forested Montane and Subalpine Zones. Therefore, it provides the most extensive source

of forage for horses. Deschampsia stature decreases and Trifolium cover increases with increased disturbance. Some of the most heavily grazed sites maintain only basal leaf tufts of Deschampsia and over one third of the ground surface is covered with Trifolium. Repeated, yearly removal of Deschampsia culms to ground level may be extremely detrimental to the maintenance of these sites as tufted hairgrass meadows.

3g. Deschampsia caespitosa - Trifolium longipes C.T. - Ranunculus gormanii Phase

The Ranunculus gormanii Phase of the Deschampsia caespitosa - Trifolium longipes C.T. is a relatively common variant of the type community. Deschampsia caespitosa cover averages 69%; Trifolium longipes and prostrate Ranunculus gormanii average 19% cover each. Potentilla drummondii and Danthonia californica have 100% presence and 2% average cover. Except for the presence of Ranunculus gormanii, the Phase and typical community are quite similar. Their relationship is uncertain but Ranunculus gormanii appears to respond well to disturbance in hydric-mesic Deschampsia communities. The plots we sampled in the Ranunculus gormanii Phase occur between 1451 and 1615 m elevation on level terrain. Soils are sandy to silty loams.

All of the sites appear to have moderate gopher activity and other surface disturbance from horses as well as deer. The ground often appears hummocky and trodden. Ranunculus gormanii exhibits a preference for these moister and generally disturbed sites in the Deschampsia caespitosa - Trifolium longipes community.

B. Mesic Series:

4. *Veratrum* Types:

4a. *Veratrum* - *Senecio triangularis* C.T.

The *Veratrum* - *Senecio triangularis* C.T. and the *Elymus glaucus* Phase typify moist, lower slope, or meadow basin margin sites with deep soils within the Western Cascade portion of the Three Sisters Wilderness. Either *Veratrum viride* or *Veratrum californicum* may dominate this community with an average cover of 75%. *Heracleum lanatum* averages 55% cover and *Viola glabella* and *Senecio triangularis* average 25% cover each. Other herbs in this tall forb community include *Aster foliaceus*, *Rudbeckia occidentalis*, *Pedicularis bracteosum*, *Aconitum columbianum*, *Epilobium watsonii*, and *Mertensia bella*. Common graminoid associates are *Carex sitchensis* (when this type borders a sedge fen) and *Deschampsia caespitosa*. *Stellaria media* and *Potentilla drummondii* may be important beneath the tall forbs.

The *Veratrum* - *Senecio triangularis* C.T. is a lush and diverse community with species richness averaging 32.5, (Table F2, Appendix F) and a total plant cover often greater than 200%. The two representative sites are at 1295 m elevation, on the gentle slopes of a hydric meadow mosaic. Slope averages 3.5% and aspects are northeast. Soils are deep silty loams to silty clay loams derived from colluvium.

The Veratrum - Senecio triangularis C.T. can be extensive in area but more often will occur as a narrow sward of forest edge vegetation. Due to the rhizomatous nature of many component species, the community may be heterogeneous on a large scale, composed of clones of Veratrum, Senecio triangularis, or Heracleum lanatum. Rather than represent these vegetation groups as distinct communities or phases we have assigned them to a single community; the microsite variation influencing vegetation differences most likely is less important than clonal spreading and history of initial establishment.

4b. Veratrum - Senecio triangularis C.T. - Elymus glaucus Phase

This variant of the lush Veratrum - Senecio triangularis community is quite similar to the type, except for the codominance of Elymus glaucus with an average of 30% cover. Veratrum averages 28% cover, Senecio triangularis, 8% cover, and Viola glabella, 11% cover. Other important forbs include Lathyrus nevadensis, Aster foliaceus, Osmorhiza chilensis, Polygonum phytolaccaefolium, Mertensia bella, and Mimulus moschatus. Sambucus racemosa is an associated shrub with low abundance. The Elymus glaucus Phase more commonly occurs on lower slopes of more extensive meadows, whereas the Veratrum - Senecio triangularis C.T. occurs more frequently on the elevated margins of hydric systems.

The two representative samples for the Elymus glaucus Phase occur on mid-slopes between 1475 and 1536 m elevation in the Horsepasture Mountain and Rebel Rock areas. Both sites have extensive areas of snag subalpine fir and this vegetation fingers amongst the tree islands. Soils are very fine sandy loams to loams, with 17% average coarse particle composition -- gravel and cobble (Table F5, Appendix F). Slope averages 16.5%, and soils are quite deep, exceeding 40 centimeters to bedrock.

5. Rudbeckia occidentalis C.T.

The Rudbeckia occidentalis C.T. is a fairly common vegetation type though it is never very extensive. Unfortunately, we have only one sample site, though this community occurs sporadically intermixed with Pteridium aquilinum - Elymus glaucus, Rubus parviflorus, and Veratrum - Senecio triangularis communities in the French Pete Addition of the Wilderness. Rudbeckia occidentalis dominates the tall forb community with a cover of 60%. Bromus carinatus and Polygonum phytolaccaefolium are important associates with 15 and 7% cover, respectively. Beneath the tall herb layer, the annual Galium bifolium dominates the ground surface with a cover of 20%. The Rudbeckia occidentalis community is moderately diverse with a species richness of 24.0 (Table F2, Appendix F).

Our sample occurs on a mid-slope at an elevation of 1659 m in the Ollalie Mountain area. Slope is 25%, and aspect is east. Similar sites, limited in

extent and with southern exposures, occur along the Walker Creek Trail beneath Lowder, Yankee and Tipsoo Mountains in the French Pete Addition. Soil is a deep fine sandy loam, with four percent gravel composition.

6. Rubus parviflorus C.T.

The Rubus parviflorus community is the most extensive of the montane mesic meadow types. It dominates a large portion of the forest-meadow mosaic in the Lowder, Yankee, and Tipsoo Mountain areas in the French Pete Addition. Rubus parviflorus dominates with 59% average cover and Pteridium aquilinum averages 18% cover. Associated herbs with 100% presence include Lathyrus nevadensis, Cirsium callilepis and Phacelia heterophylla with average covers of less than five percent. Elymus glaucus and Bromus sitchensis are important grasses with 15 and 10% average cover. Carex pachystachya, a tall, leafy sedge has high occurrence but is of low abundance. Common herbs with minimal abundance include Vicia americana, Delphinium menziesii, Galium bifolium, Polygonum phytolaccaefolium, Erysimum arenicola, and Cryptantha sp. Species diversity is quite high with an average species richness of 28.5 (Table F2, Appendix F).

The Rubus parviflorus community occurs primarily on mid-slopes of southerly aspect. Our samples are from elevations of 1511 and 1678 m and have average slopes of 51%. Soils are usually deep, greater than 50 cm to bedrock, and appear to experience slumping and other movement due to snow and water

activity. Sandy loams to silty loams derived from colluvium are typical. Coarse particles of gravel and cobble size average 16% by volume (Table F5, Appendix F).

These meadows often have scattered seedlings and saplings; in a majority of these, trees are widely separated in size and age, reflecting an irregular establishment pattern. Typically the Rubus parviflorus community occurs below drier Carex pensylvanica - Bromus and "rock garden" communities.

7. Pteridium aquilinum - Elymus glaucus C.T.

The Pteridium aquilinum - Elymus glaucus C.T. is, like the Rudbeckia occidentalis C.T., a fairly common vegetation type though it is not usually extensive. It occurs in the mosaic of Rubus parviflorus, Rudbeckia occidentalis, and Carex pensylvanica - Bromus community types common in the French Pete Addition of the Wilderness and in adjacent areas. We have only two samples but they describe a rich community in which Pteridium aquilinum, bracken fern, dominates with 80% average cover and Elymus glaucus exhibits an average of 20% cover. Common associates are Carex pachystachya, Luzula campestris, Lathyrus nevadensis, Galium bifolium, Delphinium menzensii, Mimulus moschatus, Cirsium callilepis and Aster foliaceus. Numerous other mesic species can be found, mainly beneath the Pteridium canopy. Average species richness is 31.0 (Table F2, Appendix F).

The two representative sites occur on southeast and southwest aspects on mid-slopes between elevations of 1554 and 1584 m. Average slope is 43%. Soils are very fine sandy loams to silty loams with 4 to 15% gravel composition (Table F5, Appendix F). These colluvial soils are not quite as deep as the soils beneath the Rubus parviflorus community, ranging from 20 to 24 centimeters.

The Pteridium aquilinum - Elymus galucus community occurs on mid to upper slopes, generally on shallower, drier soils than the Rubus parviflorus community, and often forming a mosaic with the Carex pensylvanica - Bromus community.

8. Carex pensylvanica Types:

8a. Carex pensylvanica - Bromus C.T.

The Carex pensylvanica - Bromus C.T. is a common vegetation type on the mesic slopes of the Lowder, Yankee, and Tipsoo Mountain ridge, often interfingering with the Pteridium aquilinum - Elymus glaucus and Rubus parviflorus communities, which most often occur on lower slope positions. Both Bromus carinatus and Bromus sitchensis occur in this community. Since these species are a complex group to differentiate in the field, the community-type name remains in the generic form. Most of the stands appear to have Bromus carinatus, although Bromus sitchensis is a codominant in one plot that is otherwise very similar.

This community type is typified by the most abundant species, Carex pensylvanica (23% average cover), occuring beneath a canopy of taller herbs. Bromus (carinatus or sitchensis) cover averages 19% and Elymus glaucus is a constant associate with 7% cover. Other important herbs include Erigeron aliceae, Lupinus latifolius and Cirsium callilepis. The community is rather diverse due to its somewhat transitional nature, with mesic influences reflected in the presence of Erigeron aliceae, Lathyrus nevadensis and Aster foliaceus and xeric influences reflected in the occurrence of Sanicula graveolens and Epilobium minutum.

The Carex pensylvanica - Bromus C.T. occurs on upper slope positions in the Western Cascades portion of the Wilderness. Our samples were from elevations between 1487 and 1682 m. Slopes averaged 41% and aspects ranged from southeast through southwest to northwest. Soils are primarily very fine sandy loams and are deeper than the soils associated with the Pteridium aquilinum - Elymus glaucus C.T. Although soils range from 40 to over 50 centimeters deep, slightly convex topography may account for the somewhat xeric nature of the vegetation. Coarse fragments average 3.3% by volume and are primarily gravel size in a colluvium matrix.

8b. Carex pensylvanica - Bromus C.T. - Haplopappus greenei Phase

The Haplopappus greenei Phase of the Carex pensylvanica - Bromus C.T. is a vegetation type encountered only in Ollalie Meadows in the French Pete

Addition. Composition is quite similar to the Carex pensylvanica - Bromus C.T., execpt that the low shrub, Haplopappus greenei, is a codominant with 27% average cover. Carex pensylvanica and Bromus sitchensis exhibit 43 and 11% cover, respectively. Important associates include Rumex acetosella, Gilia aggregata, Erigeron aliceae, Lupinus latifolius and Fragaria vesca. Pinus contorta is invading a large portion of the meadow and averages 16% cover, mostly of trees less than one decimeter DBH. Diversity is similar to that of the Carex pensylvanica - Bromus C.T., with a species richness of 22.0 (Table F2, Appendix F).

The two stands sampled occur between 1536 and 1546 m elevation on a broad expanse of gently undulating terrain of south to southeast aspect. Soils are deep fine sandy loams to sandy loams developed from colluvium. There are few coarse particles.

9. Arenaria capillaris C.T.

The Arenaria capillaris community is restricted to broad flats on Lowder Mountain in the French Pete Addition. This sharp-leaved, herbaceous species occurs elsewhere in the Wilderness but never dominates over broad areas as here. The ground appears snow covered when viewed from a distance during periods of peak flowering.

Arenaria capillaris averages 53% cover and Lupinus latifolius, Calochortus

subalpinus, and Juncus parryi are common associates with low abundance. Tsuga mertensiana often appears to be invading portions of these meadows in relatively even-aged fronts. In one sample Tsuga averaged 25% cover, primarily in the <1 decimeter DBH, >1 m tall size class. Moss can be important in the nonvegetated interstices. Diversity is relatively low at 15.5, (Table F2, Appendix F), as is total species cover which averages only 57%.

The summit flats of Lowder Mountain are unusual in the Western Cascade portion of the Three Sisters Wilderness. The physiognomy and soils of the area are more similar to the rolling pumice barrens of the High Cascades.

Soils are deep loams developed from pumice, except where trees are invading. Elevation averages 1674 m, slopes average 9%, and aspects are varied. Gopher activity is very important in the churning of these soils--extensive surface tunneling takes place beneath the winter snowpack; tunnel casts are prominent following snowmelt. This activity may contribute to the maintenance of broad meadow openings on Lowder Mountain.

C. Xeric Series:

10. Festuca idahoensis - Agrostis diegoensis C.T.

The Festuca idahoensis - Agrostis diegoensis C.T. is found within the H.J. Andrews Biosphere Reserve but not the Three Sisters Wilderness. This community exhibits characteristics of the more mesic Carex pensylvanica - Bromus C.T. as well as of the more xeric rock-garden Eriophyllum lanatum - Gilia capitata type. Appropriately, it most often occupies upper-slope landforms intermediate between the two.

Festuca idahoensis dominates the herb layer with 26% average cover. The smaller-statured Agrostis diegoensis provides 19% cover within the bunchgrass mosaic. Frequent important herbs include Achillea millefolium, Eriophyllum lanatum, and Lupinus latifolius. Elymus glaucus, Lomatium triternatum, Potentilla glandulosa, Penstemon procerus, Lathyrus nevadensis and Solidago canadensis are frequent associates. Two of the five stands sampled contain the prostrate Juniperus communis. The Festuca idahoensis - Agrostis diegoensis community type is very diverse with an average species richness of 32.0 and a maximum of 50.0 (Table F2, Appendix F).

Elevations for our samples range from 1460 to 1536 m on upper slopes in the Western Cascades. Slopes average 48% and aspects are primarily south and southwest. Soils are shallow (8-25 cm) silty loams to sandy loams. By

volume, gravel fragments average 21% but vary from 2 to 40% (Table F5, Appendix F). The upper slope sites can have anywhere from 1 to 40% exposed bedrock cover (average 16%) and 0 to 20% loose rock cover (average 5.4%). These are relatively open sites as average plant cover is 76%. Shrubby patches of Holodiscus discolor and Acer circinatum, as well as individuals of Abies procera and Pseudotsuga menziesii are often scattered across the bunchgrass slopes.

11. Eriophyllum lanatum - Gilia capitata C.T.

The Eriophyllum lanatum - Gilia capitata community is one of two that typifies the upper slope and ridgetop rock-garden "meadows" of the Wilderness. These sites occur high on steep slopes of the Western Cascades in the French Pete Addition and on Horsepasture Mountain, Taylor Castle, and English Mountain.

Eriophyllum lanatum, with 75% constancy and 22% average cover, and Gilia capitata, with 100% constancy and 14% cover, dominate this low-statured, open vegetation. Other herbs with 100% presence include Achillea millefolium, Castilleja hispida, Epilobium minutum, Calochortus subalpinus, and Collinsia parviflora. Two species of Eriogonum, E. compositum and E. umbellatum var. umbellatum, reach highest levels these sites. The fern Cryptogramma densa often inhabits small bedrock exposures common on these sites. Species diversity compares to the Festuca idahoensis - Agrostis diegoensis communities, with an average species richness of 34.3 (Table F2, Appendix F).

Stands of the Eriophyllum lanatum - Gilia capitata community were sampled between elevations of 1500 and 1706 m on upper slopes and along ridgetops. Aspects are south to southwest and the average slope is 48%. These xeric sites exhibit an average bedrock cover of 20%, although some sites have up to 40% cover; cover of loose rock averages 6.5%. Soils are typically shallow, fine sandy loams to silty loams, and derived from colluvium and residuum. Coarse fragments average 29% by volume--20% gravel and 9% cobble size (Table F5, Appendix F). Total vegetative cover averages only 75%. Cover may appear much lower by late summer after plants have set seed, browned, and dried up.

The Eriophyllum lanatum - Gilia capitata community relates closely to the Penstemon procerus - Sanicula graveolens and Festuca idahoensis - Agrostis diegoensis communities. They have many species in common. These three communities often exhibit intermediate compositions, as topographic differences are too indistinct to create discrete vegetation units.

12. Penstemon procerus - Sanicula graveolens C.T.

The Penstemon procerus - Sanicula graveolens C.T. is the second of the characteristic rock garden types. Exposed bedrock is less and loose rock is more abundant on the surface than in the Eriophyllum lanatum - Gilia capitata type. Penstemon procerus dominates this open, low stature community with 41% average cover. Other species with 100% presence include Sanicula graveolens (5% cover), Carex pensylvanica (8% cover), Comandra umbellata (2% cover), and

Calochortus subalpinus and Cryptantha sp. (each with less than 1% cover). Eriogonum umbellatum or Eriogonum compositum or both are often present as scattered individuals. Numerous other species occur in the Penstemon procerus - Sanicula graveolens community but with low constancy. It is a moderately diverse type with an average species richness of 26.7 (Table F2, Appendix F).

Our sample sites occur between 1615 and 1732 m elevation on upper slopes and ridgetops. The northeast to east aspects contrast with those of the Erophyllum lanatum - Gilia capitata type. Slope averages 54% for the non-ridgetop sites. Soils are shallow silty loams to sandy loams, 10 to 20 centimeters in depth. Coarse fragments are 52% by volume; bedrock cover averages only 3.6%, but loose rock cover averages 17% (Table F5, Appendix F). The ground surface is generally carpeted with sub-shrubs and herbs as total vegetation cover averages 117%.

Subalpine Meadows:

13. Festuca viridula C.T.

The Festuca viridula community is a common upper montane to subalpine vegetation type. It occurs over a variety of topographic positions and a broad elevational range. Sheep and packstock grazing in the early 1900's have probably reduced the extent of this tall bunchgrass community. It occurs on upper slopes in the Western Cascades in the French Pete Addition, on pumice flats along the base of the Three Sisters, and on slopes of upper montane and subalpine meadows in the High Cascades.

Festuca viridula averages 47% cover and is the only species with 100% presence. Carex pensylvanica is often found between the bunchgrass clumps with an average cover of 8%. Lupinus latifolius can be important on some sites with an average cover of 11%; on one site it was a codominant with 40% cover. Other associates include Calochortus subalpinus, Microseris alpestris, and occasionally, Polygonum newberryi. Species diversity is moderate to poor as average species richness is 13.8 (Table F2, Appendix F).

The Festuca viridula community type was sampled between 1584 and 2023 m elevation. Slopes ranged from 0 to 50% and landforms varied from flats to upper slopes. Soils are generally silty loams in the Western Cascades; in the High Cascades, on the flats and gentle slopes, soils are sandy loams and loamy

sands derived from pumice. The few coarse fragments never exceed gravel size. Total plant cover on these sites averages only 74% and can be as low as 30% due to a typical bunchgrass physiognomy.

14. Deschampsia caespitosa - Carex spectabilis C.T.

The Deschampsia caespitosa - Carex spectabilis C.T. represents the elevational limit for a Deschampsia-dominated community in a relatively mesic setting. The community appears related to the Deschampsia - Trifolium longipes community type found at slightly lower elevations. Deschampsia caespitosa dominates a dense herbaceous layer with 26% average cover. Carex spectabilis is a codominant in all but the more disturbed sites, with 47% average cover. Associates with 100% presence include: Trifolium longipes (25% cover), Ranunculus alismaefolius (24% cover), Potentilla flabellifolia (19% cover), and Veronica wormskjoldii and Senecio triangularis (with less than 1% cover each). In the more disturbed sites Potentilla flabellifolia can assume dominance in the ground layer.

When sampled, the water table was below the ground surface but water may be at the surface following snowmelt early in the growing season. Species such as Muhlenbergia filiformis, Carex luzulina, Polygonum bistortoides, Senecio cymbalarioides, and Dodecatheon jeffreyi suggest a hydric character. Carex nigricans, an important subalpine species more common at higher elevations, occurs in half the sites with 11% average cover.

The Deschampsia caespitosa - Carex spectabilis community samples occur between 1745 and 1792 m elevation on relatively gentle slopes and benches. Soils are very fine sandy loams to loams, pumiceous in nature and derived from a mixture of colluvium and alluvium. Coarse particles essentially are absent.

In several of our stands Carex spectabilis is more important than Deschampsia caespitosa. These sites could represent a purer Carex spectabilis phase not defined here. Pure stands of Carex spectabilis do occur but are usually limited in area.

15. Carex spectabilis - Lupinus latifolius C.T.

The Carex spectabilis - Lupinus latifolius community is more widespread than indicated by the two samples. Where it does occur, however, the community is not very extensive. It typifies gravelly subalpine soils and may be restricted to them. Carex spectabilis and Lupinus latifolius are codominants with 51 and 33% average cover, respectively. Other species with 100% presence are Luetkea pectinata, Phyllodoce empetriformis, Microseris alpestris, Polygonum newberryi, Ligusticum grayi and Antennaria spp. These are relatively species poor but lush meadows; species richness averages 17.5 (Table F2, Appendix F). Except for the dominants no species exceeds two percent average cover.

The Carex spectabilis - Lupinus latifolius C.T. samples occur between 2000 and 2023 m elevation. These are bench and level valley sites with gentle slopes. These soils are typically colluvial and alluvial with an average of 30% gravel by volume; soils are loamy sands to sands. These sites apparently experience an annual snowmelt wash, as they occur in microtopographic drainages.

16. Polygonum newberryi C.T.

The Polygonum newberryi community typifies the broad rolling pumice flats characteristic of the western base of the Three Sisters, the Wickiup Plains southwest of South Sister, and the drier stony mounds commonly interspersed in more mesic meadow basins in the High Cascades. These sites appear droughty, yet most soil pits display quite moist, sandy profiles. The Polygonum newberryi community appears very open as total vegetation cover averages 46%. Polygonum exhibits 11% cover and Microseris alpestris exhibits 1% cover. Other common species include Spraguea umbellata, Lomatium martindalei, Eriogonum pyrolaefolium, Eriogonum umbellatum and Sitanion hystrix.

The Polygonum newberryi community often occupies flats which border slopes covered with Festuca viridula, so that there are occasional occurrences of species characteristic of the latter community. Lupinus latifolius, Festuca viridula, and Calochortus subalpinus are examples. The Polygonum newberryi community also occurs at the lower edges and flats below mosaics of the Phyllodoce empetriformis - Cassiope mertensiana C.T., Luetkea pectinata C.T.,

Carex nigricans C.T. - Potentilla flabellifolia Phase, and Vaccinium deliciosum stands.

Elevations of our samples range between 1756 and 1880 m. Slopes are gentle, and never exceed six percent. Soils are typically sands derived from deep pumice. Coarse, gravel-size fragments may be up to 40% of the volume, although the average is 25% (Table F5, Appendix F).

17. Juncus parryi C.T.

The Juncus parryi community often occupies pumice flats as part of a mosaic setting with the Polygonum newberryi community. A single stand was sampled but it is representative of a broad expanse of the community bordering Moraine Lake south of the South Sister. Plant cover is sparse. Juncus parryi covers 25% of the ground surface while Eriogonum pyrolaefolium, E. umbellatum, Microseris alpestris, Aster alpigenus, Polygonum newberryi, and Carex breweri each exhibit trace amounts. Although the Juncus parryi community is extensive at Moraine Lake, it is typically restricted to small areas as part of a community mosaic charateristic of pumice flats.

The stand sampled is at 1999 m elevation on an extensive flat. The soil is a sandy pumice derived from colluvium. Gravel composes 35% of the volume (Table F5, Appendix F). This particular area is relatively sheltered and probably experiences a deep and persistent snowpack.

18. Luetkea pectinata C.T.

The Luetkea pectinata community is an uncommon but distinctive vegetation type. It occurs on gentle slopes in subalpine meadow mosaics with the Phyllodoce - Cassiope community, patches of Vaccinum deliciosum, and the Potentilla Phase of the Carex nigricans community. Areas of pure Luetkea pectinata can also be found within large gaps in Tsuga mertensiana or Abies lasiocarpa forests. Luetkea pectinata averages 10% cover in the sparsely vegetated community. Other characteristic species include Juncus parryi, Eriogonum pyrolaefolium, E. umbellatum, Aster alpigenus, Carex nigricans, and Phyllodoce empetriformis. In areas moister than our sample, total cover often greatly exceeds 30% and the heathers, Carex nigricans, and Luetkea pectinata form a dense, low shrub and herb mat.

The stand of Luetkea pectinata type sampled is at 2048 m elevation on a gentle west-facing 11% slope. It borders stands of the Phyllodoce empetriformis - Cassiope mertensiana community. The soil is sand derived from pumice; gravel-size particles are three percent by volume (Table F5, Appendix F). Loose surface rock has 45% cover.

19. Phyllodoce empetriformis - Cassiope mertensiana C.T.

The Phyllodoce empetriformis - Cassiope mertensiana C.T. is a subalpine heath type common to the central and northern Cascade Range. It occurs on gentle slopes in meadows along with the Luetkea pectinata and Polygonum newberryi

communities, the Potentilla flabellifolia Phase of the Carex nigricans C.T., and small stands of Vaccinum deliciosum. A dense layer of Phyllodoce is dominant (average cover of 39%). Cassiope mertensiana occurs in 75% of the stands with 40% average cover. Juncus parryi, Aster alpigenus, Ligusticum grayi, Microseris alpestris and Polygonum newberryi are frequent associates. Total plant cover (average 93%) is greatest of all subalpine meadow communities except that of Carex nigricans. Diversity is moderate; species richness averages 16.5 (Table F2, Appendix F).

Tsuga mertensiana seedlings are occasionally established in the heather mat and heather slopes often support fronts of invading Tsuga. Cassiope can be the dominant heath species without changing the physiognomy of the community.

Stands of the Phyllodoce empetriformis - Cassiope mertensiana community type were sampled between 1884 and 2020 m elevation on benches and steeper slopes (33%) with a variety of exposures. Loose rock averaged 7.8% surface cover but was as great as 30% (Table F5, Appendix F). Soils were loamy sands to sands and generally were relatively deep and nearly gravel free.

20. Carex scopulorum Types:

20a. Carex scopulorum C.T.

The Carex scopulorum community represents one of the high-elevation, hydric, meadow types. Structurally it resembles the more montane Eleocharis

pauciflora and Deschampsia - Hypericum anagalloides - Muhlenbergia filiformis communities. Indeed, the three communities share many species. The primary feature of this community is a dense Carex scopulorum layer (cover of 63%) with a moss mat (Sphagnum, Philonotis and Aulacomnium, singly or in any combination) which averages 50% cover. Important associates include Eleocharis pauciflora, Carex nigricans, C. canescens, Ranunculus alismaefolius and Dodecatheon jeffreyi. Aster alpigenus and Senecio cymbalarioides may also be important and showy herbs. The water table remains at the surface through the growing season due to subterranean flows and seepage. These boggy sites have an average species richness of 23.5 (Table F2, Appendix F).

The Carex scopulorum community samples are from elevations between 1786 and 1792 m. These sites are relatively gentle benches with surface flows, seeps, and small stream channels. Soils are highly organic and peaty.

Due to their low stature, hydric nature, and subalpine occurrence, this community is sensitive to disturbance. One site near James Creek is heavily trampled and vegetation damage and mineral soil exposure is resulting.

20b. Carex scopulorum C.T. - Deschampsia caespitosa Phase

The Deschampsia caespitosa Phase of the Carex scopulorum community occurs at relatively high elevations east of the Cascade crest. The physiognomy of the phase is very similar to the typical Carex scopulorum community. Species composition differs in the codominance of Deschampsia caespitosa (average

cover 40%). This is the upper elevational limit for a hydric, Deschampsia-dominated community. Average covers are 33% for Carex scopulorum, 17% for Muhlenbergia filiformis, 14% for Eleocharis pauciflora, 15% for Aster alpigenus, and 7% for Trifolium longipes. Other species with 100% constancy include Carex luzulina, Spiranthes romanzoffiana, and Senecio cymbalarioides; all have less than 2% average cover. Though moss occurs in only two thirds of the stands, it can form dense mats and averages 35% cover. The bog-like appearance of the Deschampsia caespitosa Phase of the Carex scopulorum community is due to graminoid dominance, a low and dense stature, and a surface water table through the growing season. Diversity is comparable to the Carex scopulorum community with an average species richness of 19.0 (Table F2, Appendix F).

Samples of the Deschampsia caespitosa Phase of the Carex scopulorum C.T. are from elevations between 1792 and 1865 m on saturated, level terrain in fen systems near and within Red Meadow. Soils are organic mucks and often peaty. As with the Carex scopulorum community on the west side of crest, the Deschampsia caespitosa Phase appears very sensitive to grazing and trampling.

Since these are some of the only Wilderness sites on the east side suitable for grazing they are vulnerable to repeated horse use. Packstock use of these sensitive hydric meadows should probably be avoided.

21. Carex nigricans Types:

21a. Carex nigricans C.T. - Carex scopulorum Phase

The Carex nigricans communities of the Three Sisters Wilderness represent subalpine sites that are the coldest and snowiest sampled. Pure Carex nigricans swards are common in heather-dominated, subalpine community mosaics but occupy relatively small areas. Other herbs and graminoids are more typically associated with Carex nigricans in larger more homogeneous communities so that a pure Carex nigricans community type has not been defined. The Carex scopulorum Phase of the Carex nigricans C.T. represents the hydric extreme of the Carex nigricans series and the upper-elevational limit of hydric meadows. The water table is at the surface through the growing season. This phase is related to the Carex scopulorum types and the Eleocharis pauciflora and Deschampsia - Hypericum - Muhlenbergia community types at lower elevations, in both composition and physiognomy. Carex scopulorum, Carex nigricans, and Eleocharis pauciflora dominate this low stature vegetation with average covers of 30, 15, and 15% respectively. Moss (Sphagnum, Philonotis, and/or Aulacomnium) forms a dense mat on the saturated soil, averaging 53% cover. Aster alpigenus, Senecio cymbalarioides, Pedicularis groenlandica, P. attolens, Tofieldia glutinosa, Ligusticum grayi, and Kalmia microphylla are frequent associates. Though our plots are primarily from the vicinity of Green Lakes, this hydric type, as well as the Carex scopulorum and Eleocharis communities, also occurs in large, unsampled

meadows beneath Tam MacArthur Rim northeast of Broken Top. Diversity is moderate in this community with an average species richness of 12.3 (Table F2, Appendix F).

Samples of the Carex scopulorum Phase of the Carex nigricans community are from between 1999 and 2195 m on flats and valley bottoms. Soils are generally organic muck but can be sandy due to alluvial or colluvial additions. This hydric, low-stature, fen community is similar to all Carex scopulorum types in its susceptiblity to trampling and grazing. Mineral soil exposure of these sites should be avoided.

21b. Carex nigricans C.T. - Aster alpigenus Phase

The Aster alpigenus Phase of the Carex nigricans community is a late snowmelt vegetation type with a water table below the soil surface during most of the growing season. Carex nigricans forms a dense mat with 55% average cover. Aster alpigenus averages 14% cover. Other equally important species include Caltha leptosepala, Trifolium longipes, and Deschampsia caespitosa. Mosses are common but lower in abundance than in more hydric Carex nigricans stands. Gentiana newberryi, which is restricted to hydric meadows east of the Cascade crest, is present with 2% average cover. Physiognomically, the vegetation forms a dense, low carpet of sedges and prostrate forbs. Diversity is moderate as the average species richness is 13.5 (Table F2, Appendix F).

This phase of the Carex nigricans C.T. occurs in the Golden Lake area at 2010 m elevation, but is not confined to this locale. Topography is flat and soils are sands to loamy sands and relatively deep . Gravel size particles average 6% of the soil mass (Table F5, Appendix F).

Sites remain moist throughout the growing season due to adjacent snowmelt. Trampling and grazing disturbance result in increased Ranunculus alismaefolius cover as it fills in between the Carex nigricans clumps. This community is not as susceptible to stock damage as the Carex scopulorum communities, due to lower water tables, more stable soils, and a more resilient Carex nigricans carpet.

21d. Carex nigricans C.T. - Kalmia microphylla Phase

The Kalmia microphylla Phase of the Carex nigricans community is restricted in our samples to gravelly soils near Green Lakes east of South Sister. Similar vegetation occurs in large meadows beneath Tam MacArthur Rim northeast of Broken Top. Kalmia microphylla (50% cover) dominates a very dwarfed herb layer. Low vigor Carex nigricans exhibits 25% cover. Other common associates include Salix commutata (15% cover), Phyllodoce empetriformis (6% cover), and Pedicularis attolens (2% cover). Gaultheria humifusa, Vaccinium occidentale, Antennaria sp., Lupinus lepidus, Hieraceum gracile and Aster alpigenus may also be present. Species richness is 13.0 (Table F2, Appendix F).

The elevation of our sample is 1999 m. Soils are very gravelly sands with 55% gravel and 5% cobble size particles (Table F5, Appendix F) derived from alluvium and colluvium. The water table is 20 cm below the surface late in the growing season. Lodgepole pines from 6 to 82 years old are scattered across this community at Green Lakes but they have poor vigor. Low shrub and sub-shrub dominance by Kalmia, Salix and Phyllodoce, may reflect extreme environmental conditions and nutrient deficient soils.

21c. Carex nigricans C.T. - Potentilla flabellifolia Phase

The Potentilla flabellifolia Phase of the Carex nigricans community is the most common and widespread of the Carex nigricans phases. Potentilla flabellifolia appears to respond positively to trampling and grazing and in more disturbed areas forms dense carpets beneath the taller clumps of Carex nigricans and Carex spectabilis.

This phase is dominated by Carex nigricans with 51% average cover; Carex spectabilis is frequently important with 19% cover and 75% constancy. Potentilla flabellifolia averages 14% cover. Other frequent associates include Aster alpigenus, Microseris alpestris, Polygonum newberryi, and Phyllodoce empetriformis. This Carex nigricans Phase is the most common in the mosaic of heather, Luetkea pectinata, Vaccinium deliciosum, and Polygonum newberryi communities. It is related to the Deschampsia caespitosa - Carex spectabilis community type, but the codominance of Carex nigricans and C. spectabilis and a lower layer of Potentilla flabellifolia distinguish the

Potentilla flabellifolia Phase. One stand may represent a relatively undisturbed stage with Carex nigricans coverage of 80% and C. spectabilis and Potentilla flabellifolia reduced to 1% cover each. Diversity is moderate with average species richness of 13.8 (Table F2, Appendix F).

In our samples, the Potentilla flabellifolia phase of the Carex nigricans community type occurs between elevations of 1829 and 1987 m and on very gentle southwest to west slopes or flats. Soils are shallow to relatively deep loamy sands and generally have low gravel content; one site near Sisters Mirror Lakes had 40% gravel, however.

This phase is at the dry limit of the Carex nigricans community. It has experienced greater human and horse disturbance than other Carex nigricans phases. It occassionally borders, perhaps due to its more extensive occurrence, drier, more exposed areas and exhibits Antennaria dominance, indicative of more disturbed soils.

Vaccinium deliciosum Stands

References to Vaccinium deliciosum stands have been made in describing the community mosaic of late snowmelt, subalpine meadow systems. The species is relatively uncommon and found most frequently along gently sloping ecotones between forests of Tsuga mertensiana and meadows where it can form narrow, relatively pure patches. Occassionally such patches extend into or occur within the meadow mosaic. The rarity and limited extent of such Vaccinium deliciosum stands in the areas sampled do not justify community recognition, however.

Similar Forest Types of Oregon, Washington, and British Columbia

Many of the forest communities which are defined for the Separation Creek drainage in the Three Sisters Biosphere Reserve, have counterparts in the Cascade Range of Washington, northern Oregon and British Columbia. In this section, a brief comparison of types is made. Separation Creek communities not mentioned below do not appear to have analogues in other locations based upon the literature. They may be 1) indigenous to the area, 2) more refined than related types found in the literature, 3) more general than types reported in the literature, or 4) not yet sufficiently described from other locations.

Tsuga heterophylla Series:

1. *Tsuga heterophylla/Acer circinatum/Polystichum munitum* C.T.

Dyrness, *et al*. (1974) describe a similar TSHE/ACCI/POMU Association from the central Western Cascades of Oregon. Of all the reported similar vegetation, this probably most resembles our community. Henderson and Peters (1981a, 1981b, 1981c, 1981d, 1982a, 1982b) report a TSHE/POMU association from the Olympic and Mt. Baker - Snoqualmie National Forests, which, in seral stages may have an important *Acer circinatum* component. Kojima and Krajina (1975) describe a *Polystichosum muniti* association within the Strathcona Provincial Park of British Columbia. *Acer circinatum* appears to be absent though the understory is similar.

Del Moral and Long (1977) note a PSME-POMU community in the Cedar River drainage of western Washington. This is a seral forest type with Tsuga heterophylla regeneration and appears similar to our community. Franklin, et al. (1979) also describe a TSHE/POMU H.T. in Mt. Rainier National Park which has similar physiognomy and composition.

2. Tsuga heterophylla/Acer circinatum/Berberis nervosa C.T.

Dyrness, et al. (1974) describe a PSME/ACCI/BENE community type in the central Western Cascades, allied to their RHMA-BENE Association. It is a seral type with Pseudotsuga menziesii canopy dominance. Brockway, et al. (1982), in the Gifford Pinchot National Forest report a Pacific Silver Fir Zone type, the ABAM/ACCI/BENE association, with a similar understory but with higher elevation representatives and 15% Abies amabilis in the tree canopy. They also describe an ABAM-TSHE/ACCI/GASH association with equal Berberis nervosa and Gaultheria shallon abundance. This is the warmest of their transitional zone types.

3. Tsuga heterophylla/Rhododendron macrophyllum/Gaultheria shallon C.T.

Hemstrom, et al. (1982) describe an ABAM-TSHE/RHMA/GASH association from the Mt. Hood and Willamette National Forests, which is a high elevation extension of the TSHE/GASH association. It is transitional in nature between the Tsuga heterophylla and Abies amabilis Zones. Dyrness, et al. (1974) in the central Western Cascades of Oregon report a very similar TSHE-RHMA-GASH Association in both mature and old-growth stands.

4. Tsuga heterophylla/Rhododendron macrophyllum/Berberis nervosa C.T.

The TSHE-RHMA-BENE association of Dyrness, et al. (1974) is a common climatic climax type in Oregon's central Western Cascades. Bailey (1966) describes a RHMA/BENE type in the southern Oregon Coast Ranges. Hemstrom, et al. (1982) describe a higher-elevation ABAM/RHMA/BENE Association from the Pacific Silver Fir Zone of the Mt. Hood and Willamette National Forests. Though Pseudotsuga menziesii and Tsuga heterophylla are major canopy dominants, Abies amabilis is the probable climax tree species.

5. Tsuga heterophylla/Berberis nervosa C.T.

Henderson, et al. (1981a, 1981b, 1982b) describe a TSHE/BENE Association from the North Bend and White River Ranger Districts of the Mt. Baker - Snoqualmie National Forest and the Soleduck Ranger District of the Olympic National Forest. Kojima and Krajina (1975) report a similar low-elevation, Berberis nervosa, forest type in the Coastal Western-Hemlock Zone in Strathcona Provincial Park, British Columbia.

6. Tsuga heterophylla/Rhododendron macrophyllum/Linnaea borealis C.T.

The only notation of this type is by Dyrness, et al. (1974) in Oregon's central Western Cascades. They report a TSHE-ABAM/RHMA/LIBO2 Association which is also similar to their TSHE/ABAM/RHMA/BENE type. These types appear similar to those in the Separation Creek drainage of the Three Sisters

Wilderness. Their association has, however, Abies amabilis codominant with Tsuga heterophylla in the regeneration layer. Henderson and Peter (1982b) report a Linnaea borealis-dominated understory in the ABAM/LIBO2 association for the Soleduck Ranger District in Olympic National Forest. It has no Rhododendron and much greater Linnaea coverage than our community.

Tsuga heterophylla - Abies amabilis Series:

7. Abies amabilis/Rhododendron macrophyllum/Xerophyllum tenax C.T.

Hemstrom, et al. (1982) describe an ABAM/RHMA/XETE Association for the Pacific Silver Fir Zone of the Mt. Hood and Willamette National Forests. It is probably a slightly cooler relative as Abies amabilis plays a greater role in the regeneration layer than in our community.

8. Abies amabilis/Xerophyllum tenax C.T.

Del Moral and Long (1977) describe a similar TSHE-ABAM/XETE community in the Cedar River Drainage of western Washington. Henderson and Peter (1981b) report an ABAM/XETE association in the White River Range District of the Mt. Baker - Snoqualmie National Forest. Here both Tsuga heterophylla and Abies amabilis are climax tree species. Franklin, et al. (1979) report an ABAM/XETE habitat type with a Tsuga heterophylla phase in Mt. Rainier National Park, which may be quite similar.

Abies amabilis - Tsuga mertensiana Series:

9. Abies amabilis/Vaccinium membranaceum C.T.

Within the Gifford Pinchot National Forest, Brockway, et al. (1982) describe an ABAM-TSME/VAME Association. Vaccinium ovalifolium and Vaccinium alaskaense occur in their association but are uncommon in the Three Sisters Wilderness. Otherwise, this type is quite similar to ours. Henderson and Peter (1981a, 1981b, 1982a) report an ABAM/VAME association in the North Bend and White River Ranger Districts and the Snoqualmie and Skykomish River Drainages in the Mt. Baker - Snoqualmie National Forest. It appears to be a relatively common, dry, forest sites type here in Washington and is replaced by a VAME/XETE Association on drier sites; this pattern also occurs in the Three Sisters Wilderness. Tsuga heterophylla plays a minor role in the regeneration layer of these ABAM/VAME Associations. Henderson and Peter (1981b, 1981c, 1982a) also report a TSME/VAME association for the White River Ranger District and the Snoqualmie and Skykomish River Drainages on the Mt. Baker - Snoqualmie National Forest as well as the Shelton Ranger District on the Olympic National Forest. Here, at slightly higher elevations, Tsuga mertensiana plays a greater role in the regeneration layer. Franklin (1966) describes an ABAM/TSME/Vaccinium Association in the southern Washington Cascades. It represents the climatic climax within the Tsuga mertensiana Zone and Abies amabilis is the only climax species, although Tsuga mertensiana dominates most of the stands sampled.

10. Abies amabilis/Vaccinium membranaceum C.T. - Xerophyllum tenax Phase

Several ABAM/VAME/XETE and TSME/VAME/XETE associations have been reported. Brockway, et al. (1982) describe an ABAM/VAME/XETE association with Abies amabilis regeneration at 10-20% cover, and Vaccinium membranaceum and Xerophyllum tenax at 30% and 80% average cover, respectively. Our phase has lower cover values, with Vaccinium at 7% and Xerophyllum at 34% average cover. Dyrness, et al. (1974) define an ABAM/VAME/XETE association in the central western Oregon Cascades. Here Vaccinium membranaceum and Xerophyllum tenax cover are quite similar to our Xerophyllum Phase of the Vaccinium membranaceum C.T., with 13% and 39% average cover, respectively. Hemstrom, et al. (1982) describe both an ABAM/VAME/XETE and a TSME/VAME/XETE Association from the Mt. Hood and Willamette National Forests. The latter is similar to the former but poorer in species; the TSME/VAME/XETE association may include Pinus contorta in low density stands, as well as more Tsuga mertensiana than Abies amabilis in the regeneration layer.

11. Abies amabilis/Rubus lasiococcus C.T.

Franklin, et al. (1979) define an ABAM/RULA habitat type in Mt. Rainier National Park. The Rubus lasiococcus phase of this type appears similar to our community, although Vaccinium membranaceum abundance is much greater at Mount Rainier.

12. Abies amabilis/Achlys triphylla C.T.

Dyrness, et al. (1974) describe an ABAM/ACTR association for the central Western Cascades of Oregon. It is the climax equivalent of the seral ABPR/ACTR type they define. Though Abies procera is not important in our stands, there is a similarity in the occassional A. grandis component. Herb cover is generally greater in their stands. Henderson and Peter (1982b) report an ABAM/ACTR association from the Soleduck Ranger District, Olympic National Forest, within the warm, dry range of the Abies amabilis Zone. Franklin (1966) describes an Abies amabilis/Achlys triphylla Association in the Mount Adams Province of the southern Washington Cascade Range. It is a topographic or topoedaphic climax type on gentle to moderate, middle to upper slopes of variable exposure. Acer circinatum does not become important in our community as it may in Franklin's (1966) association. Otherwise, the understory appears similar.

Tsuga mertensiana Series:

13. Tsuga mertensiana/Xerophyllum tenax C.T.

Dyrness, et al. (1974) describe an ABAM-TSME/XETE association on shallow soils in the highest elevation areas of Oregon's central Western Cascades. Understory composition resembles our TSME/XETE type, although Rhododendron macrophyllum and Gaultheria ovatifolia are present in our stands. Henderson

and Peter (1981a) in the North Bend Ranger District of the Mt. Baker - Snoqualmie National Forest, define a TSME/XETE association on steep, west exposures with dry topographic positions. Franklin (1966) notes a TSME/XETE/Lithosol community in the southern Washington Cascade Range which occurs on high ridgetops or steep slopes covered by a lithosolic soil. These are open stands and *Tsuga mertensiana* as well as *Chamaecyparis nootkatensis* may join *Abies amabilis* as climax species.

14. *Tsuga mertensiana/Vaccinium scoparium* C.T.

Hemstrom, *et al*. (1982) describe a TSME/VASC Association in the Pacific Silver Fir Zone of the Mt. Hood and Willamette National Forests. As in the Separation Creek drainage, these sites represent the most severe forest environments sampled. This vegetation type has also been described by Franklin (1966) near timberline in the eastern portion of the Mt. Adams Province of southwest Washington.

Similar Meadow Types of Oregon, Washington, and British Columbia

The same caveats described for the forest type comparisons apply to this analysis of the relation between our Three Sisters meadow communities and types reported in the literature.

Montane Meadows

A. Hydric Series:

1. *Carex sitchensis* C.T.

Hickman (1976) describes a broad *Caltha biflora/Carex sitchensis/Dodecatheon jeffreyi* Bog Association which contains smaller areas of a type more like our *Carex sitchensis* community. These are from complex hydric meadows, such as occur at Quaking Aspen Swamp in the French Pete addition of the Three Sisters Wilderness. Seyer (1979) defines broad areas of Sphagnum Bog in Crater Lake National Park as belonging to the *Carex sitchensis* community. She also describes *Carex sitchensis* communities from Multorpor Fen near Mount Hood (Seyer, 1983); some of these interfinger with shrub communities which physiognomically resemble our *Salix* Phase of the *Carex sitchensis* C.T. Campbell (1973) reports an expanse of a *Carex sitchensis* community at 1525 m elevation from Hunts Cove, Mount Jefferson, Oregon. Frenkel (personal communication) has identified *Carex sitchensis* fen at Torrey Lake Mire, Oregon.

2. Eleocharis pauciflora C.T.

The Eleocharis pauciflora C.T is most certainly one of the phases of the Caltha biflora/Carex sitchensis/Dodecatheon jeffreyi Bog Association alluded to by Hickman (1976) for the central Oregon Western Cascades. Seyer (1979) describes an Eleocharis pauciflora/bryophyte community resembling ours in composition and physiognomy. At Multorpor Fen in the Mt. Hood National Forest, Seyer (1983) defines an Eleocharis/herb rich/Philonotis fontana and an Eleocharis/herbs/Aulacomnium - Sphagnum community; both reflect a similar low sedge/moss-mat fen with continually saturated soils. Campbell (1973) describes an Eleocharis - Aulacomnium community in Hunts Cove, Mount Jefferson, Oregon within a larger Carex scopulorum meadow complex.

B. Mesic Series:

3. Veratrum - Senecio triangularis C.T.

Hickman (1976) describes a variant of his Veratrum viride/Valeriana sitchensis/Senecio triangularis Wet Meadow Associes in the central Western Cascades of Oregon. It occupies exposed side slopes of bogs and has a dominance of Veratrum californicum and Heracleum lanatum, with Senecio triangularis associated.

4. Rudbeckia occidentalis C.T.

Hickman (1976) defines a Bromus carinatus/Rudbeckia occidentalis Meadow Associes which may be related or ecotonal to our Rudbeckia occidentalis community type. It appears to occur on drier, higher topography and have greater Bromus content.

5. Rubus parviflorus C.T.

This common central Western Cascades community is briefly described by Hickman (1976) as the Rubus parviflorus/Pteridium aquilinum Meadow Associes. Within it he has included Pteridium aquilinum-dominated sites which we classify separately as the Pteridium aquilinum - Elymus glaucus C.T. Douglas (1970) describes a Rubus parviflorus/Epilobium angustifolium Association from the subalpine zone of the western North Cascades in Washington. Although it generally occurs at higher elevations, snow creep and soil movement on deep, well-drained soils provide a similar environment. Epilobium angustifolium is not very common in our Rubus parviflorus community type.

6. Carex pensylvanica - Bromus C.T.

Hickman (1976) discusses a "well defined phase" of his Bromus carinatus/Rudbeckia occidentalis Meadow Associes with Carex rossii and Viola nuttallii as important. Possibly he was mistaking Carex rossii for the closely related, Carex pensylvanica although the two can occur together. The phase he describes is probably related, or ecotonal, to our Carex pensylvanica - Bromus C.T.

C. Xeric Series:

7. Eriophyllum lanatum - Gilia capitata C.T.

The Eriophyllum lanatum/Castilleja hispida/Sedum oregonense Lithosolic Association of the central Western Cascades (Hickman, 1976) resembles our "rock garden" type. These lithosolic communities vary from one ridgetop site to the next but are inhabited by the same group of species tolerant of xeric, rocky environments, although in differing proportions.

Subalpine Meadows

8. Festuca viridula C.T.

Festuca viridula communities seem to be fairly widespread in the subalpine zones of Oregon and Washington, although they have probably diminished due to past grazing. Henderson (1973) describes a Festuca/Lupinus community type which appears similar to a Lupinus latifolius-rich variant of our Festuca viridula community. Sites are similarly xeric with fine-textured, deep, sandy soils and southern exposures. His sites are mainly in the western portion of Mt. Rainier National Park. Hamann (1972) recognizes the same type from eastern portions of Mount Rainier National Park. She describes the sites as having drier soils, a bunchgrass aspect, and an average of 20% bare ground. In the alpine zone of the North Cascades of Washington and British Columbia, Douglas (1973) describes two lush herb communities. The Festuca

viridula type appears similar to ours. His Lupinus latifolius community has a component of Festuca viridula but is probably more mesic than ours, with greater abundance of Lupinus latifolius, Carex spectabilis, and Polygonum bistortoides. This type appears closer to the Carex spectabilis - Lupinus latifolius community type from the Three Sisters Wilderness. Van Vechten (1960) notes a broad vegetation type on dry south slopes on both sides of the Three Sisters crest. These areas, which contain "Lupinus perennis" (probably Lupinus latifolius), Festuca viridula, Sitanion hystrix, Aster ledophyllus and Agoseris glauca, relate to our Festuca viridula community type.

9. Deschampsia caespitosa - Carex spectabilis C.T.

The only community reported from the Cascade Range resembling this high-elevation, Deschampsia caespitosa type comes from Hamann (1972) in Mt. Rainier National Park. She briefly describes an areally limited Deschampsia caespitosa association. Carex spectabilis and Potentilla flabellifolia are associated with a short grass (8-10 inches) physiognomy; basins are saturated for several weeks in spring with up to a foot of snowmelt water.

10. Carex spectabilis - Lupinus latifolius C.T.

Douglas (1970) describes a Carex spectabilis community from the subalpine zone of the western North Cascades which occasionally occurs on soil-rich talus. This landform resembles the sites to which our Carex spectabilis - Lupinus

latifolius community is restricted. Although Carex spectabilis is common in the Three Sisters it is usually limited in area. Van Vechten (1960) also reports sedge meadows dominated by Carex nigricans with Carex spectabilis in the Three Sisters, as well as lupine meadows along stream courses which contain a diversity of species including Carex spectabilis.

11. Polygonum newberryi C.T.

Van Vechten (1960) describes vegetation in his Pumice and Outwash Flats Zone near North and Middle Sister which contains Polygonum newberryi with lesser amounts of Eriogonum pyrolaefolium, Spraguea umbellata, Aster alpigenus, Catilleja arachnoidea, and Microseris alpestris. At Mount Rainier National Park, Hamann (1972) defines a Polygonum newberryi Associes on unstable pumice soil which has <5% plant cover. Also at Mount Rainier, Henderson (1973) describes an Eriogonum/Spraguea community on gentle slopes of fresh pumice which has <10% ground cover. Except for reduced prominence of Polygonum newberryi, the community composition and site characteristics are similar to our community.

12. Luetkea pectinata C.T.

Most of the Luetkea pectinata communities described in the literature are better developed and more widespread communities than our type. All (including ours) are found in a larger mosaic of Phyllodoce - Cassiope, Vaccinium deliciosum, and Carex nigricans communities. Henderson (1973) and Hamann (1972) in Mount Rainier National Park describe a Luetkea pectinata

type. Douglas (1970) has described the most extensive Luetkea-type from the North Cascades; it is found on poorly drained slopes and flats adjacent to and invading Carex nigricans mats.

13. Phyllodoce empetriformis - Cassiope mertensiana C.T.

Heather types are one of the most widely reported groups of subalpine meadow communities. Campbell (1973) describes a Phyllodoce - Cassiope community on exposed, late snowmelt slopes near 1730 m in Hunts Cove, Mount Jefferson, Oregon. Kuramoto and Bliss (1970) report this as a Heath Shrub Community in the subalpine meadows of the Olympic Mountains, Washington. It occurred on north-facing cirque basins at 1400-1500 m elevation. Doulgas (1973) describes both Phyllodoce empetriformis and Cassiope mertensiana communities in the Northern Cascade Range of Washington and British Columbia. In southwestern British Columbia Brooke et al. (1970) describe a Phyllodoce - Cassiopetalia Association of similar composition. They also present a Nano - Tsugetum mertensianae type which resembles the Phyllodoce - Cassiope community but is dominated by dwarf Tsuga mertensiana. Douglas (1970) describes a similar dwarf Tsuga mertensiana association in the western North Cascades of Washington suggesting a common pattern throughout the range of the Phyllodoce - Cassiope community.

Van Vechten (1960) describes heather vegetation in rocky substrates of his Woods and Meadow Zone, as well as in areas of seepage in his Ridge and Outwash Zone, within the Three Sisters Wilderness. Henderson (1973) defines a

Phyllodoce/Vaccinium community type which contains Phyllodoce, Cassiope, and Vaccinium deliciosum on gentle slopes with moist but well drained soils from 1650 to 2075 m elevation. Finally, Hamann (1972), also at Mount Rainier National Park, notes a Phyllodoce empetriformis - Cassiope mertensiana Association on north facing slopes on soils formed from intrusive parent material and at elevations below 6000 ft. These sites may also have individuals of Abies lasiocarpa, Tsuga mertensiana, or Chamaecyparis nootkatensis.

14. Carex scopulorum C.T.

At Hunts Cove, Mount Jefferson, Oregon, Campbell (1973) describes a Carex scopulorum community between 1525 and 1675 m elevation. Soils associated with this type remain saturated throughout the growing season.

15. Carex nigricans C.T. - Aster alpigenus Phase

Many descriptions of Carex nigricans communities exist in the literature. The variety of associated species makes it difficult to equate them, however, with any one particular phase we have identified for the Three Sisters Wilderness. Nevertheless, Henderson (1973) reports a Carex nigricans/Aster alpigenus community from Mt. Rainier National Park which occurs on moist to wet habitats with a warmer and longer growing season than his pure Carex nigricans community. At Hunts Cove, Mount Jefferson, Oregon, Campbell (1973) describes a Carex nigricans - Aster community between 1600 to 1700 m elevation

on poorly drained flats with moderately late snowpacks and basins with shallow flooding in spring. Douglas (1970, 1973) in the subalpine and alpine zones of the North Cascades in Washington and British Columbia reports a Carex nigricans community, a late snowmelt type on concave to level, poorly drained sites with a short growing season. Brooke et al. (1970) define a Caricion Nigricantis Association, which has a Polytrichum norvegicum moss mat and is often invaded by Phyllodoce and Cassiope. Kuramoto and Bliss (1970) describe a Dwarf Sedge type which occurs above 1720 m in the northeast sector and above 1400 m in the colder, wetter central portion of the Olympic Mountains.

16. Carex nigricans C.T. - Potentilla flabellifolia Phase

This phase is characterized by the presence of Potentilla flabellifolia and Carex spectabilis in the Three Sisters Wilderness. Reports of similar types exist from several areas. Campbell (1973) describes a Potentilla - Carex nigricans community in Hunts Cove, Mount Jefferson, Oregon on late snowfree sites with good drainage. It is related to her Carex nigricans - Aster type but is often restricted to a narrow band between Phyllodoce - Cassiope and Carex nigricans communities. From Mount Rainier National Park, Henderson (1973) describes a Carex nigricans/Carex spectabilis community on soils that are more fertile and finer textured than on his Carex nigricans type. Carex spectabilis, Potentilla flabellifolia, Aster alpigenus, Vaccinium deliciosum and Luetkea pectinata occur on a mat of Carex nigricans and may represent replacement of that type. Hamann (1972) also at Mount Rainier, discusses a Carex spectabilis - Potentilla flabellifolia Association dominated by Carex spectabilis with Carex nigricans and low cover of Potentilla flabellifolia.

Her Carex nigricans type occurs on microtopographically lower ground although it is occasionally mixed with the Carex spectabilis - Potentilla flabellifolia type. In this form it may most closely resemble the Potentilla flabellifolia Phase of our Carex nigricans C.T.

17. Carex nigricans C.T. - Kalmia microphylla Phase

The only report of a similar vegetation type comes from Hamann (1972) at Mount Rainier National Park, though her Kalmia polifolia (microphylla)/Aster alpigenus Association appears more lush than our community. Her community is probably more similar to some unsampled sites beneath Tam MacArthur Rim on the east side of the Three Sisters Wilderness, rather than the Green Lakes site from which our type is defined. Hamann's association has more of an affinity with boggy vegetation, though it contains similar herbaceous species and scattered Salix, as does our type.

Forest - Meadow Ecotone Transects

Tree invasion patterns in meadows in the Three Sisters Wilderness are numerous and varied. Both hydric and xeric types of vegetation are experiencing encroachment; mountain hemlock, *Tsuga mertensiana*, subalpine fir, *Abies lasiocarpa*, Engelmann spruce, *Picea engelmanii*, lodgepole pine, *Pinus contorta*, and grand fir, *Abies grandis* may occur in pure or mixed swards, as fronts, copses, or as isolated individuals.

For the present we provide a descriptive, natural history approach to the analysis of the baseline data. Continued sampling of permanent transects in the future may provide a more complete understanding of tree mortality and recruitment, copse expansion, herbaceous vegetation change, and micro-environment and soil changes.

In Appendix G we provide summary tables for each transect as well as figures which provide 1) a detailed graphical presentation of tree age and spatial distributions across transects and 2) a display of vegetation composition across transects. It may be more instructive to read the descriptions with the tree age and spatial distributions at hand. Mountain hemlocks too small to age are currently ommitted from the spatial age distribution figures. Ages will be estimated from regression equations developed in the coming year.

We provide a brief description of tree invasion patterns below, on a backdrop of the understory vegetation, topography, and soils, for each transect. Compass bearings are from forest to meadow.

Transect 1 - Lowder Mountain

Transect #1 at Lowder Mountain occurs on a flat to gently east-sloping plateau along a 37° bearing. Soils derived from pumice are loams to silty loams, and very rocky in the ecotonal area. The forest is primarily mature mountain hemlock (200+ years) with some younger subalpine fir and a depauperate understory. The ecotonal area is quite distinct with a dense 10 to 12 m wide front of mountain hemlock with an occasional subalpine fir. Individuals are primarily 1 to 4 m tall and although age determinations were not possible for trees less than 8 cm at the base, ages are probably between 20 to 35 years. The meadow vegetation beyond the invasion front is dominated by Arenaria capillaris with minor amounts of Stipa occidentalis and Lupinus latifolius.

Transet 2 - Lowder Mountain

Transect #2 at Lowder Mountain occurs on level terrain along a bearing of 115.5°. Soils are silt loams derived from pumice and are rocky in the distant portion of the meadow. The forest is mature mountain hemlock (320 years) with abundant Pacific silver fir reproduction. The ecotonal area has a gap of about 8 meters between the mature forest edge and the first invading trees. The invaders are primarily mountain hemlocks between 43 and 67 years of age and 4 to 8 m tall. Beyond these are scattered individuals from 0.2 to 2 m tall of unknown age. Meadow vegetation is primarily Festuca viridula with Arenaria capillaris and Calochortus subalpinus.

Transect 3 - Yankee Mountain Trail

Transect #3 along Yankee Mountain Trail occurs on a relatively steep (48-75%) southeast facing slope in the French Pete Addition, east of Yankee Mountain. Soils are silty loams to very fine sandy loams derived from a mixture of colluvium and residuum. The forest is young grand fir (90 years) with grand fir reproduction. The ecotonal area is narrow, with spatially clumped grand fir between 4 and 36 years old and 0.1 to 4 meters tall. Acer glabrum and Smilacina stellata dominate the forest understory, Sedum spathulifolium dominates the dry, rocky ecotonal area, and Rubus parviflorus and Bromus carinatus, progressively dominate the meadow areas.

Transect 4 - Ollalie Meadows

Transect #4 at Ollalie Meadows represents a complex pattern of communities and tree invasion. The transect runs along a bearing of 126°, on a gentle slope (12-21%) with a southwest aspect. The forest is young grand fir (97 years) with reproduction of the same species. Stretching approximately 30 m beyond the abrupt forest edge is a forby, Elymus glaucus meadow with scattered grand fir seedlings. Beyond this is a young, dense forest of grand fir, with ages of 18-48 years and heights of 1.3 to 17 m, extending for approximately 50 m downslope. At the edge of this is a dense front of grand fir saplings between 2 and 26 years old and less than 2 m tall. Two 10-11 m lodgepole pines (37 and 40 years old) also occur here. Similar individuals occur around the meadow edge and sapling lodgepole pine are scattered across the entire meadow

along with occasional grand fir seedlings. The pines are 8 to 22 years old while the grand fir are mainly 2 to 6 years. Meadow vegetation is dominated by Haplopappus greenei, Bromus sitchensis, and Carex pensylvanica. Soils are sandy loams to very fine sandy loams.

Transect 5 - Walker Creek Trail

Transect #5 along Walker Creek Trail occurs in one of the many lush forby montane meadows along this trail above Quaking Aspen Swamp in the French Pete Addition. It runs along a bearing of 159° on a relatively steep (45-50%) slope with a southeast aspect. The forest is young grand fir (121 years) with little reproduction. The ecotonal area consists of a lobe of several grand fir individuals, 25 to 65 years old and 0.3 to 18 m tall, in a matrix of Acer circinatum. Pteridium aquilinum and Rubus parviflorus dominate the lush meadow. Soils are silty loams and very rocky in the grand fir - vine maple ecotone.

Transect 6 - Walker Creek Trail 2

Transect #6 occurs further down the trail from Transect #5, but spans a greater variety of vegetation types. It follows a 154° bearing on a steep (20-56%) slope with a southeast aspect. Soils are very fine sandy loams to silty loams with a fair amount of coarse material (25%) in the lower Rubus parviflorus - Ligusticum grayi dominated meadow portion.

The forest is relatively young grand fir and Douglas-fir (121 years), and grand fir reproduction. Smilacina stellata dominates the understory. Scattered grand firs have invaded sporadically; trees range in age from 9 to 60 years with occasional areas of recent grand fir establishment (2-6 years) amongst the larger individuals. Clumps of trees occur from 30 to approximately 120 m from the forest edge. Little invasion has occurred in the dry Stipa occidentalis vegetation immediately down-slope from the forest edge.

Transect 7 - Corral Flats

Transect #7 at Corral Flats occurs south of Cow Swamp in the southwest portion of the Wilderness. The forest is diverse with mountain hemlock, Engelmann spruce, Pacific silver fir, grand fir, subalpine fir, western white pine, and noble fir. The transect bears 70° across flat terrain. The forest is young (66 years) and dense with a diverse canopy and subcanopy. The understory is dominated by Vaccinium membranaceum and Clintonia uniflora. The ecotonal area spans approximately 22 m and is composed of spruce primarily between 7 and 30 years old and a few lodgepole pines between 27 and 48 years old. The trees are clumped within a matrix of meadow dominated by Danthonia intermedia and Trifolium longipes. Pure meadow becomes progessively wetter further from the forest, and is dominated by Poa pratensis, Scirpus congdonii and other wet site sedges and herbs.

Transect 8 - Cow Swamp

Transect #8 at Cow Swamp represents a broad expanse of forest-meadow ecotone in the southwest portion of the Wilderness. The transect follows a bearing of 234° in the broad flat basin. Soils are sandy loams throughout and are saturated in the meadow. The forest is relatively young Engelmann spruce (141 years) with little reproduction; the understory is Vaccinium membranaceum. A band of invading lodgepole pine, is separated from the forest by a 20 m wide depression occupied by Vaccinium occidentale, Carex spp., Dodecatheon jeffreyi, and Deschampsia caespitosa. The 1 to 4 m tall lodgepoles are between 20 and 46 years old and are clumped in a small group (one large individual here, off the transect is 138 years old). A second clump of lodgepoles (2 to 12 years old) occurs approximately 10 m from the major group of invaders, in the meadow matrix of Deschampsia caespitosa, Juncus balticus, Eleocharis pauciflora, and Ranunculus gormanii.

Transect 9 - Cow Swamp 2

Transect #9 at Cow Swamp represents a more complex invasion story than Transect #8. The terrain is similarly level and the transect bears 170°. Soils are silty loams, organic, and saturated in the meadow areas. The forest is dominated by Engelmann spruce (147 years old) with scattered Pacific silver fir, subalpine fir and mountain hemlock. Reproduction is sparse and the understory is dominated by Vaccinium membranaceum, Xerophyllum tenax, and Cornus canadensis. An ecotonal area is not well defined as trees have

established across the wet meadow as individuals or in small clumps. This pattern extends approximately 80 m from the forest edge. Lodgepole pine, which is 3 to 128 years old is scattered across the transect. Several trees typically occur together on elevated microsites. One isolated 104 year old spruce, which is 6 m tall, is located at 56 m into the meadow. The meadow vegetation is a mosaic of Deschampsia caespitosa, Carex spp., Hypericum anagalloides, Microseris boreale, Tofieldia glutinosa, Eleocharis pauciflora, and other hydric species.

Transect 10 - Rebel Rock

Transect #10 at Rebel Rock is interesting because the forest zone is limited to a narrow, broken band along the ridgeline, from which the transect begins. The transect follows a bearing of 251° down a moderately steep slope (21-30%) with a west aspect. Soils are silty loams with 30-40% gravel content. The invasion pattern here is very complex. The oldest grand fir along the ridge is 187 years. The first 28 m of the transect consists of clumps of Pacific silver fir, grand fir, mountain hemlock, and subalpine fir. The subalpine fir are some of the oldest trees, (up to 43 years) but most individuals of all species are between 2 and 16 years old. A small opening dominated by Erigeron aliceae and Festuca viridula separates the above group from a dense 10 m-long copse of similar composition. Subalpine fir are the oldest trees (16 to 33 years) and beneath them are mountain hemlock, grand fir, and Pacific silver fir 2 to 12 years in age. A meadow segment dominated by Festuca viridula and Lupinus latifolius separates this group from another clump of invading trees

22 m away. Subalpine fir is again the oldest invading tree (28-32 years) but several mountain hemlcocks are 26 to 34 years old. Beneath these are many 2 to 22 year old mountain hemlocks and Pacific silver firs with an occasional subalpine fir seedling. The initial invasion of subalpine fir and subsequent establishment of other species beneath the subalpine fir canopy appears to be a complex process.

Transect 11 - Quaking Aspen Swamp

Transect #11 at Quaking Aspen Swamp is located in the southwest corner of the hydric basin. The transect bears 42° and emerges from a gentle side slope (17 to 5%) onto the hydric flats of the meadow. Soils are rocky sandy loams in the forest (20% cobble) and organic, silty clay loams in the meadow. The forest is young mountain hemlock (132 years) with abundant Pacific silver fir reproduction (2 to 36 years old) and occasional mountain hemlock regeneration (2 to 10 years old). The 10-m-wide ecotonal area is dominated by 36 to 81 year old subalpine fir, Pacific silver fir, and Engelmann spruce individuals with the spruce closest to the meadow.

Subalpine fir are generally the oldest of the invaders (mainly 54 to 81 years) and Pacific silver fir are the most abundant with up to 10 to 12 individuals per square meter. The understory of the ecotonal area is dominated by Vaccinium membranaceum and Rubus lasiococcus. This vegetation grades to a Vaccinium occidentale and Caltha biflora-dominated meadow edge. Deschampsia caespitosa and Dodecatheon jeffreyi vegetation grade to Carex sitchensis fen

further into the meadow. One isolated, 6 m tall spruce (30 years old) is almost 20 m beyond the last of the other trees. No reproduction occurs in the dense sedge.

Transect 12 - Quaking Aspen Swamp 2

The pattern of tree invasion along Transect #12 at Quaking Aspen Swamp is more complex than at Transect #11. Transect #12 is located along the central southern portion of Quaking Aspen Swamp, bearing 11° from a gentle side slope (8 to 3%) to the hydric meadow flats. The forest is mature mountain hemlock (175 years) with abundant Pacific silver fir regeneration (2 to 33 years old). Some subalpine fir and Pacific silver fir occur towards the forest edge and are 30 to 75 years old and up to 6 m tall. Silver fir reproduction is abundant beneath these. The forest understory is primarily Vaccinium membranaceum - Xerophyllum tenax grading downslope to V. membranceum - Rubus lasiococcus. Invading trees occur in three copses each 3 to 10 meters in length and separated by 3 to 5 meters. Individuals of subalpine fir and Engelmann spruce are the largest and oldest, ranging from 2 to 6 m tall and 16 to 90 years old. Seedlings within the copses are primarily 2 to 9 year old silver firs. The meadow vegetation separating the 'islands' is dominated by Deschampsia caespitosa and Dodecatheon jeffreyi; beyond the copses moister conditions prevail with Carex sitchensis dominant. Soils vary from silty loams in the forest to silty clays in the hydric portion of the meadow.

Transect 13 - James Creek

Transect # 13 occurs south of James Creek in an unnamed meadow. The transect bears 233° down a 15 to 27% slope with a southwest exposure. Soils are deep sandy loams. The forest is old-growth mountain hemlock (361 years) with a depauperate herb layer. At the forest margin a group of subalpine fir, many probably of layer origin, ranges in age from 6 to 37 years. Invaders occur as scattered clumps and individuals down the Festuca viridula - Carex pensylvanica-dominated meadow. The dominant invading trees are mountain hemlock 30 to 64 years of age. Beneath these 3 to 8 m tall trees are numerous smaller subalpine fir and mountain hemlock seedlings. The firs range from 2 to 24 years; though the hemlocks were not large enough to core they are probably of comparable age. Four major islands of invading trees occur at distances of 40 to 51 m, 63 to 67 m, 71 to 79 m, and 85 to 87 m from the forest edge. Pure Festuca viridula meadow occurs beyond the lower tree group.

Transect 14 - Separation Meadows

Transect #14 occurs along the west central portion of Separation Meadows. The transect bears 125° from the gentle south to southeast facing slopes to the abrupt meadow flat. A burn in the forest and meadow apparently occurred about 95 years ago as there is a sharp age break in the bordering forest, and numerous stumps are scattered many meters out into the meadow. The forest is dominated by young mountain hemlock (92 years) with dense subalpine fir regeneration between 6 and 28 years old. Meadow invasion occurs as isolated,

scattered clumps 20 m and more into the meadow. The first copse consists of 5 to 6 m tall mountain hemlocks between 56 and 62 years old. The second copse, 5 m beyond the first, has 4 to 6 m tall mountain hemlocks between 34 and 56 years old. Beneath both clumps are numerous subalpine firs between 6 and 21 years old and mainly less than 8 decimeters tall. The forest understory is dominated by Vaccinium scoparium. The meadow vegetation between the forest and first copse is dominated by Trifolium longipes and Danthonia intermedia. The main meadow, beyond the tree islands, is dominated by Deschampsia caespitosa, Potentilla flabellifolia, and Carex spectabilis. Soils are sandy loams, with 45% coarse fragments in the forest and progressively becoming finer towards the meadow.

Transect 15 - Wickiup Plains

Transect #15 at Wickiup Plains typifies the relatively sparse invasion of the central portion of the Wickiup Plains pumice flats; lower Wickiup Plains has dense lodgepole pine encroachment. The transect bears 84° along a gentle slope (10% to 2%) from forest to meadow. Soils are sands in the forest and sandy loams in the meadow, all pumiceous. The forest is an open mature mountain hemlock stand (266 years) with sparse regeneration of subalpine fir and a depauperate understory. Encroachment on the Festuca viridula - Polygonum newberryi meadow consists of two clumps of mountain hemlock, located 8 and 11 meters, respectively, from the forest edge. Individuals are 6 to 7 m tall and 53 to 58 years old.

Transect 16 - Green Lakes

Transect #16 at Green Lakes represents the most severe environment of any transect. It borders the west side of Green Lakes, bearing 140° from a steep (68%), southeast-facing slope to extensive flats adjacent to the lake. Soils are sandy and pumiceous. Mountain hemlock and whitebark pine compose the open forest (315 years old); the pine are reproducing in the understory. Luzula hitchcockii and Vaccinium scoparium are important understory herbs. The Green Lakes flats are dominated by a mosaic of Eleocharis pauciflora, Carex scopulorum, Salix comutata, Phyllodoce empetriformis, Kalmia microphylla, and other hydric species. Scattered across the drier, gravelly portion of the flats are individual lodgepole pines 0.2 to 3 m tall and 6 to 78 years of age. Their arrangement appears random, although lodgepole seedlings are clumped underneath reproducing individuals in some areas. Invading trees are generally of poor vigor with broken crowns, gnarled limbs, cankers, and scars.

Transect 17 - Linton Meadows 1

Transect #17 is in the northeast portion of the large meadow mosaic at Linton Meadows. The transect bears 202° down a steep (55-59%), southwest-facing slope. The forest is mature mountain hemlock (293 years old) with an understory of subalpine fir regeneration, Vaccinium membranaceum, and Rubus lasiococcus. Invasion is primarily into the Pteridium aquilinium - Carex pensylvanica-dominated vegetation--areas with deep, very fine to fine sandy loam soils. These soils have a greater coarse particle content (10%) than the

rarely invaded Festuca viridula - Carex pensylvanica vegetation further down-slope. Tree establishment appears primarily as scattered clumps of small (0.1 to 0.6 m tall) subalpine firs between 4 and 31 years old, at 9 to 25 meters from the forest margin. One 21 m tall hemlock (139 years) and one 11 m tall subalpine fir (68 years) occur 23 meters from the forest edge and probably have provided a microenvironment favorable for establishment of the fir reproduction, both up and down the slope.

Transect 18 - Linton Meadows 2

Transect #18 is in an isolated meadow section of the southeast portion of Linton Meadows. Tree invasion is minimal on the moderately steep (55 to 12%) west - southwest facing slope. The forest is pure mountain hemlock with trees progressing from 334 years in the center of the stand to trees 125 years old at the margin. The forest edge is abrupt, though. Mountain hemlock is reproducing in the understory, and Vaccinium membranaceum and Rubus lasiococcus are dominant shrub and herb species. Meadow vegetation dominants, progressing from the forest margin, grade from Lupinus latifolius - Polygonum newberryi through Festuca viridula - Lupinus latifolius and Festuca viridula - Carex spectabilis to Carex spectabilis - Carex nigricans with increasing soil moisture. Soils are deep very fine sandy loams, and are rocky within the forest (20% coarse particles by volume). A small group of 4 to 6 m tall mountain hemlock, 37 to 46 years old have invaded the meadow 50 meters from the forest margin but are located much closer to a nearby forest lobe. Charcoal occurs in the soil of the upper meadow.

Transect 19 - Racetrack Meadow

Transect #19 at Racetrack Meadow illustrates invasion of mountain hemlock into a sloping heather community. The transect bears 42° into an isolated pumice flat adjacent to Racetrack Meadow. Slope varies from 25% to 50% in the forest, 17% to 5% in the ecotone invasion area, and 0% in the lower pumice flats. The aspect is northeast to north. Soils vary from stony silty loams in the forest to sandy loams and sands down the sloping heather to the pumice flats. The forest is old-growth mountain hemlock (444 years) with little reproduction and a Vaccinium membranaceum understory. Dense mountain hemlock invasion occurs from meters 25 to 66 with up to 20 trees per square meter in some plots.

The hemlock range from 0.1 to 2.5 meters tall but are concentrated in the 0.3 to 0.5 m tall class. They span a mosaic dominated by Cassiope mertensiana, Vaccinium deliciosum, Phyllodoce empetriformis, and Carex nigricans. The 2.4 to 2.5 m tall individuals are 42 to 51 years old; the smaller trees need to be aged by regression analysis. Eriogonum pyrolaefolium - Polygonum newberryi-dominated vegetation is interpersed with mats of Carex nigricans in the lower portion of the meadow, below the invasion front.

Transect 20 - Obsidian Flats

Transect #20 at Obsidian Flats is located in the eastern portion of this gently sloping to basin-like pumice flat south of Obsidian Cliffs. The transect follows a 288° bearing along a 15 to 10% slope with a southwest aspect. The forest is mature mountain hemlock (262 years) with a mixture of Pacific silver fir and subalpine fir reproduction. Several whitebark pines occur at the forest margin as well as in the meadow itself. The forest understory is dominated by Luzula hitchcockii.

The ecotonal area (approximately 14 meters wide) has whitebark pines up to 1.6 m tall, and ranging in age from 5 to 28 years. Beyond these are several mountain hemlocks 1.1 to 2.6 m tall and 31 to 35 years old. These trees occur within a meadow matrix dominated by Lupinus latifolius and Eriogonum pyrolaefolium. Three subalpine firs occur approximately 10 meters from the mountain hemlock group. They are 0.1 to 0.8 m tall and are 16 to 17 years old. The vegetation is predominantly Festuca viridula and Eriogonum pyrolaefolium.

Transect 21 - Obsidian Creek Meadow

Transect #21 occurs approximately one mile west of Obsidian Falls, in an open meadow system fed by Obsidian Creek. Streamflow was absent by late September. The transect follows a bearing of 194° down the southwest-facing slope of the southern of the two meadow basins. The slope is gentle (12 to 22%) and flattens abruptly into a broad basin. A mature mountain hemlock

forest (336 years old) with sparse hemlock and subalpine fir regeneration, grades to a more open margin and then to a dense front of layering subalpine fir, 0.5 to 4 meters tall. Several taller (8 to 15 m) subalpine firs and whitebark pines occur at the forest margin off the transect. The 5 m wide invading fir front contains individuals between 30 and 138 years of age. The youngest occur furthest from the forest margin. Downslope, tree invasion is minimal. A relatively xeric Sitanion hystrix - Lupinus latifolius meadow is encountered first; soils are 30% coarse particles by volume (gravel and cobble size). Deeper, finer soils with Festuca viridula and Lupinus latifolius are next. Two isolated mountain hemlocks, 2 to 2.8 m tall, 22 and 30 years old, occur in this area with numerous 2 to 10 year old seedlings beneath them. Meadow vegetation further downslope grades to more mesic Festuca viridula - Carex spectabilis and finally to pure Carex spectabilis where the side slope meets the basin floor. Silty loams of the Festuca viridula slope abruptly change to very coarse sand and gravel beneath the Carex spectabilis flat.

PLANS FOR PUBLICATION

We hope to submit for publication, three separate manuscripts based on field work conducted in forest systems in 1981, meadow vegetation in 1982, and forest-meadow ecotones in 1983.

The first manuscript will address the forest communities of the Separation Creek drainage--their composition, structure, distribution, and relationship to environment and disturbance. The second manuscript will be a descriptive paper on the meadow communities of the Three Sisters Wilderness, their composition, distribution, relationship to environment and disturbance and a comparison with both montane and subalpine meadow systems described from the North Cascades of Washington through the Sierra Nevada of Southern California. The third manuscript will present the results of the initial detailed survey of forest-meadow ecotone patterns in montane and subalpine systems of the Three Sisters Wilderness Area. Included will be a discussion of 1) tree invasion patterns across a diversity of forest and meadow communities, 2) their relationship to vegetation composition and environmental gradients, and 3) a comparison with similar studies reported in the literature for other Cascade, Sierra and Rocky Mountain systems.

ARCHIVING OF INFORMATION

All data associated with reconnaissance sampling of forest and meadow communities have been stored on magnetic tape at the Milne Computer Center at Oregon State University. Duplicate tapes and documentation will be filed with the Forest Science Department Data Bank, Oregon State University.

Forest-meadow ecotone transect information will be archived similarly. Duplicate copies of ordination and classification analyses; locations of reconnaissance plots and permanent ecotone transects on U.S.G.S. topographic maps; descriptions of locations of permanent transects; and permanent photos and photopoint descriptions will be archived in the permanent files of Project 1251 - Pacific Northwest Forest & Range Experiment Station, Corvallis, Oregon under the direction of Dr. Jerry F. Franklin.

ADDITIONAL RESEARCH NEEDS

Currently we have an extensive data set containing information on both forest and meadow ecosystems in the Three Sisters Wilderness. In itself, the data set is instructive, but perhaps more important, it serves as the ground work for future research in two principal areas.

The classification of forest communities in the Separation Creek Drainage is based on extensive sampling in that area. The classification may serve, generally, for forest communities on the west side of the Cascade crest. However, in order to present an encompassing classification of forest communities in the entire Three Sisters Wilderness Area, further sampling needs to be done in 1) the Mink Lake Basin and areas south towards Irish Mountain and Cultus Lake, 2) the French Pete Addition in the western portion of the Wilderness, 3) the area north of Foley Ridge, across the lava flows towards the McKenzie Highway, Condon Butte and Campers Lake, and 4) the entire east side of the Wilderness from Broken Top and Tam McArthur Rim on the south to Black Crater on the north.

The second area of interest concerning future research focuses on meadow systems. First, we would like to continue reconnaissance sampling of communities which need more extensive study as well as portions of the Wilderness Area currently under-represented in the data. These include Cedar Swamp, Bear Flats, Wildcat Swamp, Lower Linton Meadows, and Indian Holes on the west side and meadows north of Broken Top to the McKenzie Highway on the east side of the crest.

Second, we would like to continue with the forest-meadow ecotone dynamics study, attempting to address some of the following questions:

1. What are the origins of the variety of non-forested lands within the Wilderness?

2. What environmental and/or biotic features maintain them as such?

3. What changes are occurring within these meadows and across their ecotones? Why and when did they occur?

These studies will be more process and function oriented and thus more experimental in nature. We will have to explore plant-soil-water relations, snow-lie patterns, natural and human disturbance history, and current disturbance influences. Together with Dr. Robert E. Frenkel of the Department of Geography, Oregon State University and Dr. Jerry F. Franklin of the Pacific Northwest Forest and Range Experiment Station, the first author hopes to submit a proposal for funding to continue these research ideas.

We have been in contact with National Forest Area Ecologists Miles Hemstrom and Bill Hopkins concerning our classification work. We hope to integrate the classification of forest communities in the Separation Creek Drainage with the work Miles Hemstrom is conducting in the Willamette National Forest in the

Silver Fir and Mountain Hemlock Zones. Bud Kovalchick and Bill Hopkins of the Deschutes National Forest are developing a classification of riparian vegetation for the Winema, Fremont, Ochoco, and Deschutes National Forests. We are currently helping to fill in gaps in sampling on the east side of the Three Sisters Wilderness, with plots from hydric meadow systems we have sampled.

Through such exchange of ideas and information we may be better able to create a broad and more widely applicable vegetation classification for Central Oregon Cascade forest and meadow ecosystems.

LITERATURE CITED

Bailey, A. W. 1966. Forest associations and secondary plant succession in the Southern Oregon Coast Range. Ph.D. Thesis, Oregon State University, Corvallis. 164 p.

Brockway, D. G., M. A. Hemstrom, and W. H. Emmingham. 1982. Preliminary plant association and management guide for the Pacific silver fir zone of the Gifford Pinchot National Forest. Area 6 Guide, USDA Forest Service, Portland, Oregon.

Brooke, R. C., E. B. Peterson, and V. J. Krajina. 1970. The subalpine mountain hemlock zone. In V. J. Krajina (ed.), Ecology of Western North America. Vol. 2, p. 147-349, illus. Univ. B.C. Dep. Bot.

Campbell, A. G. 1973. Vegetative ecology of Hunts Cove, Mt. Jefferson, Oregon. M.S. Thesis, Oregon State University, Corvallis. 89 p.

Del Moral, R. and J. N. Long. 1977. Classification of montane forest community types in the Cedar River drainage of western Washington, U.S.A. Canad. Jour. For. Res. 7(2):217-255, illus.

Douglas, G. W. 1970. A vegetation study in the subalpine zone of the western North Cascades, Washington. M.S. Thesis, University of Washington, Seattle. 293 p., illus.

Douglas, G. W. 1973. Alpine plant communities of the North Cascades Range, Washington and British Columbia. Ph.D. Thesis, University of Alberta, Edmonton. 45 p. illus.

Dyrness, C. T., J. F. Franklin and W. H. Moir. 1974. A preliminary classification of forest communities in the central portion of the western Cascades in Oregon. U.S.I.B.P. - Coniferous Forest Biome Bull. 4. University of Washington, Seattle. 123 p.

Franklin, J. F. 1966. Vegetation and soils in the subalpine forests of the southern Washington Cascade Range. Ph.D. Thesis. 32 p., illus. Wash. State Univ., Pullman.

Franklin, J. F. 1977. The biosphere reserve program in the United States. Science 195:262-267.

Franklin, J.F. and C.T. Dyrness. 1973. Natural vegetation of Oregon and Washington. Pacific Northwest Forest and Range Experiment Station. Forest Service, USDA Portland, Oregon. USDA Forest Service General Technical Report PNW-8. 417 p.

Franklin, J. F., C. T. Dyrness, and W. H. Moir. 1970. A reconnaissance method for forest site classification. Shinrin Richi XII (1):1-14.

Franklin, J. F., W. H. Moir, M. A. Hemstrom, and S. Greene. 1979. Forest ecosystems of Mount Rainier National Park. Unpublished Review Draft. 221 p.

Hamann, M. J. 1972. Vegetation of alpine and subalpine meadows of Mount Rainier National Park, Washington. M.S. Thesis, Washington State University, Pullman. 120 p., illus.

Hemstrom, M.A., and J.F. Franklin. 1982. Fire and other disturbances of the forests in Mount Rainier National Park. Quarternary Research 18:32-51.

Hemstrom, M. A., W. H. Emmingham, N. M. Halverson, S. E. Logan, and C. Topik. 1982. Plant association and management guide for the Pacific silver fir zone, Mt. Hood and Willamette National Forests, Pacific Northwest Region, USDA Forest Service, Portland, Oregon.

Henderson, J. A. 1973. Composition, distribution, and succession of subalpine meadows in Mount Rainier National Park, Washington. Ph.D. Thesis, Oregon State University, Corvallis. 150 p., illus.

Henderson, J. A. and D. Peter. 1981a. Preliminary plant associations and habitat types of the North Bend Ranger District, Mt. Baker-Snoqualmie National Forest. Draft manuscript, USDA Forest Service, Pacific Northwest Region, Mt. Baker-Snoqualmie National Forest, Washington. 106 p.

Henderson, J. A. and D. Peter. 1981b. Preliminary plant associations and habitat types of the White River Ranger District, Mt. Baker-Snoqualmie National Forest. Draft manuscript, USDA Forest Service, Pacific Northwest Region, Mt. Baker-Snoqualmie National Forest, Washington. 111 p.

Henderson, J. A. and D. Peter. 1981c. Preliminary plant associations and habitat types of the Shelton Ranger District, Olympic National Forest. Draft manuscript, USDA Forest Service, Pacific Northwest Region, Olympia, Washington. 63 p.

Henderson, J. A. and D. Peter. 1981d. Preliminary plant associations and habitat types of the Quinalt Ranger District, Olympic National Forest. Draft manuscript, USDA Forest Service, Pacific Northwest Region, Olympic National Forest, Olympia, Washington. 46 p.

Henderson, J. A. and D. Peter. 1982a. Preliminary plant associations and habitat types of the Snoqualmie and adjacent Skykomish River drainages, Mt. Baker-Snoqualmie National Forest. Draft manuscript, USDA Forest Service, Pacific Northwest Region, Mt. Baker-Snoqualmie National Forest, Washington. 140 p.

Henderson, J. A. and D. Peter. 1982b. Preliminary plant associations and habitat types of the Soleduck Ranger District, Olympic National Forest. Draft manuscript, USDA Forest Service, Pacific Northwest Region, Olympic National Forest, Washington. 162 p.

Hickman, J. C. 1976. Non-forest vegetation of the central western Cascade Mountains of Oregon. Northwest Sci. 50:145-155.

Hill, M.O. 1973. Reciprocal averaging: an eigenvector method of ordination. Journal of Ecology. 61:237-249.

Hill, M.O. 1974. Correspondence analysis: a neglected multivariate method. Applied Statistics. 23:340-354.

Hill, M.O. 1979a. DECORANA-A fortran program for detrended correspondence analysis and reciprocal averaging. Ecology and Systematics, Cornell University, Ithaca, New York. 52 p.

Hill, M.O. 1979b. TWINSPAN-A fortran program for arranging multivariate data in an ordered two-way table by classification of the individuals and attributes. Ecology and Systematics, Cornell University, Ithaca, New York. 90 p.

Hill, M.O., R.G.H. Bunce and M.W. Shaw. 1975. Indicator species analysis, a divisive polythetic method of classification and its application to a survey of native pinewoods in Scotland. Journal of Ecology. 63:597-613.

Hill, M.O. and H. Gauch. 1980. Detrended correspondence analysis: an improved ordination technique. Vegetatio. 42:47-58.

Ireland, O. L. 1968. Plants of the Three Sisters region, Oregon Cascade region. Mus. Nat. Hist. Univ. Oregon Bull. No. 12. 130 p., illus.

Kojima, S. and V. J. Krajina. 1975. Vegetation and environment of the coastal western hemlock zone in Strathcona Provincial Park, British Columbia, Canada. Syesis 8(1):1-123.

Kuramoto, R. T. and L. C. Bliss. 1970. Ecology of subalpine meadows in the Olympic Mountains, Washington. Ecol. Monogr. 40:317-347, illus.

Mueller-Dombois, D. and H. Ellenberg. 1974. Aims and methods of vegetation ecology. Wiley, New York. 547 p.

Pechanec, A. A. 1961. Some aspects of the ecology of the bryophytes in the Three Sisters Primitive Area. Ph.D. Thesis, Oregon State University, Corvallis. 187 p., illus.

Seyer, S. C. 1979. Vegetative ecology of a montane mire, Crater Lake National Park, Oregon. M.S. Thesis, Oregon State University, Corvallis. 187 p.

Seyer, S. C. 1983. Ecological analysis of Multorpor Fen Preserve, Oregon. Unpublished report to The Nature Conservancy. 29 p.

Task force on: Criteria and guidelines for the choice and establishment of Biosphere Reserves. 1974. UNESCO MAB Report Series, No. 22, Paris. 61 p.

Van Vechten, G. W. III. 1960. The ecology of the timberline and alpine vegetation of the Three Sisters, Oregon. Ph.D. Thesis, Oregon State University, Corvallis. 111 p., illus.

Westhoff, V. and E. van der Maarel. 1978. The Braun-Blanquet approach. Junk, The Hauge. p. 287-399.

Zobel, D.B. 1973. Local variation in intergrading Abies grandis-Abies concolor populations in the central Oregon Cascades: needle morphology and periderm color. Bot. Gaz. 134(3):209-220.

Zobel, D.B. 1974. Local variation in intergrading Abies grandis-Abies concolor populations in the central Oregon Cascades. II. Stomatal reaction to moisture stress. Bot. Gaz. 135(3):200-210.

Zobel, D.B. 1975. Local varation in intergrading Abies grandis-Abies concolor populations in the central Oregon Cascades. III. Timing of growth and stomatal characteristics in relation to environment. Bot. Gaz. 136(1):63-71.

APPENDIX A

Figures A1. - A6. Separation Creek Drainage Forest Community Ordinations.

Figure A1.

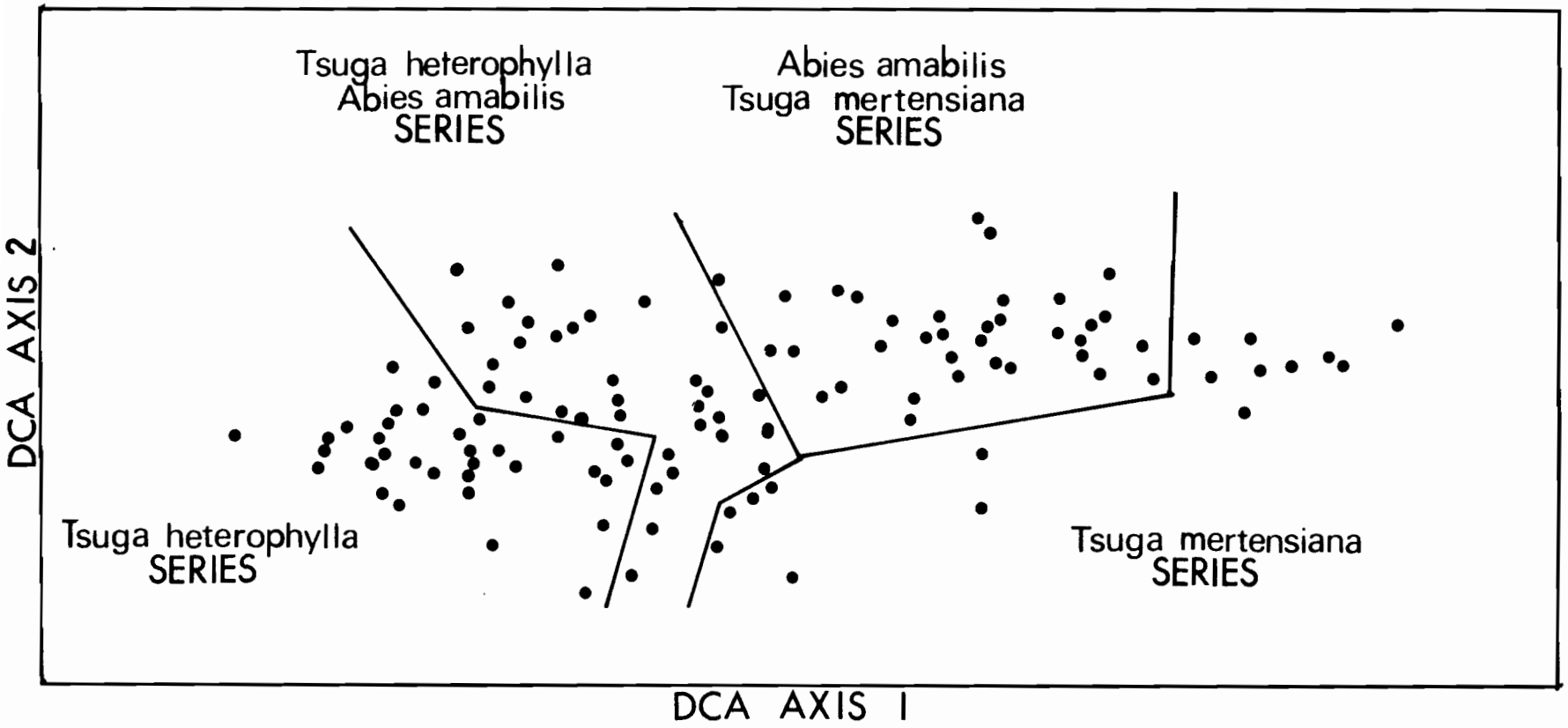

Tsuga heterophylla
Abies amabilis
SERIES
Abies amabilis
Tsuga mertensiana
SERIES
Tsuga heterophylla
SERIES
Tsuga mertensiana
SERIES
DCA AXIS 2
DCA AXIS 1

Figure A2.

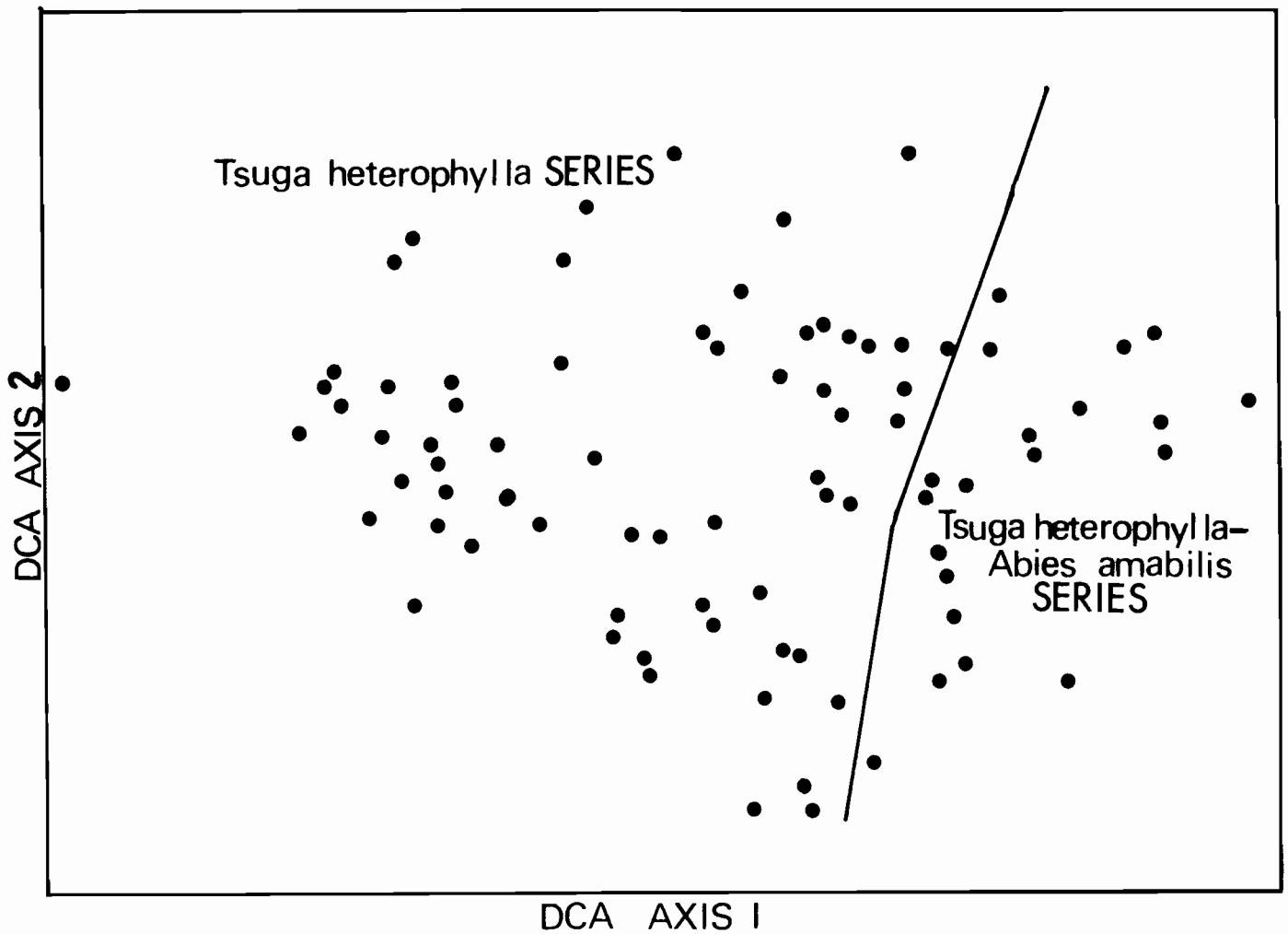

Tsuga heterophylla SERIES
Tsuga heterophylla–
Abies amabilis
SERIES
DCA AXIS 2
DCA AXIS I

Figure A3.

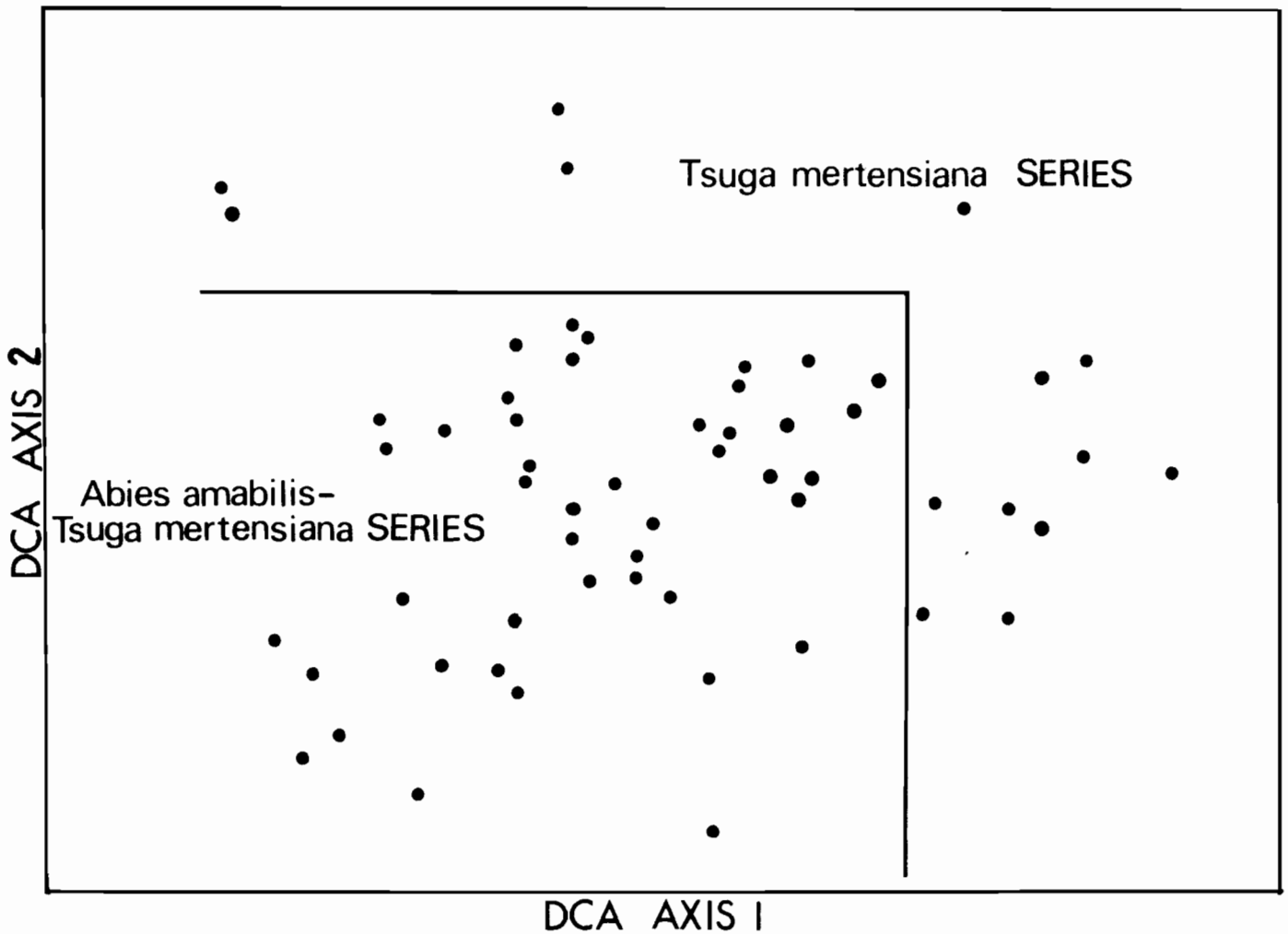
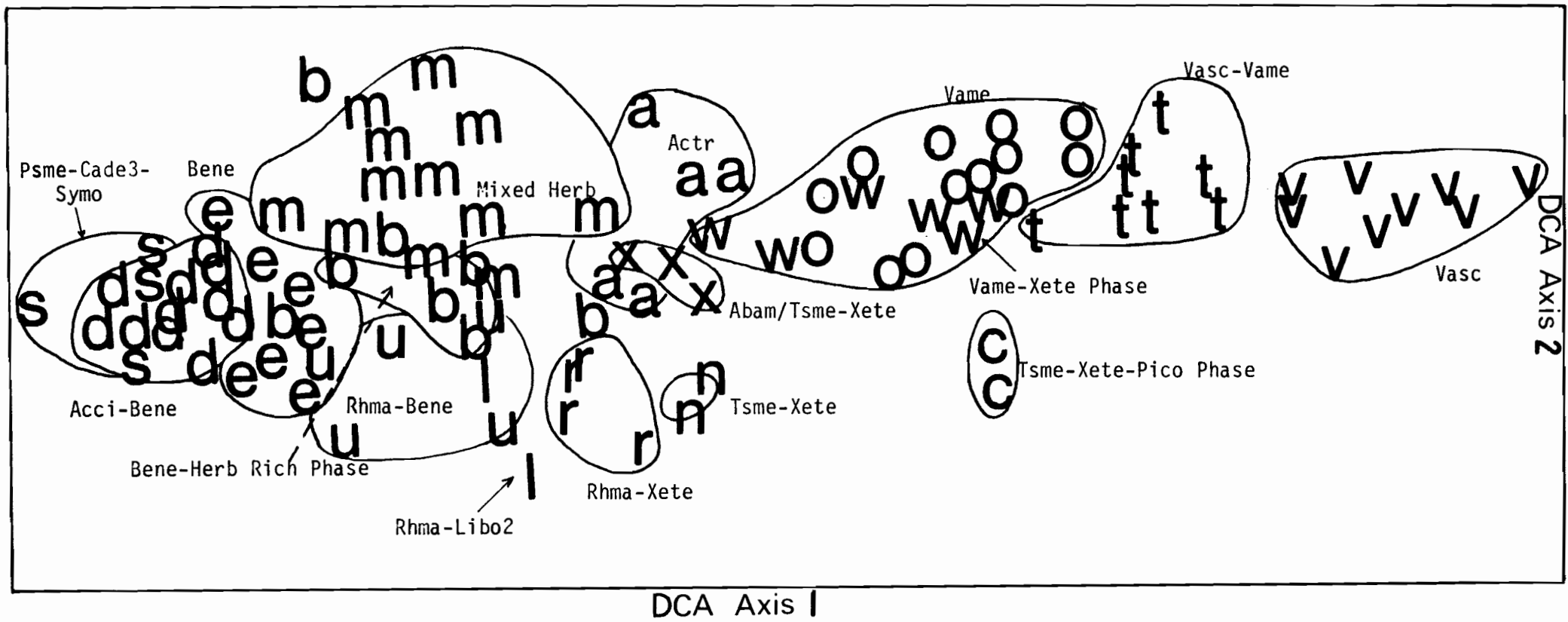

Tsuga mertensiana SERIES
Abies amabilis-
Tsuga mertensiana SERIES
DCA AXIS 2
DCA AXIS I

Figure A4.



DCA Axis 1

Figure A5.

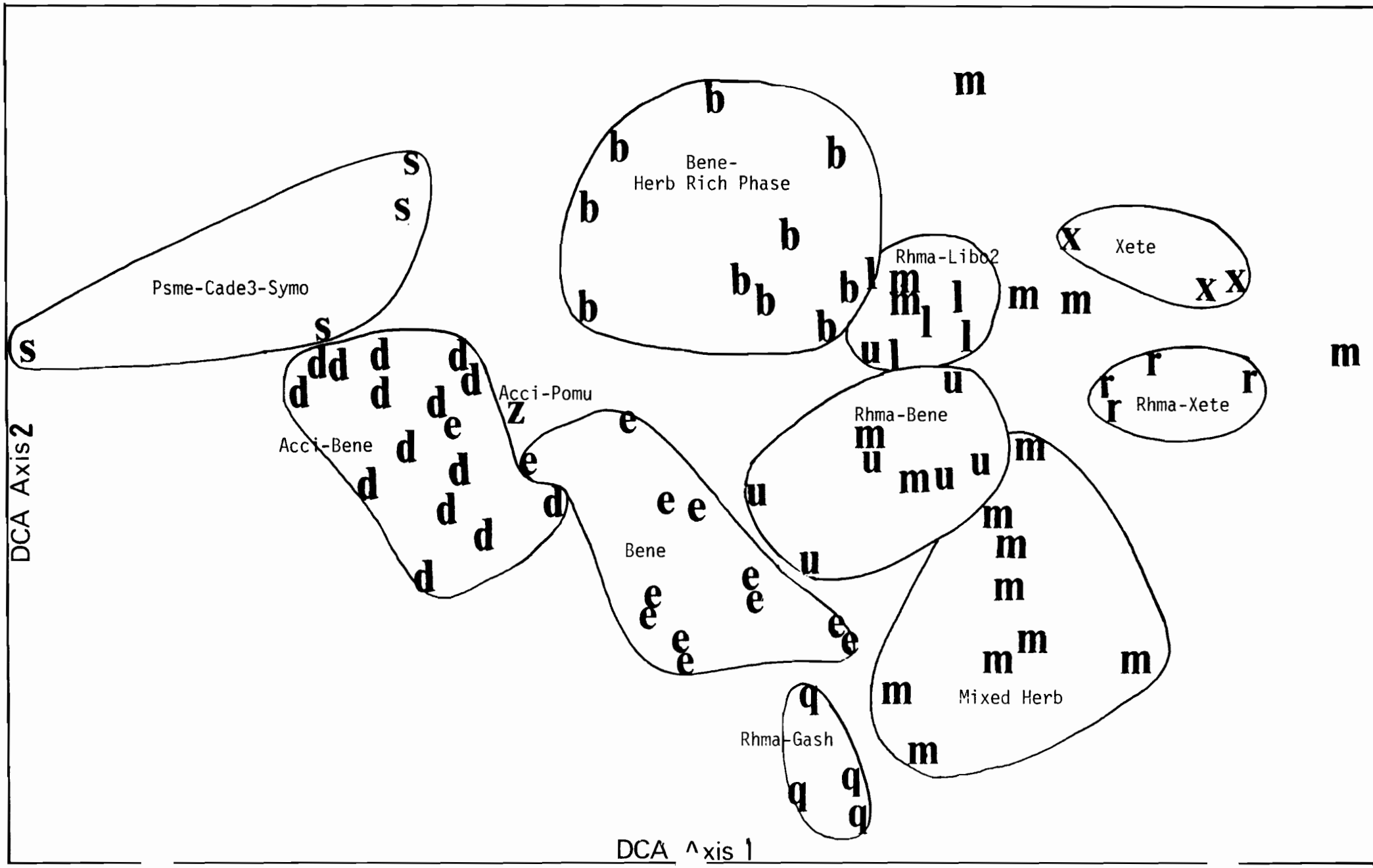
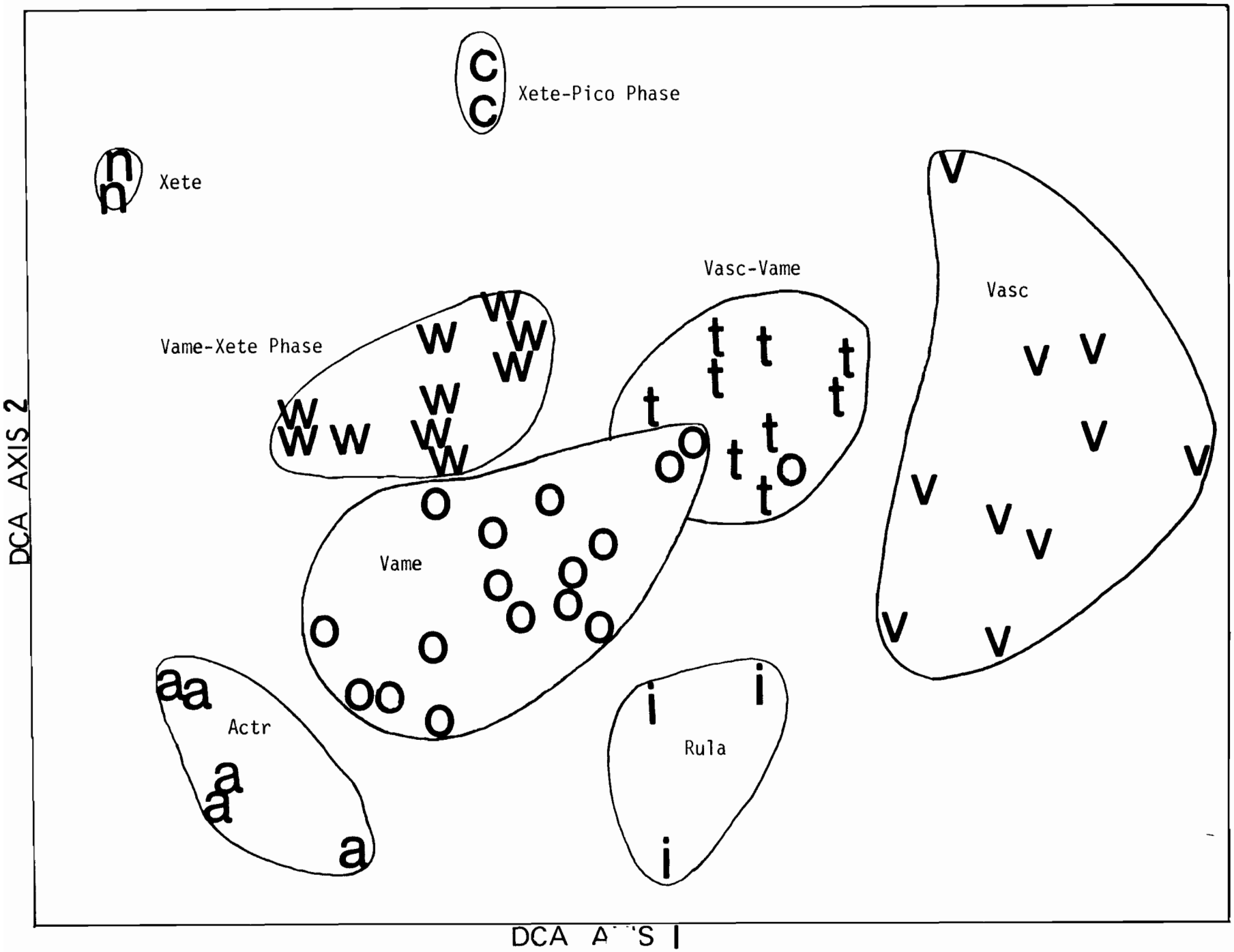

Psme-Cade3-Symo
Bene-
Herb Rich Phase
Rhma-Libo2
Xete
Acci-Pomu
Acci-Bene
Rhma-Bene
Rhma-Xete
Bene
Mixed Herb
Rhma-Gash
DCA Axis 2
DCA Axis 1

Figure A6.


Xete-Pico Phase
Xete
Vasc-Vame
Vasc
Vame-Xete Phase
Vame
Actr
Rula
DCA AXIS 2
DCA AXIS 1

APPENDIX B

Figures B1. - B5. Separation Creek Drainage Forest Communities Ordination Positions vs. Environmental Characteristics.

Figure B1.

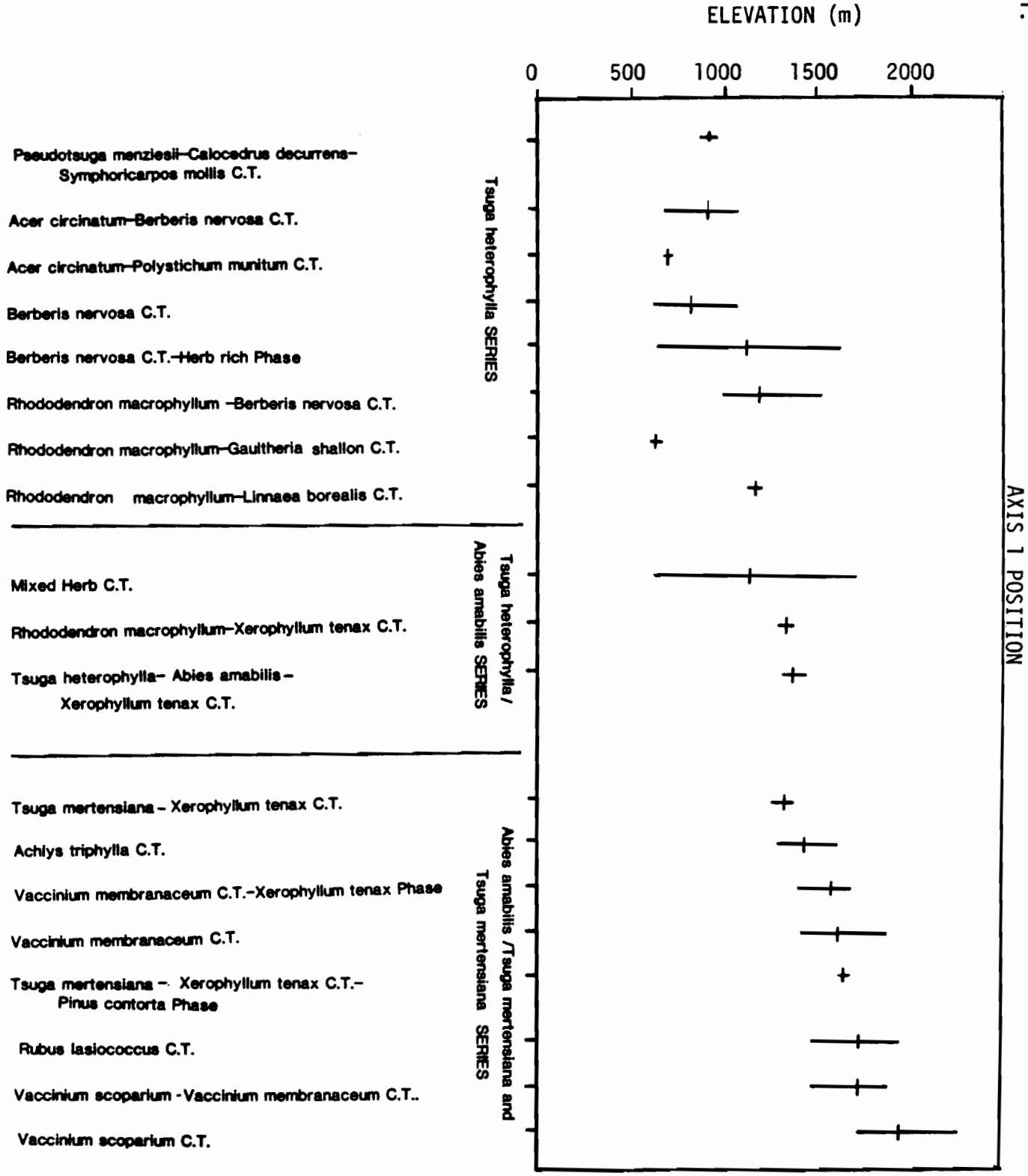

ELEVATION (m)
0
500
1000
1500
2000
AXIS 1 POSITION
Pseudotsuga menziesii–Calocedrus decurrens–
Symphoricarpos mollis C.T.
Acer circinatum–Berberis nervosa C.T.
Acer circinatum–Polystichum munitum C.T.
Berberis nervosa C.T.
Berberis nervosa C.T.–Herb rich Phase
Rhododendron macrophyllum –Berberis nervosa C.T.
Rhododendron macrophyllum–Gaultheria shallon C.T.
Rhododendron macrophyllum–Linnaea borealis C.T.
Tsuga heterophylla SERIES
Mixed Herb C.T.
Rhododendron macrophyllum–Xerophyllum tenax C.T.
Tsuga heterophylla– Abies amabilis–
Xerophyllum tenax C.T.
Tsuga heterophylla / Abies amabilis SERIES
Tsuga mertensiana – Xerophyllum tenax C.T.
Achlys triphylla C.T.
Vaccinium membranaceum C.T.–Xerophyllum tenax Phase
Vaccinium membranaceum C.T.
Tsuga mertensiana – Xerophyllum tenax C.T.–
Pinus contorta Phase
Rubus lasiococcus C.T.
Vaccinium scoparium - Vaccinium membranaceum C.T..
Vaccinium scoparium C.T.
Abies amabilis / Tsuga mertensiana and Tsuga mertensiana SERIES

Figure B2.

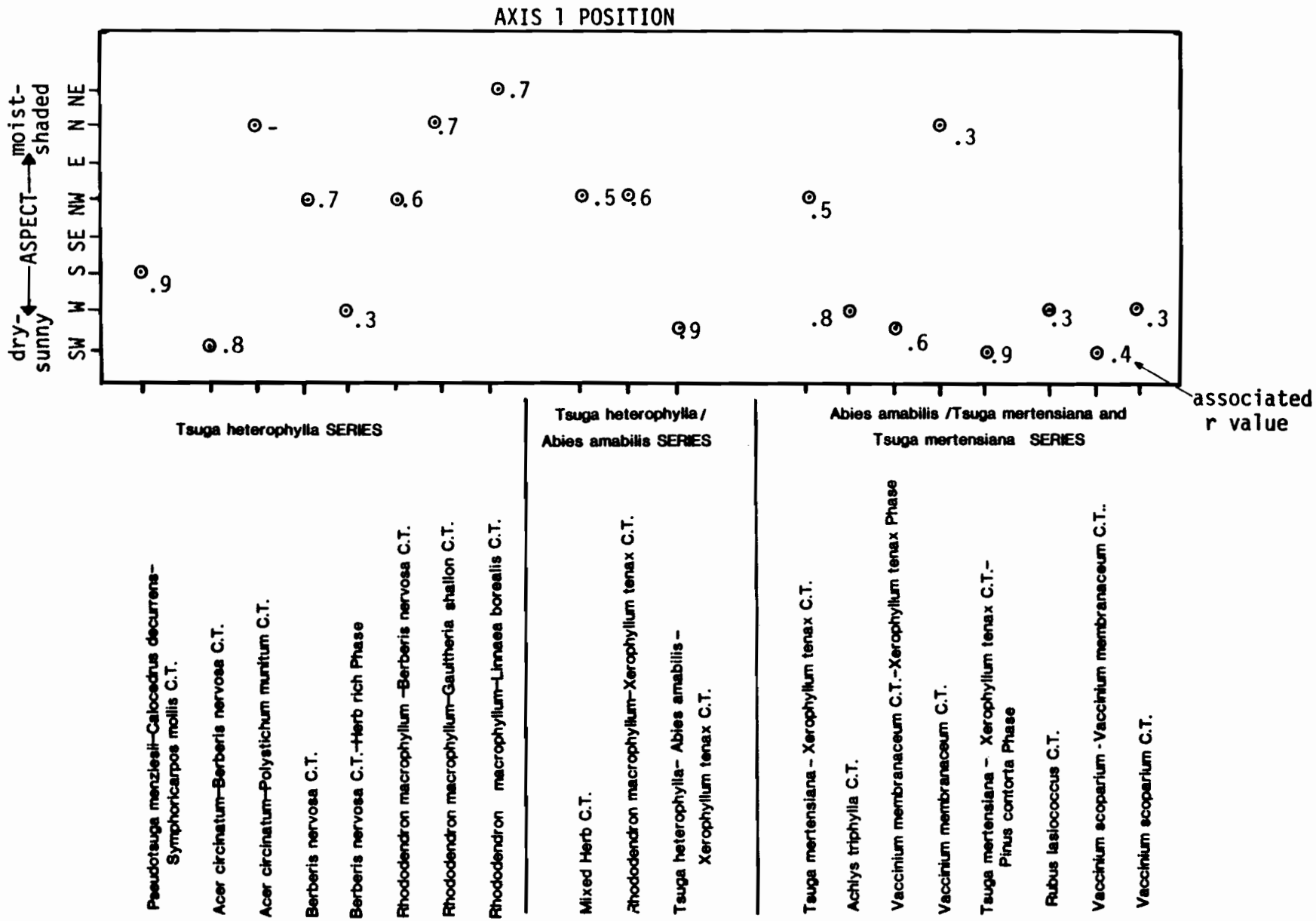

AXIS 1 POSITION
dry-sunny
ASPECT
moist-shaded
SW W S SE NW E N NE
associated r value
Tsuga heterophylla SERIES
Tsuga heterophylla / Abies amabilis SERIES
Abies amabilis /Tsuga mertensiana and Tsuga mertensiana SERIES
Pseudotsuga menziesii–Calocedrus decurrens–Symphoricarpos mollis C.T.
Acer circinatum–Berberis nervosa C.T.
Acer circinatum–Polystichum munitum C.T.
Berberis nervosa C.T.
Berberis nervosa C.T.–Herb rich Phase
Rhododendron macrophyllum –Berberis nervosa C.T.
Rhododendron macrophyllum–Gaultheria shallon C.T.
Rhododendron macrophyllum–Linnaea borealis C.T.
Mixed Herb C.T.
Rhododendron macrophyllum–Xerophyllum tenax C.T.
Tsuga heterophylla– Abies amabilis – Xerophyllum tenax C.T.
Tsuga mertensiana – Xerophyllum tenax C.T.
Achlys triphylla C.T.
Vaccinium membranaceum C.T.–Xerophyllum tenax Phase
Vaccinium membranaceum C.T.
Tsuga mertensiana – Xerophyllum tenax C.T.– Pinus contorta Phase
Rubus lasiococcus C.T.
Vaccinium scoparium -Vaccinium membranaceum C.T..
Vaccinium scoparium C.T.

Figure B3.

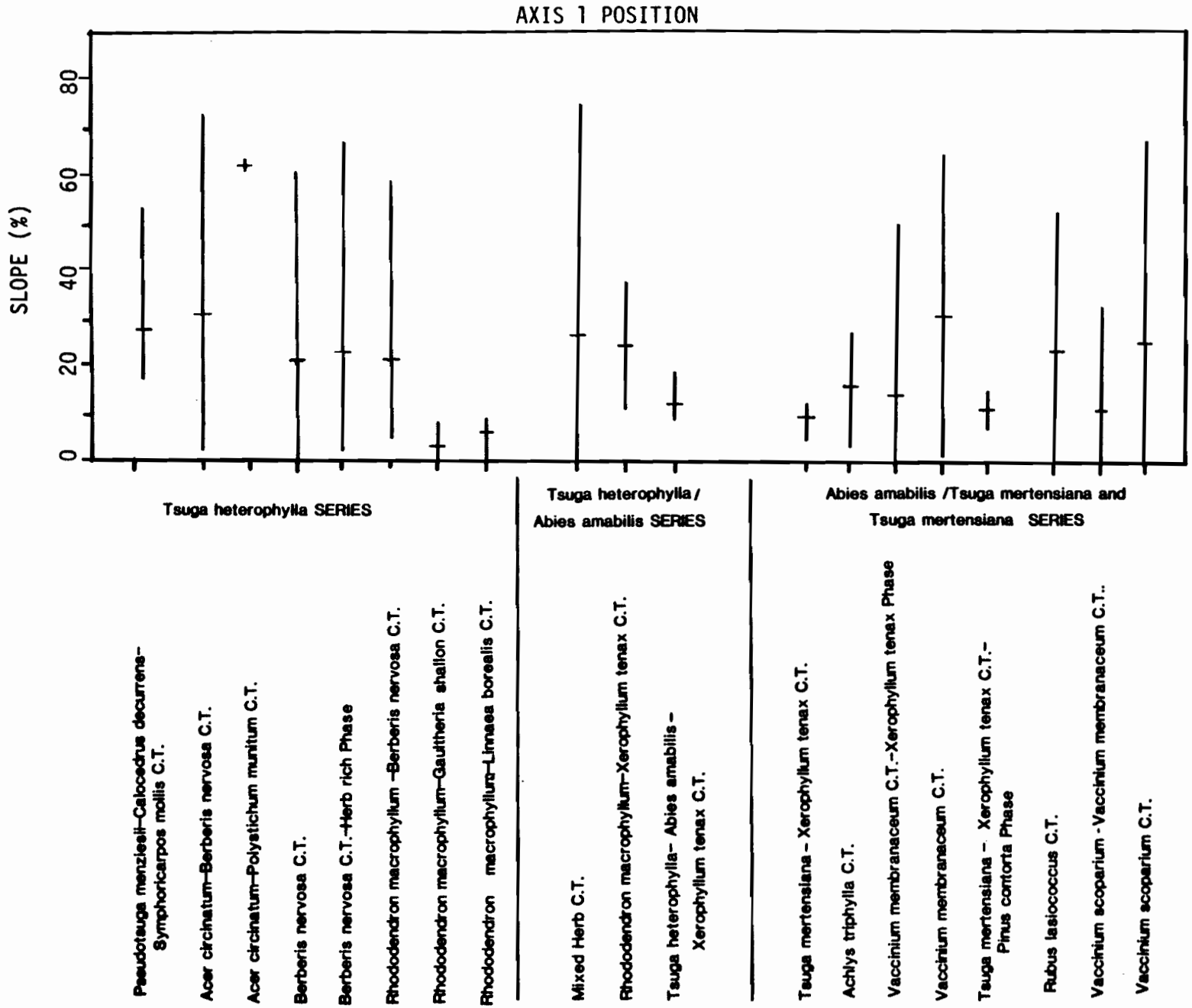

AXIS 1 POSITION
SLOPE (%)
0
20
40
60
80
Tsuga heterophylla SERIES
Tsuga heterophylla / Abies amabilis SERIES
Abies amabilis /Tsuga mertensiana and Tsuga mertensiana SERIES
Pseudotsuga menziesii–Calocedrus decurrens–Symphoricarpos mollis C.T.
Acer circinatum–Berberis nervosa C.T.
Acer circinatum–Polystichum munitum C.T.
Berberis nervosa C.T.
Berberis nervosa C.T.–Herb rich Phase
Rhododendron macrophyllum –Berberis nervosa C.T.
Rhododendron macrophyllum–Gaultheria shallon C.T.
Rhododendron macrophyllum–Linnaea borealis C.T.
Mixed Herb C.T.
Rhododendron macrophyllum–Xerophyllum tenax C.T.
Tsuga heterophylla– Abies amabilis – Xerophyllum tenax C.T.
Tsuga mertensiana – Xerophyllum tenax C.T.
Achlys triphylla C.T.
Vaccinium membranaceum C.T.–Xerophyllum tenax Phase
Vaccinium membranaceum C.T.
Tsuga mertensiana – Xerophyllum tenax C.T.– Pinus contorta Phase
Rubus lasiococcus C.T.
Vaccinium scoparium - Vaccinium membranaceum C.T..
Vaccinium scoparium C.T.

Figure B4.

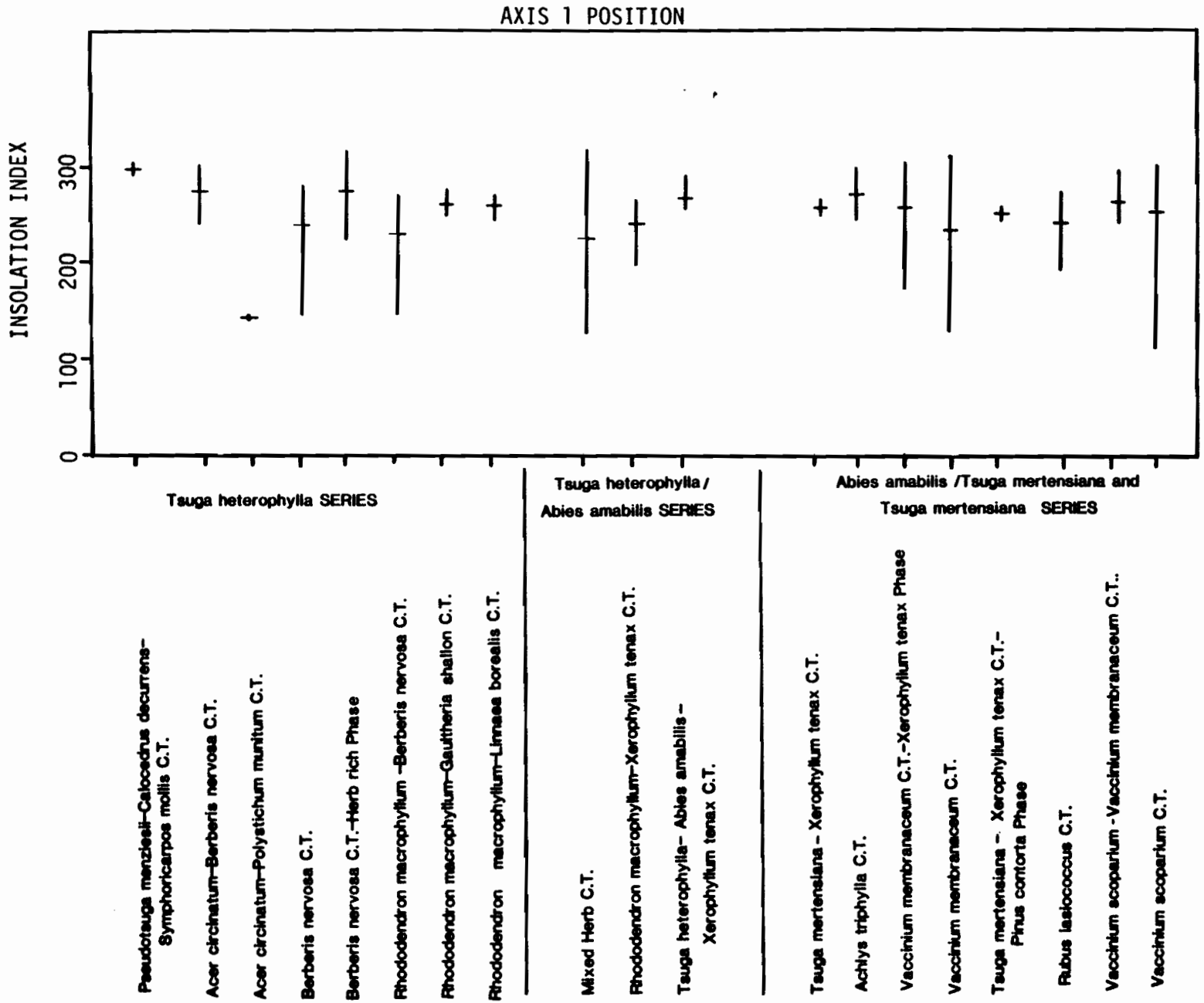
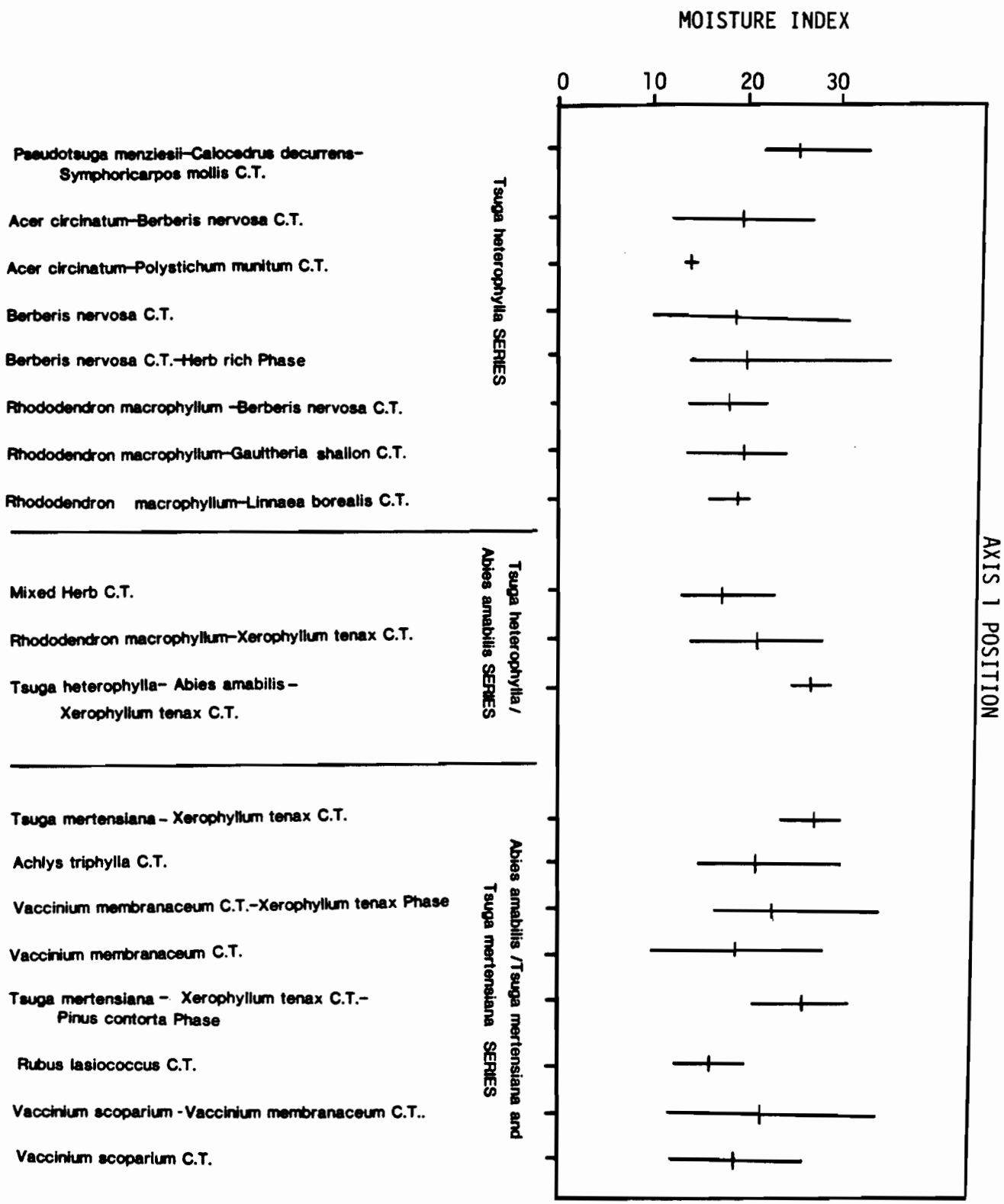

AXIS 1 POSITION
INSOLATION INDEX
0
100
200
300
Tsuga heterophylla SERIES
Tsuga heterophylla / Abies amabilis SERIES
Abies amabilis /Tsuga mertensiana and Tsuga mertensiana SERIES
Pseudotsuga menziesii-Calocedrus decurrens-Symphoricarpos mollis C.T.
Acer circinatum-Berberis nervosa C.T.
Acer circinatum-Polystichum munitum C.T.
Berberis nervosa C.T.
Berberis nervosa C.T.-Herb rich Phase
Rhododendron macrophyllum -Berberis nervosa C.T.
Rhododendron macrophyllum-Gaultheria shallon C.T.
Rhododendron macrophyllum-Linnaea borealis C.T.
Mixed Herb C.T.
Rhododendron macrophyllum-Xerophyllum tenax C.T.
Tsuga heterophylla- Abies amabilis - Xerophyllum tenax C.T.
Tsuga mertensiana - Xerophyllum tenax C.T.
Achlys triphylla C.T.
Vaccinium membranaceum C.T.-Xerophyllum tenax Phase
Vaccinium membranaceum C.T.
Tsuga mertensiana - Xerophyllum tenax C.T.- Pinus contorta Phase
Rubus lasiococcus C.T.
Vaccinium scoparium - Vaccinium membranaceum C.T..
Vaccinium scoparium C.T.

Figure B5.


AXIS 1 POSITION
0
10
20
30
MOISTURE INDEX
Tsuga heterophylla SERIES
Pseudotsuga menziesii–Calocedrus decurrens–Symphoricarpos mollis C.T.
Acer circinatum–Berberis nervosa C.T.
Acer circinatum–Polystichum munitum C.T.
Berberis nervosa C.T.
Berberis nervosa C.T.–Herb rich Phase
Rhododendron macrophyllum –Berberis nervosa C.T.
Rhododendron macrophyllum–Gaultheria shallon C.T.
Rhododendron macrophyllum–Linnaea borealis C.T.
Tsuga heterophylla / Abies amabilis SERIES
Mixed Herb C.T.
Rhododendron macrophyllum–Xerophyllum tenax C.T.
Tsuga heterophylla– Abies amabilis – Xerophyllum tenax C.T.
Abies amabilis /Tsuga mertensiana and Tsuga mertensiana SERIES
Tsuga mertensiana – Xerophyllum tenax C.T.
Achlys triphylla C.T.
Vaccinium membranaceum C.T.–Xerophyllum tenax Phase
Vaccinium membranaceum C.T.
Tsuga mertensiana – Xerophyllum tenax C.T.– Pinus contorta Phase
Rubus lasiococcus C.T.
Vaccinium scoparium - Vaccinium membranaceum C.T..
Vaccinium scoparium C.T.

APPENDIX C

Separation Creek Drainage Forest Communities.

1. Plant Association Tables. Average cover is based on only those plots in which species occurs.

2. Overstory Parameters and Vegetation Structure Table. Cover is in percent. Overstory and regeneration species number refer to tree layer species richness; mean tree height and mean age are based on largest individual (Table C1).

3. Species Richness Table (Table C2).

4. N1 and N2 Diversity Table. N1 value approximates the number of fairly dominant species; N2 estimates the number of highly dominant species (Table C3).

5. Environmental Characteristics Table (Table C4).

6. Soil Surface and Profile Variable Table. Rock cover applies to loose rock < 7 cm in length. Coarse litter applies to debris < 1 cm in length. Coarse fragments are on a volume basis (Table C5).

Note: Blank represents a value of zero (0); dash (-) represents an unavailable value.

TABLE 1. STAND TABLE FOR THE PSME- CADE3- SYMO C.T. .

SPECIES	CONS	AVE COVER	PLOT LABELS 95	111	159	160
TOTAL OVERSTORY COVER						
PSEUDOTSUGA MENZIESII	100	69	45	70	70	90
CALOCEDRUS DECURRENS	100	10	5	10	20	4
ARBUTUS MENZIESII	100	7	15	8	3	1
ACER MACROPHYLLUM	100	2	7	T	1	T
RHAMNUS PURSHIANA	100	T	T	T	T	T
CORNUS NUTTALLII	75	7	.	2	15	3
CHRYSOLEPIS CHRYSOPHYLLA	75	1	.	2	1	T
TSUGA HETEROPHYLLA	50	4	.	T	.	7
ABIES GRANDIS	50	3	.	.	5	T
> 1M DBH SIZE CLASS						
PSEUDOTSUGA MENZIESII	25	10	.	.	.	10
CALOCEDRUS DECURRENS	25	7	.	7	.	.
3 - 10 DM DBH SIZE CLASS						
PSEUDOTSUGA MENZIESII	100	61	40	60	70	75
CALOCEDRUS DECURRENS	50	6	5	.	7	.
ARBUTUS MENZIESII	25	10	10	.	.	.
TSUGA HETEROPHYLLA	25	6	.	.	.	6
ABIES GRANDIS	25	5	.	.	5	.
1 - 3 DM DBH SIZE CLASS						
PSEUDOTSUGA MENZIESII	100	7	6	10	1	10
ARBUTUS MENZIESII	75	5	5	8	3	.
CALOCEDRUS DECURRENS	50	7	.	3	10	.
CORNUS NUTTALLI	25	15	.	.	15	.
ACER MACROPHYLLUM	25	7	7	.	.	.
TSUGA HETEROPHYLLA	25	1	.	.	.	1
CHRYSOLEPIS CHRYSOPHYLLA	25	1	.	1	.	.

TABLE 1. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 95	111	159	160
< 1DM DBH AND > 1M SIZE CLASS						
CALOCEDRUS DECURRENS	75	2	.	T	2	4
CORNUS NUTTALLI	75	1	.	1	1	2
PSEUDOTSUGA MENZIESII	50	4	2	5	.	.
CHRYSOLEPIS CHRYSOPHYLLA	25	1	.	1	.	.
ACER MACROPHYLLUM	25	T	T	.	.	.
< 1 M TALL SIZE CLASS						
ACER MACROPHYLLUM	100	T	T	T	1	T
CALOCEDRUS DECURRENS	100	T	T	T	1	T
CORNUS NUTTALLI	75	1	.	1	T	1
ARBUTUS MENZIESII	75	T	.	T	T	1
PSEUDOTSUGA MENZIESII	75	T	1	T	.	T
CHRYSOLEPIS CHRYSOPHYLLA	50	1	.	.	1	T
TSUGA HETEROPHYLLA	25	T	.	T	.	.
ABIES GRANDIS	25	T	.	.	.	T
TALL SHRUB SPECIES						
ROSA GYMNOCARPA	100	1	T	T	2	2
ACER CIRCINATUM	100	1	T	T	1	1
CORYLUS CORNUTA CALIFORNICA	100	2	1	1	4	.
HOLODISCUS DISCOLOR	50	2	3	1	.	.
RUBUS PARVIFLORUS	25	1	.	.	1	.
VACCINIUM PARVIFOLIUM	25	T	.	.	.	T
RHODODENDRON MACROPHYLLUM	25	T	.	.	.	T
LOW SHRUB AND SUB-SHRUB SPECIES						
SYMPHORICARPOS MOLLIS HESPERIUS	100	3	3	5	2	3
BERBERIS NERVOSA	100	1	T	3	1	1
RUBUS URSINUS	75	1	1	1	1	.

TABLE 1. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 95	111	159	160
LOW SHRUB AND SUB-SHRUB SPECIES	CONTINUED					
BERBERIS AQUIFOLIUM	50	2	3	.	T	.
LINNAEA BOREALIS	50	1	.	T	2	.
PACHISTIMA MYRSINITES	50	1	T	1	.	.
LONICERA CILIOSA	50	T	.	.	T	T
CHIMAPHILA UMBELLATA OCCIDENTALIS	50	T	.	T	.	T
APOCYNUM	25	T	.	T	.	.
GAULTHERIA SHALLON	25	T	.	.	T	.
GRASS, SEDGE AND RUSH SPECIES						
POACEAE	75	T	1	T	.	T
TRISETUM CERNUUM	25	T	T	.	.	.
FERN, LYCOPOD AND MOSS SPECIES						
PTERIDIUM AQUILINUM	50	2	.	.	T	3
POLYSTICHUM MUNITUM	25	1	1	.	.	.
ASPIDOTIS DENSA	25	T	T	.	.	.
FORB SPECIES						
GOODYERA OBLONGIFOLIA	100	T	T	T	1	T
HIERACIUM ALBIFLORUM	100	T	T	T	T	1
FRAGARIA VESCA	100	T	T	T	T	T
TRIENTALIS LATIFOLIA	75	2	1	5	.	1
ADENOCAULON BICOLOR	75	1	.	T	1	2
VIOLA SEMPERVIRENS	75	1	.	1	1	1
ACHLYS TRIPHYLLA	75	T	.	T	T	1
VANCOUVERIA HEXANDRA	75	T	.	T	T	T
ASTER RADULINUS	50	5	10	T	.	.
CORNUS CANADENSIS	50	2	.	.	1	2
SATUREJA DOUGLASII	50	1	1	1	.	.
SMILACINA STELLATA	50	1	.	.	1	1

TABLE 1. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 95	111	159	160
FORB SPECIES CONTINUED						
GALIUM TRIFLORUM	50	1	.	.	1	1
ANEMONE DELTOIDEA	50	1	.	.	1	1
CAMPANULA SCOULERI	50	1	.	.	T	1
TRILLIUM OVATUM	50	T	.	.	T	T
ACTAEA RUBRA	25	T	.	.	.	T
CLINTONIA UNIFLORA	25	T	.	.	.	T
MIMULUS GUTTATUS	25	T	T	.	.	.
SENECIO SPHAEROCEPHALUS	25	T	.	T	.	.
OSMORHIZA CHILENSIS	25	T	.	.	.	T
MONTIA PARVIFOLIA	25	T	T	.	.	.
HABENARIA	25	T	.	T	.	.
LILIUM	25	T	.	T	.	.
IRIS TENAX	25	T	T	.	.	.
EBUROPHYTON AUSTINIAE	25	T	.	T	.	.

TABLE 2. STAND TABLE FOR THE TSHE- ACCI- POMU C.T. .

SPECIES	PLOT LABELS 156
TOTAL OVERSTORY COVER	
CORNUS NUTTALLII	4
PSEUDOTSUGA MENZIESII	65
ACER MACROPHYLLUM	T
THUJA PLICATA	15
> 1M DBH SIZE CLASS	
PSEUDOTSUGA MENZIESII	10
3 - 10 DM DBH SIZE CLASS	
PSEUDOTSUGA MENZIESII	50
THUJA PLICATA	5
1 - 3 DM DBH SIZE CLASS	
PSEUDOTSUGA MENZIESII	3
THUJA PLICATA	10
< 1DM DBH AND > 1M SIZE CLASS	
PSEUDOTSUGA MENZIESII	2
CORNUS NUTTALLI	4
< 1 M TALL SIZE CLASS	
ACER MACROPHYLLUM	T
TALL SHRUB SPECIES	
ACER CIRCINATUM	25
AMELANCHIER ALNIFOLIA	T
RHODODENDRON MACROPHYLLUM	5
RUBUS PARVIFLORUS	1
VACCINIUM MEMBRANACEUM	T
VACCINIUM PARVIFOLIUM	1

TABLE 2. CONTINUED.

SPECIES	PLOT LABELS 156
LOW SHRUB AND SUB-SHRUB SPECIES	
BERBERIS NERVOSA	1
LINNAEA BOREALIS	3
RUBUS URSINUS	2
FERN, LYCOPOD AND MOSS SPECIES	
POLYSTICHUM MUNITUM	35
FORB SPECIES	
ACHLYS TRIPHYLLA	T
ADENOCAULON BICOLOR	T
CORNUS CANADENSIS	T
GALIUM TRIFLORUM	T
PYROLA ASARIFOLIA	T
SENECIO BOLANDERI	T
SMILACINA RACEMOSA	T
VANCOUVERIA HEXANDRA	2
VIOLA SEMPERVIRENS	T

TABLE 3. PART 1. STAND TABLE FOR THE TSHE- ACCI- BENE C.T. .

SPECIES	CONS	AVE COVER	PLOT LABELS 2	4	10	11	19	92	93	94	108	110
TOTAL OVERSTORY COVER												
PSEUDOTSUGA MENZIESII	100	70	75	73	50	70	75	70	80	80	85	80
CORNUS NUTTALLII	76	4	2	5	.	.	10	T	6	3	10	T
ACER MACROPHYLLUM	53	5	T	T	T	20	7	7	2	10	T	.
TSUGA HETEROPHYLLA	53	3	T	.	7	.	2	.	3	1	5	.
RHAMNUS PURSHIANA	47	T	T	T	.	.	T	.	1	T	.	T
CHRYSOLEPIS CHRYSOPHYLLA	41	2	5	.	2	T	1	.	.	.	.	2
ABIES GRANDIS	29	2	.	.	T	5	.	.	.	T	.	.
PINUS MONTICOLA	24	2	.	.	T	T	.	.	.	.	.	.
THUJA PLICATA	18	3	.	.	.	.	.	3	3	.	.	.
ABIES AMABILIS	18	2	.	.	.	.	.	.	.	.	.	.
CALOCEDRUS DECURRENS	12	5	.	.	.	.	.	.	.	.	.	.
TAXUS BREVIFOLIA	12	1	.	.	.	.	1	.	.	.	.	.
ABIES PROCERA	6	9	.	.	.	.	.	.	.	.	.	.
> 1M DBH SIZE CLASS												
PSEUDOTSUGA MENZIESII	6	7	.	.	.	.	.	.	.	.	.	.
3 - 10 DM DBH SIZE CLASS												
PSEUDOTSUGA MENZIESII	100	61	60	61	50	70	75	50	70	75	65	60
TSUGA HETEROPHYLLA	6	7	.	.	7	.	.	.	.	.	.	.
PINUS MONTICOLA	6	7	.	.	.	.	.	.	.	.	.	.
ABIES AMABILIS	6	5	.	.	.	.	.	.	.	.	.	.
ABIES GRANDIS	6	4	.	.	.	.	.	.	.	.	.	.
ACER MACROPHYLLUM	6	4	.	.	.	.	.	4	.	.	.	.
ABIES PROCERA	6	3	.	.	.	.	.	.	.	.	.	.
CHRYSOLEPIS CHRYSOPHYLLA	6	3	.	.	.	.	.	.	.	.	.	.
1 - 3 DM DBH SIZE CLASS												
PSEUDOTSUGA MENZIESII	76	16	50	22	.	1	.	20	10	7	25	20
CORNUS NUTTALLI	35	5	.	4	.	.	.	.	5	3	7	.

TABLE 3. PART 1. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 2	4	10	11	19	92	93	94	108	110
1 - 3 DM DBH SIZE CLASS CONTINUED												
TSUGA HETEROPHYLLA	29	2	.	.	.	.	.	.	2	1	3	.
ACER MACROPHYLLUM	24	8	.	.	.	20	.	3	2	7	.	.
THUJA PLICATA	18	3	.	.	.	.	.	3	3	.	.	.
CHRYSOLEPIS CHRYSOPHYLLA	18	3	5	.	2	.	.	.	.	.	.	2
CALOCEDRUS DECURRENS	12	4	.	.	.	.	.	.	.	.	.	.
ABIES PROCERA	6	5	.	.	.	.	.	.	.	.	.	.
ABIES GRANDIS	6	5	.	.	.	5	.	.	.	.	.	.
< 1DM DBH AND > 1M SIZE CLASS												
CORNUS NUTTALLI	47	3	2	1	.	.	10	.	1	T	3	.
TSUGA HETEROPHYLLA	47	1	T	.	T	.	2	.	1	.	2	.
ACER MACROPHYLLUM	29	2	T	T	.	.	7	.	.	2	T	.
PSEUDOTSUGA MENZIESII	18	2	.	.	T	.	.	.	.	.	1	.
ABIES PROCERA	6	1	.	.	.	.	.	.	.	.	.	.
CALOCEDRUS DECURRENS	6	1	.	.	.	.	.	.	.	.	.	.
ABIES GRANDIS	6	T	.	.	.	.	.	.	.	T	.	.
ABIES AMABILIS	6	T	.	.	.	.	.	.	.	.	.	.
< 1 M TALL SIZE CLASS												
CORNUS NUTTALLI	47	T	T	.	.	.	2	T	T	T	T	T
ACER MACROPHYLLUM	35	T	T	T	T	T	T	.	.	1	.	.
TSUGA HETEROPHYLLA	24	1	T	.	T	.	.	.	.	.	1	.
ABIES GRANDIS	24	T	.	.	T	.	.	.	.	T	.	.
PSEUDOTSUGA MENZIESII	24	T	.	.	T	T	.	.	T	.	.	.
CHRYSOLEPIS CHRYSOPHYLLA	18	T	.	.	.	T	1	.	.	.	.	.
PINUS MONTICOLA	18	T	.	.	T	T	.	.	.	.	.	.
TAXUS BREVIFOLIA	12	1	.	.	.	.	1	.	.	.	.	.
ABIES AMABILIS	12	T	.	.	.	.	.	.	.	.	.	.
ABIES PROCERA	6	T	.	.	.	.	.	.	.	.	.	.

TABLE 3. PART 1. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 2	4	10	11	19	92	93	94	108	110
TALL SHRUB SPECIES												
ACER CIRCINATUM	100	42	10	20	25	85	50	25	4	30	25	95
ROSA GYMNOCARPA	88	1	T	.	T	.	T	3	1	1	1	T
CORYLUS CORNUTA CALIFORNICA	71	6	10	4	10	.	1	T	4	3	2	.
VACCINIUM PARVIFOLIUM	53	T	T	T	T	.	2	T	1	T	.	.
HOLODISCUS DISCOLOR	41	1	T	T	2	.	.	1	1	.	T	.
RUBUS PARVIFLORUS	29	1	.	T	.	.	.	.	1	1	.	.
RHODODENDRON MACROPHYLLUM	24	1	.	.	.	.	3	.	.	.	.	.
VACCINIUM MEMBRANACEUM	24	T	.	T	T	T	.	.	.	.	.	.
ALNUS SINUATA	6	1	.	.	.	.	.	.	.	.	.	.
RIBES	6	T	.	.	.	.	.	.	.	.	.	.
SALIX	6	T	.	.	.	.	.	.	.	.	.	T
AMELANCHIER ALNIFOLIA	6	T	.	.	.	.	.	.	.	.	.	.
LOW SHRUB AND SUB-SHRUB SPECIES												
BERBERIS NERVOSA	100	32	45	12	38	80	40	25	5	25	55	40
RUBUS URSINUS	100	1	T	T	T	T	1	1	1	2	1	T
SYMPHORICARPOS MOLLIS HESPERIUS	76	1	T	.	T	.	2	5	2	1	.	T
GAULTHERIA SHALLON	53	17	40	12	.	.	50	1	3	.	15	T
LINNAEA BOREALIS	47	2	T	3	T	.	T	.	.	.	1	.
CHIMAPHILA UMBELLATA OCCIDENTALIS	29	T	T	T	.	.	1	.	.	.	.	.
CHIMAPHILA MENZIESII	29	T	T	T	.	.	T	.	T	.	.	T
BERBERIS AQUIFOLIUM	24	T	.	.	T	.	.	T	T	.	.	.
PACHISTIMA MYRSINITES	18	1	.	.	.	.	.	T	1	.	.	.
GAULTHERIA OVATIFOLIA	6	T	.	.	.	.	.	.	.	.	.	.
APOCYNUM	6	T	.	.	.	.	.	.	.	.	.	.
GRASS, SEDGE AND RUSH SPECIES												
POACEAE	35	T	.	T	T	.	.	T	.	.	.	.
TRISETUM CANESCENS	18	T	.	.	T	.	.	.	T	T	.	.
POA	6	T	.	.	.	.	T	.	.	.	.	.

TABLE 3. PART 1. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 2	4	10	11	19	92	93	94	108	110
FERN, LYCOPOD AND MOSS SPECIES												
PTERIDIUM AQUILINUM	82	1	1	1	T	T	8	.	2	.	1	T
POLYSTICHUM MUNITUM	71	1	.	1	T	T	.	T	3	2	2	.
FORB SPECIES												
ANEMONE DELTOIDEA	94	T	T	T	1	T	T	T	T	T	T	T
GOODYERA OBLONGIFOLIA	88	T	T	T	T	T	T	T	T	1	T	T
VIOLA SEMPERVIRENS	76	1	T	1	.	.	T	T	.	.	2	T
TRIENTALIS LATIFOLIA	71	T	T	T	1	.	.	1	T	1	T	.
ACHLYS TRIPHYLLA	71	T	T	T	T	.	1	T	.	T	T	.
ADENOCAULON BICOLOR	59	T	T	.	T	T	T	T	.	T	.	.
GALIUM TRIFLORUM	59	T	.	T	T	.	T	.	.	T	T	.
FRAGARIA VESCA	47	T	T	.	.	.	.	T	T	T	T	.
TRILLIUM OVATUM	47	T	T	T	T	T	.	.	.	.	T	T
HIERACIUM ALBIFLORUM	41	T	.	.	T	.	T	1	.	T	.	.
SMILACINA STELLATA	35	T	.	.	.	.	T	.	.	T	.	T
OSMORHIZA CHILENSIS	29	T	.	T	T	.	T	.	.	.	.	.
ANEMONE LYALLII	24	T	.	.	.	.	.	.	.	.	.	.
LISTERA CORDATA	24	T	T	T	T	.	T	.	.	.	.	.
CORNUS CANADENSIS	18	1	.	.	.	.	2	.	.	.	.	.
VANCOUVERIA HEXANDRA	18	T	.	T	.	.	T	.	.	.	.	T
ASARUM CAUDATUM	18	T	.	.	.	.	.	.	.	.	.	T
TIARELLA TRIFOLIATA UNIFOLIATA	18	T	.	T	.	.	T	.	.	.	.	.
PYROLA PICTA	12	T	.	.	T	.	.	.	.	.	.	.
CAMPANULA SCOULERI	12	T	.	.	.	.	.	.	.	T	.	.
PYROLA ASARIFOLIA	12	T	T	.	.	.	T	.	.	.	.	.
CAPSELLA BURSA-PASTORIS	12	T	T	T	.	.	.	.	.	.	.	.
COLLOMIA HETEROPHYLLA	12	T	T	.	T	.	.	.	.	.	.	.
VICIA AMERICANA	6	1	.	.	.	.	.	.	.	.	.	.
CIRCAEA ALPINA	6	1	.	.	.	.	.	.	.	.	.	.
SATUREJA DOUGLASII	6	T	.	.	.	.	.	T	.	.	.	.

TABLE 3. PART 1. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 2	4	10	11	19	92	93	94	108	110
FORB SPECIES CONTINUED												
SISYRINCHIUM DOUGLASII	6	T	.	.	.	.	.	.	.	.	.	.
ACTAEA RUBRA	6	T	.	.	.	.	.	.	.	.	.	.
CLINTONIA UNIFLORA	6	T	.	.	.	.	T	.	.	.	.	.
STACHYS COOLEYAE	6	T	.	.	.	.	T	.	.	.	.	.
UNKNOWN SPECIES	6	T	.	.	.	.	.	.	.	.	.	.
IRIS TENAX	6	T	.	.	.	.	.	T	.	.	.	.
SMILACINA RACEMOSA	6	T	.	.	.	.	.	.	.	.	.	.
EBUROPHYTON AUSTINIAE	6	T	.	.	.	.	.	.	.	.	.	T
CORALLORHIZA STRIATA	6	T	.	.	.	T	.	.	.	.	.	.
SYNTHYRIS RENIFORMIS	6	T	.	.	.	.	.	.	T	.	.	.
ARENARIA MACROPHYLLA	6	T	.	.	.	.	.	.	T	.	.	.
CONIUM MACULATUM	6	T	.	T	.	.	.	.	.	.	.	.
HEMITOMES CONGESTUM	6	T	T	.	.	.	.	.	.	.	.	.
PENSTEMON SERRULATUS	6	T	.	.	.	.	T	.	.	.	.	.
LISTERA CAURINA	6	T	.	.	T	.	.	.	.	.	.	.

TABLE 3 PART 2. STAND TABLE FOR THE TSHE- ACCI- BENE C.T. .

SPECIES	PLOT LABELS						
	112	138	139	140	141	150	158
TOTAL OVERSTORY COVER							
PSEUDOTSUGA MENZIESII	75	75	60	60	55	83	50
CORNUS NUTTALLII	T	2	5	1	.	.	5
ACER MACROPHYLLUM	.	.	.	.	.	.	.
TSUGA HETEROPHYLLA	.	3	.	5	2	.	.
RHAMNUS PURSHIANA	.	T	.	.	.	.	T
CHRYSOLEPIS CHRYSOPHYLLA	.	.	.	3	.	.	T
ABIES GRANDIS	.	.	.	T	5	.	.
PINUS MONTICOLA	.	.	.	.	1	7	.
THUJA PLICATA	.	3	.	.	.	.	.
ABIES AMABILIS	.	T	5	T	.	.	.
CALOCEDRUS DECURRENS	6	.	.	.	.	.	3
TAXUS BREVIFOLIA	.	.	.	.	.	.	T
ABIES PROCERA	9	.	.	.	.	.	.
> 1M DBH SIZE CLASS							
PSEUDOTSUGA MENZIESII	.	.	.	.	.	.	7
3 - 10 DM DBH SIZE CLASS							
PSEUDOTSUGA MENZIESII	65	75	60	59	54	70	23
TSUGA HETEROPHYLLA	.	.	.	.	.	.	.
PINUS MONTICOLA	.	.	.	.	.	7	.
ABIES AMABILIS	.	.	5	.	.	.	.
ABIES GRANDIS	.	.	.	.	4	.	.
ACER MACROPHYLLUM	.	.	.	.	.	.	.
ABIES PROCERA	3	.	.	.	.	.	.
CHRYSOLEPIS CHRYSOPHYLLA	.	.	.	3	.	.	.
1 - 3 DM DBH SIZE CLASS							
PSEUDOTSUGA MENZIESII	10	.	.	1	1	15	20
CORNUS NUTTALLI	.	.	5	.	.	.	5

TABLE 3 PART 2. CONTINUED.

SPECIES	PLOT LABELS 112	138	139	140	141	150	158
1 - 3 DM DBH SIZE CLASS CONTINUED							
TSUGA HETEROPHYLLA	.	2	.	4	.	.	.
ACER MACROPHYLLUM	.	.	.	.	.	.	.
THUJA PLICATA	.	3	.	.	.	.	.
CHRYSOLEPIS CHRYSOPHYLLA	.	.	.	.	.	.	.
CALOCEDRUS DECURRENS	5	.	.	.	.	.	3
ABIES PROCERA	5	.	.	.	.	.	.
ABIES GRANDIS	.	.	.	.	.	.	.
< 1DM DBH AND > 1M SIZE CLASS							
CORNUS NUTTALLI	.	2	.	1	.	.	.
TSUGA HETEROPHYLLA	.	1	.	1	1	.	.
ACER MACROPHYLLUM	.	.	.	.	.	.	.
PSEUDOTSUGA MENZIESII	.	.	.	.	.	.	5
ABIES PROCERA	1	.	.	.	.	.	.
CALOCEDRUS DECURRENS	1	.	.	.	.	.	.
ABIES GRANDIS	.	.	.	.	.	.	.
ABIES AMABILIS	.	.	T	.	.	.	.
< 1 M TALL SIZE CLASS							
CORNUS NUTTALLI	T	.	.	.	.	.	.
ACER MACROPHYLLUM	.	.	.	.	.	.	.
TSUGA HETEROPHYLLA	.	.	.	.	1	.	.
ABIES GRANDIS	.	.	.	T	1	.	.
PSEUDOTSUGA MENZIESII	.	.	.	.	T	.	.
CHRYSOLEPIS CHRYSOPHYLLA	.	.	.	.	.	.	T
PINUS MONTICOLA	.	.	.	.	1	.	.
TAXUS BREVIFOLIA	.	.	.	.	.	.	T
ABIES AMABILIS	.	T	.	T	.	.	.
ABIES PROCERA	T	.	.	.	.	.	.

TABLE 3 PART 2. CONTINUED.

SPECIES	PLOT LABELS						
	112	138	139	140	141	150	158
TALL SHRUB SPECIES							
ACER CIRCINATUM	50	20	85	55	15	40	80
ROSA GYMNOCARPA	1	T	1	1	T	T	T
CORYLUS CORNUTA CALIFORNICA	.	20	2	5	10	.	.
VACCINIUM PARVIFOLIUM	.	.	.	.	.	T	T
HOLODISCUS DISCOLOR	.	.	.	.	.	2	.
RUBUS PARVIFLORUS	.	.	.	2	.	T	.
RHODODENDRON MACROPHYLLUM	.	.	.	T	.	T	T
VACCINIUM MEMBRANACEUM	.	.	.	.	.	T	.
ALNUS SINUATA	.	.	.	.	.	.	1
RIBES	.	T	.	.	.	.	.
SALIX	.	.	.	.	.	.	.
AMELANCHIER ALNIFOLIA	.	.	.	.	.	.	T
LOW SHRUB AND SUB-SHRUB SPECIES							
BERBERIS NERVOSA	35	35	45	20	3	25	8
RUBUS URSINUS	T	3	T	1	2	T	1
SYMPHORICARPOS MOLLIS HESPERIUS	T	2	T	1	2	.	T
GAULTHERIA SHALLON	.	.	.	.	10	25	.
LINNAEA BOREALIS	.	5	.	.	2	.	1
CHIMAPHILA UMBELLATA OCCIDENTALIS	.	.	.	.	.	T	T
CHIMAPHILA MENZIESII	.	.	.	.	.	.	.
BERBERIS AQUIFOLIUM	.	.	.	.	.	.	T
PACHISTIMA MYRSINITES	.	.	.	.	.	1	.
GAULTHERIA OVATIFOLIA	.	.	.	T	.	.	.
APOCYNUM	T	.	.	.	.	.	.
GRASS, SEDGE AND RUSH SPECIES							
POACEAE	.	T	.	T	T	.	.
TRISETUM CANESCENS	.	.	.	.	.	.	.
POA	.	.	.	.	.	.	.

TABLE 3 PART 2. CONTINUED.

SPECIES	PLOT LABELS						
	112	138	139	140	141	150	158
FERN, LYCOPOD AND MOSS SPECIES							
PTERIDIUM AQUILINUM	1	T	T	T	2	1	.
POLYSTICHUM MUNITUM	.	T	T	2	.	T	T
FORB SPECIES							
ANEMONE DELTOIDEA	1	T	1	1	T	.	1
GOODYERA OBLONGIFOLIA	T	T	T	T	.	.	T
VIOLA SEMPERVIRENS	2	T	T	T	3	T	T
TRIENTALIS LATIFOLIA	T	.	T	T	T	T	.
ACHLYS TRIPHYLLA	.	T	T	.	T	T	T
ADENOCAULON BICOLOR	.	1	T	.	1	.	T
GALIUM TRIFLORUM	.	T	T	T	T	.	T
FRAGARIA VESCA	.	T	.	.	T	T	.
TRILLIUM OVATUM	.	.	.	.	T	.	T
HIERACIUM ALBIFLORUM	.	T	T	.	2	.	.
SMILACINA STELLATA	T	.	.	T	.	.	T
OSMORHIZA CHILENSIS	.	T	T	.	.	.	.
ANEMONE LYALLII	T	T	.	T	1	.	.
LISTERA CORDATA	.	.	.	.	.	.	.
CORNUS CANADENSIS	.	T	T	.	.	.	.
VANCOUVERIA HEXANDRA	.	.	.	.	.	.	.
ASARUM CAUDATUM	.	T	.	.	T	.	.
TIARELLA TRIFOLIATA UNIFOLIATA	.	T	.	.	.	.	.
PYROLA PICTA	.	.	.	T	.	.	.
CAMPANULA SCOULERI	.	T	.	.	.	.	.
PYROLA ASARIFOLIA	.	.	.	.	.	.	.
CAPSELLA BURSA-PASTORIS	.	.	.	.	.	.	.
COLLOMIA HETEROPHYLLA	.	.	.	.	.	.	.
VICIA AMERICANA	.	1	.	.	.	.	.
CIRCAEA ALPINA	.	1	.	.	.	.	.
SATUREJA DOUGLASII	.	.	.	.	.	.	.

TABLE 3 PART 2. CONTINUED.

SPECIES	PLOT LABELS						
	112	138	139	140	141	150	158
FORB SPECIES CONTINUED							
SISYRINCHIUM DOUGLASII	.	T	.	.	.	.	.
ACTAEA RUBRA	.	.	.	.	.	T	.
CLINTONIA UNIFLORA	.	.	.	.	.	.	.
STACHYS COOLEYAE	.	.	.	.	.	.	.
UNKNOWN SPECIES	.	.	T	.	.	.	.
IRIS TENAX	.	.	.	.	.	.	.
SMILACINA RACEMOSA	.	.	.	.	.	T	.
EBUROPHYTON AUSTINIAE	.	.	.	.	.	.	.
CORALLORHIZA STRIATA	.	.	.	.	.	.	.
SYNTHYRIS RENIFORMIS	.	.	.	.	.	.	.
ARENARIA MACROPHYLLA	.	.	.	.	.	.	.
CONIUM MACULATUM	.	.	.	.	.	.	.
HEMITOMES CONGESTUM	.	.	.	.	.	.	.
PENSTEMON SERRULATUS	.	.	.	.	.	.	.
LISTERA CAURINA	.	.	.	.	.	.	.

TABLE 4A. PART 1. STAND TABLE FOR THE TSHE- BENE C.T. .

SPECIES	CONS	AVE COVER	PLOT LABELS 1	3	12	18	20	21	104	106	107	142
TOTAL OVERSTORY COVER												
PSEUDOTSUGA MENZIESII	100	59	80	70	50	75	80	70	75	20	20	80
TSUGA HETEROPHYLLA	93	22	8	7	15	30	10	3	6	50	55	3
THUJA PLICATA	67	36	45	75	.	40	.	85	1	25	20	.
CORNUS NUTTALLII	60	3	4	2	.	.	5	2	2	1	T	.
CHRYSOLEPIS CHRYSOPHYLLA	47	6	T	.	T	.	.	.	T	.	T	4
TAXUS BREVIFOLIA	20	1	2	.	.	.	.	.	.	T	2	.
RHAMNUS PURSHIANA	20	T	.	T	.	T	.	.	.	.	.	.
ABIES GRANDIS	13	1	.	.	.	.	T	.	1	.	.	.
ACER MACROPHYLLUM	13	1	.	.	.	.	T	.	1	.	.	.
ARBUTUS MENZIESII	7	7	.	.	.	.	.	.	.	.	.	.
ACER GLABRUM DOUGLASII	7	2	2	.	.	.	.	.	.	.	.	.
CALOCEDRUS DECURRENS	7	1	.	.	.	.	.	.	.	.	.	.
TSUGA MERTENSIANA	7	T	.	.	.	.	.	.	T	.	.	.
ABIES AMABILIS	7	T	.	.	.	.	.	.	.	.	.	.
PINUS MONTICOLA	7	T	.	.	T	.	.	.	.	.	.	.
> 1M DBH SIZE CLASS												
PSEUDOTSUGA MENZIESII	33	14	.	.	.	.	.	15	.	.	5	.
3 - 10 DM DBH SIZE CLASS												
PSEUDOTSUGA MENZIESII	100	49	80	65	45	75	25	65	70	20	15	70
THUJA PLICATA	53	18	.	50	.	22	.	7	.	4	20	.
TSUGA HETEROPHYLLA	40	27	.	5	.	.	.	3	.	35	45	.
1 - 3 DM DBH SIZE CLASS												
TSUGA HETEROPHYLLA	80	12	3	2	13	25	10	.	5	20	20	3
PSEUDOTSUGA MENZIESII	73	12	.	5	8	.	55	1	8	1	.	10
THUJA PLICATA	53	26	38	25	.	15	.	75	.	20	2	.
CHRYSOLEPIS CHRYSOPHYLLA	20	13	.	.	T	.	.	.	.	.	.	3
TAXUS BREVIFOLIA	13	2	2	.	.	.	.	.	.	.	1	.

TABLE 4A. PART 1. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 1	3	12	18	20	21	104	106	107	142
1 - 3 DM DBH SIZE CLASS CONTINUED												
CORNUS NUTTALLI	13	2	.	.	.	.	2	.	.	1	.	.
ABIES GRANDIS	13	1	.	.	.	.	T	.	1	.	.	.
ARBUTUS MENZIESII	7	7	.	.	.	.	.	.	.	.	.	.
< 1DM DBH AND > 1M SIZE CLASS												
TSUGA HETEROPHYLLA	67	3	5	T	4	5	.	.	1	5	4	.
THUJA PLICATA	60	3	7	2	.	3	.	8	1	2	1	.
CORNUS NUTTALLI	40	3	4	1	.	.	3	2	2	.	.	.
PSEUDOTSUGA MENZIESII	33	2	.	.	1	.	.	.	T	.	.	1
ACER MACROPHYLLUM	13	1	.	.	.	.	T	.	1	.	.	.
ACER GLABRUM DOUGLASII	7	2	2	.	.	.	.	.	.	.	.	.
CALOCEDRUS DECURRENS	7	1	.	.	.	.	.	.	.	.	.	.
TAXUS BREVIFOLIA	7	1	.	.	.	.	.	.	.	.	1	.
TSUGA MERTENSIANA	7	T	.	.	.	.	.	.	T	.	.	.
< 1 M TALL SIZE CLASS												
TSUGA HETEROPHYLLA	47	T	T	.	T	T	.	.	T	1	T	.
THUJA PLICATA	33	T	.	1	.	T	.	.	.	1	T	.
CHRYSOLEPIS CHRYSOPHYLLA	33	T	T	.	.	.	.	.	T	.	T	1
CORNUS NUTTALLI	20	1	.	1	.	.	.	.	.	.	T	.
TAXUS BREVIFOLIA	20	T	T	.	.	.	.	.	.	T	T	.
PSEUDOTSUGA MENZIESII	13	T	.	.	T	.	.	.	.	.	.	.
ACER MACROPHYLLUM	7	T	.	.	.	.	.	.	T	.	.	.
ABIES AMABILIS	7	T	.	.	.	.	.	.	.	.	.	.
ACER GLABRUM DOUGLASII	7	T	T	.	.	.	.	.	.	.	.	.
ABIES GRANDIS	7	T	.	.	.	.	T	.	.	.	.	.
PINUS MONTICOLA	7	T	.	.	T	.	.	.	.	.	.	.
TALL SHRUB SPECIES												
RHODODENDRON MACROPHYLLUM	87	7	2	.	15	T	6	1	4	10	5	3

TABLE 4A. PART 1. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 1	3	12	18	20	21	104	106	107	142
TALL SHRUB SPECIES CONTINUED												
VACCINIUM PARVIFOLIUM	80	1	1	T	1	T	1	T	3	T	T	2
ACER CIRCINATUM	73	3	5	T	1	15	.	1	8	.	.	1
VACCINIUM MEMBRANACEUM	47	T	T	.	T	.	T	.	2	T	T	.
ROSA GYMNOCARPA	40	T	T	.	T	T	T	.	.	.	.	.
HOLODISCUS DISCOLOR	40	T	T	.	T	T	T	.	T	.	.	.
CORYLUS CORNUTA CALIFORNICA	27	2	1	.	7	.	.	T	.	T	.	.
RUBUS PARVIFLORUS	27	T	T	.	T	.	.	.	1	.	.	.
ALNUS SINUATA	13	1	.	.	.	.	.	.	.	.	.	.
AMELANCHIER ALNIFOLIA	13	T	T	.	.	.	.	.	.	.	.	.
RIBES LACUSTRE	7	T	.	.	.	.	.	.	T	.	.	.
AMELANCHIER	7	T	.	.	.	.	.	.	T	.	.	.
LOW SHRUB AND SUB-SHRUB SPECIES												
BERBERIS NERVOSA	100	25	40	18	70	25	30	3	15	10	7	40
GAULTHERIA SHALLON	100	18	3	T	10	T	70	1	30	5	5	20
RUBUS URSINUS	93	T	T	T	T	T	T	T	2	.	T	1
LINNAEA BOREALIS	87	2	1	10	T	T	T	T	.	2	T	3
CHIMAPHILA UMBELLATA OCCIDENTALIS	87	1	T	T	T	T	T	T	4	T	T	10
CHIMAPHILA MENZIESII	53	T	T	T	T	T	.	T	.	T	T	.
SYMPHORICARPOS MOLLIS HESPERIUS	33	1	T	T	.	.	.	T	T	.	.	.
PACHISTIMA MYRSINITES	27	T	.	.	.	.	.	.	T	T	.	.
RUBUS NIVALIS	7	1	.	1	.	.	.	.	.	.	.	.
RUBUS LASIOCOCCUS	7	T	.	.	T	.	.	.	.	.	.	.
GAULTHERIA OVATIFOLIA	7	T	.	.	.	.	.	.	T	.	.	.
LONICERA CILIOSA	7	T	.	.	.	.	.	.	.	.	.	.
GRASS, SEDGE AND RUSH SPECIES												
POACEAE	13	T	.	.	T	.	.	.	.	.	.	.

TABLE 4A. PART 1. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 1	3	12	18	20	21	104	106	107	142
FERN, LYCOPOD AND MOSS SPECIES												
PTERIDIUM AQUILINUM	73	3	T	T	20	T	1	.	2	.	.	1
POLYSTICHUM MUNITUM	47	T	1	T	.	T	.	T	T	.	.	.
ATHYRIUM FILIX-FEMINA	7	T	T	.	.	.	.	.	.	.	.	.
FORB SPECIES												
VIOLA SEMPERVIRENS	80	T	.	T	T	T	1	T	.	T	1	T
ACHLYS TRIPHYLLA	67	1	1	T	7	T	.	T	T	.	.	T
GOODYERA OBLONGIFOLIA	67	T	.	T	T	T	T	.	.	T	T	.
ANEMONE DELTOIDEA	67	T	T	T	T	T	.	.	.	T	T	.
PYROLA ASARIFOLIA	53	T	T	T	T	T	T	T	.	.	.	.
TRILLIUM OVATUM	53	T	T	T	T	T	.	T	.	T	T	.
CORNUS CANADENSIS	47	T	.	.	T	.	1	T	.	.	.	T
PYROLA PICTA	47	T	.	T	.	.	.	T	.	.	T	T
CLINTONIA UNIFLORA	27	T	.	T	T	T	.	.	.	.	T	.
TRIENTALIS LATIFOLIA	27	T	.	.	T	.	.	.	.	.	.	.
TIARELLA TRIFOLIATA UNIFOLIATA	20	T	.	T	T	T	.	.	.	.	.	.
VANCOUVERIA HEXANDRA	20	T	T	.	.	T	.	.	.	.	.	.
ADENOCAULON BICOLOR	20	T	.	T	T	T	.	.	.	.	.	.
LISTERA CORDATA	20	T	T	T	T	.	.	.	.	.	.	.
CORALLORHIZA MACULATA	20	T	.	T	T	.	.	.	.	.	.	.
ACTAEA RUBRA	13	T	.	.	T	.	.	.	.	.	.	.
PYROLA SECUNDA	13	T	.	.	.	.	.	.	.	T	.	.
GALIUM TRIFLORUM	13	T	.	.	T	.	.	.	.	.	.	T
OSMORHIZA CHILENSIS	13	T	.	.	T	.	.	.	.	.	.	.
FRAGARIA VESCA	13	T	.	T	T	.	.	.	.	.	.	.
HIERACIUM ALBIFLORUM	13	T	.	.	T	.	.	.	.	.	.	.
CAPSELLA BURSA-PASTORIS	13	T	T	T	.	.	.	.	.	.	.	.
VIOLA ORBICULATA	7	T	T	.	.	.	.	.	.	.	.	.
ANEMONE LYALLII	7	T	.	.	.	.	.	.	.	.	T	.
SMILACINA RACEMOSA	7	T	.	.	.	.	.	.	.	.	.	.

TABLE 4A. PART 1. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 1	3	12	18	20	21	104	106	107	142
FORB SPECIES CONTINUED												
SMILACINA STELLATA	7	T	.	.	T	.	.	.	.	.	.	.
DISPORUM SMITHII	7	T	.	T	.	.	.	.	.	.	.	.
ASARUM CAUDATUM	7	T	.	.	.	.	.	.	.	.	.	T
MONOTROPA HYPOPITYS	7	T	.	.	.	.	.	.	.	.	T	.
SENECIO BOLANDERI	7	T	.	.	.	.	.	.	.	.	.	.
DISPORUM HOOKERI	7	T	T	.	.	.	.	.	.	.	.	.

TABLE 4A. PART 2. STAND TABLE FOR THE TSHE- BENE C.T. .

SPECIES	PLOT LABELS				
	151	152	153	155	161
TOTAL OVERSTORY COVER					
PSEUDOTSUGA MENZIESII	90	50	20	60	50
TSUGA HETEROPHYLLA	3	25	70	25	.
THUJA PLICATA	.	25	10	35	.
CORNUS NUTTALLII	.	.	6	.	1
CHRYSOLEPIS CHRYSOPHYLLA	.	.	T	.	35
TAXUS BREVIFOLIA	.	.	.	.	.
RHAMNUS PURSHIANA	.	.	.	.	T
ABIES GRANDIS	.	.	.	.	.
ACER MACROPHYLLUM	.	.	.	.	.
ARBUTUS MENZIESII	.	.	.	.	7
ACER GLABRUM DOUGLASII	.	.	.	.	.
CALOCEDRUS DECURRENS	.	.	.	.	1
TSUGA MERTENSIANA	.	.	.	.	.
ABIES AMABILIS	.	.	T	.	.
PINUS MONTICOLA	.	.	.	.	.
> 1M DBH SIZE CLASS					
PSEUDOTSUGA MENZIESII	.	.	7	25	20
3 - 10 DM DBH SIZE CLASS					
PSEUDOTSUGA MENZIESII	85	50	8	35	20
THUJA PLICATA	.	15	10	15	.
TSUGA HETEROPHYLLA	.	25	50	.	.
1 - 3 DM DBH SIZE CLASS					
TSUGA HETEROPHYLLA	3	.	20	24	.
PSEUDOTSUGA MENZIESII	10	1	5	.	25
THUJA PLICATA	.	10	.	20	.
CHRYSOLEPIS CHRYSOPHYLLA	.	.	.	.	35
TAXUS BREVIFOLIA	.	.	.	.	.

TABLE 4A. PART 2. CONTINUED.

SPECIES	PLOT LABELS 151	152	153	155	161
1 - 3 DM DBH SIZE CLASS CONTINUED					
CORNUS NUTTALLI	.	.	.	.	.
ABIES GRANDIS	.	.	.	.	.
ARBUTUS MENZIESII	.	.	.	.	7
< 1DM DBH AND > 1M SIZE CLASS					
TSUGA HETEROPHYLLA	.	1	3	1	.
THUJA PLICATA	.	1	.	2	.
CORNUS NUTTALLI	.	.	6	.	.
PSEUDOTSUGA MENZIESII	.	1	.	.	5
ACER MACROPHYLLUM	.	.	.	.	.
ACER GLABRUM DOUGLASII	.	.	.	.	.
CALOCEDRUS DECURRENS	.	.	.	.	1
TAXUS BREVIFOLIA	.	.	.	.	.
TSUGA MERTENSIANA	.	.	.	.	.
< 1 M TALL SIZE CLASS					
TSUGA HETEROPHYLLA	.	.	.	T	.
THUJA PLICATA	.	T	.	.	.
CHRYSOLEPIS CHRYSOPHYLLA	.	.	T	.	.
CORNUS NUTTALLI	.	.	.	.	1
TAXUS BREVIFOLIA	.	.	.	.	.
PSEUDOTSUGA MENZIESII	.	T	.	.	.
ACER MACROPHYLLUM	.	.	.	.	.
ABIES AMABILIS	.	.	T	.	.
ACER GLABRUM DOUGLASII	.	.	.	.	.
ABIES GRANDIS	.	.	.	.	.
PINUS MONTICOLA	.	.	.	.	.
TALL SHRUB SPECIES					
RHODODENDRON MACROPHYLLUM	.	30	10	2	2

TABLE 4A. PART 2. CONTINUED.

SPECIES	PLOT LABELS 151	152	153	155	161
TALL SHRUB SPECIES CONTINUED					
VACCINIUM PARVIFOLIUM	1	1	.	.	.
ACER CIRCINATUM	3	T	2	.	2
VACCINIUM MEMBRANACEUM	1	.	.	.	.
ROSA GYMNOCARPA	1	.	.	.	T
HOLODISCUS DISCOLOR	1	.	.	.	.
CORYLUS CORNUTA CALIFORNICA	.	.	.	.	.
RUBUS PARVIFLORUS	T	.	.	.	.
ALNUS SINUATA	T	.	.	.	1
AMELANCHIER ALNIFOLIA	.	.	T	.	.
RIBES LACUSTRE	.	.	.	.	.
AMELANCHIER	.	.	.	.	.
LOW SHRUB AND SUB-SHRUB SPECIES					
BERBERIS NERVOSA	20	5	20	9	60
GAULTHERIA SHALLON	40	25	15	1	40
RUBUS URSINUS	1	T	T	T	1
LINNAEA BOREALIS	1	1	1	T	.
CHIMAPHILA UMBELLATA OCCIDENTALIS	T	1	.	T	.
CHIMAPHILA MENZIESII	.	.	.	T	.
SYMPHORICARPOS MOLLIS HESPERIUS	.	.	.	.	5
PACHISTIMA MYRSINITES	T	.	.	.	T
RUBUS NIVALIS	.	.	.	.	.
RUBUS LASIOCOCCUS	.	.	.	.	.
GAULTHERIA OVATIFOLIA	.	.	.	.	.
LONICERA CILIOSA	.	.	.	.	T
GRASS, SEDGE AND RUSH SPECIES					
POACEAE	.	.	.	.	T

TABLE 4A. PART 2. CONTINUED.

SPECIES	PLOT LABELS				
	151	152	153	155	161
FERN, LYCOPOD AND MOSS SPECIES					
PTERIDIUM AQUILINUM	T	T	T	.	3
POLYSTICHUM MUNITUM	T	.	.	T	.
ATHYRIUM FILIX-FEMINA	.	.	.	.	.
FORB SPECIES					
VIOLA SEMPERVIRENS	T	.	T	T	1
ACHLYS TRIPHYLLA	T	.	.	T	T
GOODYERA OBLONGIFOLIA	T	T	T	.	T
ANEMONE DELTOIDEA	T	T	T	T	.
PYROLA ASARIFOLIA	.	T	T	.	.
TRILLIUM OVATUM	.	.	T	.	.
CORNUS CANADENSIS	.	T	.	T	1
PYROLA PICTA	T	T	.	T	.
CLINTONIA UNIFLORA	.	.	.	.	.
TRIENTALIS LATIFOLIA	.	T	.	T	T
TIARELLA TRIFOLIATA UNIFOLIATA	.	.	.	.	.
VANCOUVERIA HEXANDRA	.	.	.	T	.
ADENOCAULON BICOLOR	.	.	.	.	.
LISTERA CORDATA	.	.	.	.	.
CORALLORHIZA MACULATA	.	T	.	.	.
ACTAEA RUBRA	.	.	.	.	T
PYROLA SECUNDA	T	.	.	.	.
GALIUM TRIFLORUM	.	.	.	.	.
OSMORHIZA CHILENSIS	.	.	.	.	T
FRAGARIA VESCA	.	.	.	.	.
HIERACIUM ALBIFLORUM	.	.	.	.	T
CAPSELLA BURSA-PASTORIS	.	.	.	.	.
VIOLA ORBICULATA	.	.	.	.	.
ANEMONE LYALLII	.	.	.	.	.
SMILACINA RACEMOSA	T	.	.	.	.

TABLE 4A. PART 2. CONTINUED.

SPECIES	PLOT LABELS				
	151	152	153	155	161
FORB SPECIES CONTINUED					
SMILACINA STELLATA	.	.	.	.	.
DISPORUM SMITHII	.	.	.	.	.
ASARUM CAUDATUM	.	.	.	.	.
MONOTROPA HYPOPITYS	.	.	.	.	.
SENECIO BOLANDERI	.	T	.	.	.
DISPORUM HOOKERI	.	.	.	.	.

TABLE 4B. STAND TABLE FOR THE TSHE- BENE C.T.- HERB RICH PHASE .

SPECIES	CONS	AVE COVER	PLOT LABELS 13	15	17	41	49	96	102	103	120	146
TOTAL OVERSTORY COVER												
PSEUDOTSUGA MENZIESII	100	60	70	45	25	15	85	80	80	43	85	75
TSUGA HETEROPHYLLA	80	24	5	75	15	.	15	4	3	60	.	15
ABIES GRANDIS	80	11	2	.	15	45	7	2	.	15	T	3
ABIES AMABILIS	60	3	3	3	.	.	T	.	.	4	7	T
PINUS MONTICOLA	50	2	T	5	.	T	.	T	.	.	.	3
TAXUS BREVIFOLIA	50	1	.	1	3	.	.	.	T	2	.	T
CHRYSOLEPIS CHRYSOPHYLLA	50	T	T	T	.	.	.	.	T	T	.	1
THUJA PLICATA	40	10	.	T	35	.	.	.	2	1	.	.
PICEA ENGELMANNII	10	4	.	.	.	.	.	4	.	.	.	.
TSUGA MERTENSIANA	10	1	.	.	.	1	.	.	.	.	.	.
ABIES LASIOCARPA	10	1	.	.	.	1	.	.	.	.	.	.
RHAMNUS PURSHIANA	10	T	.	.	T	.	.	.	.	.	.	.
ACER MACROPHYLLUM	10	T	.	.	T	.	.	.	.	.	.	.
ALNUS RUBRA	10	T	.	.	T	.	.	.	.	.	.	.
PINUS CONTORTA	10	T	.	.	.	T	.	.	.	.	.	.
> 1M DBH SIZE CLASS												
PSEUDOTSUGA MENZIESII	50	34	3	35	20	.	75	.	.	35	.	.
THUJA PLICATA	10	10	.	.	10	.	.	.	.	.	.	.
3 - 10 DM DBH SIZE CLASS												
PSEUDOTSUGA MENZIESII	90	44	65	7	7	10	10	76	70	.	80	75
TSUGA HETEROPHYLLA	30	40	.	65	.	.	.	.	.	45	.	10
ABIES GRANDIS	30	19	.	.	15	35	.	.	.	6	.	.
ABIES AMABILIS	20	5	.	.	.	.	.	.	.	4	5	.
THUJA PLICATA	10	15	.	.	15	.	.	.	.	.	.	.
PICEA ENGELMANNII	10	4	.	.	.	.	.	4	.	.	.	.
PINUS MONTICOLA	10	T	T	.	.	.	.	.	.	.	.	.

TABLE 4B. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 13	15	17	41	49	96	102	103	120	146
1 - 3 DM DBH SIZE CLASS												
TSUGA HETEROPHYLLA	80	11	3	20	15	.	13	1	1	35	.	3
PSEUDOTSUGA MENZIESII	70	6	2	7	.	4	.	4	10	8	5	.
ABIES GRANDIS	40	8	.	.	.	10	5	1	.	15	.	.
THUJA PLICATA	40	5	.	T	15	.	.	.	2	1	.	.
ABIES AMABILIS	30	2	2	3	.	.	.	.	.	.	2	.
PINUS MONTICOLA	20	4	.	5	.	.	.	.	.	.	.	3
TAXUS BREVIFOLIA	20	2	.	.	1	.	.	.	.	2	.	.
< 1DM DBH AND > 1M SIZE CLASS												
TSUGA HETEROPHYLLA	80	2	2	T	T	.	2	3	1	2	.	2
ABIES GRANDIS	40	3	2	.	.	3	2	.	.	.	.	3
ABIES AMABILIS	30	T	1	T	.	.	.	.	.	.	.	T
TAXUS BREVIFOLIA	20	2	.	1	2	.	.	.	.	.	.	.
PSEUDOTSUGA MENZIESII	20	1	.	.	.	1	.	.	.	.	.	1
THUJA PLICATA	10	2	.	.	2	.	.	.	.	.	.	.
TSUGA MERTENSIANA	10	1	.	.	.	1	.	.	.	.	.	.
ABIES LASIOCARPA	10	1	.	.	.	1	.	.	.	.	.	.
ACER MACROPHYLLUM	10	T	.	.	T	.	.	.	.	.	.	.
CHRYSOLEPIS CHRYSOPHYLLA	10	T	.	.	.	.	.	.	.	.	.	T
< 1 M TALL SIZE CLASS												
TSUGA HETEROPHYLLA	70	T	T	T	T	.	.	T	1	1	.	T
ABIES GRANDIS	50	T	T	.	.	.	T	1	.	.	T	T
CHRYSOLEPIS CHRYSOPHYLLA	50	T	T	T	.	.	.	.	T	T	.	1
PINUS MONTICOLA	40	T	T	T	.	T	.	T	.	.	.	.
ABIES AMABILIS	30	T	T	T	.	.	T	.	.	.	.	.
PSEUDOTSUGA MENZIESII	20	T	.	.	.	.	.	T	.	.	T	.
TAXUS BREVIFOLIA	20	T	.	.	.	.	.	.	T	.	.	T
PICEA ENGELMANNII	10	T	.	.	.	.	.	T	.	.	.	.
TSUGA MERTENSIANA	10	T	.	.	.	T	.	.	.	.	.	.

TABLE 4B. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 13	15	17	41	49	96	102	103	120	146
< 1 M TALL SIZE CLASS CONTINUED												
ACER MACROPHYLLUM	10	T	.	.	T	.	.	.	.	.	.	.
THUJA PLICATA	10	T	.	.	T	.	.	.	.	.	.	.
PINUS CONTORTA	10	T	.	.	.	T	.	.	.	.	.	.
ALNUS RUBRA	10	T	.	.	T	.	.	.	.	.	.	.
TALL SHRUB SPECIES												
VACCINIUM PARVIFOLIUM	70	1	1	T	T	.	.	1	1	T	.	1
ROSA GYMNOCARPA	50	1	.	T	.	.	1	.	1	1	T	.
VACCINIUM MEMBRANACEUM	50	T	T	T	.	.	.	.	T	T	.	T
ACER CIRCINATUM	40	8	.	.	.	.	25	2	5	.	.	T
HOLODISCUS DISCOLOR	30	T	T	.	.	.	1	.	.	T	.	.
RHODODENDRON MACROPHYLLUM	20	2	.	T	.	.	.	3	.	.	.	.
CORYLUS CORNUTA CALIFORNICA	20	1	.	.	T	.	.	2	.	.	.	.
RUBUS PARVIFLORUS	20	T	.	.	T	.	.	.	T	.	.	.
SORBUS SITCHENSIS	10	T	.	.	.	.	.	.	.	.	T	.
RIBES SANGUINEUM	10	T	.	.	T	.	.	.	.	.	.	.
LOW SHRUB AND SUB-SHRUB SPECIES												
BERBERIS NERVOSA	100	17	40	15	5	10	5	40	15	15	2	25
RUBUS URSINUS	90	1	T	T	1	2	.	1	2	T	3	T
LINNAEA BOREALIS	80	6	10	T	15	.	3	5	10	3	.	5
CHIMAPHILA UMBELLATA OCCIDENTALIS	80	6	20	T	.	3	10	.	7	3	T	2
PACHISTIMA MYRSINITES	50	T	T	.	.	T	.	.	1	.	1	T
SYMPHORICARPOS MOLLIS HESPERIUS	50	T	T	T	.	.	T	T	.	T	.	.
CHIMAPHILA MENZIESII	50	T	T	.	.	T	T	.	T	T	.	.
RUBUS LASIOCOCCUS	40	1	3	.	.	1	.	.	.	.	T	T
GAULTHERIA OVATIFOLIA	30	1	1	.	.	.	.	.	T	.	.	2
GAULTHERIA SHALLON	20	T	.	.	.	.	.	T	T	.	.	.
RUBUS NIVALIS	10	T	.	.	.	.	.	.	.	T	.	.

TABLE 4B. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 13	15	17	41	49	96	102	103	120	146
GRASS, SEDGE AND RUSH SPECIES												
TRISETUM CANESCENS	40	T	T	.	.	T	T	T	.	.	.	.
POACEAE	30	T	T	.	.	.	.	.	.	.	T	T
LUZULA PARVIFLORA	10	T	.	.	T	.	.	.	.	.	.	.
FERN, LYCOPOD AND MOSS SPECIES												
PTERIDIUM AQUILINUM	80	2	1	T	.	6	1	4	5	T	T	.
POLYSTICHUM MUNITUM	30	1	.	.	1	.	.	1	.	1	.	.
FORB SPECIES												
ANEMONE DELTOIDEA	100	1	T	T	2	1	3	T	T	T	T	T
ACHLYS TRIPHYLLA	90	10	30	T	T	T	40	15	1	1	.	T
TRILLIUM OVATUM	80	T	T	T	T	T	T	.	T	T	.	T
VIOLA SEMPERVIRENS	70	3	3	.	5	.	3	3	5	2	.	T
FRAGARIA VESCA	70	1	1	.	.	T	3	T	1	.	T	1
TIARELLA TRIFOLIATA UNIFOLIATA	70	1	T	T	1	.	3	T	1	1	.	.
CORNUS CANADENSIS	60	12	20	1	.	.	.	T	20	3	.	30
TRIENTALIS LATIFOLIA	60	1	T	.	T	.	3	T	T	.	1	.
ADENOCAULON BICOLOR	60	T	T	.	T	.	T	1	1	.	.	T
HIERACIUM ALBIFLORUM	60	T	T	.	T	.	T	T	T	.	1	.
GOODYERA OBLONGIFOLIA	60	T	T	.	T	.	T	T	.	T	.	T
CLINTONIA UNIFLORA	50	3	.	T	10	.	.	T	3	.	T	.
GALIUM TRIFLORUM	50	T	T	.	T	T	T	T	.	.	.	.
PYROLA SECUNDA	40	1	.	.	.	5	.	.	T	T	T	.
PYROLA PICTA	40	T	T	.	.	T	.	.	.	T	T	.
CAMPANULA SCOULERI	40	T	T	.	T	T	.	T	.	.	.	.
OSMORHIZA CHILENSIS	40	T	T	.	.	.	T	T	.	.	.	T
CORALLORHIZA MACULATA	40	T	.	.	.	T	T	.	.	T	T	.
SMILACINA STELLATA	30	20	.	.	60	.	T	.	.	T	.	.
ASARUM CAUDATUM	30	T	.	.	T	.	T	.	.	T	.	.
XEROPHYLLUM TENAX	20	1	.	.	.	2	.	.	.	.	.	T

TABLE 4B. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 13	15	17	41	49	96	102	103	120	146
FORB SPECIES CONTINUED												
VANCOUVERIA HEXANDRA	20	1	.	.	1	.	.	.	.	T	.	.
SENECIO BOLANDERI	20	1	.	.	.	.	1	.	.	T	.	.
LILIUM COLUMBIANUM	20	1	.	.	.	T	.	.	.	.	1	.
ARENARIA MACROPHYLLA	20	T	.	.	.	T	.	.	.	.	T	.
ANEMONE LYALLII	20	T	.	T	.	T	.	.	.	.	.	.
UNKNOWN SPECIES	10	T	.	.	.	.	.	.	.	.	T	.
ANTENNARIA LANATA	10	T	.	.	.	.	T	.	.	.	.	.
VIOLA GLABELLA	10	T	.	.	.	.	T	.	.	.	.	.
VIOLA ORBICULATA	10	T	.	T	.	.	.	.	.	.	.	.
SATUREJA DOUGLASII	10	T	.	.	.	.	T	.	.	.	.	.
ARUNCUS SYLVESTER	10	T	.	.	T	.	.	.	.	.	.	.
PYROLA ASARIFOLIA	10	T	.	T	.	.	.	.	.	.	.	.
LOTUS	10	T	.	.	.	.	T	.	.	.	.	.
TELLIMA GRANDIFLORA	10	T	.	.	T	.	.	.	.	.	.	.
STREPTOPUS AMPLEXIFOLIUS	10	T	.	.	T	.	.	.	.	.	.	.
PLEURICOSPORA FIMBRIOLATA	10	T	.	.	.	.	T	.	.	.	.	.
ACTAEA RUBRA	10	T	.	.	T	.	.	.	.	.	.	.
MONTIA SIBIRICA	10	T	.	.	T	.	.	.	.	.	.	.
GALIUM APARINE	10	T	.	.	T	.	.	.	.	.	.	.

TABLE 5. STE FOR THE TSHE- RHMA- GASH C.T. .

SPECIES	CONS	AVE COVER	PLOT LABELS 16	105	154	157
TOTAL OVERSTORY						
TSUGA HETEROPHYLLA	100	49	55	22	80	40
PSEUDOTSUGA MENZIES	100	23	30	20	7	35
THUJA PLICATA	100	17	15	18	20	15
CORNUS NUTTALLII	75	2	T	1	4	.
PINUS LAMBERTIANA	50	8	.	8	7	.
TAXUS BREVIFOLIA	50	1	.	1	.	T
CHRYSOLEPIS CHRYSOP	25	T	.	T	.	.
> 1M DBH SIZE CL						
PSEUDOTSUGA MENZIES	50	19	30	.	7	.
PINUS LAMBERTIANA	50	6	.	5	7	.
3 - 10 DM DBH SI						
TSUGA HETEROPHYLLA	75	37	55	.	30	25
PSEUDOTSUGA MENZIES	50	25	.	15	.	35
THUJA PLICATA	50	8	10	.	.	5
PINUS LAMBERTIANA	25	3	.	3	.	.
1 - 3 DM DBH SIZ						
TSUGA HETEROPHYLLA	100	22	6	20	50	10
THUJA PLICATA	100	7	5	15	5	4
PSEUDOTSUGA MENZIES	25	5	.	5	.	.
< 1DM DBH AND > CLASS						
THUJA PLICATA	100	7	3	3	15	5
TSUGA HETEROPHYLLA	100	6	3	1	5	15
CORNUS NUTTALLI	50	3	.	1	4	.
CHRYSOLEPIS CHRYSOP	25	T	.	T	.	.
TAXUS BREVIFOLIA	25	T	.	.	.	T

TABLE 5. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 16	105	154	157
< 1 M TALL SIZE CLASS						
TSUGA HETEROPHYLLA	100	1	T	1	T	2
THUJA PLICATA	75	T	T	T	.	1
TAXUS BREVIFOLIA	25	1	.	1	.	.
CHRYSOLEPIS CHRYSOPHYLLA	25	T	.	T	.	.
CORNUS NUTTALLI	25	T	T	.	.	.
TALL SHRUB SPECIES						
RHODODENDRON MACROPHYLLUM	100	26	25	25	3	50
VACCINIUM PARVIFOLIUM	50	T	T	.	T	.
VACCINIUM MEMBRANACEUM	50	T	T	T	.	.
ACER CIRCINATUM	25	10	10	.	.	.
AMELANCHIER ALNIFOLIA	25	T	.	.	T	.
LOW SHRUB AND SUB-SHRUB SPECIES						
GAULTHERIA SHALLON	100	21	8	15	2	60
BERBERIS NERVOSA	100	3	3	1	5	2
CHIMAPHILA UMBELLATA OCCIDENTALIS	75	1	1	T	.	1
PACHISTIMA MYRSINITES	75	T	.	T	T	T
LINNAEA BOREALIS	50	1	2	.	T	.
CHIMAPHILA MENZIESII	25	T	T	.	.	.
RUBUS URSINUS	25	T	T	.	.	.
FERN, LYCOPOD AND MOSS SPECIES						
PTERIDIUM AQUILINUM	50	T	.	T	T	.
FORB SPECIES						
GOODYERA OBLONGIFOLIA	100	T	T	T	T	T
VIOLA SEMPERVIRENS	50	T	T	.	.	T
PYROLA ASARIFOLIA	50	T	T	T	.	.
ALLOTROPA VIRGATA	50	T	T	T	.	.

TABLE 5. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 16	105	154	157
FORB SPECIES CONTINUED						
XEROPHYLLUM TENAX	25	T	.	T	.	.
PLEURICOSPORA FIMBRIOLATA	25	T	T	.	.	.
LISTERA CORDATA	25	T	T	.	.	.
ACHLYS TRIPHYLLA	25	T	T	.	.	.
CORALLORHIZA MACULATA	25	T	T	.	.	.
DISPORUM SMITHII	25	T	T	.	.	.
PLAGIOBOTHRYS FIGURATUS	25	T	T	.	.	.

TABLE 6. STAND TABLE FOR THE TSHE- RHMA- BENE C.T. .

SPECIES	CONS	AVE COVER	PLOT LABELS 9	56	72	85	97	143	148
TOTAL OVERSTORY COVER									
PSEUDOTSUGA MENZIESII	100	51	75	40	45	20	62	60	55
TSUGA HETEROPHYLLA	86	29	25	75	22	45	6	2	.
CHRYSOLEPIS CHRYSOPHYLLA	86	1	T	T	T	T	6	1	.
ABIES AMABILIS	57	2	.	T	4	5	.	.	T
THUJA PLICATA	43	33	15	25	.	.	.	.	60
ABIES GRANDIS	29	9	.	.	7	10	.	.	.
PINUS MONTICOLA	29	8	T	.	.	.	.	.	15
TSUGA MERTENSIANA	29	6	.	.	1	10	.	.	.
TAXUS BREVIFOLIA	14	2	2	.	.	.	.	.	.
ABIES PROCERA	14	T	.	.	.	.	T	.	.
3 - 10 DM DBH SIZE CLASS									
PSEUDOTSUGA MENZIESII	100	49	70	38	35	20	77	50	50
TSUGA HETEROPHYLLA	57	30	15	60	.	40	3	.	.
THUJA PLICATA	43	22	15	20	.	.	.	.	30
ABIES GRANDIS	29	8	.	.	5	10	.	.	.
PINUS MONTICOLA	14	15	.	.	.	.	.	.	15
TSUGA MERTENSIANA	14	10	.	.	.	10	.	.	.
ABIES AMABILIS	14	5	.	.	.	5	.	.	.
1 - 3 DM DBH SIZE CLASS									
PSEUDOTSUGA MENZIESII	86	7	10	2	10	.	5	10	5
TSUGA HETEROPHYLLA	71	13	7	30	20	5	.	2	.
THUJA PLICATA	43	14	2	5	.	.	.	.	35
CHRYSOLEPIS CHRYSOPHYLLA	14	5	.	.	.	.	5	.	.
ABIES AMABILIS	14	2	.	.	2	.	.	.	.
TSUGA MERTENSIANA	14	1	.	.	1	.	.	.	.
< 1DM DBH AND > 1M SIZE CLASS									
TSUGA HETEROPHYLLA	71	4	7	7	2	2	3	.	.

TABLE 6. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 9	56	72	85	97	143	148
< 1DM DBH AND > 1M SIZE CLASS CONTINUED									
THUJA PLICATA	43	3	2	1	.	.	.	.	5
ABIES AMABILIS	29	1	.	T	1	.	.	.	.
TAXUS BREVIFOLIA	14	2	2	.	.	.	.	.	.
ABIES GRANDIS	14	2	.	.	2	.	.	.	.
< 1 M TALL SIZE CLASS									
CHRYSOLEPIS CHRYSOPHYLLA	86	T	T	T	T	T	1	1	.
TSUGA HETEROPHYLLA	57	1	1	1	.	1	T	.	.
ABIES AMABILIS	43	T	.	T	1	.	.	.	T
THUJA PLICATA	43	T	T	1	.	.	.	.	T
ABIES PROCERA	14	T	.	.	.	.	T	.	.
PINUS MONTICOLA	14	T	T	.	.	.	.	.	.
PSEUDOTSUGA MENZIESII	14	T	.	.	.	.	T	.	.
TALL SHRUB SPECIES									
RHODODENDRON MACROPHYLLUM	100	50	25	20	75	80	20	75	55
VACCINIUM MEMBRANACEUM	86	T	T	1	T	1	T	.	T
VACCINIUM PARVIFOLIUM	57	1	T	.	.	.	T	T	3
ACER CIRCINATUM	43	2	.	2	.	.	1	.	3
ROSA GYMNOCARPA	43	1	.	T	.	1	.	.	1
VACCINIUM OVALIFOLIUM	14	2	.	2	.	.	.	.	.
ALNUS SINUATA	14	1	.	.	.	.	.	.	1
RUBUS PARVIFLORUS	14	T	.	.	.	.	T	.	.
LOW SHRUB AND SUB-SHRUB SPECIES									
BERBERIS NERVOSA	100	20	20	5	25	5	50	35	2
CHIMAPHILA UMBELLATA OCCIDENTALIS	100	3	10	1	2	1	5	3	1
LINNAEA BOREALIS	86	3	5	2	T	.	2	3	5
RUBUS URSINUS	86	1	T	T	T	.	3	1	T
PACHISTIMA MYRSINITES	86	1	T	1	1	2	.	T	T

TABLE 6. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 9	56	72	85	97	143	148
LOW SHRUB AND SUB-SHRUB SPECIES	CONTINUED								
GAULTHERIA OVATIFOLIA	71	3	5	2	1	1	.	.	5
RUBUS LASIOCOCCUS	71	T	T	T	T	T	.	.	1
GAULTHERIA SHALLON	43	12	5	.	.	.	20	10	.
RUBUS NIVALIS	29	1	T	.	1	.	.	.	.
SYMPHORICARPOS MOLLIS HESPERIUS	14	T	T	.	.	.	.	.	.
CHIMAPHILA MENZIESII	14	T	T	.	.	.	.	.	.
FERN, LYCOPOD AND MOSS SPECIES									
PTERIDIUM AQUILINUM	86	3	T	T	T	.	7	1	7
POLYSTICHUM MUNITUM	14	T	T	.	.	.	.	.	.
FORB SPECIES									
PYROLA ASARIFOLIA	86	1	T	1	2	2	T	.	1
VIOLA SEMPERVIRENS	71	1	1	T	.	.	2	T	T
CORNUS CANADENSIS	57	14	20	5	.	.	10	.	20
TRILLIUM OVATUM	57	T	T	T	.	T	.	.	1
ACHLYS TRIPHYLLA	57	T	T	T	.	T	.	.	T
TIARELLA TRIFOLIATA UNIFOLIATA	57	T	T	T	.	T	.	.	T
CLINTONIA UNIFLORA	43	2	.	2	.	.	.	T	3
GOODYERA OBLONGIFOLIA	43	T	.	T	T	.	.	.	T
PYROLA SECUNDA	43	T	.	T	.	T	.	.	T
LISTERA CAURINA	43	T	T	T	.	T	.	.	.
GALIUM TRIFLORUM	29	T	T	.	.	.	T	.	.
TRIENTALIS LATIFOLIA	29	T	T	.	.	.	.	.	T
ANEMONE DELTOIDEA	29	T	T	.	.	T	.	.	.
SMILACINA STELLATA	14	1	.	.	.	.	.	.	1
PYROLA PICTA	14	T	.	T	.	.	.	.	.
ADENOCAULON BICOLOR	14	T	T	.	.	.	.	.	.
PEDICULARIS RACEMOSA	14	T	.	T	.	.	.	.	.
ACTAEA RUBRA	14	T	T	.	.	.	.	.	.

TABLE 6. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 9	56	72	85	97	143	148
FORB SPECIES CONTINUED									
MONOTROPA HYPOPITYS	14	T	.	T	.	.	.	.	.
HEMITOMES CONGESTUM	14	T	T	.	.	.	.	.	.
PLAGIOBOTHRYS FIGURATUS	14	T	T	.	.	.	.	.	.

TABLE 7. STAND TABLE FOR THE TSHE- RHMA- LIBO2 C.T. .

SPECIES	CONS	AVE COVER	PLOT LABELS 98	99	100	144	145
TOTAL OVERSTORY COVER							
PSEUDOTSUGA MENZIESII	100	41	45	45	37	35	45
TSUGA HETEROPHYLLA	100	9	3	6	20	5	10
ABIES GRANDIS	100	4	1	16	T	1	2
PINUS MONTICOLA	100	3	5	1	7	T	2
ABIES AMABILIS	60	2	.	.	3	1	1
CHRYSOLEPIS CHRYSOPHYLLA	60	T	T	.	.	T	T
THUJA PLICATA	40	5	.	.	5	.	4
PICEA ENGELMANNII	20	1	.	.	1	.	.
SALIX SCOULERIANA	20	1	1	.	.	.	.
PINUS CONTORTA	20	T	T	.	.	.	.
TAXUS BREVIFOLIA	20	T	.	.	T	.	.
> 1M DBH SIZE CLASS							
PSEUDOTSUGA MENZIESII	20	30	.	.	30	.	.
3 - 10 DM DBH SIZE CLASS							
PSEUDOTSUGA MENZIESII	100	28	35	35	5	20	44
TSUGA HETEROPHYLLA	40	10	.	5	15	.	.
PINUS MONTICOLA	40	3	3	.	3	.	.
ABIES GRANDIS	20	15	.	15	.	.	.
1 - 3 DM DBH SIZE CLASS							
PSEUDOTSUGA MENZIESII	100	8	10	10	2	15	1
TSUGA HETEROPHYLLA	100	4	2	1	7	3	7
PINUS MONTICOLA	60	2	1	1	3	.	.
THUJA PLICATA	40	5	.	.	5	.	4
ABIES AMABILIS	20	2	.	.	2	.	.
PICEA ENGELMANNII	20	1	.	.	1	.	.
ABIES GRANDIS	20	1	.	1	.	.	.

TABLE 7. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 98	99	100	144	145
< 1DM DBH AND > 1M SIZE CLASS							
TSUGA HETEROPHYLLA	100	1	1	T	1	2	2
ABIES GRANDIS	80	1	1	.	T	1	1
PINUS MONTICOLA	60	1	1	.	1	.	1
PSEUDOTSUGA MENZIESII	60	1	1	T	.	1	.
ABIES AMABILIS	40	1	.	.	.	1	1
< 1 M TALL SIZE CLASS							
PINUS MONTICOLA	100	T	T	T	T	T	1
TSUGA HETEROPHYLLA	100	T	T	T	T	T	1
ABIES GRANDIS	80	T	T	T	.	T	1
ABIES AMABILIS	60	T	.	.	1	T	T
CHRYSOLEPIS CHRYSOPHYLLA	60	T	T	.	.	T	T
PSEUDOTSUGA MENZIESII	40	1	T	1	.	.	.
PINUS CONTORTA	20	T	T	.	.	.	.
TAXUS BREVIFOLIA	20	T	.	.	T	.	.
TALL SHRUB SPECIES							
RHODODENDRON MACROPHYLLUM	100	44	15	85	50	65	6
VACCINIUM MEMBRANACEUM	80	1	1	.	2	T	T
ROSA GYMNOCARPA	40	1	T	1	.	.	.
VACCINIUM PARVIFOLIUM	40	1	.	.	.	T	1
ALNUS SINUATA	20	1	.	.	1	.	.
ACER CIRCINATUM	20	1	.	.	.	1	.
RUBUS PARVIFLORUS	20	T	.	.	.	T	.
LOW SHRUB AND SUB-SHRUB SPECIES							
LINNAEA BOREALIS	100	13	5	20	3	20	15
CHIMAPHILA UMBELLATA OCCIDENTALIS	100	3	2	5	2	1	3
RUBUS URSINUS	100	1	T	3	2	T	T
PACHISTIMA MYRSINITES	100	1	1	1	1	1	T

TABLE 7. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 98	99	100	144	145
LOW SHRUB AND SUB-SHRUB SPECIES	CONTINUED						
GAULTHERIA OVATIFOLIA	80	5	2	.	15	1	2
BERBERIS NERVOSA	60	1	1	1	.	.	2
APOCYNUM	40	1	2	T	.	.	.
ARCTOSTAPHYLOS NEVADENSIS	20	1	1	.	.	.	.
RUBUS LASIOCOCCUS	20	1	.	1	.	.	.
LONICERA CILIOSA	20	T	.	.	.	.	T
GAULTHERIA SHALLON	20	T	.	.	.	T	.
FERN, LYCOPOD AND MOSS SPECIES							
PTERIDIUM AQUILINUM	80	2	2	.	2	1	1
FORB SPECIES							
CORNUS CANADENSIS	100	3	T	5	5	1	5
PYROLA ASARIFOLIA	60	1	T	2	1	.	.
VIOLA SEMPERVIRENS	60	T	.	.	1	T	T
FRAGARIA VESCA	60	T	.	T	.	T	T
CLINTONIA UNIFLORA	40	3	.	5	.	1	.
ANEMONE DELTOIDEA	40	T	T	.	.	.	T
VIOLA ORBICULATA	40	T	T	T	.	.	.
GOODYERA OBLONGIFOLIA	40	T	.	.	T	.	T
HIERACIUM ALBIFLORUM	40	T	.	T	.	.	T
XEROPHYLLUM TENAX	20	2	2	.	.	.	.
ASTERACEAE	20	1	1	.	.	.	.
FRAGARIA VIRGINIANA	20	T	T	.	.	.	.
PYROLA SECUNDA	20	T	.	T	.	.	.
SMILACINA STELLATA	20	T	.	T	.	.	.
SENECIO BOLANDERI	20	T	.	.	.	.	T
CORALLORHIZA MACULATA	20	T	.	.	.	T	.
LISTERA CAURINA	20	T	.	T	.	.	.
TRILLIUM OVATUM	20	T	.	.	.	.	T

TABLE 7. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 98	99	100	144	145
FORB SPECIES CONTINUED							
ACHLYS TRIPHYLLA	20	T	.	T	.	.	.
PYROLA PICTA	20	T	.	.	.	T	.

TABLE 11B. STAND TABLE FOR THE ABAM/ TSME- VAME C.T.- XETE PHASE .

SPECIES	CONS	AVE COVER	PLOT LABELS 23	25	33	37	42	43	46	81	115	116
TOTAL OVERSTORY COVER												
ABIES AMABILIS	100	34	71	45	75	1	3	15	2	55	40	30
TSUGA MERTENSIANA	100	25	1	25	4	70	25	45	15	45	4	20
PSEUDOTSUGA MENZIESII	40	14	3	.	.	.	12	.	35	.	.	7
ABIES GRANDIS	30	13	T	.	.	.	25	.	15	.	.	.
PINUS MONTICOLA	30	6	.	T	12	.	.	.	.	.	7	.
PICEA ENGELMANNII	30	2	.	.	.	.	1	.	5	T	.	.
ABIES LASIOCARPA	30	1	.	.	.	.	2	T	1	.	.	.
TSUGA HETEROPHYLLA	10	5	.	.	.	.	5	.	.	.	.	.
PINUS CONTORTA	10	T	.	.	.	.	T	.	.	.	.	.
3 - 10 DM DBH SIZE CLASS												
TSUGA MERTENSIANA	70	28	.	25	.	70	10	25	5	45	.	15
ABIES AMABILIS	50	28	50	15	.	.	.	.	.	40	20	15
PSEUDOTSUGA MENZIESII	40	13	3	.	.	.	10	.	30	.	.	7
PINUS MONTICOLA	20	9	.	.	10	.	.	.	.	.	7	.
ABIES GRANDIS	10	10	.	.	.	.	.	.	10	.	.	.
PICEA ENGELMANNII	10	5	.	.	.	.	.	.	5	.	.	.
1 - 3 DM DBH SIZE CLASS												
ABIES AMABILIS	70	27	50	40	30	.	.	12	.	25	25	7
TSUGA MERTENSIANA	70	9	.	.	1	2	20	20	13	.	4	5
ABIES GRANDIS	20	8	.	.	.	.	12	.	3	.	.	.
PSEUDOTSUGA MENZIESII	20	3	.	.	.	.	1	.	5	.	.	.
ABIES LASIOCARPA	10	1	.	.	.	.	1	.	.	.	.	.
PICEA ENGELMANNII	10	1	.	.	.	.	1	.	.	.	.	.
PINUS MONTICOLA	10	T	.	.	T	.	.	.	.	.	.	.
< 1DM DBH AND > 1M SIZE CLASS												
ABIES AMABILIS	90	9	5	5	45	.	1	3	1	3	5	10
TSUGA MERTENSIANA	50	2	1	.	3	.	3	1	3	.	.	.

TABLE 11B. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 23	25	33	37	42	43	46	81	115	116
< 1DM DBH AND > 1M SIZE CLASS CONTINUED												
ABIES GRANDIS	30	5	T	.	.	.	13	.	2	.	.	.
ABIES LASIOCARPA	30	1	.	.	.	.	1	T	1	.	.	.
PSEUDOTSUGA MENZIESII	20	1	.	.	.	.	1	.	1	.	.	.
PINUS MONTICOLA	10	2	.	.	2	.	.	.	.	.	.	.
TSUGA HETEROPHYLLA	10	2	.	.	.	.	2	.	.	.	.	.
< 1 M TALL SIZE CLASS												
ABIES AMABILIS	100	5	1	7	5	1	2	3	1	4	20	5
TSUGA MERTENSIANA	40	T	T	.	T	.	T	T	.	.	.	.
ABIES LASIOCARPA	20	T	.	.	.	.	.	T	T	.	.	.
PINUS MONTICOLA	20	T	.	T	T	.	.	.	.	.	.	.
TSUGA HETEROPHYLLA	10	3	.	.	.	.	3	.	.	.	.	.
PSEUDOTSUGA MENZIESII	10	T	.	.	.	.	T	.	.	.	.	.
ABIES GRANDIS	10	T	.	.	.	.	T	.	.	.	.	.
PINUS CONTORTA	10	T	.	.	.	.	T	.	.	.	.	.
PICEA ENGELMANNII	10	T	.	.	.	.	.	.	.	T	.	.
TALL SHRUB SPECIES												
VACCINIUM MEMBRANACEUM	100	7	T	10	25	1	T	T	T	10	15	6
VACCINIUM SCOPARIUM	30	T	.	T	T	1	.	.	.	.	.	.
LOW SHRUB AND SUB-SHRUB SPECIES												
RUBUS LASIOCOCCUS	90	1	T	T	T	T	T	.	T	T	1	3
CHIMAPHILA UMBELLATA OCCIDENTALIS	60	1	1	.	.	T	1	.	1	.	1	1
PACHISTIMA MYRSINITES	30	T	T	.	.	.	T	.	T	.	.	.
RUBUS URSINUS	10	1	.	.	.	.	1	.	.	.	.	.
BERBERIS NERVOSA	10	T	.	.	.	.	T	.	.	.	.	.
GAULTHERIA OVATIFOLIA	10	T	T	.	.	.	.	.	.	.	.	.

TABLE 11B. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 23	25	33	37	42	43	46	81	115	116
GRASS, SEDGE AND RUSH SPECIES												
CAREX ROSSII	10	T	.	.	T	.	.	.	.	.	.	.
FERN, LYCOPOD AND MOSS SPECIES												
PTERIDIUM AQUILINUM	10	T	.	.	.	.	T	.	.	.	.	.
POLYSTICHUM MUNITUM	10	T	.	.	.	.	T	.	.	.	.	.
FORB SPECIES												
XEROPHYLLUM TENAX	100	34	60	25	20	5	12	30	50	5	70	60
PYROLA SECUNDA	40	T	.	.	.	T	.	T	T	1	.	.
MONOTROPA HYPOPITYS	40	T	.	T	T	.	T	T	.	.	.	.
ACHLYS TRIPHYLLA	30	1	3	.	.	.	T	.	T	.	.	.
ANEMONE DELTOIDEA	30	T	T	.	.	.	T	.	T	.	.	.
VIOLA ORBICULATA	20	1	.	.	.	.	T	.	1	.	.	.
GOODYERA OBLONGIFOLIA	20	T	T	.	T	.	.	.	.	.	.	.
CLINTONIA UNIFLORA	20	T	T	.	.	.	T	.	.	.	.	.
LILIUM	20	T	T	.	.	.	.	.	T	.	.	.
LISTERA CAURINA	10	T	.	.	.	.	.	.	T	.	.	.
ANEMONE LYALLII	10	T	.	.	.	.	T	.	.	.	.	.
TRILLIUM OVATUM	10	T	.	.	.	.	.	.	T	.	.	.
LILIUM COLUMBIANUM	10	T	.	.	.	.	T	.	.	.	.	.
HIERACIUM ALBIFLORUM	10	T	.	.	.	.	T	.	.	.	.	.
LUPINUS LATIFOLIUS	10	T	.	.	.	.	.	T	.	.	.	.
ANEMONE OREGANA	10	T	T	.	.	.	.	.	.	.	.	.
FRAGARIA VESCA	10	T	.	.	.	.	.	.	T	.	.	.

TABLE 12. STAND TABLE FOR THE ABAM/ TSME- VASC- VAME C.T. .

SPECIES	CONS	AVE COVER	PLOT LABELS 27	32	38	62	63	67	69	78	122
TOTAL OVERSTORY COVER											
TSUGA MERTENSIANA	100	56	50	45	35	50	55	75	65	70	55
ABIES AMABILIS	100	8	1	30	4	3	20	2	9	1	3
ABIES LASIOCARPA	67	5	1	.	9	15	.	T	.	1	1
PINUS MONTICOLA	22	8	.	T	.	.	.	.	.	.	15
PINUS CONTORTA	11	1	.	.	1	.	.	.	.	.	.
> 1M DBH SIZE CLASS											
TSUGA MERTENSIANA	33	7	.	.	.	10	.	.	6	5	.
3 - 10 DM DBH SIZE CLASS											
TSUGA MERTENSIANA	100	47	45	40	35	30	52	55	60	55	50
ABIES AMABILIS	44	6	.	7	1	.	15	.	2	.	.
PINUS MONTICOLA	11	15	.	.	.	.	.	.	.	.	15
ABIES LASIOCARPA	11	10	.	.	.	10	.	.	.	.	.
1 - 3 DM DBH SIZE CLASS											
TSUGA MERTENSIANA	100	10	15	5	3	15	3	25	2	10	15
ABIES AMABILIS	56	6	.	20	1	.	5	.	2	.	1
ABIES LASIOCARPA	22	4	.	.	3	5	.	.	.	.	.
PINUS CONTORTA	11	1	.	.	1	.	.	.	.	.	.
< 1DM DBH AND > 1M SIZE CLASS											
ABIES AMABILIS	89	2	1	5	1	2	1	1	3	1	.
TSUGA MERTENSIANA	56	1	T	.	2	2	.	1	.	.	2
ABIES LASIOCARPA	44	2	1	.	4	.	.	T	.	.	1
< 1 M TALL SIZE CLASS											
ABIES AMABILIS	100	2	T	1	1	1	8	1	2	T	2
TSUGA MERTENSIANA	56	T	T	T	T	.	.	T	.	T	.
ABIES LASIOCARPA	44	1	T	.	2	.	.	.	.	1	T

TABLE 12. CON

SPECIES	CONS	AVE COVER	PLOT LABELS 27	32	38	62	63	67	69	78	122
< 1 M TALL SIZE CINTINUED											
PINUS MONTICOLA	11	T	.	T	.	.	.	.	.	.	.
TALL SHRUB SPECIE											
VACCINIUM SCOPARIUM	100	12	25	15	5	2	5	6	30	3	13
VACCINIUM MEMBRANACE	100	6	15	5	15	T	T	10	7	1	1
LOW SHRUB AND SUB'ECIES											
RUBUS LASIOCOCCUS	67	1	T	T	.	T	T	.	3	T	.
PACHISTIMA MYRSINITE	33	T	T	.	T	.	.	T	.	.	.
CHIMAPHILA UMBELLATATALIS	22	1	.	.	.	.	.	1	.	.	1
VACCINIUM DELICIOSUM	11	T	.	.	.	.	T	.	.	.	.
LUETKEA PECTINATA	11	T	T	.	.	.	.	.	.	.	.
GRASS, SEDGE AND :IES											
LUZULA HITCHCOCKII	22	T	.	.	.	T	.	.	.	T	.
CAREX ROSSII	22	T	T	.	T	.	.	.	.	.	.
JUNCUS PARRYI	11	T	T	.	.	.	.	.	.	.	.
FORB SPECIES											
PYROLA SECUNDA	44	1	.	.	.	T	.	1	T	.	1
MONOTROPA HYPOPITYS	33	T	.	.	T	.	.	T	.	T	.
XEROPHYLLUM TENAX	22	T	.	T	.	.	.	.	.	.	T
LUPINUS LATIFOLIUS	11	T	T	.	.	.	.	.	.	.	.
HEMITOMES CONGESTUM	11	T	.	.	.	.	.	T	.	.	.
ARABIS	11	T	T	.	.	.	.	.	.	.	.

TABLE 13. STAND TABLE FOR THE ABAM/ TSME- RULA C.T .

SPECIES	CONS	AVE COVER	PLOT LABELS 65	75	82
TOTAL OVERSTORY COVER					
ABIES AMABILIS	100	39	6	35	75
TSUGA MERTENSIANA	100	30	43	45	3
ABIES LASIOCARPA	33	10	10	.	.
> 1M DBH SIZE CLASS					
TSUGA MERTENSIANA	33	5	.	5	.
3 - 10 DM DBH SIZE CLASS					
TSUGA MERTENSIANA	100	19	40	15	3
ABIES AMABILIS	67	45	.	30	60
ABIES LASIOCARPA	33	2	2	.	.
1 - 3 DM DBH SIZE CLASS					
ABIES AMABILIS	100	9	3	3	20
TSUGA MERTENSIANA	67	17	3	30	.
ABIES LASIOCARPA	33	5	5	.	.
< 1DM DBH AND > 1M SIZE CLASS					
ABIES AMABILIS	100	2	2	3	2
TSUGA MERTENSIANA	67	3	3	2	.
ABIES LASIOCARPA	33	2	2	.	.
< 1 M TALL SIZE CLASS					
ABIES AMABILIS	100	2	1	2	3
ABIES LASIOCARPA	33	1	1	.	.
TSUGA MERTENSIANA	33	T	T	.	.
TALL SHRUB SPECIES					
VACCINIUM MEMBRANACEUM	100	4	1	10	1
VACCINIUM SCOPARIUM	67	3	5	.	T

TABLE 13. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 65	75	82
LOW SHRUB AND SUB-SHRUB SPECIES					
RUBUS LASIOCOCCUS	100	22	20	10	35
VACCINIUM DELICIOSUM	33	3	.	.	3
GRASS, SEDGE AND RUSH SPECIES					
LUZULA HITCHCOCKII	67	8	T	15	.
POACEAE	33	T	.	T	.
FORB SPECIES					
MITELLA BREWERI	100	2	2	T	3
VIOLA ORBICULATA	100	1	T	T	3
VALERIANA SITCHENSIS	100	T	1	T	T
SENECIO TRIANGULARIS	100	T	T	T	T
ANEMONE DELTOIDEA	100	T	T	T	T
CLINTONIA UNIFLORA	67	8	15	.	T
STREPTOPUS ROSEUS CURVIPES	67	3	T	.	5
PYROLA SECUNDA	67	2	3	.	1
PEDICULARIS RACEMOSA	67	1	1	T	.
TRILLIUM OVATUM	67	T	T	.	T
LISTERA CAURINA	67	T	T	.	T
APIACEAE	67	T	T	.	T
OSMORHIZA CHILENSIS	67	T	T	T	.
TIARELLA TRIFOLIATA UNIFOLIATA	33	T	.	.	T
ACHLYS TRIPHYLLA	33	T	.	.	T
VERATRUM	33	T	T	.	.
ANEMONE LYALLII	33	T	T	.	.
VIOLA GLABELLA	33	T	T	.	.

TABLE 8. PART 1. STAND TABLE FOR THE TSHE/ ABAM- MIXED HERB C.T. .

SPECIES	CONS	AVE COVER	PLOT LABELS 8	14	29	50	51	73	84	101	109	113
TOTAL OVERSTORY COVER												
PSEUDOTSUGA MENZIESII	100	37	40	80	5	35	25	50	15	35	12	20
TSUGA HETEROPHYLLA	94	45	70	30	.	25	60	60	80	35	85	30
THUJA PLICATA	88	24	6	45	.	70	35	35	2	40	20	30
TAXUS BREVIFOLIA	59	4	2	2	.	T	.	4	1	3	.	1
ABIES AMABILIS	47	5	.	.	.	2	3	.	3	10	.	5
PINUS MONTICOLA	35	4	.	T	.	.	.	.	2	.	.	.
ABIES GRANDIS	24	33	.	.	90	.	T	.	.	.	.	.
CHRYSOLEPIS CHRYSOPHYLLA	18	T	T	.	.	.	T	.	.	.	.	.
PICEA ENGELMANNII	6	7	.	.	.	.	.	.	.	.	.	.
PINUS LAMBERTIANA	6	3	.	.	.	.	.	.	.	.	3	.
ABIES LASIOCARPA	6	1	.	.	.	.	.	.	.	.	.	.
ALNUS RUBRA	6	T	.	.	.	.	T	.	.	.	.	.
PINUS CONTORTA	6	T	.	.	T	.	.	.	.	.	.	.
> 1M DBH SIZE CLASS												
PSEUDOTSUGA MENZIESII	41	15	35	.	.	15	15	.	.	.	.	5
THUJA PLICATA	6	5	.	.	.	.	.	.	.	5	.	.
PINUS LAMBERTIANA	6	3	.	.	.	.	.	.	.	.	3	.
3 - 10 DM DBH SIZE CLASS												
PSEUDOTSUGA MENZIESII	100	29	5	75	4	20	10	50	15	30	10	10
THUJA PLICATA	76	19	5	40	.	65	25	30	.	30	5	10
TSUGA HETEROPHYLLA	71	23	30	.	.	.	50	30	5	25	3	15
ABIES GRANDIS	18	35	.	.	80	.	.	.	.	.	.	.
ABIES AMABILIS	18	7	.	.	.	.	.	.	.	7	.	5
PINUS MONTICOLA	18	5	.	.	.	.	.	.	.	.	.	.
1 - 3 DM DBH SIZE CLASS												
TSUGA HETEROPHYLLA	88	28	40	25	.	.	10	30	75	20	85	16
THUJA PLICATA	53	12	.	15	.	7	15	3	.	15	12	20

TABLE 8. PART 1. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 8	14	29	50	51	73	84	101	109	113
1 - 3 DM DBH SIZE CLASS CONTINUED												
PSEUDOTSUGA MENZIESII	53	5	.	10	1	.	.	.	.	5	2	5
ABIES GRANDIS	18	13	.	.	25	.	.	.	.	.	.	.
TAXUS BREVIFOLIA	18	4	.	2	.	.	.	.	.	1	.	.
ABIES AMABILIS	18	4	.	.	.	.	.	.	2	3	.	.
PINUS MONTICOLA	12	3	.	.	.	.	.	.	2	.	.	.
PICEA ENGELMANNII	6	7	.	.	.	.	.	.	.	.	.	.
< 1DM DBH AND > 1M SIZE CLASS												
TSUGA HETEROPHYLLA	94	5	3	6	.	25	2	2	6	1	3	1
THUJA PLICATA	65	3	1	5	.	.	1	3	2	1	4	.
TAXUS BREVIFOLIA	47	3	2	.	.	.	.	4	1	2	.	1
ABIES AMABILIS	24	2	.	.	.	1	2	.	1	.	.	.
PSEUDOTSUGA MENZIESII	6	2	.	.	.	.	.	.	.	.	.	.
ABIES LASIOCARPA	6	1	.	.	.	.	.	.	.	.	.	.
ALNUS RUBRA	6	T	.	.	.	.	T	.	.	.	.	.
< 1 M TALL SIZE CLASS												
TSUGA HETEROPHYLLA	76	T	T	T	.	1	2	T	T	T	T	T
THUJA PLICATA	53	1	T	.	.	.	T	T	.	1	1	.
ABIES AMABILIS	41	T	.	.	.	1	1	.	.	T	.	T
TAXUS BREVIFOLIA	35	T	.	.	.	T	.	T	.	T	.	T
CHRYSOLEPIS CHRYSOPHYLLA	18	T	T	.	.	.	T	.	.	.	.	.
ABIES GRANDIS	12	T	.	.	.	.	T	.	.	.	.	.
PINUS CONTORTA	6	T	.	.	T	.	.	.	.	.	.	.
PINUS MONTICOLA	6	T	.	T	.	.	.	.	.	.	.	.
TALL SHRUB SPECIES												
VACCINIUM PARVIFOLIUM	76	T	T	T	.	1	1	T	.	T	.	T
VACCINIUM MEMBRANACEUM	59	T	T	T	T	.	.	.	.	T	T	T
RHODODENDRON MACROPHYLLUM	47	2	.	2	.	.	.	T	2	.	3	.

TABLE 8. PART 1. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 8	14	29	50	51	73	84	101	109	113
TALL SHRUB SPECIES CONTINUED												
ACER CIRCINATUM	29	T	T	.	.	T	.	.	.	T	.	.
RUBUS SPECTABILIS	6	1	.	.	.	.	1	.	.	.	.	.
AMELANCHIER ALNIFOLIA	6	T	.	.	.	.	.	.	.	.	.	.
ROSA GYMNOCARPA	6	T	.	.	T	.	.	.	.	.	.	.
LOW SHRUB AND SUB-SHRUB SPECIES												
CHIMAPHILA UMBELLATA OCCIDENTALIS	82	1	T	1	T	T	T	.	.	T	T	T
BERBERIS NERVOSA	71	2	T	5	.	T	.	1	2	T	2	.
RUBUS URSINUS	71	T	.	T	T	T	T	T	T	.	T	T
LINNAEA BOREALIS	53	1	T	T	.	T	T	.	.	.	.	T
PACHISTIMA MYRSINITES	47	T	.	T	T	.	.	.	1	.	T	.
RUBUS LASIOCOCCUS	35	T	.	T	T	.	.	.	T	.	.	.
GAULTHERIA OVATIFOLIA	29	2	.	T	.	.	.	.	T	.	.	.
CHIMAPHILA MENZIESII	24	T	T	.	T	T	T	.	.	.	.	.
RUBUS NIVALIS	12	1	T	.	.	.	.	.	.	.	.	.
GAULTHERIA SHALLON	12	T	.	.	.	.	.	.	.	.	T	.
GRASS, SEDGE AND RUSH SPECIES												
POACEAE	6	T	.	.	.	.	T	.	.	.	.	.
FERN, LYCOPOD AND MOSS SPECIES												
PTERIDIUM AQUILINUM	24	1	.	.	.	.	.	.	.	T	T	.
POLYSTICHUM MUNITUM	24	1	.	.	.	1	.	.	T	1	.	.
BLECHNUM SPICANT	12	2	.	.	.	.	3	.	.	T	.	.
ATHYRIUM FILIX-FEMINA	6	5	.	.	.	.	5	.	.	.	.	.
FORB SPECIES												
TIARELLA TRIFOLIATA UNIFOLIATA	59	T	T	.	.	T	1	T	T	T	.	T
TRILLIUM OVATUM	59	T	T	T	.	T	.	T	T	T	.	T
CORNUS CANADENSIS	53	8	T	1	.	.	2	.	.	T	.	3

TABLE 8. PART 1. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 8	14	29	50	51	73	84	101	109	113
FORB SPECIES CONTINUED												
GOODYERA OBLONGIFOLIA	47	T	T	T	.	T	.	.	.	T	T	T
VIOLA SEMPERVIRENS	47	T	T	.	.	1	.	.	.	T	T	.
PYROLA PICTA	47	T	T	T	T	.	.	T	.	.	.	.
PYROLA SECUNDA	35	T	.	T	T	.	.	T	.	.	.	.
SMILACINA STELLATA	29	T	.	.	T	.	1	.	.	T	.	T
PYROLA ASARIFOLIA	29	T	.	T	.	.	.	T	.	.	.	.
CLINTONIA UNIFLORA	18	2	.	.	.	.	T	.	.	.	.	.
ACHLYS TRIPHYLLA	18	2	.	.	.	.	.	.	.	T	.	.
XEROPHYLLUM TENAX	18	T	.	T	T	.	.	.	.	.	.	.
TRIENTALIS LATIFOLIA	18	T	.	.	.	T	.	.	.	.	.	.
CORALLORHIZA MACULATA	18	T	.	T	T	T	.	.	.	.	.	.
ASARUM CAUDATUM	12	T	.	.	.	.	T	.	.	.	.	.
ALLOTROPA VIRGATA	12	T	T	.	.	.	.	.	.	.	T	.
ANEMONE DELTOIDEA	12	T	.	T	T	.	.	.	.	.	.	.
MONOTROPA HYPOPITYS	12	T	T	T	.	.	.	.	.	.	.	.
PLEURICOSPORA FIMBRIOLATA	12	T	.	.	.	T	.	T	.	.	.	.
CORALLORHIZA MERTENSIANA	12	T	T	.	.	.	T	.	.	.	.	.
PLAGIOBOTHRYS FIGURATUS	12	T	T	.	.	T	.	.	.	.	.	.
LISTERA CORDATA	12	T	.	.	.	T	T	.	.	.	.	.
LYSICHITUM AMERICANUM	6	10	.	.	.	.	10	.	.	.	.	.
OXALIS OREGANA	6	1	.	.	.	.	1	.	.	.	.	.
MITELLA OVALIS	6	T	.	.	.	.	T	.	.	.	.	.
VIOLA ORBICULATA	6	T	.	T	.	.	.	.	.	.	.	.
BOYKINIA ELATA	6	T	.	T	.	.	.	.	.	.	.	.
ADENOCAULON BICOLOR	6	T	.	.	.	.	.	.	.	.	.	.
SMILACINA RACEMOSA	6	T	.	.	.	.	.	.	.	.	.	.
ANEMONE LYALLII	6	T	.	T	.	.	.	.	.	.	.	.
PYROLA APHYLLA	6	T	.	.	.	.	.	.	.	.	.	.
PYROLA UNIFLORA	6	T	T	.	.	.	.	.	.	.	.	.
HIERACIUM ALBIFLORUM	6	T	.	.	.	.	.	.	.	.	.	.

TABLE 8. PART 1. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 8	14	29	50	51	73	84	101	109	113
FORB SPECIES CONTINUED												
STREPTOPUS ROSEUS CURVIPES	6	T	.	.	.	T	.	.	.	.	.	.
TRAUTVETTERIA CAROLINIENSIS OCCIDENTA	6	T	.	.	T	.	.	.	.	.	.	.
ANTENNARIA LANATA	6	T	.	.	T	.	.	.	.	.	.	.
HEMITOMES CONGESTUM	6	T	.	.	.	T	.	.	.	.	.	.

TABLE 8. PART 2. STAND TABLE FOR THE TSHE/ ABAM- MIXED HERB C.T. .

SPECIES	PLOT LABELS						
	114	128	129	130	131	147	162
TOTAL OVERSTORY COVER							
PSEUDOTSUGA MENZIESII	30	45	40	65	20	85	25
TSUGA HETEROPHYLLA	30	45	20	30	78	15	30
THUJA PLICATA	15	3	35	10	2	.	15
TAXUS BREVIFOLIA	.	1	1	.	.	.	20
ABIES AMABILIS	T	.	.	.	.	10	10
PINUS MONTICOLA	3	5	.	.	7	4	.
ABIES GRANDIS	.	.	.	.	.	15	25
CHRYSOLEPIS CHRYSOPHYLLA	.	.	.	.	.	T	.
PICEA ENGELMANNII	.	.	.	.	.	7	.
PINUS LAMBERTIANA	.	.	.	.	.	.	.
ABIES LASIOCARPA	.	.	.	.	.	1	.
ALNUS RUBRA	.	.	.	.	.	.	.
PINUS CONTORTA	.	.	.	.	.	.	.
> 1M DBH SIZE CLASS							
PSEUDOTSUGA MENZIESII	10	.	10	15	.	.	.
THUJA PLICATA	.	.	.	.	.	.	.
PINUS LAMBERTIANA	.	.	.	.	.	.	.
3 - 10 DM DBH SIZE CLASS							
PSEUDOTSUGA MENZIESII	15	45	30	55	10	83	20
THUJA PLICATA	2	3	25	8	.	.	5
TSUGA HETEROPHYLLA	20	40	13	.	20	.	25
ABIES GRANDIS	.	.	.	.	.	5	20
ABIES AMABILIS	.	.	.	.	.	.	10
PINUS MONTICOLA	3	5	.	.	7	.	.
1 - 3 DM DBH SIZE CLASS							
TSUGA HETEROPHYLLA	15	4	4	25	55	5	5
THUJA PLICATA	13	.	.	.	.	.	7

TABLE 8. PART 2. CONTINUED.

SPECIES	PLOT LABELS 114	128	129	130	131	147	162
1 - 3 DM DBH SIZE CLASS CONTINUED							
PSEUDOTSUGA MENZIESII	6	.	.	.	10	5	5
ABIES GRANDIS	.	.	.	.	.	10	5
TAXUS BREVIFOLIA	.	.	.	.	.	.	10
ABIES AMABILIS	.	.	.	.	.	6	.
PINUS MONTICOLA	.	.	.	.	.	4	.
PICEA ENGELMANNII	.	.	.	.	.	7	.
< 1DM DBH AND > 1M SIZE CLASS							
TSUGA HETEROPHYLLA	2	1	3	5	3	10	5
THUJA PLICATA	T	.	10	2	.	.	3
TAXUS BREVIFOLIA	.	1	1	.	.	.	10
ABIES AMABILIS	.	.	.	.	.	4	.
PSEUDOTSUGA MENZIESII	.	.	.	.	.	2	.
ABIES LASIOCARPA	.	.	.	.	.	1	.
ALNUS RUBRA	.	.	.	.	.	.	.
< 1 M TALL SIZE CLASS							
TSUGA HETEROPHYLLA	T	T	.	.	.	1	1
THUJA PLICATA	T	.	T	.	2	.	1
ABIES AMABILIS	T	.	.	.	.	T	T
TAXUS BREVIFOLIA	.	T	.	.	.	.	1
CHRYSOLEPIS CHRYSOPHYLLA	.	.	.	.	.	T	.
ABIES GRANDIS	.	.	.	.	.	.	T
PINUS CONTORTA	.	.	.	.	.	.	.
PINUS MONTICOLA	.	.	.	.	.	.	.
TALL SHRUB SPECIES							
VACCINIUM PARVIFOLIUM	T	1	T	.	T	2	T
VACCINIUM MEMBRANACEUM	T	.	.	.	T	T	T
RHODODENDRON MACROPHYLLUM	.	2	1	.	.	3	3

TABLE 8. PART 2. CONTINUED.

SPECIES	PLOT LABELS						
	114	128	129	130	131	147	162
TALL SHRUB SPECIES CONTINUED							
ACER CIRCINATUM	.	.	.	.	T	1	.
RUBUS SPECTABILIS	.	.	.	.	.	.	.
AMELANCHIER ALNIFOLIA	.	.	.	.	.	T	.
ROSA GYMNOCARPA	.	.	.	.	.	.	.
LOW SHRUB AND SUB-SHRUB SPECIES							
CHIMAPHILA UMBELLATA OCCIDENTALIS	1	5	.	T	T	1	T
BERBERIS NERVOSA	.	5	1	.	T	2	1
RUBUS URSINUS	1	T	.	.	.	T	2
LINNAEA BOREALIS	1	2	.	.	.	4	3
PACHISTIMA MYRSINITES	.	T	.	.	T	1	T
RUBUS LASIOCOCCUS	.	1	.	.	.	1	T
GAULTHERIA OVATIFOLIA	3	.	.	.	.	3	2
CHIMAPHILA MENZIESII	.	.	.	.	.	.	.
RUBUS NIVALIS	.	1	.	.	.	.	.
GAULTHERIA SHALLON	.	T	.	.	.	.	.
GRASS, SEDGE AND RUSH SPECIES							
POACEAE	.	.	.	.	.	.	.
FERN, LYCOPOD AND MOSS SPECIES							
PTERIDIUM AQUILINUM	T	.	.	.	.	2	.
POLYSTICHUM MUNITUM	.	.	T	.	.	.	.
BLECHNUM SPICANT	.	.	.	.	.	.	.
ATHYRIUM FILIX-FEMINA	.	.	.	.	.	.	.
FORB SPECIES							
TIARELLA TRIFOLIATA UNIFOLIATA	1	.	.	T	.	.	2
TRILLIUM OVATUM	T	T	.	.	.	.	T
CORNUS CANADENSIS	2	5	.	.	.	60	2

TABLE 8. PART 2. CONTINUED.

SPECIES	PLOT LABELS						
	114	128	129	130	131	147	162
FORB SPECIES CONTINUED							
GOODYERA OBLONGIFOLIA	.	.	.	.	.	1	T
VIOLA SEMPERVIRENS	T	T	T	.	.	T	.
PYROLA PICTA	T	.	T	T	T	.	.
PYROLA SECUNDA	.	T	.	T	T	.	.
SMILACINA STELLATA	.	T	.	.	.	.	.
PYROLA ASARIFOLIA	T	T	.	.	.	.	1
CLINTONIA UNIFLORA	.	2	.	.	.	5	.
ACHLYS TRIPHYLLA	.	5	.	.	.	1	.
XEROPHYLLUM TENAX	1	.	.	.	.	.	.
TRIENTALIS LATIFOLIA	.	.	1	.	.	.	T
CORALLORHIZA MACULATA	.	.	.	.	.	.	.
ASARUM CAUDATUM	T	.	.	.	.	.	.
ALLOTROPA VIRGATA	.	.	.	.	.	.	.
ANEMONE DELTOIDEA	.	.	.	.	.	.	.
MONOTROPA HYPOPITYS	.	.	.	.	.	.	.
PLEURICOSPORA FIMBRIOLATA	.	.	.	.	.	.	.
CORALLORHIZA MERTENSIANA	.	.	.	.	.	.	.
PLAGIOBOTHRYS FIGURATUS	.	.	.	.	.	.	.
LISTERA CORDATA	.	.	.	.	.	.	.
LYSICHITUM AMERICANUM	.	.	.	.	.	.	.
OXALIS OREGANA	.	.	.	.	.	.	.
MITELLA OVALIS	.	.	.	.	.	.	.
VIOLA ORBICULATA	.	.	.	.	.	.	.
BOYKINIA ELATA	.	.	.	.	.	.	.
ADENOCAULON BICOLOR	.	T	.	.	.	.	.
SMILACINA RACEMOSA	.	T	.	.	.	.	.
ANEMONE LYALLII	.	.	.	.	.	.	.
PYROLA APHYLLA	.	T	.	.	.	.	.
PYROLA UNIFLORA	.	.	.	.	.	.	.
HIERACIUM ALBIFLORUM	.	.	.	.	.	.	T

TABLE 8. PART 2. CONTINUED.

SPECIES	PLOT LABELS						
	114	128	129	130	131	147	162
FORB SPECIES CONTINUED							
STREPTOPUS ROSEUS CURVIPES	.	.	.	.	.	.	.
TRAUTVETTERIA CAROLINIENSIS OCCIDENTA	.	.	.	.	.	.	.
ANTENNARIA LANATA	.	.	.	.	.	.	.
HEMITOMES CONGESTUM	.	.	.	.	.	.	.

TABLE 9. STAND TABLE FOR THE TSHE/ ABAM- RHMA- XETE C.T. .

SPECIES	CONS	AVE COVER	PLOT LABELS 6	90	135	136
TOTAL OVERSTORY COVER						
PSEUDOTSUGA MENZIESII	100	29	30	35	20	30
TSUGA HETEROPHYLLA	100	24	30	25	25	15
ABIES AMABILIS	100	7	11	5	5	7
TSUGA MERTENSIANA	100	5	T	4	10	5
CHRYSOLEPIS CHRYSOPHYLLA	75	10	1	20	.	10
PINUS MONTICOLA	50	4	5	3	.	.
PINUS CONTORTA	25	T	T	.	.	.
ABIES GRANDIS	25	T	.	T	.	.
3 - 10 DM DBH SIZE CLASS						
PSEUDOTSUGA MENZIESII	100	26	25	30	20	30
TSUGA HETEROPHYLLA	100	16	15	20	20	10
ABIES AMABILIS	75	5	7	3	.	5
TSUGA MERTENSIANA	75	3	.	2	5	3
PINUS MONTICOLA	25	3	.	3	.	.
1 - 3 DM DBH SIZE CLASS						
TSUGA HETEROPHYLLA	100	6	15	2	3	5
ABIES AMABILIS	100	2	3	1	3	1
TSUGA MERTENSIANA	75	3	.	2	5	2
PSEUDOTSUGA MENZIESII	50	6	7	5	.	.
CHRYSOLEPIS CHRYSOPHYLLA	50	4	.	5	.	3
PINUS MONTICOLA	25	5	5	.	.	.
< 1DM DBH AND > 1M SIZE CLASS						
TSUGA HETEROPHYLLA	100	2	1	3	2	T
CHRYSOLEPIS CHRYSOPHYLLA	75	8	1	15	.	7
ABIES AMABILIS	75	1	T	1	2	.
PINUS MONTICOLA	25	T	T	.	.	.

TABLE 9. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 6	90	135	136
< 1 M TALL SIZE CLASS						
ABIES AMABILIS	100	1	1	T	T	1
TSUGA HETEROPHYLLA	100	T	T	1	T	T
CHRYSOLEPIS CHRYSOPHYLLA	50	2	T	3	.	.
TSUGA MERTENSIANA	50	T	T	.	.	T
PINUS MONTICOLA	25	T	T	.	.	.
ABIES GRANDIS	25	T	.	T	.	.
PINUS CONTORTA	25	T	T	.	.	.
TALL SHRUB SPECIES						
RHODODENDRON MACROPHYLLUM	100	43	70	10	30	60
VACCINIUM MEMBRANACEUM	75	T	T	T	T	.
LOW SHRUB AND SUB-SHRUB SPECIES						
GAULTHERIA OVATIFOLIA	100	5	15	3	1	1
CHIMAPHILA UMBELLATA OCCIDENTALIS	100	2	T	5	T	2
PACHISTIMA MYRSINITES	100	1	T	1	T	1
BERBERIS NERVOSA	75	16	.	20	3	25
LINNAEA BOREALIS	75	4	.	T	1	10
ARCTOSTAPHYLOS NEVADENSIS	25	T	T	.	.	.
RUBUS URSINUS	25	T	.	T	.	.
RUBUS LASIOCOCCUS	25	T	.	.	T	.
FORB SPECIES						
XEROPHYLLUM TENAX	100	36	20	60	25	40
PYROLA ASARIFOLIA	75	T	.	1	T	T
PYROLA SECUNDA	75	T	.	1	T	T
PYROLA PICTA	75	T	T	T	T	.
CORNUS CANADENSIS	25	3	.	.	3	.
LILIUM	25	T	T	.	.	.

TABLE 10. STAND TABLE FOR THE TSHE/ ABAM- XETE C.T. .

SPECIES	CONS	AVE COVER	PLOT LABELS 5	22	89
TOTAL OVERSTORY COVER					
TSUGA HETEROPHYLLA	100	70	70	70	70
PSEUDOTSUGA MENZIESII	100	19	30	13	15
ABIES AMABILIS	100	12	15	T	20
TSUGA MERTENSIANA	100	4	2	7	2
PINUS MONTICOLA	67	1	T	1	.
CHRYSOLEPIS CHRYSOPHYLLA	67	T	T	T	.
3 - 10 DM DBH SIZE CLASS					
TSUGA HETEROPHYLLA	100	47	40	60	40
PSEUDOTSUGA MENZIESII	100	17	29	12	10
ABIES AMABILIS	33	10	.	.	10
1 - 3 DM DBH SIZE CLASS					
TSUGA HETEROPHYLLA	100	32	30	35	30
PSEUDOTSUGA MENZIESII	100	2	1	1	5
ABIES AMABILIS	67	13	15	.	10
TSUGA MERTENSIANA	67	5	.	7	2
PINUS MONTICOLA	33	1	.	1	.
< 1DM DBH AND > 1M SIZE CLASS					
ABIES AMABILIS	67	6	10	.	1
TSUGA HETEROPHYLLA	33	2	.	.	2
TSUGA MERTENSIANA	33	2	2	.	.
PINUS MONTICOLA	33	T	T	.	.
< 1 M TALL SIZE CLASS					
ABIES AMABILIS	100	T	1	T	T
TSUGA HETEROPHYLLA	100	T	T	T	1
CHRYSOLEPIS CHRYSOPHYLLA	67	T	T	T	.

TABLE 10. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 5	22	89
TALL SHRUB SPECIES					
VACCINIUM MEMBRANACEUM	100	T	T	T	T
VACCINIUM PARVIFOLIUM	33	T	T	.	.
ROSA GYMNOCARPA	33	T	T	.	.
LOW SHRUB AND SUB-SHRUB SPECIES					
BERBERIS NERVOSA	100	3	10	T	T
CHIMAPHILA UMBELLATA OCCIDENTALIS	100	T	1	T	T
LINNAEA BOREALIS	100	T	T	T	T
GAULTHERIA OVATIFOLIA	100	T	T	T	T
RUBUS LASIOCOCCUS	100	T	T	T	T
PACHISTIMA MYRSINITES	100	T	T	T	T
RUBUS URSINUS	67	T	T	.	T
GAULTHERIA SHALLON	33	T	T	.	.
FERN, LYCOPOD AND MOSS SPECIES					
PTERIDIUM AQUILINUM	33	T	T	.	.
FORB SPECIES					
XEROPHYLLUM TENAX	100	42	40	50	35
CORNUS CANADENSIS	100	1	3	T	T
GOODYERA OBLONGIFOLIA	67	T	T	T	.
PYROLA PICTA	67	T	T	T	.
VIOLA ORBICULATA	33	T	T	.	.
PYROLA SECUNDA	33	T	.	T	.
TIARELLA TRIFOLIATA UNIFOLIATA	33	T	T	.	.
ANEMONE DELTOIDEA	33	T	T	.	.
ACHLYS TRIPHYLLA	33	T	T	.	.
MONOTROPA HYPOPITYS	33	T	.	T	.

TABLE 11A. PART 1. STAND TABLE FOR THE ABAM/ TSME- VAME C.T. .

SPECIES	CONS	AVE COVER	PLOT LABELS 26	40	44	45	59	60	61	64	66	68
TOTAL OVERSTORY COVER												
ABIES AMABILIS	100	40	50	T	50	2	35	65	71	30	25	60
TSUGA MERTENSIANA	100	26	35	70	16	45	4	20	T	45	82	15
PINUS MONTICOLA	29	3	.	.	.	.	12	T	.	.	T	.
PSEUDOTSUGA MENZIESII	18	10	.	.	.	.	.	.	.	.	.	.
ABIES LASIOCARPA	12	14	.	.	.	7	.	.	.	.	.	.
PINUS CONTORTA	6	T	.	.	.	.	T	.	.	.	.	.
PICEA ENGELMANNII	6	T	.	.	.	.	.	.	.	.	.	.
> 1M DBH SIZE CLASS												
PSEUDOTSUGA MENZIESII	6	10	.	.	.	.	.	.	.	.	.	.
ABIES AMABILIS	6	7	.	.	.	.	.	.	.	.	.	.
TSUGA MERTENSIANA	6	5	.	.	5	.	.	.	.	.	.	.
3 - 10 DM DBH SIZE CLASS												
TSUGA MERTENSIANA	88	27	35	70	11	40	.	20	.	45	80	2
ABIES AMABILIS	76	26	10	.	25	.	10	40	60	.	.	20
PSEUDOTSUGA MENZIESII	12	11	.	.	.	.	.	.	.	.	.	.
ABIES LASIOCARPA	12	6	.	.	.	2	.	.	.	.	.	.
PINUS MONTICOLA	6	3	.	.	.	.	3	.	.	.	.	.
1 - 3 DM DBH SIZE CLASS												
ABIES AMABILIS	88	15	3	.	15	.	22	40	10	5	2	35
TSUGA MERTENSIANA	41	6	.	.	.	15	2	.	.	.	5	13
ABIES LASIOCARPA	12	5	.	.	.	3	.	.	.	.	.	.
PINUS MONTICOLA	12	3	.	.	.	.	5	.	.	.	.	.
< 1DM DBH AND > 1M SIZE CLASS												
ABIES AMABILIS	94	8	25	T	10	1	10	3	.	20	8	3
TSUGA MERTENSIANA	53	1	.	T	.	2	2	.	.	.	1	T
ABIES LASIOCARPA	12	2	.	.	.	1	.	.	.	.	.	.

TABLE 11A. PART 1. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 26	40	44	45	59	60	61	64	66	68
< 1DM DBH AND > 1M SIZE CLASS CONTINUED												
PINUS MONTICOLA	6	3	.	.	.	.	3	.	.	.	.	.
PINUS CONTORTA	6	T	.	.	.	.	T	.	.	.	.	.
< 1 M TALL SIZE CLASS												
ABIES AMABILIS	100	6	30	T	3	1	5	5	1	5	15	2
TSUGA MERTENSIANA	41	T	T	T	.	T	T	T	T	.	T	.
PINUS MONTICOLA	24	T	.	.	.	.	1	T	.	.	T	.
ABIES LASIOCARPA	12	2	.	.	.	1	.	.	.	.	.	.
PINUS CONTORTA	6	T	.	.	.	.	T	.	.	.	.	.
PICEA ENGELMANNII	6	T	.	.	.	.	.	.	.	.	.	.
TALL SHRUB SPECIES												
VACCINIUM MEMBRANACEUM	100	32	3	50	40	12	25	15	3	80	25	35
VACCINIUM SCOPARIUM	29	1	3	1	T	.	.	.	T	.	.	3
SORBUS SITCHENSIS	29	T	T	.	.	.	.	.	.	T	.	.
RIBES LACUSTRE	6	1	.	.	.	.	.	.	.	.	.	.
ROSA GYMNOCARPA	6	1	.	.	.	.	.	.	.	.	.	.
RIBES	6	T	.	.	.	.	.	.	.	.	.	.
SORBUS	6	T	.	T	.	.	.	.	.	.	.	.
LOW SHRUB AND SUB-SHRUB SPECIES												
RUBUS LASIOCOCCUS	94	3	T	T	1	4	.	3	2	5	2	T
CHIMAPHILA UMBELLATA OCCIDENTALIS	41	2	.	.	.	1	5	.	.	.	1	.
PACHISTIMA MYRSINITES	35	1	.	.	.	.	T	.	T	.	.	.
GAULTHERIA OVATIFOLIA	12	2	.	.	.	.	.	.	.	.	.	.
PHYLLODOCE EMPETRIFORMIS	6	T	.	T	.	.	.	.	.	.	.	.
GRASS, SEDGE AND RUSH SPECIES												
CAREX ROSSII	18	T	.	.	.	T	.	.	T	.	.	.
LUZULA HITCHCOCKII	6	T	.	T	.	.	.	.	.	.	.	.

TABLE 11A. PART 1. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 26	40	44	45	59	60	61	64	66	68
FERN, LYCOPOD AND MOSS SPECIES												
POLYSTICHUM MUNITUM	6	T	.	.	.	.	.	.	.	.	.	.
PTERIDIUM AQUILINUM	6	T	.	.	.	.	.	.	.	.	.	.
FORB SPECIES												
PYROLA SECUNDA	82	1	.	.	.	4	1	1	1	T	1	T
CLINTONIA UNIFLORA	41	2	.	.	.	.	.	T	.	.	T	.
XEROPHYLLUM TENAX	35	2	.	.	.	6	T	.	.	.	1	.
VIOLA ORBICULATA	35	1	.	.	.	4	.	.	T	.	T	.
ACHLYS TRIPHYLLA	29	1	.	.	.	.	.	.	.	.	.	.
MONOTROPA HYPOPITYS	29	T	T	.	.	.	T	T	.	.	T	T
SMILACINA STELLATA	24	T	.	.	.	T	.	T	.	.	.	.
PEDICULARIS RACEMOSA	18	T	.	.	.	.	.	.	.	.	T	.
LISTERA CAURINA	18	T	.	.	.	T	.	T	.	.	.	.
GOODYERA OBLONGIFOLIA	12	2	.	.	.	.	.	.	.	.	.	.
TIARELLA TRIFOLIATA UNIFOLIATA	12	1	.	.	.	.	.	.	.	.	.	.
ANEMONE DELTOIDEA	12	1	.	.	.	T	.	.	.	.	.	.
TRILLIUM OVATUM	12	1	.	.	.	.	.	.	.	.	.	.
VIOLA SEMPERVIRENS	12	1	.	.	.	.	.	.	.	.	.	.
SMILACINA RACEMOSA	12	T	.	.	.	.	.	.	.	.	.	.
ARNICA CORDIFOLIA	6	5	.	.	.	.	.	.	.	.	.	.
PYROLA ASARIFOLIA	6	1	.	.	.	.	.	.	.	.	.	.
ARENARIA MACROPHYLLA	6	1	.	.	.	.	.	.	.	.	.	.
CIRCAEA ALPINA	6	1	.	.	.	.	.	.	.	.	.	.
MITELLA BREWERI	6	T	.	.	.	.	.	.	.	T	.	.
DICENTRA FORMOSA	6	T	.	.	.	.	.	.	.	.	.	.
STREPTOPUS ROSEUS CURVIPES	6	T	.	.	.	.	.	.	.	.	.	.
HIERACIUM ALBIFLORUM	6	T	.	.	.	.	.	.	.	.	.	.
ANEMONE LYALLII	6	T	.	.	.	T	.	.	.	.	.	.
PYROLA PICTA	6	T	.	.	.	.	.	.	.	.	.	.

TABLE 11A. PART 2. STAND TABLE FOR THE ABAM/ TSME- VAME C.T. .

SPECIES	PLOT LABELS						
	70	80	119	124	125	126	127
TOTAL OVERSTORY COVER							
ABIES AMABILIS	65	65	20	50	30	15	40
TSUGA MERTENSIANA	5	5	5	25	17	25	25
PINUS MONTICOLA	.	.	1	.	T	.	.
PSEUDOTSUGA MENZIESII	.	.	6	.	.	15	10
ABIES LASIOCARPA	.	.	20	.	.	.	.
PINUS CONTORTA	.	.	.	.	.	.	.
PICEA ENGELMANNII	.	T	.	.	.	.	.
> 1M DBH SIZE CLASS							
PSEUDOTSUGA MENZIESII	.	.	.	.	.	.	10
ABIES AMABILIS	.	7	.	.	.	.	.
TSUGA MERTENSIANA	.	.	.	.	.	.	.
3 - 10 DM DBH SIZE CLASS							
TSUGA MERTENSIANA	5	5	3	25	15	24	20
ABIES AMABILIS	55	50	15	10	25	10	8
PSEUDOTSUGA MENZIESII	.	.	6	.	.	15	.
ABIES LASIOCARPA	.	.	10	.	.	.	.
PINUS MONTICOLA	.	.	.	.	.	.	.
1 - 3 DM DBH SIZE CLASS							
ABIES AMABILIS	10	10	4	40	2	5	15
TSUGA MERTENSIANA	.	.	.	.	2	1	5
ABIES LASIOCARPA	.	.	7	.	.	.	.
PINUS MONTICOLA	.	.	1	.	.	.	.
< 1DM DBH AND > 1M SIZE CLASS							
ABIES AMABILIS	2	5	2	3	2	20	20
TSUGA MERTENSIANA	T	T	2	.	.	.	1
ABIES LASIOCARPA	.	.	2	.	.	.	.

TABLE 11A. PART 2. CONTINUED.

SPECIES	PLOT LABELS 70	80	119	124	125	126	127
< 1DM DBH AND > 1M SIZE CLASS CONTINUED							
PINUS MONTICOLA	.	.	.	.	.	.	.
PINUS CONTORTA	.	.	.	.	.	.	.
< 1 M TALL SIZE CLASS							
ABIES AMABILIS	1	3	1	2	1	30	1
TSUGA MERTENSIANA	.	.	.	.	.	.	.
PINUS MONTICOLA	.	.	.	.	T	.	.
ABIES LASIOCARPA	.	.	2	.	.	.	.
PINUS CONTORTA	.	.	.	.	.	.	.
PICEA ENGELMANNII	.	T	.	.	.	.	.
TALL SHRUB SPECIES							
VACCINIUM MEMBRANACEUM	45	25	3	67	80	30	5
VACCINIUM SCOPARIUM	.	.	.	.	.	.	.
SORBUS SITCHENSIS	T	.	.	.	.	T	T
RIBES LACUSTRE	1	.	.	.	.	.	.
ROSA GYMNOCARPA	.	.	1	.	.	.	.
RIBES	.	.	T	.	.	.	.
SORBUS	.	.	.	.	.	.	.
LOW SHRUB AND SUB-SHRUB SPECIES							
RUBUS LASIOCOCCUS	5	2	15	3	1	2	1
CHIMAPHILA UMBELLATA OCCIDENTALIS	.	.	1	.	T	3	2
PACHISTIMA MYRSINITES	3	.	1	.	.	1	T
GAULTHERIA OVATIFOLIA	.	.	.	.	2	2	.
PHYLLODOCE EMPETRIFORMIS	.	.	.	.	.	.	.
GRASS, SEDGE AND RUSH SPECIES							
CAREX ROSSII	.	.	T	.	.	.	.
LUZULA HITCHCOCKII	.	.	.	.	.	.	.

TABLE 11A. PART 2. CONTINUED.

SPECIES	PLOT LABELS						
	70	80	119	124	125	126	127
FERN, LYCOPOD AND MOSS SPECIES							
POLYSTICHUM MUNITUM	T	.	.	.	.	.	.
PTERIDIUM AQUILINUM	.	.	T	.	.	.	.
FORB SPECIES							
PYROLA SECUNDA	2	3	3	1	1	1	1
CLINTONIA UNIFLORA	1	7	1	.	.	3	1
XEROPHYLLUM TENAX	.	T	1	.	.	2	.
VIOLA ORBICULATA	T	T	T	.	.	.	.
ACHLYS TRIPHYLLA	1	1	1	.	.	1	T
MONOTROPA HYPOPITYS	.	.	.	.	.	.	.
SMILACINA STELLATA	.	.	T	.	.	.	T
PEDICULARIS RACEMOSA	T	.	.	.	.	.	T
LISTERA CAURINA	T	.	.	.	.	.	.
GOODYERA OBLONGIFOLIA	3	.	.	.	T	.	.
TIARELLA TRIFOLIATA UNIFOLIATA	.	T	.	.	.	2	.
ANEMONE DELTOIDEA	.	.	2	.	.	.	.
TRILLIUM OVATUM	2	.	T	.	.	.	.
VIOLA SEMPERVIRENS	.	.	.	.	.	1	1
SMILACINA RACEMOSA	.	.	T	.	.	T	.
ARNICA CORDIFOLIA	5	.	.	.	.	.	.
PYROLA ASARIFOLIA	.	.	.	.	.	1	.
ARENARIA MACROPHYLLA	.	.	1	.	.	.	.
CIRCAEA ALPINA	.	.	1	.	.	.	.
MITELLA BREWERI	.	.	.	.	.	.	.
DICENTRA FORMOSA	T	.	.	.	.	.	.
STREPTOPUS ROSEUS CURVIPES	.	T	.	.	.	.	.
HIERACIUM ALBIFLORUM	T	.	.	.	.	.	.
ANEMONE LYALLII	.	.	.	.	.	.	.
PYROLA PICTA	.	.	T	.	.	.	.

TABLE 14. STAND TABLE FOR THE ABAM/ TSME- ACTR C.T. .

SPECIES	CONS	AVE COVER	PLOT LABELS 34	47	71	79	117
TOTAL OVERSTORY COVER							
PSEUDOTSUGA MENZIESII	100	29	22	2	35	7	80
ABIES AMABILIS	100	19	10	1	40	20	25
TSUGA MERTENSIANA	80	16	25	10	.	25	5
TSUGA HETEROPHYLLA	60	22	20	T	45	.	.
PICEA ENGELMANNII	60	8	8	7	.	10	.
ABIES GRANDIS	40	23	.	45	.	.	1
ABIES LASIOCARPA	20	2	.	2	.	.	.
PINUS MONTICOLA	20	T	.	T	.	.	.
> 1M DBH SIZE CLASS							
PSEUDOTSUGA MENZIESII	40	25	.	.	35	.	15
ABIES GRANDIS	20	15	.	15	.	.	.
TSUGA HETEROPHYLLA	20	15	.	.	15	.	.
3 - 10 DM DBH SIZE CLASS							
PSEUDOTSUGA MENZIESII	80	23	20	1	.	7	65
TSUGA MERTENSIANA	60	12	20	7	.	8	.
ABIES AMABILIS	60	8	5	.	10	10	.
PICEA ENGELMANNII	60	6	4	3	.	10	.
ABIES GRANDIS	20	30	.	30	.	.	.
TSUGA HETEROPHYLLA	20	25	.	.	25	.	.
1 - 3 DM DBH SIZE CLASS							
ABIES AMABILIS	80	16	1	.	35	5	23
TSUGA MERTENSIANA	80	7	5	1	.	17	5
TSUGA HETEROPHYLLA	40	15	20	.	10	.	.
PICEA ENGELMANNII	40	4	4	3	.	.	.
PSEUDOTSUGA MENZIESII	40	2	2	1	.	.	.
ABIES GRANDIS	20	5	.	5	.	.	.

TABLE 14. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 34	47	71	79	117
< 1DM DBH AND > 1M SIZE CLASS							
ABIES AMABILIS	100	3	3	1	5	3	2
TSUGA MERTENSIANA	60	2	3	2	.	1	.
ABIES GRANDIS	40	2	.	2	.	.	1
PICEA ENGELMANNII	40	1	1	1	.	.	.
TSUGA HETEROPHYLLA	40	1	1	.	1	.	.
ABIES LASIOCARPA	20	1	.	1	.	.	.
< 1 M TALL SIZE CLASS							
ABIES AMABILIS	100	1	1	T	T	2	1
TSUGA MERTENSIANA	80	T	T	T	.	T	T
PICEA ENGELMANNII	60	T	T	T	.	T	.
TSUGA HETEROPHYLLA	40	1	.	T	1	.	.
ABIES LASIOCARPA	20	1	.	1	.	.	.
PSEUDOTSUGA MENZIESII	20	T	T	.	.	.	.
PINUS MONTICOLA	20	T	.	T	.	.	.
TALL SHRUB SPECIES							
VACCINIUM MEMBRANACEUM	80	1	1	.	T	2	T
VACCINIUM OVALIFOLIUM	20	1	1	.	.	.	.
RIBES	20	T	.	.	.	T	.
LOW SHRUB AND SUB-SHRUB SPECIES							
CHIMAPHILA UMBELLATA OCCIDENTALIS	100	7	5	7	1	1	20
RUBUS LASIOCOCCUS	100	4	T	T	T	15	3
LINNAEA BOREALIS	60	2	5	.	T	.	1
RUBUS URSINUS	60	T	T	.	T	.	1
BERBERIS NERVOSA	40	T	T	.	.	.	T
PACHISTIMA MYRSINITES	40	T	.	T	.	.	T
GAULTHERIA OVATIFOLIA	20	10	10	.	.	.	.
SYMPHORICARPOS MOLLIS HESPERIUS	20	T	.	T	.	.	.

TABLE 14. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 34	47	71	79	117
LOW SHRUB AND SUB-SHRUB SPECIES	CONTINUED						
CHIMAPHILA MENZIESII	20	T	.	T	.	.	.
GRASS, SEDGE AND RUSH SPECIES							
POACEAE	60	T	.	T	.	T	T
MELICA	20	T	T	.	.	.	.
CAREX ROSSII	20	T	.	.	.	T	.
FERN, LYCOPOD AND MOSS SPECIES							
PTERIDIUM AQUILINUM	60	1	1	.	.	3	T
FORB SPECIES							
ACHLYS TRIPHYLLA	100	11	20	1	1	2	30
TRILLIUM OVATUM	100	T	T	T	T	1	T
ANEMONE DELTOIDEA	100	T	T	T	T	T	T
VIOLA ORBICULATA	80	1	1	1	T	3	.
PYROLA SECUNDA	80	1	T	T	1	1	.
TIARELLA TRIFOLIATA UNIFOLIATA	80	1	T	T	1	1	.
HIERACIUM ALBIFLORUM	80	T	T	1	.	T	T
CAMPANULA SCOULERI	60	3	T	10	.	T	.
XEROPHYLLUM TENAX	60	2	5	1	.	.	1
CLINTONIA UNIFLORA	60	2	3	.	T	2	.
CORNUS CANADENSIS	60	T	T	.	1	.	T
SMILACINA STELLATA	60	T	.	T	T	T	.
GALIUM TRIFLORUM	60	T	.	T	.	T	T
ANEMONE LYALLII	60	T	T	T	.	.	T
LISTERA CAURINA	60	T	T	T	.	T	.
GALIUM	40	1	T	.	.	1	.
PEDICULARIS RACEMOSA	40	T	.	T	.	T	.
FRAGARIA VESCA	40	T	T	.	.	T	.
TRAUTVETTERIA CAROLINIENSIS OCCIDENTA	20	5	.	5	.	.	.

TABLE 14. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 34	47	71	79	117
FORB SPECIES CONTINUED							
OSMORHIZA CHILENSIS	20	T	.	.	.	T	.
VIOLA SEMPERVIRENS	20	T	.	.	.	.	T
GOODYERA OBLONGIFOLIA	20	T	.	T	.	.	.
ARENARIA MACROPHYLLA	20	T	.	.	.	T	.
CORALLORHIZA MERTENSIANA	20	T	.	.	T	.	.
LILIUM COLUMBIANUM	20	T	.	T	.	.	.
PENSTEMON SERRULATUS	20	T	T	.	.	.	.
VIOLA	20	T	.	T	.	.	.
LILIUM	20	T	.	.	.	T	.
TRIENTALIS LATIFOLIA	20	T	.	.	.	.	T
PYROLA PICTA	20	T	.	T	.	.	.
HEMITOMES CONGESTUM	20	T	T	.	.	.	.
PYROLA ASARIFOLIA	20	T	T	.	.	.	.

TABLE 15A. STAND TABLE FOR THE TSME- XETE C.T. .

SPECIES	CONS	AVE COVER	PLOT LABELS 7	91
TOTAL OVERSTORY COVER				
TSUGA MERTENSIANA	100	25	30	20
PSEUDOTSUGA MENZIESII	100	14	20	7
PINUS MONTICOLA	100	11	2	20
TSUGA HETEROPHYLLA	100	11	20	2
ABIES AMABILIS	100	5	8	1
PINUS CONTORTA	50	1	.	1
CHRYSOLEPIS CHRYSOPHYLLA	50	T	.	T
3 - 10 DM DBH SIZE CLASS				
TSUGA MERTENSIANA	100	16	20	12
PSEUDOTSUGA MENZIESII	50	10	10	.
TSUGA HETEROPHYLLA	50	8	8	.
PINUS MONTICOLA	50	2	.	2
1 - 3 DM DBH SIZE CLASS				
TSUGA MERTENSIANA	100	13	15	10
PINUS MONTICOLA	100	8	1	15
PSEUDOTSUGA MENZIESII	100	8	10	5
TSUGA HETEROPHYLLA	50	11	11	.
ABIES AMABILIS	50	7	7	.
PINUS CONTORTA	50	1	.	1
< 1DM DBH AND > 1M SIZE CLASS				
PINUS MONTICOLA	100	3	1	5
ABIES AMABILIS	100	2	2	1
PSEUDOTSUGA MENZIESII	100	2	1	2
TSUGA MERTENSIANA	100	1	1	1
TSUGA HETEROPHYLLA	100	1	T	1
PINUS CONTORTA	50	T	.	T

TABLE 15A. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 7	91
< 1 M TALL SIZE CLASS				
PINUS MONTICOLA	100	2	T	3
TSUGA HETEROPHYLLA	100	1	1	1
ABIES AMABILIS	100	T	T	T
TSUGA MERTENSIANA	100	T	T	T
CHRYSOLEPIS CHRYSOPHYLLA	50	T	.	T
PSEUDOTSUGA MENZIESII	50	T	.	T
PINUS CONTORTA	50	T	.	T
TALL SHRUB SPECIES				
RHODODENDRON MACROPHYLLUM	100	4	2	5
VACCINIUM MEMBRANACEUM	100	1	T	2
VACCINIUM PARVIFOLIUM	50	T	T	.
LOW SHRUB AND SUB-SHRUB SPECIES				
GAULTHERIA OVATIFOLIA	100	8	10	5
PACHISTIMA MYRSINITES	100	1	T	2
CHIMAPHILA UMBELLATA OCCIDENTALIS	100	1	T	1
LINNAEA BOREALIS	100	T	T	T
RUBUS URSINUS	50	1	.	1
BERBERIS NERVOSA	50	T	.	T
ARCTOSTAPHYLOS NEVADENSIS	50	T	T	.
FORB SPECIES				
XEROPHYLLUM TENAX	100	28	30	25
PYROLA ASARIFOLIA	50	T	.	T
PEDICULARIS RACEMOSA	50	T	.	T

TABLE 15B. STAND TABLE FOR THE TSME- XETE C.T.- PICO PHASE .

SPECIES	CONS	AVE COVER	PLOT LABELS 35	36
TOTAL OVERSTORY COVER				
PINUS CONTORTA	100	28	25	30
TSUGA MERTENSIANA	100	16	12	20
ABIES LASIOCARPA	100	4	6	2
PINUS MONTICOLA	100	3	2	3
ABIES AMABILIS	100	2	2	2
PSEUDOTSUGA MENZIESII	50	2	2	.
> 1M DBH SIZE CLASS				
PSEUDOTSUGA MENZIESII	50	2	2	.
3 - 10 DM DBH SIZE CLASS				
PINUS CONTORTA	100	11	12	10
TSUGA MERTENSIANA	50	3	.	3
PINUS MONTICOLA	50	T	T	.
1 - 3 DM DBH SIZE CLASS				
PINUS CONTORTA	100	15	10	20
TSUGA MERTENSIANA	100	4	2	5
ABIES LASIOCARPA	100	3	5	1
ABIES AMABILIS	100	2	2	2
PINUS MONTICOLA	100	2	1	2
< 1DM DBH AND > 1M SIZE CLASS				
TSUGA MERTENSIANA	100	5	5	5
PINUS CONTORTA	100	2	2	1
ABIES LASIOCARPA	100	1	1	1
PINUS MONTICOLA	100	1	1	1
ABIES AMABILIS	50	T	.	T
PSEUDOTSUGA MENZIESII	50	T	T	.

TABLE 15B. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 35	36
< 1 M TALL SIZE CLASS				
TSUGA MERTENSIANA	100	8	5	10
PINUS CONTORTA	100	1	1	T
ABIES LASIOCARPA	100	T	T	T
PINUS MONTICOLA	100	T	T	T
ABIES AMABILIS	50	T	.	T
PSEUDOTSUGA MENZIESII	50	T	T	.
TALL SHRUB SPECIES				
VACCINIUM SCOPARIUM	100	2	3	T
VACCINIUM MEMBRANACEUM	50	1	1	.
RIBES	50	T	T	.
LOW SHRUB AND SUB-SHRUB SPECIES				
CHIMAPHILA UMBELLATA OCCIDENTALIS	100	T	T	T
ARCTOSTAPHYLOS NEVADENSIS	50	2	2	.
PACHISTIMA MYRSINITES	50	T	T	.
FORB SPECIES				
XEROPHYLLUM TENAX	100	23	20	25
PYROLA SECUNDA	50	T	.	T

TABLE 16. STAND TABLE FOR THE TSME- VASC C.T. .

SPECIES	CONS	AVE COVER	PLOT LABELS 28	30	39	52	53	54	55	74	76	77
TOTAL OVERSTORY COVER												
TSUGA MERTENSIANA	100	54	41	45	20	65	55	50	70	42	75	80
ABIES LASIOCARPA	60	7	.	3	10	.	1	20	.	.	5	1
PINUS ALBICAULIS	30	2	.	T	.	.	2	4	.	.	.	.
ABIES AMABILIS	20	1	T	.	.	.	.	.	.	.	.	1
PINUS CONTORTA	10	T	.	T	.	.	.	.	.	.	.	.
> 1M DBH SIZE CLASS												
TSUGA MERTENSIANA	40	8	5	.	.	10	.	.	7	.	.	10
3 - 10 DM DBH SIZE CLASS												
TSUGA MERTENSIANA	100	46	35	30	2	50	55	45	58	40	70	70
ABIES LASIOCARPA	20	3	.	.	3	.	.	.	.	.	2	.
1 - 3 DM DBH SIZE CLASS												
TSUGA MERTENSIANA	90	7	.	13	15	5	5	10	5	2	6	3
ABIES LASIOCARPA	40	3	.	2	6	.	.	.	.	.	2	1
PINUS ALBICAULIS	20	1	.	.	.	.	1	1	.	.	.	.
< 1DM DBH AND > 1M SIZE CLASS												
TSUGA MERTENSIANA	80	3	.	2	5	.	1	5	1	3	5	1
ABIES LASIOCARPA	40	3	.	1	.	.	1	10	.	.	1	.
PINUS ALBICAULIS	30	1	.	T	.	.	1	2	.	.	.	.
ABIES AMABILIS	20	1	T	.	.	.	.	.	.	.	.	1
< 1 M TALL SIZE CLASS												
TSUGA MERTENSIANA	90	1	1	T	T	T	.	T	T	2	1	1
ABIES LASIOCARPA	60	2	.	T	1	.	T	10	.	.	T	T
PINUS ALBICAULIS	20	1	.	.	.	.	T	1	.	.	.	.
ABIES AMABILIS	20	T	T	.	.	.	.	.	.	.	.	T
PINUS CONTORTA	10	T	.	T	.	.	.	.	.	.	.	.

TABLE 16. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 28	30	39	52	53	54	55	74	76	77
TALL SHRUB SPECIES												
VACCINIUM SCOPARIUM	80	14	15	6	3	1	20	60	T	10	.	.
VACCINIUM MEMBRANACEUM	40	3	.	T	1	1	.	.	.	10	.	.
SORBUS SITCHENSIS	20	T	.	.	.	T	.	.	.	T	.	.
JUNIPERUS COMMUNIS	10	1	.	.	1	.	.	.	.	.	.	.
LOW SHRUB AND SUB-SHRUB SPECIES												
LUETKEA PECTINATA	60	2	2	.	T	T	.	5	1	5	.	.
RUBUS LASIOCOCCUS	60	1	T	.	T	T	.	.	.	1	T	5
PHYLLODOCE EMPETRIFORMIS	20	2	2	.	.	.	.	.	.	1	.	.
VACCINIUM DELICIOSUM	20	1	T	.	.	2	.	.	.	.	.	.
CASSIOPE MERTENSIANA	10	4	4	.	.	.	.	.	.	.	.	.
GRASS, SEDGE AND RUSH SPECIES												
LUZULA HITCHCOCKII	90	12	T	.	T	1	5	15	T	5	80	3
POACEAE	40	T	T	.	.	.	.	.	.	T	T	T
CAREX ROSSII	20	T	.	T	T	.	.	.	.	.	.	.
JUNCUS PARRYI	10	T	.	T	.	.	.	.	.	.	.	.
CAREX NIGRICANS	10	T	T	.	.	.	.	.	.	.	.	.
FORB SPECIES												
LUPINUS LATIFOLIUS	40	3	.	.	2	.	.	.	.	10	T	1
MITELLA BREWERI	40	3	.	.	.	T	.	10	.	.	T	1
ASTERACEAE	30	T	.	.	.	.	T	.	.	T	T	.
PYROLA SECUNDA	20	T	.	.	T	.	.	T	.	.	.	.
APIACEAE	20	T	.	.	T	T	.	.	.	.	.	.
PEDICULARIS RACEMOSA	10	1	.	.	.	.	.	.	.	1	.	.
PENSTEMON DAVIDSONII	10	T	.	.	.	.	T	.	.	.	.	.
ANTENNARIA ALPINA	10	T	.	.	.	.	.	T	.	.	.	.
POLYGONUM NEWBERRYI	10	T	.	T	.	.	.	.	.	.	.	.
EPILOBIUM	10	T	.	T	.	.	.	.	.	.	.	.

TABLE 16. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 28	30	39	52	53	54	55	74	76	77
FORB SPECIES CONTINUED												
POTENTILLA GRACILIS FLABELLIFORMIS	10	T	.	.	T	.	.	.	.	.	.	.
VIOLA ORBICULATA	10	T	.	.	T	.	.	.	.	.	.	.
SPRAGUEA UMBELLATA	10	T	.	T	.	.	.	.	.	.	.	.
CASTILLEJA	10	T	.	.	.	.	.	T	.	.	.	.
LUPINUS LEPIDUS	10	T	.	.	T	.	.	.	.	.	.	.
ANEMONE LYALLII	10	T	.	.	T	.	.	.	.	.	.	.
MONOTROPA HYPOPITYS	10	T	.	.	.	.	.	.	T	.	.	.

Table C1.

	Tsuga heterophylla SERIES								Tsuga heterophylla / Abies amabilis SERIES			Abies amabilis /Tsuga mertensiana and Tsuga mertensiana SERIES							
	Pseudotsuga menziesii–Calocedrus decurrens–Symphoricarpos mollis C.T.	Acer circinatum–Berberis nervosa C.T.	Acer circinatum–Polystichum munitum C.T.	Berberis nervosa C.T.	Berberis nervosa C.T.–Herb rich Phase	Rhododendron macrophyllum –Berberis nervosa C.T.	Rhododendron macrophyllum–Gaultheria shallon C.T.	Rhododendron macrophyllum–Linnaea borealis C.T.	Mixed Herb C.T.	Rhododendron macrophyllum–Xerophyllum tenax C.T.	Tsuga heterophylla– Abies amabilis – Xerophyllum tenax C.T.	Tsuga mertensiana – Xerophyllum tenax C.T.	Achlys triphylla C.T.	Vaccinium membranaceum C.T.–Xerophyllum tenax Phase	Vaccinium membranaceum C.T.	Tsuga mertensiana – Xerophyllum tenax C.T.– Pinus contorta Phase	Rubus lasiococcus C.T.	Vaccinium scoparium -Vaccinium membranaceum C.T..	Vaccinium scoparium C.T.
n :	4	17	1	15	10	7	4	5	17	4	3	2	5	10	17	2	3	9	10
OVERSTORY SPECIES NUMBER	4.5	3.5	3.0	3.9	4.5	3.7	4.5	5.0	4.4	5.0	4.3	5.5	4.4	3.4	2.4	5.5	2.3	2.8	2.1
REGENERATION SPECIES NUMBER	5.3	2.2	1.0	2.0	3.4	2.7	2.5	4.8	2.5	3.8	2.7	5.5	3.4	2.3	1.9	5.0	1.7	2.1	2.0
MEAN BASAL AREA	88	63	60	72	93	76	74	44	105	65	83	49	85	72	78	30	82	85	101
MEAN TREE HEIGHT	39	47	63	45	46	40	47	32	45	24	31	20	40	33	36	25	39	33	28
MEAN AGE	85	85	-	144	199	117	376	88	303	118	145	268	284	268	323	89	253	337	371
TREE COVER	85	76	65	87	82	71	86	55	89	59	85	60	74	58	62	40	67	61	55
TALL SHRUB COVER	3.8	45	30	10	8.3	51	30	44	0.9	45	0.0	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LOW SHRUB COVER	4.8	42	4.0	39	21	35	23	8.4	3.1	19	3.7	11	13	7.0	34	3.0	26	18	14
HERB COVER	10	4.4	40	4.3	34	14	0.6	20	7.7	40	43	28	16	33	4.7	23	26	0.3	14
MOSS COVER	28	41	20	52	26	19	68	44	29	4.3	13	3.0	1.6	0.8	0.8	T	0.0	0.3	0.1
LICHEN COVER	1.5	0.4	T	T	T	T	T	T	T	T	0.0	T	T	T	T	T	0.0	T	T
REPRODUCTION COVER	3.3	1.5	1.0	1.8	1.7	2.7	4.5	3.4	3.6	5.5	2.0	7.5	6.0	12	12	18	5.0	3.9	4.9

Table C2.

	Tsuga heterophylla SERIES								Tsuga heterophylla / Abies amabilis SERIES			Abies amabilis /Tsuga mertensiana and Tsuga mertensiana SERIES							
	Pseudotsuga menziesii–Calocedrus decurrens–Symphoricarpos mollis C.T.	Acer circinatum–Berberis nervosa C.T.	Acer circinatum–Polystichum munitum C.T.	Berberis nervosa C.T.	Berberis nervosa C.T.–Herb rich Phase	Rhododendron macrophyllum –Berberis nervosa C.T.	Rhododendron macrophyllum–Gaultheria shallon C.T.	Rhododendron macrophyllum–Linnaea borealis C.T.	Mixed Herb C.T.	Rhododendron macrophyllum–Xerophyllum tenax C.T.	Tsuga heterophylla– Abies amabilis – Xerophyllum tenax C.T.	Tsuga mertensiana – Xerophyllum tenax C.T.	Achlys triphylla C.T.	Vaccinium membranaceum C.T.–Xerophyllum tenax Phase	Vaccinium membranaceum C.T.	Tsuga mertensiana – Xerophyllum tenax C.T.–Pinus contorta Phase	Rubus lasiococcus C.T.	Vaccinium scoparium - Vaccinium membranaceum C.T..	Vaccinium scoparium C.T.
n:	4	17	1	15	10	7	4	5	17	4	3	2	5	10	17	2	3	9	10
SPECIES RICHNESS:																			
TREE	7.5	4.9	4.0	4.8	5.8	4.9	5.0	6.4	4.9	5.8	5.3	6.0	4.8	3.8	2.7	5.5	2.3	3.0	6.0
TALL SHRUB	3.0	3.1	5.0	3.4	2.1	2.7	2.0	2.4	1.5	1.8	1.0	2.0	1.2	1.0	1.5	1.0	1.0	1.0	0.6
LOW SHRUB	6.3	5.8	3.0	6.4	6.4	7.1	4.5	6.0	4.7	4.5	6.7	5.0	4.0	2.4	2.2	3.0	2.0	2.3	2.0
HERB	17	13	11	10	17	9.4	5.3	9.2	8.0	4.5	6.7	3.0	17	4.3	4.8	1.5	13	2.0	5.0
MOSS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UNDERSTORY	26	22	19	20	25	19	12	18	14	11	14	10	22	7.7	8.5	5.5	16	5.3	7.6
TOTAL	34	27	23	25	31	24	17	24	19	17	20	16	27	12	11	11	18	8.3	9.8

Table C3.

	Tsuga heterophylla SERIES								Tsuga heterophylla / Abies amabilis SERIES			Abies amabilis /Tsuga mertensiana and Tsuga mertensiana SERIES							
	Pseudotsuga menziesii–Calocedrus decurrens–Symphoricarpos mollis C.T.	Acer circinatum–Berberis nervosa C.T.	Acer circinatum–Polystichum munitum C.T.	Berberis nervosa C.T.	Berberis nervosa C.T.–Herb rich Phase	Rhododendron macrophyllum –Berberis nervosa C.T.	Rhododendron macrophyllum–Gaultheria shallon C.T.	Rhododendron macrophyllum–Linnaea borealis C.T.	Mixed Herb C.T.	Rhododendron macrophyllum–Xerophyllum tenax C.T.	Tsuga heterophylla– Abies amabilis – Xerophyllum tenax C.T.	Tsuga mertensiana – Xerophyllum tenax C.T.	Achlys triphylla C.T.	Vaccinium membranaceum C.T.–Xerophyllum tenax Phase	Vaccinium membranaceum C.T.	Tsuga mertensiana – Xerophyllum tenax C.T.–Pinus contorta Phase	Rubus lasiococcus C.T.	Vaccinium scoparium -Vaccinium membranaceum C.T..	Vaccinium scoparium C.T.
n:	4	17	1	15	10	7	4	5	17	4	3	2	5	10	17	2	3	9	10
N1 DIVERSITY:																			
TREE	2.6	1.6	1.9	2.3	2.2	2.5	3.2	2.5	3.0	3.8	2.5	3.9	3.2	2.3	1.9	3.4	1.8	1.7	1.3
TALL SHRUBS	2.2	1.6	1.8	1.8	1.6	1.2	1.3	1.2	1.1	1.0	1.0	1.4	1.0	1.0	1.0	0.7	1.0	1.0	0.4
LOW SHRUBS	3.5	2.0	2.8	2.0	2.3	3.3	1.8	4.0	2.4	1.8	2.7	2.2	1.6	1.4	1.6	2.0	1.3	1.2	1.4
HERBS	6.7	3.5	1.6	3.0	4.2	2.6	2.1	3.3	3.0	1.4	1.1	1.1	4.5	1.1	2.5	1.0	2.8	1.2	1.9
UNDERSTORY	11.7	4.3	4.2	3.7	5.9	4.7	3.0	4.9	4.6	3.3	1.5	3.0	5.8	1.8	2.7	1.6	3.7	1.9	2.8
TOTAL	5.5	4.9	5.5	4.9	5.8	6.2	5.3	6.4	4.1	6.8	3.9	6.8	6.7	3.6	3.8	5.0	4.6	2.7	2.7
N2 DIVERSITY:																			
TREE	1.9	1.3	1.6	2.0	1.8	2.2	2.8	1.9	2.6	3.3	2.0	3.4	2.9	2.0	1.8	2.7	1.6	1.5	1.2
TALL SHRUBS	2.0	1.4	1.5	1.6	1.5	1.1	1.2	1.0	1.1	1.0	1.0	1.4	1.0	1.0	1.0	0.6	1.0	1.0	0.4
LOW SHRUBS	3.1	1.7	2.7	1.7	1.8	2.6	1.5	3.5	2.0	1.5	2.3	1.9	1.4	1.3	1.4	2.0	1.2	1.1	1.3
HERBS	5.5	2.7	1.3	2.4	3.1	2.1	1.8	2.6	2.4	1.2	1.1	1.0	3.6	1.1	2.2	1.0	2.2	1.0	1.7
UNDERSTORY	9.2	3.4	3.0	2.3	4.1	3.2	2.5	3.1	3.5	2.6	1.2	2.2	4.2	1.5	2.0	1.3	2.8	1.6	2.4
TOTAL	2.9	3.5	4.0	3.7	3.8	4.5	4.3	4.0	3.1	5.4	3.1	5.5	5.0	2.9	2.9	4.1	3.4	2.2	2.1

Table C4.

	Tsuga heterophylla SERIES								Tsuga heterophylla / Abies amabilis SERIES			Abies amabilis /Tsuga mertensiana and Tsuga mertensiana SERIES							
	Pseudotsuga menziesii–Calocedrus decurrens–Symphoricarpos mollis C.T.	Acer circinatum–Berberis nervosa C.T.	Acer circinatum–Polystichum munitum C.T.	Berberis nervosa C.T.	Berberis nervosa C.T.–Herb rich Phase	Rhododendron macrophyllum –Berberis nervosa C.T.	Rhododendron macrophyllum–Gaultheria shallon C.T.	Rhododendron macrophyllum–Linnaea borealis C.T.	Mixed Herb C.T.	Rhododendron macrophyllum–Xerophyllum tenax C.T.	Tsuga heterophylla– Abies amabilis – Xerophyllum tenax C.T.	Tsuga mertensiana – Xerophyllum tenax C.T.	Achlys triphylla C.T.	Vaccinium membranaceum C.T.–Xerophyllum tenax Phase	Vaccinium membranaceum C.T.	Tsuga mertensiana – Xerophyllum tenax C.T.–Pinus contorta Phase	Rubus lasiococcus C.T.	Vaccinium scoparium -Vaccinium membranaceum C.T..	Vaccinium scoparium C.T.
n:	4	17	1	15	10	7	4	5	17	4	3	2	5	10	17	2	3	9	10
MEAN ASPECT (degrees)	198	245	347	299	250	320	358	23	333	301	254	318	265	251	338	223	273	229	272
r	.93	.82	-	.69	.35	.65	.68	.66	.53	.61	.85	.54	.75	.56	.31	.95	.35	.41	.34
MEAN ELEVATION (m)	915	919	690	827	1177	1190	632	1170	1164	1342	1373	1325	1432	1576	1624	1650	1740	1736	1962
min.	880	690	690	640	660	1000	610	1160	640	1320	1320	1280	1280	1410	1430	1650	1490	1590	1740
max.	940	1060	690	1070	1620	1520	640	1190	1710	1360	1430	1370	1580	1680	1890	1650	1950	1890	2240
MEAN SLOPE (%)	28	30	62	20	22	21	3.5	5.2	26	24	12	8.5	15	15	30	11	24	11	25
min.	18	3	62	0	3	5	0	0	0	11	9	5	5	0	2	7	0	0	0
max.	53	73	62	60	67	58	9	9	73	38	18	12	27	49	65	14	53	32	67
MEAN INSOLATION INDEX	295	274	144	240	269	233	262	260	235	245	273	264	274	263	237	277	249	276	262
min.	294	243	144	151	234	147	253	252	131	202	261	258	256	186	136	277	200	250	142
max.	297	299	144	284	319	270	268	268	318	268	290	269	305	304	316	277	279	306	309
MEAN MOISTURE INDEX	26	19	14	18	19	18	20	19	17	22	27	27	21	23	19	26	16	22	19
min.	22	12	14	10	14	14	14	16	13	14	25	24	15	15	10	21	11	11	12
max.	33	27	14	31	35	22	24	20	23	28	29	30	30	34	28	31	20	32	26

APPENDIX D

Figures D1. - D4. Three Sisters Wilderness Area Meadow Community Ordinations.

Figure D1.

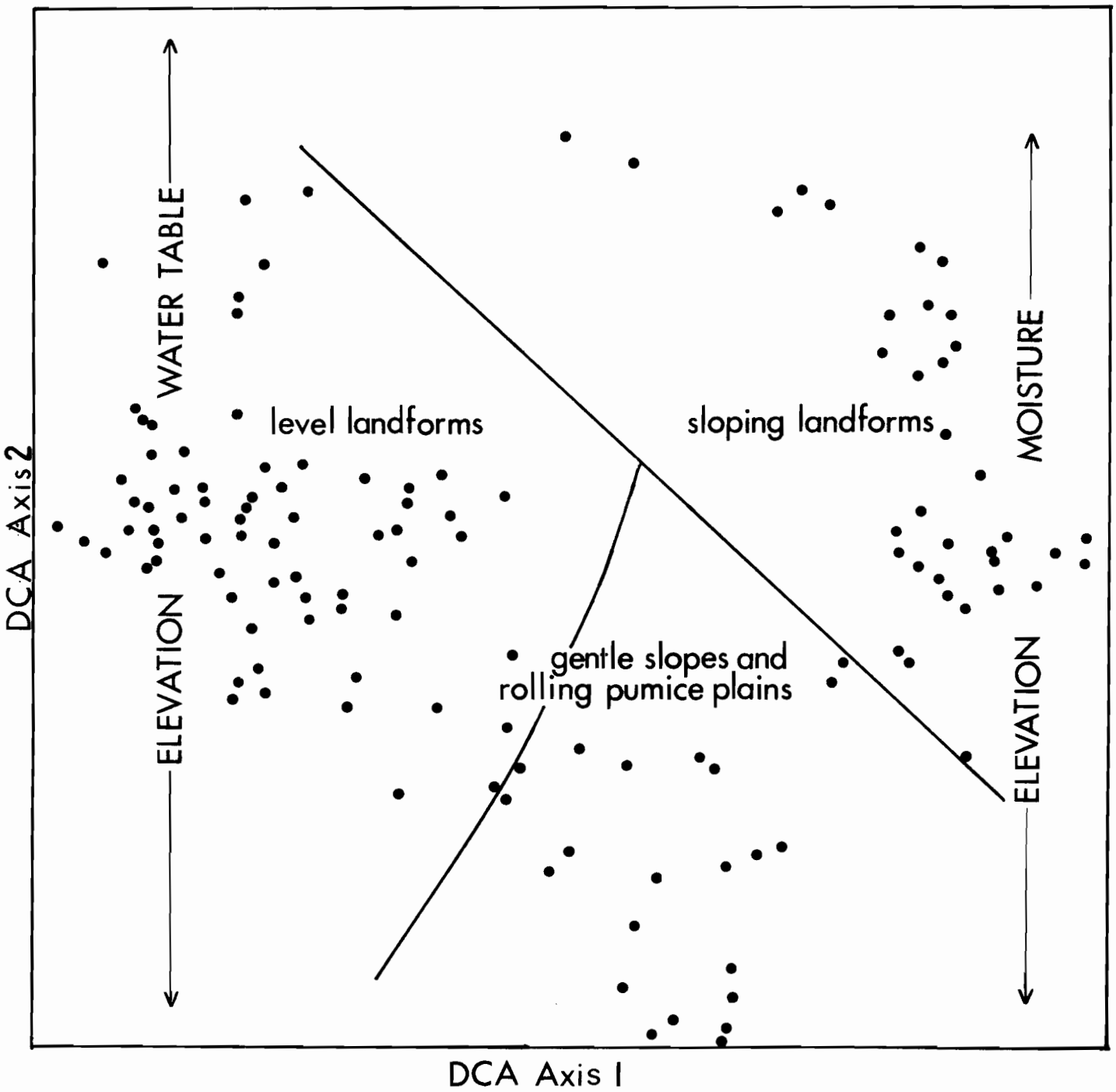

WATER TABLE
ELEVATION
level landforms
sloping landforms
MOISTURE
ELEVATION
gentle slopes and
rolling pumice plains
DCA Axis 2
DCA Axis I

Figure D2.

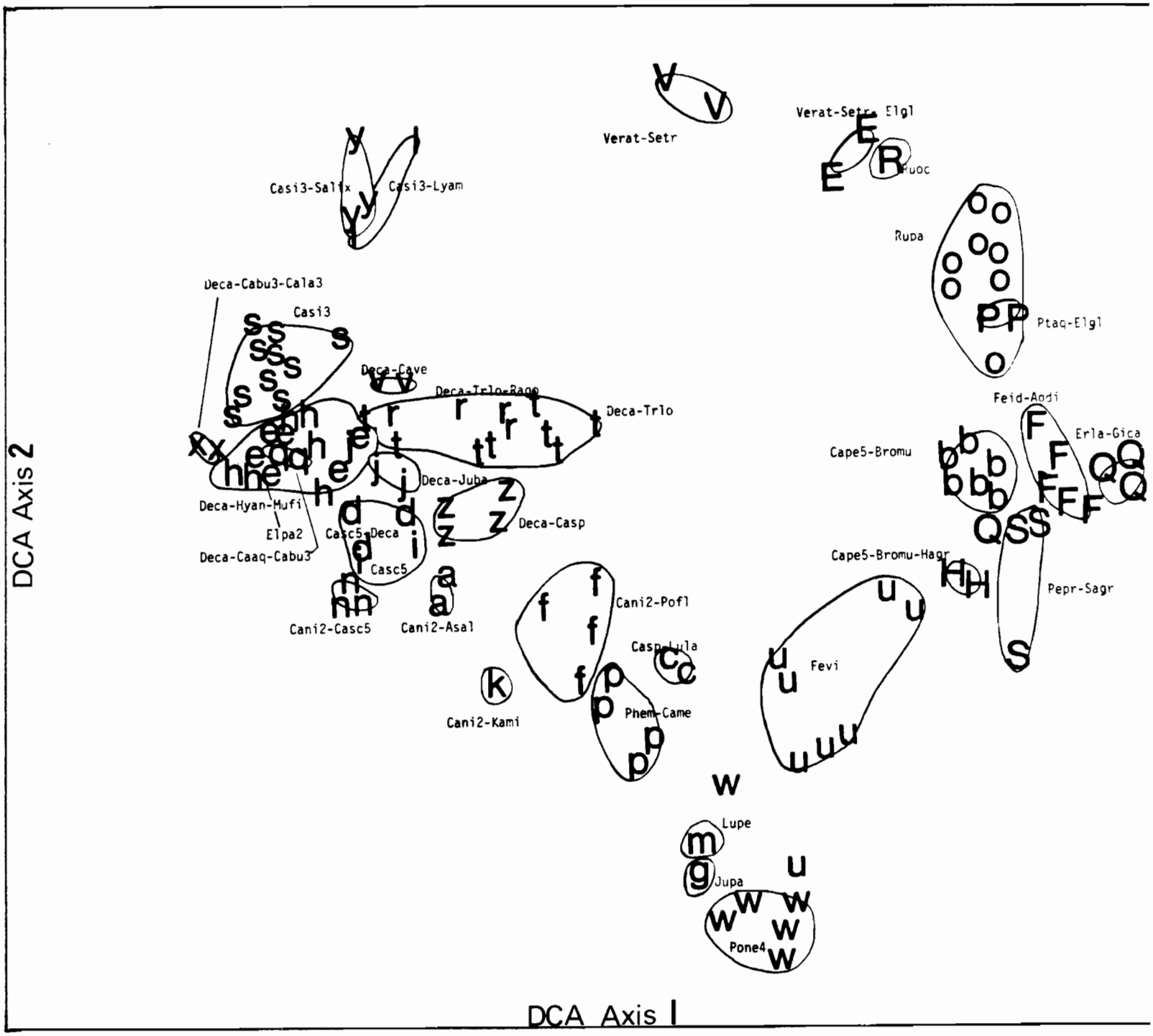

Verat-Setr
Verat-Setr-Elgl
Puoc
Casi3-Salix
Casi3-Lyam
Rupa
Deca-Cabu3-Cala3
Casi3
Ptaq-Elgl
Deca-Cave
Deca-Trlo-Rago
Deca-Trlo
Feid-Aodi
Erla-Gica
Cape5-Bromu
Deca-Juba
Deca-Hyan-Mufi
Elpa2
Casc5-Deca
Deca-Casp
Deca-Caaq-Cabu3
Casc5
Cape5-Bromu-Hagr
Pepr-Sagr
Cani2-Casc5
Cani2-Asal
Cani2-Pofl
Casp-Lula
Fevi
Cani2-Kami
Phem-Came
Lupe
Jupa
Pone4
DCA Axis 2
DCA Axis 1

Figure D3.

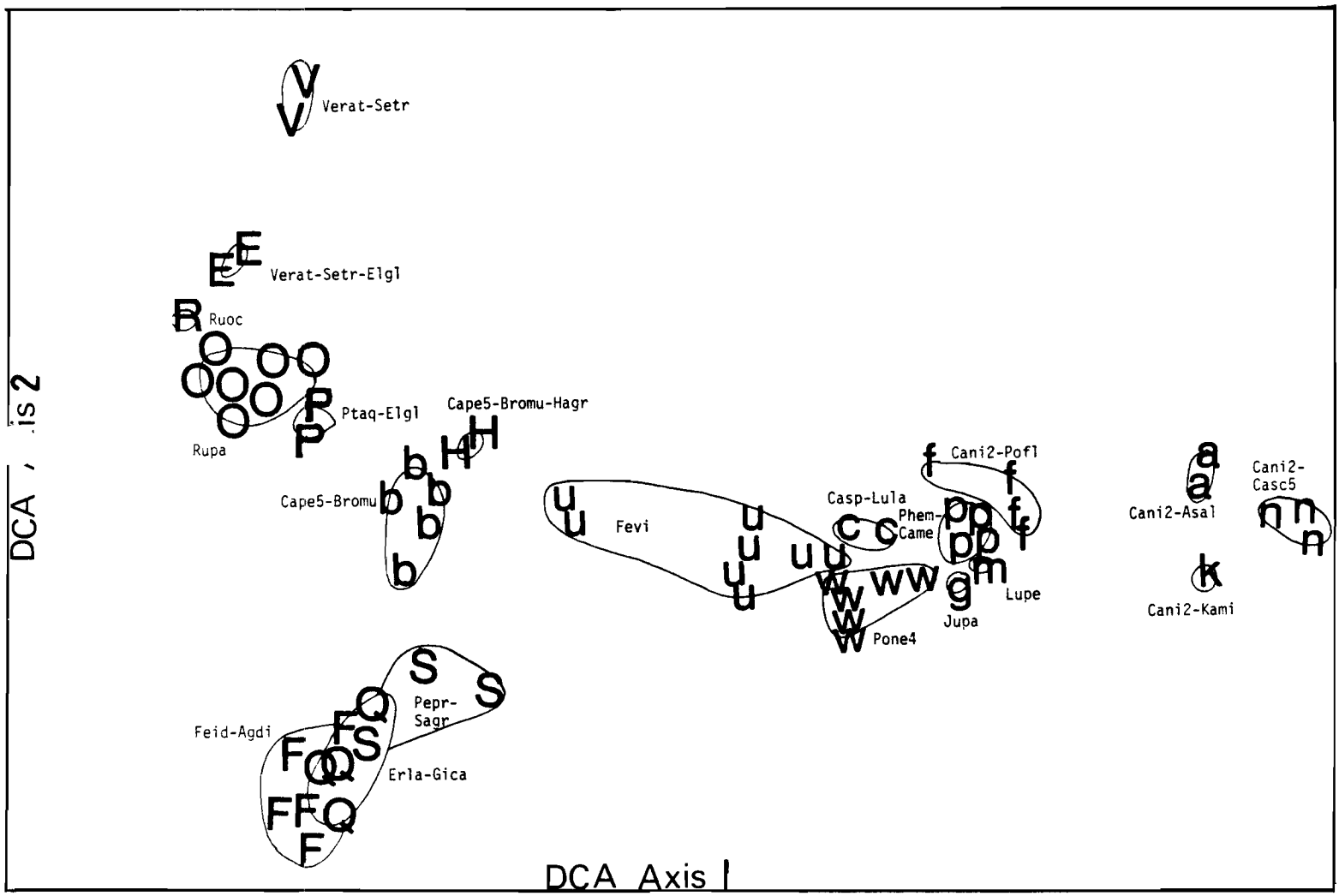
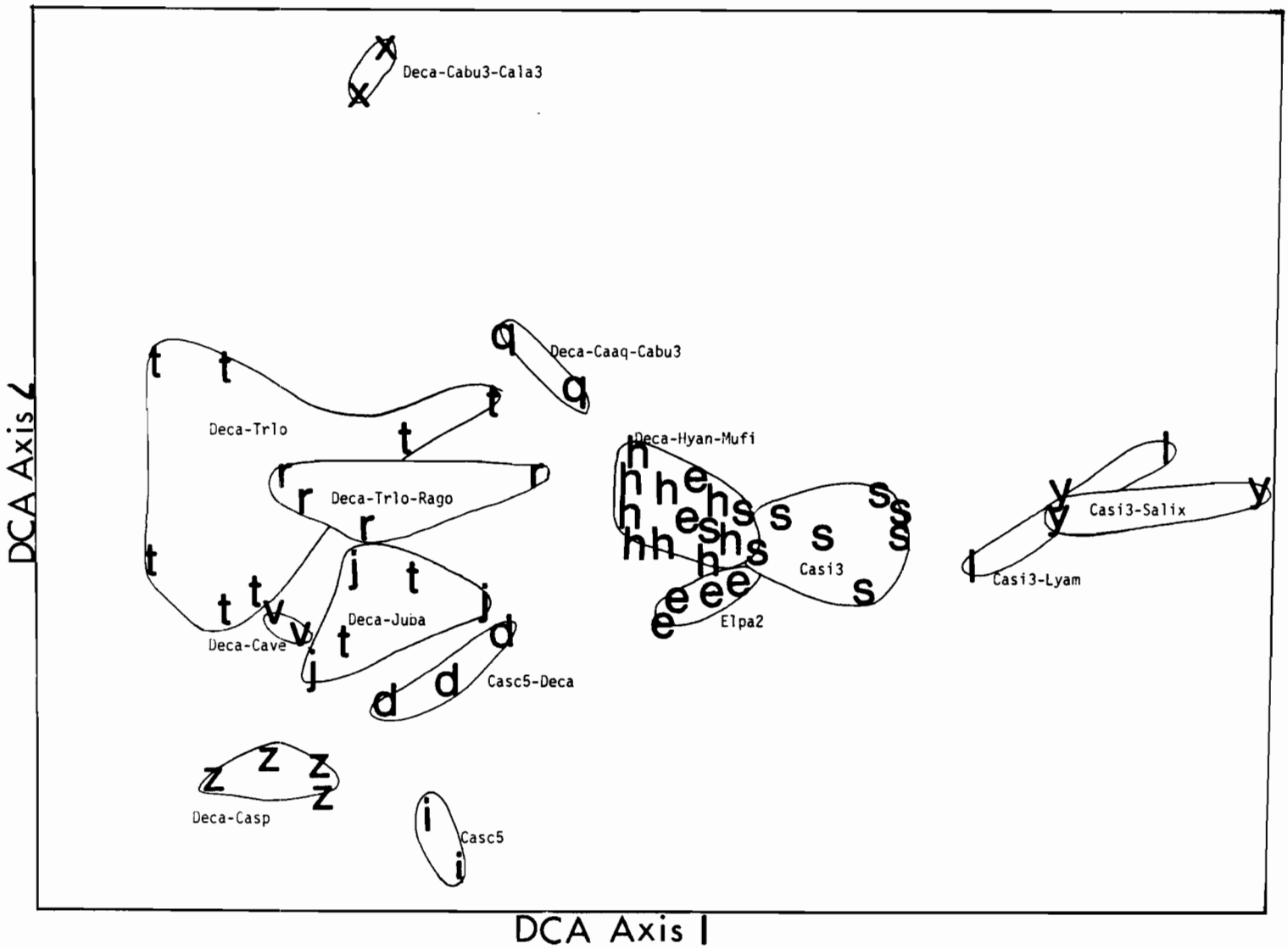

Verat-Setr
Verat-Setr-Elgl
Ruoc
Rupa
Ptaq-Elgl
Cape5-Bromu-Hagr
Cape5-Bromu
Fevi
Casp-Lula
Phem-Came
Cani2-Pofl
Cani2-Asal
Cani2-Casc5
Cani2-Kami
Lupe
Jupa
Pone4
Pepr-Sagr
Feid-Agdi
Erla-Gica
DCA Axis 2
DCA Axis 1

Figure D4.


Deca-Cabu3-Cala3
Deca-Caaq-Cabu3
Deca-Trlo
Deca-Trlo-Rago
Deca-Hyan-Mufi
Casi3
Casi3-Salix
Casi3-Lyam
Elpa2
Deca-Juba
Deca-Cave
Casc5-Deca
Deca-Casp
Casc5
DCA Axis 2
DCA Axis 1

APPENDIX E

Figure E1. - E3. Three Sisters Wilderness Area Meadow Communities Ordination Position vs. Elevation

Figure E1.

AXIS 2 POSITION USING RIGHT PORTION OF INITIAL ALL SAMPLE ORDINATION

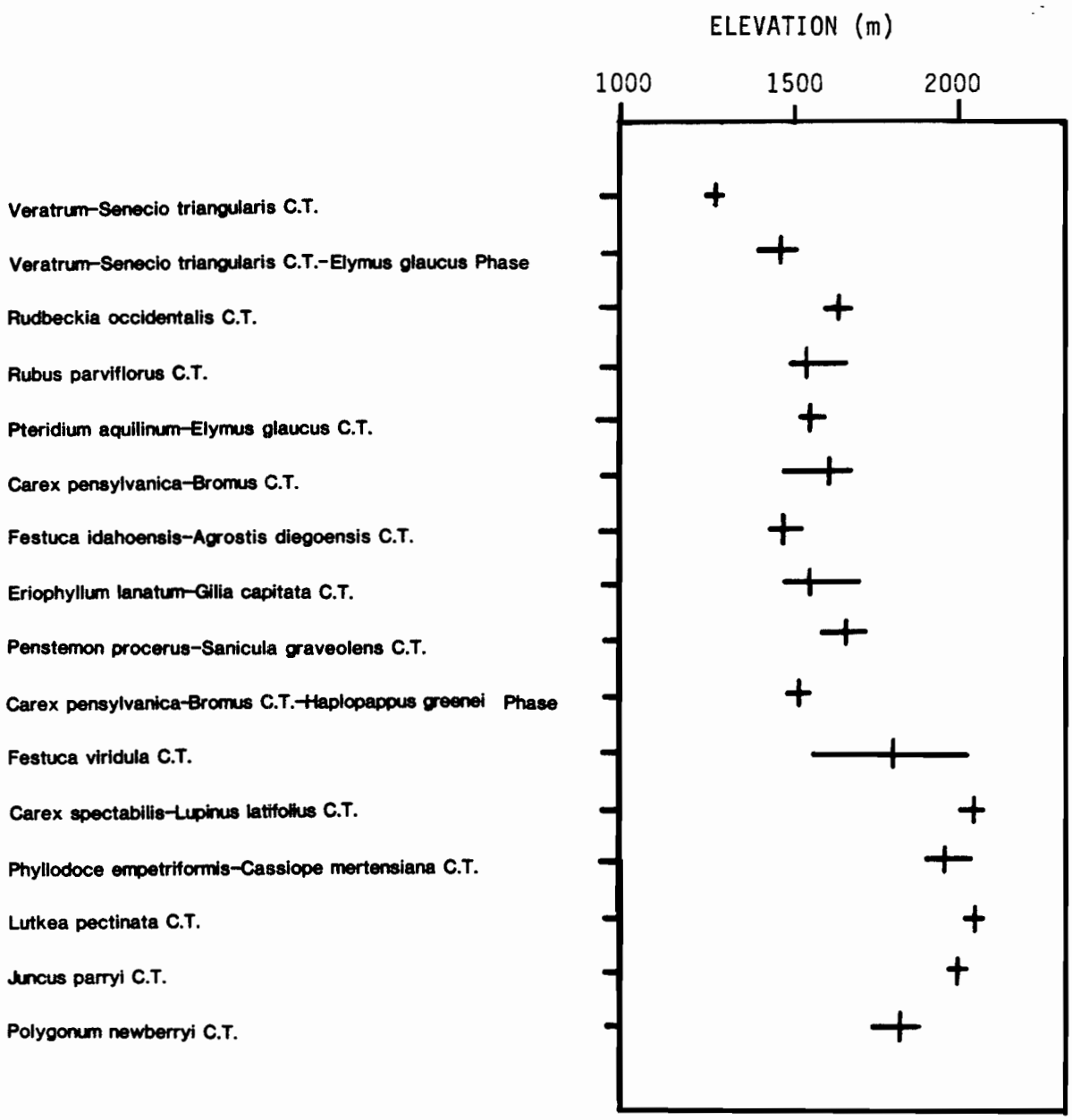
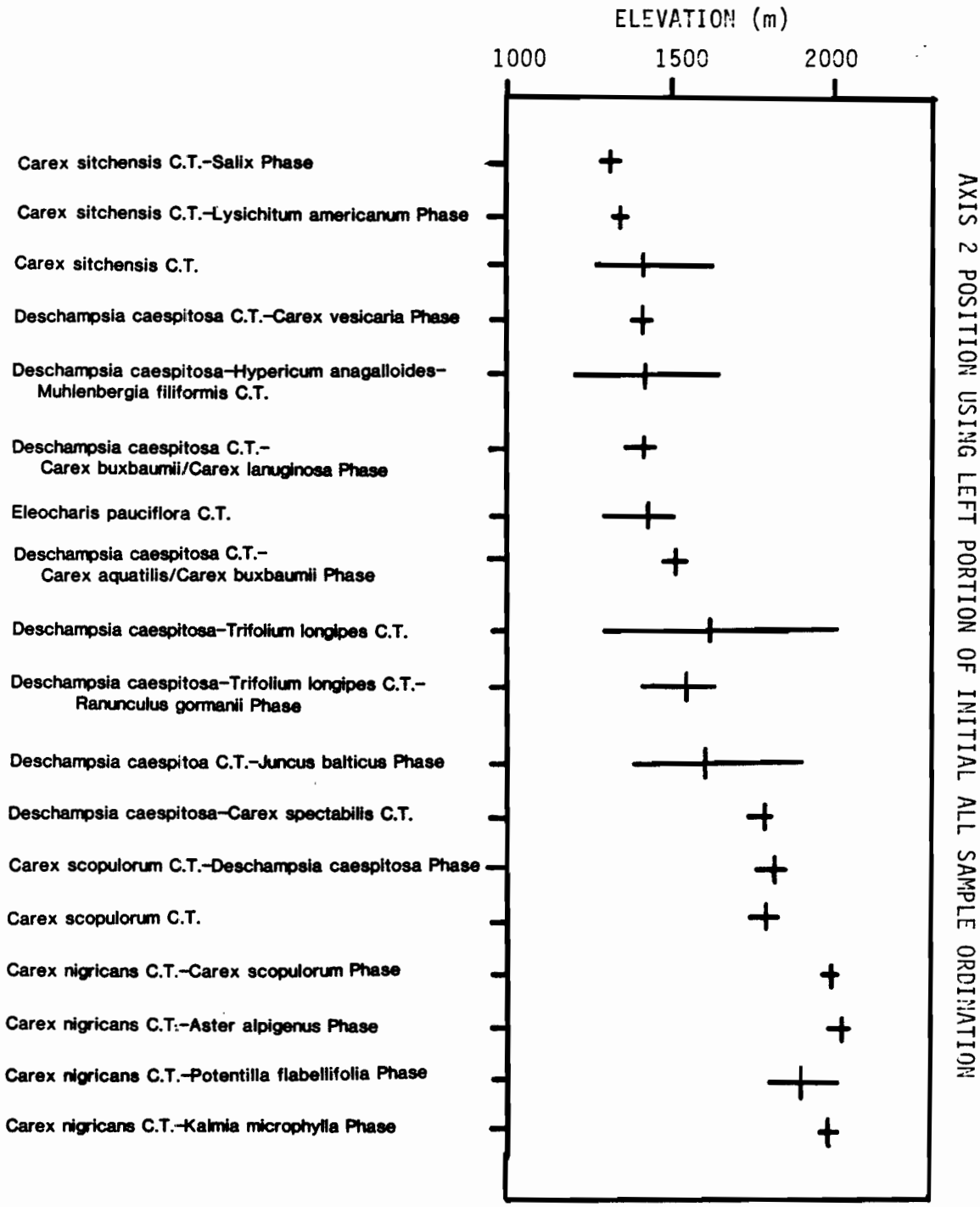


Figure E1. (continued)



AXIS 2 POSITION USING LEFT PORTION OF INITIAL ALL SAMPLE ORDINATION

Figure E2.

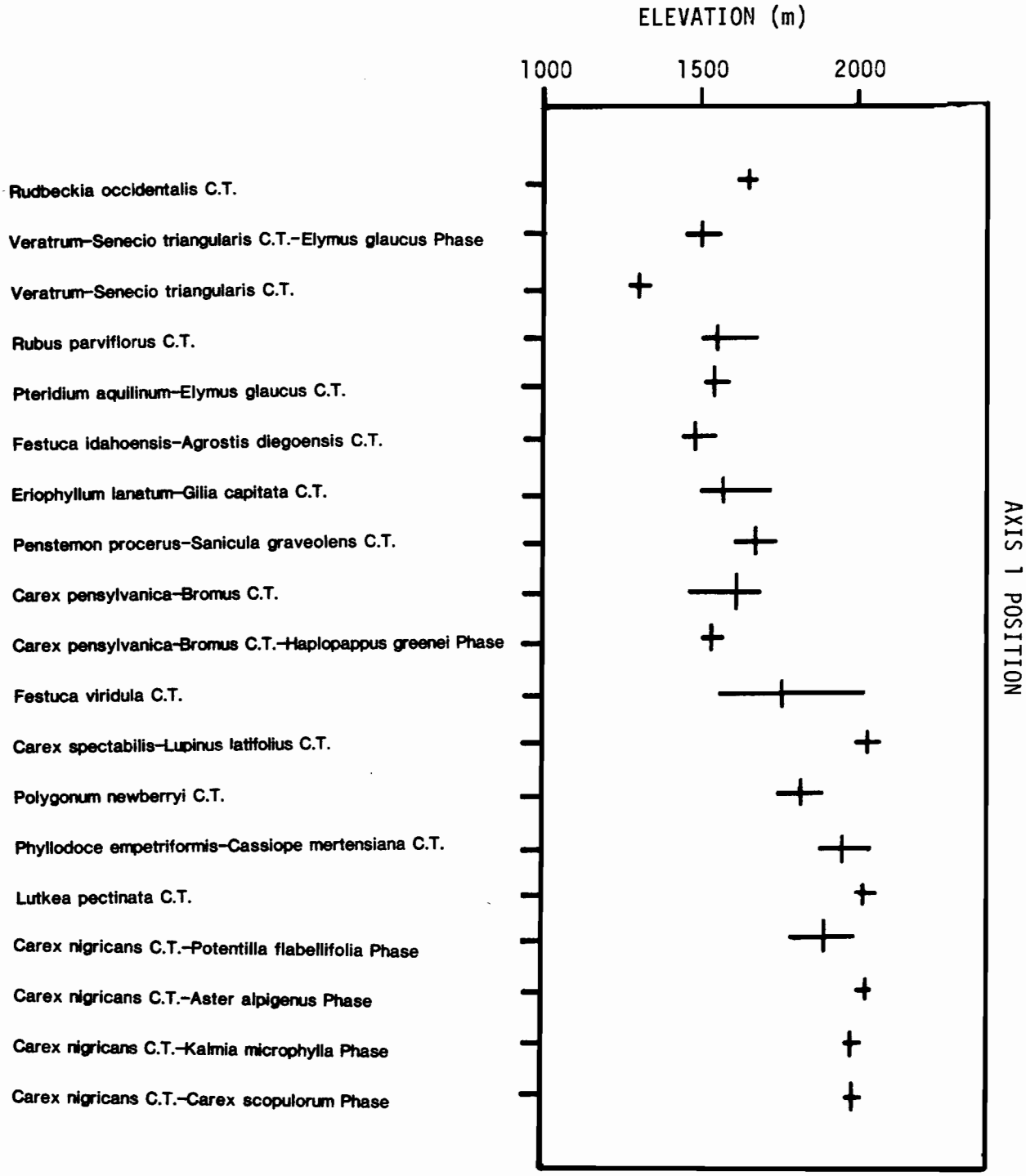
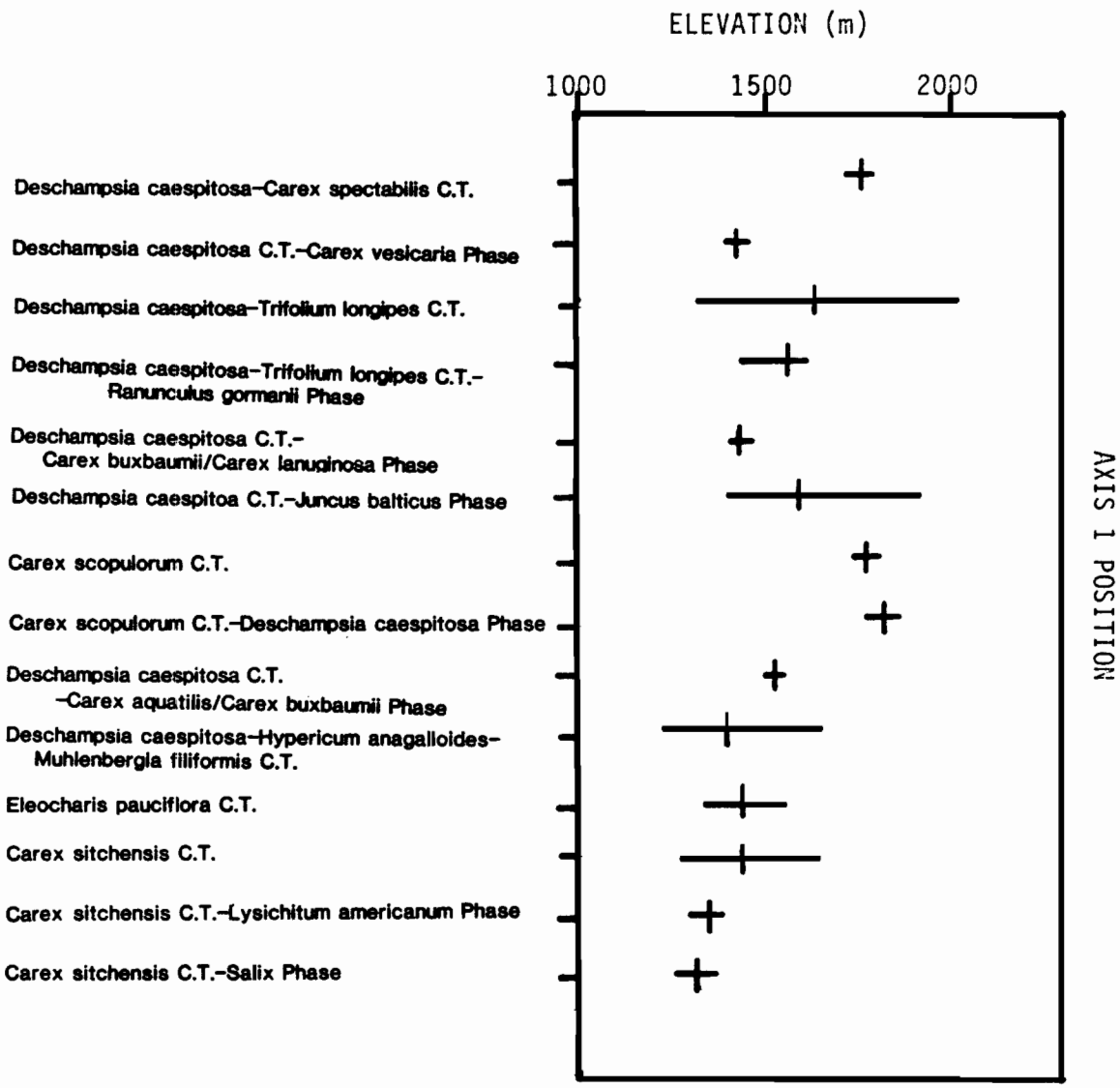

ELEVATION (m)
1000
1500
2000
Rudbeckia occidentalis C.T.
Veratrum-Senecio triangularis C.T.-Elymus glaucus Phase
Veratrum-Senecio triangularis C.T.
Rubus parviflorus C.T.
Pteridium aquilinum-Elymus glaucus C.T.
Festuca idahoensis-Agrostis diegoensis C.T.
Eriophyllum lanatum-Gilia capitata C.T.
Penstemon procerus-Sanicula graveolens C.T.
Carex pensylvanica-Bromus C.T.
Carex pensylvanica-Bromus C.T.-Haplopappus greenei Phase
Festuca viridula C.T.
Carex spectabilis-Lupinus latifolius C.T.
Polygonum newberryi C.T.
Phyllodoce empetriformis-Cassiope mertensiana C.T.
Lutkea pectinata C.T.
Carex nigricans C.T.-Potentilla flabellifolia Phase
Carex nigricans C.T.-Aster alpigenus Phase
Carex nigricans C.T.-Kalmia microphylla Phase
Carex nigricans C.T.-Carex scopulorum Phase
AXIS 1 POSITION

Figure E3.


ELEVATION (m)
1000
1500
2000
Deschampsia caespitosa-Carex spectabilis C.T.
Deschampsia caespitosa C.T.-Carex vesicaria Phase
Deschampsia caespitosa-Trifolium longipes C.T.
Deschampsia caespitosa-Trifolium longipes C.T.-Ranunculus gormanii Phase
Deschampsia caespitosa C.T.-Carex buxbaumii/Carex lanuginosa Phase
Deschampsia caespitoa C.T.-Juncus balticus Phase
Carex scopulorum C.T.
Carex scopulorum C.T.-Deschampsia caespitosa Phase
Deschampsia caespitosa C.T.-Carex aquatilis/Carex buxbaumii Phase
Deschampsia caespitosa-Hypericum anagalloides-Muhlenbergia filiformis C.T.
Eleocharis pauciflora C.T.
Carex sitchensis C.T.
Carex sitchensis C.T.-Lysichitum americanum Phase
Carex sitchensis C.T.-Salix Phase
AXIS 1 POSITION

APPENDIX F

Three Sisters Wilderness Area Meadow Communities.

1. Plant Association Tables. Average cover is based on only those plots in which species occurs.

2. Vegetation Structure Table. Cover is in percent (Table F1).

3. Species Richness Table (Table F2).

4. N1 and N2 Diversity Table. N1 value estimates the number of fairly dominant species; N2 estimates the number of highly dominant species (Table F3).

5. Environmental Characteristics Table (Table F4).

6. Soil Surface and Profile Variable Table. Rock cover applies to loose rock < 7 cm in length. Fine litter applies to debris < 1 cm in length. Coarse fragments are on a volume basis (Table F5).

Note: Blank represents a value of zero (0); dash (-) represents an unavailable value.

TABLE 1A. STAND TABLE FOR THE CASI3 C.T. .

SPECIES	CONS	AVE COVER	PLOT LABELS 180	181	194	225	228	231	293	294	317
TALL SHRUB SPECIES											
VACCINIUM OCCIDENTALE	56	22	30	T	.	60	20	.	.	.	T
SALIX MYRTILLIFOLIA	44	22	.	.	20	1	10	.	.	.	55
SALIX GEYERIANA	33	4	.	.	.	5	4	2	.	.	.
BETULA GLANDULOSA	11	35	.	.	.	.	.	.	.	.	35
SPIRAEA DENSIFLORA	11	5	.	.	.	.	5	.	.	.	.
GRASS. SEDGE AND RUSH SPECIES											
CAREX SITCHENSIS	100	76	60	95	85	85	70	80	90	50	70
CAREX ROSTRATA	56	21	.	.	.	T	25	20	.	60	1
ELEOCHARIS PAUCIFLORA	56	10	15	5	.	.	.	T	.	25	5
DESCHAMPSIA CAESPITOSA	56	3	.	5	T	.	2	T	.	10	.
CAREX MURICATA	44	7	8	15	.	.	3	2	.	.	.
CAREX LUZULINA	33	5	3	7	4	.	.	.	.	.	.
CAREX JONESII	22	2	.	.	.	.	.	.	.	2	1
CALAMAGROSTIS INEXPANSA	11	20	.	.	.	.	.	.	.	20	.
CAREX SIMULATA	11	3	.	.	.	.	.	.	.	3	.
CAREX LEPORINELLA	11	2	.	.	.	.	.	.	.	2	.
CAREX CANESCENS	11	1	.	.	.	.	1	.	.	.	.
AGROSTIS THURBERIANA	11	1	.	.	.	.	1	.	.	.	.
MUHLENBERGIA FILIFORMIS	11	T	.	.	T	.	.	.	.	.	.
LUZULA CAMPESTRIS	11	T	T	.	.	.	.	.	.	.	.
AGROSTIS	11	T	.	.	.	.	.	.	.	.	T
JUNCUS ENSIFOLIUS	11	T	.	.	.	.	.	.	.	.	T
FERN. LYCOPOD AND MOSS SPECIES											
SPHAGNUM	89	27	90	1	3	4	10	.	40	50	20
EQUISETUM ARVENSE	33	1	.	.	T	.	.	.	.	T	3
FORB SPECIES											
DODECATHEON JEFFREYI	78	5	15	10	4	1	1	T	.	1	.

TABLE 1A. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 180	181	194	225	228	231	293	294	317
FORB SPECIES CONTINUED											
HYPERICUM ANAGALLOIDES	67	1	4	1	.	.	T	T	.	T	2
POLYGONUM BISTORTOIDES	56	4	1	8	7	2	.	.	.	.	3
CALTHA BIFLORA	44	6	12	10	2	.	1	.	.	.	.
PEDICULARIS GROENLANDICA	44	1	1	.	1	.	.	T	.	.	1
HABENARIA DILATATA	44	1	T	2	T	T	.	.	.	.	.
RANUNCULUS GORMANII	33	3	4	1	5	.	.	.	.	.	.
MICROSERIS BOREALE	33	1	T	1	3	.	.	.	.	.	.
VERONICA AMERICANA	22	5	.	.	10	.	.	.	.	.	T
VIOLA MACLOSKEYI	22	2	.	.	.	.	.	1	.	3	.
EPILOBIUM WATSONII	22	1	.	.	1	T	.	.	.	.	.
EPILOBIUM ALPINUM	22	T	.	.	.	.	.	T	.	.	T
UTRICULARIA VULGARIS	11	10	.	.	.	.	10	.	.	.	.
VIOLA ADUNCA	11	8	.	.	.	.	8	.	.	.	.
POTENTILLA PALUSTRIS	11	4	.	.	.	.	.	4	.	.	.
VERONICA SCUTELLATA	11	2	.	.	.	.	2	.	.	.	.
RANUNCULUS ALISMAEFOLIUS	11	1	.	.	.	.	.	.	.	1	.
AQUILEGIA FORMOSA	11	1	.	.	.	.	.	.	.	.	1
ASTER FOLIACEUS	11	1	.	1	.	.	.	.	.	.	.
SAXIFRAGA OREGANA	11	1	.	.	.	.	.	.	.	.	1
SPIRANTHES ROMANZOFFIANA	11	1	.	.	.	.	.	.	.	1	.
GALIUM BIFOLIUM	11	1	.	.	1	.	.	.	.	.	.
ERIGERON ALICEAE	11	T	.	.	T	.	.	.	.	.	.
ASTER LEDOPHYLLUS	11	T	.	.	T	.	.	.	.	.	.
VIOLA GLABELLA	11	T	.	.	.	.	.	.	.	.	T
FRAGARIA VESCA	11	T	.	.	.	.	.	.	.	T	.
TRIFOLIUM LONGIPES	11	T	.	.	.	.	.	.	.	T	.
GALIUM APARINE	11	T	.	T	.	.	.	.	.	.	.
SENECIO CYMBALARIOIDES	11	T	.	.	.	.	.	.	.	T	.
PYROLA ASARIFOLIA	11	T	.	.	.	.	.	.	.	.	T
POTENTILLA DRUMMONDII	11	T	.	.	.	.	.	.	.	T	.

TABLE 1A. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 180	181	194	225	228	231	293	294	317
FORB SPECIES CONTINUED											
TOFIELDIA GLUTINOSA BREVISTYLA	11	T	T	.	.	.	.	.	.	.	.
VIOLA PALUSTRIS	11	T	.	T	.	.	.	.	.	.	.
LYSICHITUM AMERICANUM	11	T	.	.	.	.	.	.	.	.	T
ANGELICA ARGUTA	11	T	.	.	.	.	.	T	.	.	.
SENECIO TRIANGULARIS	11	T	.	.	.	.	T	.	.	.	.

TABLE 1B. STAND TABLE FOR THE CASI3 C.T.- LYAM PHASE .

SPECIES	CONS	AVE COVER	PLOT LABELS 184	185
TALL SHRUB SPECIES				
ALNUS SINUATA	50	4	.	4
RUBUS SPECTABILIS	50	1	.	1
GRASS. SEDGE AND RUSH SPECIES				
CAREX SITCHENSIS	100	77	99	55
CALAMAGROSTIS INEXPANSA	100	15	20	10
CAREX CANESCENS	50	T	.	T
FERN. LYCOPOD AND MOSS SPECIES				
EQUISETUM ARVENSE	100	1	1	1
SPHAGNUM	50	20	.	20
ATHYRIUM FILIX-FEMINA	50	2	.	2
FORB SPECIES				
SENECIO TRIANGULARIS	100	11	1	20
MIMULUS GUTTATUS	100	10	5	15
POLYGONUM BISTORTOIDES	100	8	T	15
LYSICHITUM AMERICANUM	100	5	2	8
ANGELICA ARGUTA	100	5	10	T
EPILOBIUM WATSONII	100	4	3	5
CALTHA BIFLORA	50	25	.	25
DODECATHEON JEFFREYI	50	20	.	20
VIOLA PALUSTRIS	50	12	12	.
POTENTILLA PALUSTRIS	50	7	.	7
ACONITUM COLUMBIANUM	50	4	.	4
VIOLA MACLOSKEYI	50	4	.	4
PEDICULARIS GROENLANDICA	50	3	.	3
HABENARIA SACCATA	50	3	.	3
HYPERICUM ANAGALLOIDES	50	2	.	2
ELODEA CANADENSIS	50	T	.	T

TABLE 1B. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 184	185
FORB SPECIES CONTINUED				
POTENTILLA DRUMMONDII	50	T	.	T
MONTIA SIBIRICA	50	T	T	.
MITELLA OVALIS	50	T	.	T
HYPERICUM FORMOSUM	50	T	T	.
CICUTA DOUGLASII	50	T	.	T

TABLE 1C. STAND TABLE FOR THE CASI3 C.T.- SALIX PHASE .

SPECIES	CONS	AVE COVER	PLOT LABELS 186	187	195
TALL SHRUB SPECIES					
SALIX GEYERIANA	100	38	30	35	50
SALIX MYRTILLIFOLIA	67	10	.	10	10
SALIX SITCHENSIS	33	40	40	.	.
ALNUS SINUATA	33	15	.	15	.
SPIRAEA DOUGLASII	33	15	.	15	.
VACCINIUM MEMBRANACEUM	33	2	.	2	.
RIBES BRACTEOSUM	33	1	.	.	1
RHODODENDRON MACROPHYLLUM	33	1	.	1	.
LOW SHRUB AND SUB-SHRUB SPECIES					
RUBUS LASIOCOCCUS	33	T	.	T	.
GRASS. SEDGE AND RUSH SPECIES					
CAREX SITCHENSIS	100	67	90	50	60
CALAMAGROSTIS INEXPANSA	67	4	.	7	1
MUHLENBERGIA FILIFORMIS	67	1	T	1	.
FERN. LYCOPOD AND MOSS SPECIES					
EQUISETUM ARVENSE	33	2	.	.	2
FORB SPECIES					
LYSICHITUM AMERICANUM	100	7	17	2	2
ANGELICA ARGUTA	100	2	5	2	T
EPILOBIUM WATSONII	100	1	1	T	1
VERONICA SERPYLLIFOLIA	67	1	.	1	T
DODECATHEON JEFFREYI	67	1	.	T	1
VERONICA AMERICANA	67	1	.	T	1
GALIUM BIFOLIUM	67	T	T	T	.
TRIENTALIS ARCTICA	33	6	.	6	.
VIOLA MACLOSKEYI	33	5	.	5	.

TABLE 1C. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 186	187	195
FORB SPECIES CONTINUED					
HYPERICUM ANAGALLOIDES	33	3	.	3	.
POLYGONUM BISTORTOIDES	33	3	.	.	3
VIOLA PALUSTRIS	33	2	2	.	.
UNKNOWN SPECIES	33	2	2	.	.
VERATRUM	33	1	.	.	1
MIMULUS GUTTATUS	33	1	.	.	1
HABENARIA DILATATA	33	1	.	.	1
CORNUS CANADENSIS	33	1	.	1	.
CARDAMINE BREWERI	33	1	1	.	.
RUDBECKIA OCCIDENTALIS	33	T	.	.	T
STELLARIA MEDIA	33	T	.	.	T
GEUM MACROPHYLLUM MACROPHYLLUM	33	T	.	.	T
MITELLA BREWERI	33	T	.	.	T

TABLE 2. STAND TABLE FOR THE ELPA2 C.T. .

SPECIES	CONS	AVE COVER	PLOT LABELS 210	214	215	227	236	316
TOTAL OVERSTORY COVER								
PICEA ENGELMANNII	50	T	T	1	.	.	.	T
ABIES LASIOCARPA	33	T	T	T	.	.	.	.
TSUGA MERTENSIANA	33	T	T	T	.	.	.	.
PINUS CONTORTA	33	T	.	T	.	.	.	T
< 1DM DBH AND > 1M SIZE CLASS								
PICEA ENGELMANNII	17	1	.	1	.	.	.	.
< 1 M TALL SIZE CLASS								
ABIES LASIOCARPA	33	T	T	T	.	.	.	.
TSUGA MERTENSIANA	17	T	.	T	.	.	.	.
PINUS CONTORTA	17	T	.	T	.	.	.	.
TALL SHRUB SPECIES								
VACCINIUM OCCIDENTALE	100	8	2	35	3	6	1	T
SALIX COMMUTATA	33	5	3	7	.	.	.	.
SPIRAEA DENSIFLORA	33	1	.	2	T	.	.	.
SALIX GEYERIANA	33	1	.	1	.	T	.	.
BETULA GLANDULOSA	17	1	.	.	.	.	.	1
SALIX MYRTILLIFOLIA	17	T	.	.	.	.	.	T
SALIX	17	T	.	.	.	.	T	.
SALIX SITCHENSIS	17	T	T	.	.	.	.	.
AMELANCHIER ALNIFOLIA	17	T	T	.	.	.	.	.
ROSA GYMNOCARPA	17	T	.	.	.	.	T	.
RIBES LACUSTRE	17	T	T	.	.	.	.	.
SORBUS SITCHENSIS	17	T	T	.	.	.	.	.
VACCINIUM MEMBRANACEUM	17	T	T	.	.	.	.	.
ALNUS SINUATA	17	T	T	.	.	.	.	.

TABLE 2. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 210	214	215	227	236	316
LOW SHRUB AND SUB-SHRUB SPECIES								
KALMIA OCCIDENTALIS	33	T	T	.	.	.	T	.
LONICERA INVOLUCRATA	17	1	.	1	.	.	.	.
RUBUS LASIOCOCCUS	17	T	T	.	.	.	.	.
GRASS. SEDGE AND RUSH SPECIES								
ELEOCHARIS PAUCIFLORA	100	58	30	35	80	55	90	60
MUHLENBERGIA FILIFORMIS	83	5	1	3	1	.	20	1
CAREX ROSTRATA	83	2	.	T	T	3	7	T
CAREX SITCHENSIS	67	17	.	22	15	20	10	.
CAREX LUZULINA	67	11	25	10	2	6	.	.
CAREX MURICATA	67	4	T	15	2	.	T	.
SCIRPUS CONGDONII	67	1	T	4	T	T	.	.
DESCHAMPSIA CAESPITOSA	67	1	.	T	.	T	1	2
CAREX JONESII	50	4	3	1	.	.	.	8
CAREX SCOPULORUM	33	3	5	.	.	.	.	1
LUZULA CAMPESTRIS	33	1	.	2	T	.	.	.
AGROSTIS THURBERIANA	33	T	.	T	.	.	T	.
JUNCUS EFFUSUS	33	T	.	T	.	.	T	.
JUNCUS ENSIFOLIUS	33	T	.	.	T	.	T	.
POA TRIVIALIS	33	T	T	.	T	.	.	.
DANTHONIA CALIFORNICA	33	T	.	T	.	.	T	.
CAREX AQUATILIS	17	35	35	.	.	.	.	.
JUNCUS NEVADENSIS NEVADENSIS	17	18	.	.	.	.	18	.
CAREX SIMULATA	17	8	.	.	.	.	.	8
CAREX BUXBAUMII	17	5	.	.	.	5	.	.
CAREX HOODII	17	2	.	2	.	.	.	.
AGROSTIS	17	1	.	.	.	.	.	1
JUNCUS ORTHOPHYLLUS	17	1	.	.	.	.	1	.
POA PALUSTRIS	17	T	.	.	.	T	.	.
CAREX ILLOTA	17	T	.	T	.	.	.	.

TABLE 2. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 210	214	215	227	236	316
GRASS. SEDGE AND RUSH SPECIES	CONTINUED							
DANTHONIA INTERMEDIA	17	T	.	T	.	.	.	.
CAREX MICROPTERA	17	T	T	.	.	.	.	.
PHLEUM ALPINUM	17	T	T	.	.	.	.	.
FERN. LYCOPOD AND MOSS SPECIES								
SPHAGNUM	100	34	40	90	4	2	10	60
EQUISETUM ARVENSE	67	1	.	4	T	.	T	T
ATHYRIUM FILIX-FEMINA	17	T	T	.	.	.	.	.
FORB SPECIES								
DODECATHEON JEFFREYI	100	8	9	10	1	17	1	9
PEDICULARIS GROENLANDICA	100	2	5	2	1	1	T	T
RANUNCULUS GORMANII	83	6	.	7	2	T	22	1
HYPERICUM ANAGALLOIDES	83	5	1	6	2	.	15	2
TOFIELDIA GLUTINOSA BREVISTYLA	83	3	6	5	1	1	T	.
MICROSERIS BOREALE	83	T	1	1	T	T	T	.
HABENARIA DILATATA	83	T	T	T	T	T	T	.
EPILOBIUM ALPINUM	83	T	.	T	T	T	T	T
CALTHA BIFLORA	67	11	30	8	1	4	.	.
POLYGONUM BISTORTOIDES	67	1	T	.	.	2	1	1
ASTER ALPIGENUS	67	1	.	T	T	1	.	1
MIMULUS PRIMULOIDES	50	T	.	T	T	.	T	.
DROSERA ANGLICA	33	7	.	4	10	.	.	.
SAXIFRAGA OREGANA	33	2	.	.	.	.	T	4
UTRICULARIA VULGARIS	33	2	.	.	.	.	3	T
EPILOBIUM ANGUSTIFOLIUM	33	1	T	1	.	.	.	.
LIGUSTICUM GRAYI	33	1	T	1	.	.	.	.
SPIRANTHES ROMANZOFFIANA	33	T	.	.	.	.	T	T
ASTER FOLIACEUS	33	T	T	T	.	.	.	.
SMILACINA STELLATA	33	T	T	.	.	.	T	.

TABLE 2. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 210	214	215	227	236	316
FORB SPECIES CONTINUED								
POTENTILLA DRUMMONDII	33	T	T	.	.	.	T	.
SENECIO TRIANGULARIS	33	T	T	.	T	.	.	.
MENYANTHES TRIFOLIATA	17	3	.	.	3	.	.	.
LUPINUS LATIFOLIUS	17	2	.	2	.	.	.	.
FRAGARIA VESCA	17	T	.	T	.	.	.	.
PEDICULARIS ATTOLLENS	17	T	.	.	.	T	.	.
ARNICA MOLLIS	17	T	.	T	.	.	.	.
RUMEX ACETOSELLA	17	T	.	T	.	.	.	.
ASTER OCCIDENTALIS	17	T	.	.	.	.	T	.
VIOLA MACLOSKEYI	17	T	T	.	.	.	.	.
HABENARIA SACCATA	17	T	T	.	.	.	.	.
TRIFOLIUM LONGIPES	17	T	T	.	.	.	.	.
ANGELICA ARGUTA	17	T	.	.	.	.	.	T
MITELLA BREWERI	17	T	T	.	.	.	.	.
MITELLA OVALIS	17	T	T	.	.	.	.	.
EPILOBIUM WATSONII	17	T	T	.	.	.	.	.
STREPTOPUS AMPLEXIFOLIUS	17	T	T	.	.	.	.	.
ACHILLEA MILLEFOLIUM	17	T	.	.	.	.	T	.
VERATRUM	17	T	.	.	T	.	.	.
VIOLA PALUSTRIS	17	T	T	.	.	.	.	.
VERONICA WORMSKJOLDII	17	T	.	T	.	.	.	.
GENTIANA SIMPLEX	17	T	.	.	.	.	T	.
LYSICHITUM AMERICANUM	17	T	T	.	.	.	.	.

TABLE 3A. PART 1. STAND TABLE FOR THE DECA- HYAN- MUFI C.T. .

SPECIES	CONS	AVE COVER	PLOT LABELS 182	183	222	229	237	238	272	295	300	301
TOTAL OVERSTORY COVER												
PINUS CONTORTA	18	1	.	.	.	2	.	.	.	.	.	T
PICEA ENGELMANNII	18	T	.	.	.	.	.	.	.	.	T	T
< 1DM DBH AND > 1M SIZE CLASS												
PINUS CONTORTA	9	1	.	.	.	1	.	.	.	.	.	.
< 1 M TALL SIZE CLASS												
PINUS CONTORTA	18	1	.	.	.	1	.	.	.	.	.	T
PICEA ENGELMANNII	9	T	.	.	.	.	.	.	.	.	.	T
TALL SHRUB SPECIES												
VACCINIUM OCCIDENTALE	82	4	10	.	3	4	T	5	2	.	4	4
SALIX GEYERIANA	45	1	.	.	T	5	T	.	.	.	T	T
SALIX MYRTILLIFOLIA	27	1	.	.	T	1	.	2	.	.	.	.
ALNUS INCANA	18	T	.	.	.	.	.	.	.	.	T	T
SPIRAEA DENSIFLORA	9	1	.	.	1	.	.	.	.	.	.	.
SALIX COMMUTATA	9	1	.	.	.	.	.	.	1	.	.	.
SALIX	9	T	.	.	.	.	.	T	.	.	.	.
BETULA GLANDULOSA	9	T	.	.	.	.	.	.	.	.	T	.
LOW SHRUB AND SUB-SHRUB SPECIES												
KALMIA OCCIDENTALIS	9	T	.	.	.	.	.	T	.	.	.	.
GRASS. SEDGE AND RUSH SPECIES												
DESCHAMPSIA CAESPITOSA	100	36	12	7	35	35	30	35	70	50	90	3
ELEOCHARIS PAUCIFLORA	91	16	3	5	3	2	50	5	50	.	30	T
MUHLENBERGIA FILIFORMIS	82	10	T	.	30	25	7	4	20	.	2	2
CAREX SITCHENSIS	82	8	3	10	7	8	25	8	7	.	.	3
CAREX LUZULINA	64	29	75	45	70	4	.	1	T	.	.	.
CAREX ROSTRATA	55	20	.	.	.	13	.	2	.	50	35	10

TABLE I. CONTINUED.

SPECI	CONS	AVE COVER	PLOT LABELS 182	183	222	229	237	238	272	295	300	301
GRASS SPECIES CONTINUED												
CAREX MU	55	7	T	3	.	4	.	10	5	.	.	.
SCIRPUS	45	1	1	2	1	1	.	.	.	.	.	.
CAREX JO	36	4	.	.	.	.	4	8	2	2	.	.
LUZULA C	36	T	T	.	.	.	.	T	T	.	1	.
CAREX SI	27	4	.	.	.	.	.	.	2	.	6	5
JUNCUS E	27	T	.	.	.	T	.	T	.	.	T	.
JUNCUS NENSIS	18	35	.	.	.	.	.	.	.	.	30	40
POA PALU	18	3	.	.	.	.	.	.	.	.	T	5
JUNCUS O	18	3	.	.	.	.	4	1	.	.	.	.
DANTHONI	18	1	.	.	1	.	.	.	T	.	.	.
AGROSTIS	18	T	.	.	T	.	.	T	.	.	.	.
CALAMAGR	9	40	.	.	.	.	.	.	.	40	.	.
CAREX SC	9	5	.	.	.	.	.	.	.	5	.	.
JUNCUS E	9	T	.	.	.	.	.	T	.	.	.	.
AGROSTIS	9	T	.	.	.	.	.	.	.	.	T	.
GLYCERIA	9	T	.	.	.	.	.	.	.	.	T	.
AGROSTIS	9	T	.	.	.	.	.	.	T	.	.	.
POA TRIV	9	T	.	.	.	.	.	.	.	.	T	.
PHLEUM A	9	T	.	.	.	.	.	.	T	.	.	.
JUNCUS B	9	T	.	.	.	.	.	.	T	.	.	.
PHALARIS	9	T	.	.	T	.	.	.	.	.	.	.
PHLEUM P	9	T	.	.	.	.	.	.	.	.	T	.
FERN.S SPECIES												
SPHAGNUM	82	49	20	.	90	25	3	10	60	35	95	99
EQUISETU	27	5	1	.	.	.	.	15	.	.	T	.
FORB S												
HYPERICU	91	10	4	20	30	25	1	5	2	.	3	10
DODECATH	82	8	4	40	7	6	T	T	8	T	.	.

TABLE 3A. PART 1. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 182	183	222	229	237	238	272	295	300	301
FORB SPECIES CONTINUED												
RANUNCULUS GORMANII	64	18	4	25	2	1	55	40	.	.	.	.
TOFIELDIA GLUTINOSA BREVISTYLA	64	2	1	1	T	.	.	1	.	.	1	7
MICROSERIS BOREALE	55	14	2	4	25	.	10	3	.	.	.	.
CALTHA BIFLORA	55	6	17	1	1	.	.	15	T	.	.	.
TRIFOLIUM LONGIPES	55	3	.	10	2	T	.	T	T	.	.	.
MIMULUS PRIMULOIDES	45	9	.	.	.	.	5	1	3	.	15	20
PEDICULARIS GROENLANDICA	45	6	.	2	3	.	.	3	23	.	.	.
POLYGONUM BISTORTOIDES	45	5	1	.	T	.	10	12	.	.	.	.
EPILOBIUM ALPINUM	45	1	.	.	.	1	1	T	1	.	1	.
SPIRANTHES ROMANZOFFIANA	45	T	.	.	.	.	T	.	T	.	T	T
GALIUM BIFOLIUM	36	1	.	.	.	1	.	.	T	.	T	.
HABENARIA DILATATA	36	T	T	.	T	.	.	1	.	.	T	.
ASTER FOLIACEUS	36	T	1	.	.	.	.	.	T	.	T	T
ASTER ALPIGENUS	27	3	.	2	T	.	.	.	8	.	.	.
VIOLA MACLOSKEYI	27	3	.	1	.	7	.	.	.	.	.	.
EPILOBIUM WATSONII	27	T	T	.	T	.	.	T	.	.	.	.
SENECIO CYMBALARIOIDES	18	11	.	.	.	.	.	.	20	.	2	.
MENYANTHES TRIFOLIATA	18	3	.	.	.	.	.	.	.	.	1	5
SANGUISORBA OCCIDENTALIS	18	2	.	.	.	.	.	.	.	.	3	1
VIOLA ADUNCA	18	2	.	.	T	.	.	.	.	.	.	.
POTENTILLA DRUMMONDII	18	2	.	.	.	1	.	.	.	.	.	.
ASTER OCCIDENTALIS	18	1	.	.	.	.	2	T	.	.	.	.
VERONICA SCUTELLATA	18	1	.	.	T	1	.	.	.	.	.	.
LYSICHITUM AMERICANUM	18	1	.	.	.	.	.	.	.	.	T	1
EPILOBIUM GLABERRIMUM	18	1	.	.	.	.	.	T	.	.	1	.
MIMULUS GUTTATUS	18	T	.	.	.	.	.	T	.	.	T	.
CASTILLEJA MINIATA	18	T	.	.	.	T	.	T	.	.	.	.
VERONICA WORMSKJOLDII	18	T	.	.	.	T	.	.	T	.	.	.
ANGELICA ARGUTA	18	T	T	.	.	.	.	.	.	.	T	.
LIGUSTICUM GRAYI	18	T	T	.	.	.	.	.	T	.	.	.

TABLE 3A. PART 1. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 182	183	222	229	237	238	272	295	300	301
FORB SPECIES CONTINUED												
RANUNCULUS ALISMAEFOLIUS	9	3	.	.	.	.	.	.	3	.	.	.
PEDICULARIS ATTOLLENS	9	3	.	.	.	3	.	.	.	.	.	.
SISYRINCHIUM ANGUSTIFOLIUM	9	1	1	.	.	.	.	.	.	.	.	.
VIOLA	9	1	.	.	.	.	.	.	.	.	1	.
DROSERA ROTUNDIFOLIA	9	1	.	1	.	.	.	.	.	.	.	.
DROSERA ANGLICA	9	1	.	1	.	.	.	.	.	.	.	.
SENECIO TRIANGULARIS	9	T	.	.	.	.	.	T	.	.	.	.
AGOSERIS AURANTIACA	9	T	T	.	.	.	.	.	.	.	.	.
SAXIFRAGA OREGANA	9	T	.	.	.	.	.	T	.	.	.	.
POTENTILLA FLABELLIFOLIA	9	T	.	.	.	.	.	.	T	.	.	.
HYPERICUM FORMOSUM	9	T	.	.	.	.	.	.	.	.	T	.
POTENTILLA PALUSTRIS	9	T	.	.	.	.	.	.	.	T	.	.
ACONITUM COLUMBIANUM	9	T	.	.	.	.	.	.	.	.	T	.
ARNICA MOLLIS	9	T	.	.	.	.	.	T	.	.	.	.
GALIUM	9	T	.	.	.	.	.	.	.	.	T	.

TABLE 3A. PART 2. STAND TABLE FOR THE DECA- HYAN- MUFI C.T. .

SPECIES	PLOT LABELS 310
TOTAL OVERSTORY COVER	
PINUS CONTORTA	.
PICEA ENGELMANNII	.
< 1DM DBH AND > 1M SIZE CLASS	
PINUS CONTORTA	.
< 1 M TALL SIZE CLASS	
PINUS CONTORTA	.
PICEA ENGELMANNII	.
TALL SHRUB SPECIES	
VACCINIUM OCCIDENTALE	1
SALIX GEYERIANA	.
SALIX MYRTILLIFOLIA	.
ALNUS INCANA	.
SPIRAEA DENSIFLORA	.
SALIX COMMUTATA	.
SALIX	.
BETULA GLANDULOSA	.
LOW SHRUB AND SUB-SHRUB SPECIES	
KALMIA OCCIDENTALIS	.
GRASS. SEDGE AND RUSH SPECIES	
DESCHAMPSIA CAESPITOSA	30
ELEOCHARIS PAUCIFLORA	15
MUHLENBERGIA FILIFORMIS	4
CAREX SITCHENSIS	5
CAREX LUZULINA	10
CAREX ROSTRATA	10

TABLE 3A. PART 2. CONTINUED.

SPECIES	PLOT LABELS 310
GRASS. SEDGE AND RUSH SPECIES CONTINUED	
CAREX MURICATA	20
SCIRPUS CONGDONII	1
CAREX JONESII	.
LUZULA CAMPESTRIS	.
CAREX SIMULATA	.
JUNCUS ENSIFOLIUS	.
JUNCUS NEVADENSIS NEVADENSIS	.
POA PALUSTRIS	.
JUNCUS ORTHOPHYLLUS	.
DANTHONIA CALIFORNICA	.
AGROSTIS THURBERIANA	.
CALAMAGROSTIS INEXPANSA	.
CAREX SCOPULORUM	.
JUNCUS EFFUSUS	.
AGROSTIS TENUIS	.
GLYCERIA ELATA	.
AGROSTIS EXARATA	.
POA TRIVIALIS	.
PHLEUM ALPINUM	.
JUNCUS BALTICUS	.
PHALARIS ARUNDINACEA	.
PHLEUM PRATENSE	.
FERN. LYCOPOD AND MOSS SPECIES	
SPHAGNUM	.
EQUISETUM ARVENSE	.
FORB SPECIES	
HYPERICUM ANAGALLOIDES	3
DODECATHEON JEFFREYI	10

TABLE 3A. PART 2. CONTINUED.

SPECIES	PLOT LABELS 310
FORB SPECIES CONTINUED	
RANUNCULUS GORMANII	1
TOFIELDIA GLUTINOSA BREVISTYLA	3
MICROSERIS BOREALE	40
CALTHA BIFLORA	1
TRIFOLIUM LONGIPES	8
MIMULUS PRIMULOIDES	.
PEDICULARIS GROENLANDICA	1
POLYGONUM BISTORTOIDES	3
EPILOBIUM ALPINUM	.
SPIRANTHES ROMANZOFFIANA	1
GALIUM BIFOLIUM	1
HABENARIA DILATATA	.
ASTER FOLIACEUS	.
ASTER ALPIGENUS	.
VIOLA MACLOSKEYI	1
EPILOBIUM WATSONII	.
SENECIO CYMBALARIOIDES	.
MENYANTHES TRIFOLIATA	.
SANGUISORBA OCCIDENTALIS	.
VIOLA ADUNCA	3
POTENTILLA DRUMMONDII	2
ASTER OCCIDENTALIS	.
VERONICA SCUTELLATA	.
LYSICHITUM AMERICANUM	.
EPILOBIUM GLABERRIMUM	.
MIMULUS GUTTATUS	.
CASTILLEJA MINIATA	.
VERONICA WORMSKJOLDII	.
ANGELICA ARGUTA	.
LIGUSTICUM GRAYI	.

TABLE 3A. PART 2. CONTINUED.

SPECIES	PLOT LABELS 310
FORB SPECIES CONTINUED	
RANUNCULUS ALISMAEFOLIUS	.
PEDICULARIS ATTOLLENS	.
SISYRINCHIUM ANGUSTIFOLIUM	.
VIOLA	.
DROSERA ROTUNDIFOLIA	.
DROSERA ANGLICA	.
SENECIO TRIANGULARIS	.
AGOSERIS AURANTIACA	.
SAXIFRAGA OREGANA	.
POTENTILLA FLABELLIFOLIA	.
HYPERICUM FORMOSUM	.
POTENTILLA PALUSTRIS	.
ACONITUM COLUMBIANUM	.
ARNICA MOLLIS	.
GALIUM	.

TABLE 3B. STAND TABLE FOR THE DECA C.T.- CAVE PHASE .

SPECIES	CONS	AVE COVER	PLOT LABELS 315	318
TOTAL OVERSTORY COVER				
PINUS CONTORTA	100	T	T	T
PICEA ENGELMANNII	50	T	.	T
TALL SHRUB SPECIES				
SPIRAEA DOUGLASII	100	1	T	1
VACCINIUM OCCIDENTALE	100	T	T	T
GRASS. SEDGE AND RUSH SPECIES				
DESCHAMPSIA CAESPITOSA	100	80	80	80
CAREX VESICARIA	100	28	15	40
JUNCUS BALTICUS	100	6	10	1
FORB SPECIES				
ASTER ALPIGENUS	50	2	.	2
ASTER FOLIACEUS	50	T	.	T
GALIUM BIFOLIUM	50	T	.	T
TRIFOLIUM LONGIPES	50	T	.	T

TABLE 3C. STAND TABLE FOR THE DECA C.T.- JUBA PHASE .

SPECIES	CONS	AVE COVER	PLOT LABELS 273	296	314
TALL SHRUB SPECIES					
SALIX GEYERIANA	33	1	.	.	1
VACCINIUM OCCIDENTALE	33	T	.	.	T
SPIRAEA DOUGLASII	33	T	.	.	T
GRASS. SEDGE AND RUSH SPECIES					
DESCHAMPSIA CAESPITOSA	100	80	80	80	80
JUNCUS BALTICUS	100	30	15	50	25
SCIRPUS CONGDONII	67	13	25	.	1
MUHLENBERGIA FILIFORMIS	67	6	.	10	2
CAREX ROSTRATA	67	2	2	.	1
CAREX SPECTABILIS	33	8	.	8	.
CAREX CAPITATA	33	1	.	1	.
CALAMAGROSTIS CANADENSIS	33	1	.	.	1
CAREX SUBFUSCA	33	T	.	T	.
FERN. LYCOPOD AND MOSS SPECIES					
SPHAGNUM	67	39	.	60	18
FORB SPECIES					
ASTER ALPIGENUS	100	3	5	2	2
RANUNCULUS ALISMAEFOLIUS	100	3	T	1	7
ASTER FOLIACEUS	100	2	T	T	6
TRIFOLIUM LONGIPES	100	1	2	1	T
DODECATHEON JEFFREYI	67	3	.	T	6
GENTIANA NEWBERRYI	33	25	.	25	.
MIMULUS PRIMULOIDES	33	12	.	12	.
SENECIO CYMBALARIOIDES	33	2	.	2	.
PEDICULARIS GROENLANDICA	33	1	.	.	1
POTENTILLA DRUMMONDII	33	1	.	1	.
HYPERICUM ANAGALLOIDES	33	1	.	.	1

TABLE 3C. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 273	296	314
FORB SPECIES CONTINUED					
VERONICA AMERICANA	33	1	.	.	1
EPILOBIUM ALPINUM	33	T	.	T	.
SPHENOSCIADIUM CAPITELLATUM	33	T	.	T	.
SPIRANTHES ROMANZOFFIANA	33	T	.	T	.
GALIUM BIFOLIUM	33	T	.	T	.

TABLE 3D. ST FOR THE DECA C.T.- CAAQ/CABU3 PHASE .

SPECIES	CONS	AVE COVER	PLOT LABELS 232	233
TALL SHRUB SPECII				
VACCINIUM OCCIDENTAI	100	3	T	5
SPIRAEA DENSIFLORA	100	1	T	1
SALIX GEYERIANA	50	3	.	3
LOW SHRUB AND SUIECIES				
KALMIA OCCIDENTALIS	50	1	.	1
GRASS. SEDGE AND IES				
DESCHAMPSIA CAESPIT(	100	45	40	50
CAREX AQUATILIS	100	33	20	45
CAREX BUXBAUMII	100	25	35	15
SCIRPUS CONGDONII	100	3	4	2
CAREX ROSTRATA	100	2	T	3
JUNCUS EFFUSUS	50	4	4	.
ELEOCHARIS PAUCIFLOI	50	1	.	1
CAREX LUZULINA	50	1	.	1
CAREX SITCHENSIS	50	1	1	.
CALAMAGROSTIS INEXPA	50	T	T	.
DANTHONIA CALIFORNIC	50	T	T	.
FERN. LYCOPOD ANDCIES				
SPHAGNUM	100	9	15	2
FORB SPECIES				
TRIFOLIUM LONGIPES	100	29	55	3
VERONICA SCUTELLATA	50	5	5	.
RANUNCULUS GORMANII	50	1	1	.
POTENTILLA PALUSTRIS	50	1	.	1
ASTER ALPIGENUS	50	1	.	1
DODECATHEON JEFFREYI	50	1	.	1

TABLE 3D. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 232	233
FORB SPECIES CONTINUED				
GALIUM BIFOLIUM	50	T	T	.
POTENTILLA DRUMMONDII	50	T	T	.
LIGUSTICUM GRAYI	50	T	T	.
PEDICULARIS ATTOLLENS	50	T	T	.
CASTILLEJA MINIATA	50	T	T	.

TABLE 3E. STAND TABLE FOR THE DECA C.T.- CABU3/CALA3 PHASE .

SPECIES	CONS	AVE COVER	PLOT LABELS 234	235
GRASS. SEDGE AND RUSH SPECIES				
DESCHAMPSIA CAESPITOSA	100	63	70	55
CAREX BUXBAUMII	100	28	20	35
CAREX LASIOCARPA	100	19	20	17
ELEOCHARIS PALUSTRIS	100	11	7	15
MUHLENBERGIA FILIFORMIS	100	8	T	15
CALAMAGROSTIS INEXPANSA	50	1	1	.
CAREX ROSTRATA	50	T	T	.
FORB SPECIES				
ASTER OCCIDENTALIS	100	4	3	4
RANUNCULUS GORMANII	50	3	.	3
SPIRANTHES ROMANZOFFIANA	50	T	.	T

TABLE 3F. STAND TABLE FOR THE DECA- TRLO C.T. .

SPECIES	CONS	AVE COVER	PLOT LABELS 216	218	219	230	274	288	291	297	299
TALL SHRUB SPECIES											
SALIX COMMUTATA	11	T	.	T	.	.	.	.	.	.	.
VACCINIUM OCCIDENTALE	11	T	.	.	.	T	.	.	.	.	.
SPIRAEA DENSIFLORA	11	T	.	.	.	T	.	.	.	.	.
LOW SHRUB AND SUB-SHRUB SPECIES											
ERIOGONUM UMBELLATUM UMBELLATUM	11	T	.	.	T	.	.	.	.	.	.
LONICERA INVOLUCRATA	11	T	.	.	.	T	.	.	.	.	.
GRASS. SEDGE AND RUSH SPECIES											
DESCHAMPSIA CAESPITOSA	100	65	70	70	55	75	70	50	80	40	75
DANTHONIA CALIFORNICA	44	8	.	.	1	1	30	.	.	T	.
MUHLENBERGIA FILIFORMIS	33	10	.	.	.	T	.	10	.	.	20
CAREX LUZULINA	33	4	1	9	.	2	.	.	.	.	.
CALAMAGROSTIS INEXPANSA	33	4	.	10	T	1	.	.	.	.	.
CAREX SCOPULORUM	33	3	.	.	.	.	.	1	2	.	5
PHLEUM ALPINUM	33	1	.	.	.	.	T	.	.	2	2
CAREX BUXBAUMII	22	8	.	8	.	7	.	.	.	.	.
CAREX JONESII	22	6	6	.	.	.	.	.	5	.	.
CAREX SUBFUSCA	22	5	.	.	.	.	.	10	T	.	.
ELEOCHARIS PAUCIFLORA	22	5	.	4	.	.	.	.	5	.	.
CAREX PACHYSTACHYA	22	4	.	.	7	.	.	.	.	1	.
JUNCUS EFFUSUS	22	3	T	5	.	.	.	.	.	.	.
KOELERIA CRISTATA	22	3	.	.	.	.	.	.	.	2	3
STIPA OCCIDENTALIS	22	T	.	.	.	.	.	.	T	T	.
LUZULA CAMPESTRIS	22	T	T	.	.	T	.	.	.	.	.
JUNCUS BALTICUS	11	30	.	.	.	.	.	.	.	30	.
CAREX LENTICULARIS	11	8	.	8	.	.	.	.	.	.	.
DANTHONIA INTERMEDIA	11	7	7	.	.	.	.	.	.	.	.
CAREX TUMULICOLA	11	7	.	.	.	.	.	.	.	.	7
CAREX ROSTRATA	11	3	.	.	.	.	.	.	3	.	.

TABLE 3F. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 216	218	219	230	274	288	291	297	299
GRASS. SEDGE AND RUSH SPECIES	CONTINUED										
HORDEUM BRACHYANTHERUM	11	3	.	.	.	.	.	.	.	3	.
POA PRATENSIS	11	3	3	.	.	.	.	.	.	.	.
SCIRPUS CONGDONII	11	2	.	.	.	2	.	.	.	.	.
CAREX LANUGINOSA	11	T	.	.	T	.	.	.	.	.	.
CAREX PENSYLVANICA	11	T	.	.	T	.	.	.	.	.	.
ELYMUS GLAUCUS	11	T	.	.	.	T	.	.	.	.	.
FERN. LYCOPOD AND MOSS SPECIES											
SPHAGNUM	11	5	.	5	.	.	.	.	.	.	.
FORB SPECIES											
TRIFOLIUM LONGIPES	100	25	5	35	35	30	15	20	30	15	40
ASTER FOLIACEUS	89	9	1	3	15	T	20	5	.	25	5
POTENTILLA DRUMMONDII	78	9	35	.	T	7	5	.	T	10	3
ASTER ALPIGENUS	56	3	7	1	.	2	.	.	4	.	2
PEDICULARIS ATTOLLENS	56	2	T	2	T	7	T	.	.	.	.
PENSTEMON PROCERUS	44	8	.	.	1	.	.	20	.	10	1
RANUNCULUS GORMANII	33	1	3	.	1	T	.	.	.	.	.
VIOLA ADUNCA	33	T	T	.	.	T	.	.	.	1	.
RANUNCULUS ALISMAEFOLIUS	22	8	.	.	.	.	10	.	.	.	5
LIGUSTICUM GRAYI	22	3	1	.	.	.	5	.	.	.	.
EPILOBIUM ALPINUM	22	1	T	.	2	.	.	.	.	.	.
SPIRANTHES ROMANZOFFIANA	22	1	.	.	.	.	T	.	1	.	.
ANTENNARIA	22	1	.	.	.	.	.	.	.	1	T
VERONICA SERPYLLIFOLIA	22	1	.	.	.	.	.	.	.	T	1
EPILOBIUM	22	1	.	.	.	.	.	.	.	T	1
SENECIO CYMBALARIOIDES	22	1	.	.	.	.	T	.	.	.	1
VERONICA WORMSKJOLDII	22	T	T	.	.	.	T	.	.	.	.
ACHILLEA MILLEFOLIUM	11	40	.	.	.	.	40	.	.	.	.
GENTIANA NEWBERRYI	11	30	.	.	.	.	.	.	.	30	.

TABLE 3F. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 216	218	219	230	274	288	291	297	299
FORB SPECIES CONTINUED											
MIMULUS PRIMULOIDES	11	20	.	.	.	.	.	.	.	.	20
FRAGARIA VESCA	11	10	.	.	.	.	.	10	.	.	.
MICROSERIS BOREALE	11	10	.	10	.	.	.	.	.	.	.
DELPHINIUM MENZIESII	11	5	.	.	5	.	.	.	.	.	.
VIOLA MACLOSKEYI	11	1	.	.	.	.	.	1	.	.	.
DODECATHEON JEFFREYI	11	1	.	1	.	.	.	.	.	.	.
POLYGONUM CASCADENSE	11	1	.	.	.	.	.	.	.	.	1
ANTENNARIA MICROCEPHALA	11	T	.	.	T	.	.	.	.	.	.
CALTHA BIFLORA	11	T	.	T	.	.	.	.	.	.	.
POTENTILLA FLABELLIFOLIA	11	T	.	.	.	.	.	T	.	.	.
VERATRUM	11	T	.	T	.	.	.	.	.	.	.
MONTIA SPATHULATA	11	T	.	.	.	.	.	.	.	.	T
POLYGONUM NEWBERRYI NEWBERRYI	11	T	.	.	T	.	.	.	.	.	.
LUPINUS LEPIDUS	11	T	.	.	T	.	.	.	.	.	.
PEDICULARIS GROENLANDICA	11	T	.	.	.	.	T	.	.	.	.
CASTILLEJA	11	T	.	.	T	.	.	.	.	.	.

TABLE 3G. STAND TABLE FOR THE DECA- TRLO C.T.- RAGO PHASE .

SPECIES	CONS	AVE COVER	PLOT LABELS 220	221	223	224
GRASS. SEDGE AND RUSH SPECIES						
DESCHAMPSIA CAESPITOSA	100	69	60	75	70	70
DANTHONIA CALIFORNICA	100	2	2	4	1	1
KOELERIA CRISTATA	75	4	8	T	5	.
CAREX LUZULINA	75	3	T	.	7	3
PHLEUM ALPINUM	75	2	1	1	3	.
SCIRPUS CONGDONII	50	15	.	.	T	30
MUHLENBERGIA FILIFORMIS	50	3	5	.	1	.
BROMUS SITCHENSIS	50	T	T	T	.	.
CAREX MURICATA	25	2	.	.	.	2
CAREX SITCHENSIS	25	T	.	.	.	T
HORDEUM BRACHYANTHERUM	25	T	.	.	.	T
LUZULA CAMPESTRIS	25	T	T	.	.	.
CAREX ROSTRATA	25	T	.	.	T	.
ELYMUS GLAUCUS	25	T	T	.	.	.
FERN. LYCOPOD AND MOSS SPECIES						
EQUISETUM ARVENSE	25	T	.	.	.	T
FORB SPECIES						
RANUNCULUS GORMANII	100	19	20	15	20	20
TRIFOLIUM LONGIPES	100	19	20	25	15	15
POTENTILLA DRUMMONDII	100	2	T	T	5	1
ASTER FOLIACEUS	75	4	2	7	2	.
MICROSERIS BOREALE	75	3	1	3	4	.
POLYGONUM BISTORTOIDES	75	2	.	1	2	3
LIGUSTICUM GRAYI	75	2	T	T	5	.
EPILOBIUM ALPINUM	75	1	2	T	1	.
VIOLA ADUNCA	75	1	2	1	T	.
ACHILLEA MILLEFOLIUM	75	1	T	1	1	.
CASTILLEJA	50	7	4	10	.	.

TABLE 3G. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 220	221	223	224
FORB SPECIES CONTINUED						
MONTIA SPATHULATA	50	2	3	T	.	.
DODECATHEON JEFFREYI	50	1	.	.	T	1
SISYRINCHIUM ANGUSTIFOLIUM	50	T	T	.	T	.
MIMULUS PRIMULOIDES	50	T	T	.	.	T
PEDICULARIS ATTOLLENS	50	T	T	T	.	.
DELPHINIUM MENZIESII	50	T	T	T	.	.
MIMULUS GUTTATUS	50	T	T	.	.	T
VERONICA SCUTELLATA	25	7	.	.	.	7
HYPERICUM ANAGALLOIDES	25	2	.	.	.	2
CALTHA BIFLORA	25	2	.	.	.	2
PEDICULARIS GROENLANDICA	25	1	.	.	.	1
PENSTEMON PROCERUS	25	1	.	1	.	.
MICROSERIS NUTANS	25	T	.	.	.	T
GALIUM BIFOLIUM	25	T	.	.	.	T
POLYGONUM	25	T	T	.	.	.
VERONICA WORMSKJOLDII	25	T	T	.	.	.
CIRSIUM CALLILEPIS OREGONENSE	25	T	T	.	.	.

TABLE 4A. STAND TABLE FOR THE VERAT- SETR C.T. .

SPECIES	CONS	AVE COVER	PLOT LABELS 178	179
GRASS, SEDGE AND RUSH SPECIES				
CAREX SITCHENSIS	100	14	20	7
DESCHAMPSIA CAESPITOSA	100	2	1	2
CAREX LUZULINA	100	1	T	2
CAREX PACHYSTACHYA	100	T	T	T
BROMUS SITCHENSIS	50	4	4	.
ELYMUS GLAUCUS	50	2	.	2
PHALARIS ARUNDINACEA	50	2	.	2
MUHLENBERGIA FILIFORMIS	50	T	.	T
FERN, LYCOPOD AND MOSS SPECIES				
EQUISETUM ARVENSE	100	1	T	2
FORB SPECIES				
VERATRUM	100	75	70	80
HERACLEUM LANATUM	100	55	50	60
VIOLA GLABELLA	100	25	35	15
SENECIO TRIANGULARIS	100	23	20	25
STELLARIA MEDIA	100	10	4	15
ASTER FOLIACEUS	100	9	3	15
RUDBECKIA OCCIDENTALIS	100	7	3	10
PEDICULARIS BRACTEOSA	100	3	1	5
ACONITUM COLUMBIANUM	100	2	T	4
EPILOBIUM WATSONII	100	2	1	3
MERTENSIA BELLA	100	2	3	1
POTENTILLA DRUMMONDII	100	1	1	1
MONTIA CHAMISSOI	50	20	.	20
MIMULUS GUTTATUS	50	8	.	8
MERTENSIA PLATYPHYLLA	50	6	.	6
POLEMONIUM CARNEUM	50	2	2	.
MONTIA SIBIRICA	50	2	2	.

TABLE 4A. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 178	179
FORB SPECIES CONTINUED				
GEUM MACROPHYLLUM MACROPHYLLUM	50	1	1	.
ANGELICA ARGUTA	50	1	.	1
DELPHINIUM MENZIESII	50	1	1	.
HYDROPHYLLUM OCCIDENTALE	50	1	1	.
POLYGONUM BISTORTOIDES	50	T	.	T
LATHYRUS NEVADENSIS	50	T	T	.
VERONICA WORMSKJOLDII	50	T	T	.
HYDROPHYLLUM FENDLERI	50	T	.	T
VIOLA MACLOSKEYI	50	T	.	T
BARBAREA ORTHOCERAS	50	T	.	T
MITELLA OVALIS	50	T	.	T
GALIUM TRIFLORUM	50	T	.	T
VERONICA	50	T	.	T
BARBAREA VULGARIS	50	T	T	.
STELLARIA CRISPA	50	T	T	.
VERONICA SERPYLLIFOLIA	50	T	.	T
FRAGARIA VESCA	50	T	T	.
MYOSOTIS LAXA	50	T	T	.
TARAXACUM OFFICINALE	50	T	T	.
RUMEX ACETOSELLA	50	T	T	.
RANUNCULUS UNALASCHENSIS	50	T	T	.

TABLE 4B. STAND TABLE FOR THE VERAT- SETR C.T.- ELGL PHASE .

SPECIES	CONS	AVE COVER	PLOT LABELS 171	190
TALL SHRUB SPECIES				
SAMBUCUS RACEMOSA	100	2	1	3
RIBES LACUSTRE	50	2	.	2
GRASS. SEDGE AND RUSH SPECIES				
ELYMUS GLAUCUS	100	30	20	40
LUZULA CAMPESTRIS	100	T	T	T
CAREX PACHYSTACHYA	50	6	.	6
FERN. LYCOPOD AND MOSS SPECIES				
PTERIDIUM AQUILINUM	50	15	.	15
FORB SPECIES				
VERATRUM	100	28	15	40
VIOLA GLABELLA	100	11	2	20
SENECIO TRIANGULARIS	100	8	1	15
LATHYRUS NEVADENSIS	100	3	T	5
ASTER FOLIACEUS	100	3	T	5
OSMORHIZA CHILENSIS	100	2	3	1
POLYGONUM PHYTOLACCAEFOLIUM	100	2	1	2
MIMULUS MOSCHATUS	100	2	1	2
MERTENSIA BELLA	100	2	2	1
GALIUM BIFOLIUM	100	1	T	2
VALERIANA SITCHENSIS	100	1	T	1
MYOSOTIS LAXA	100	1	1	T
AQUILEGIA FORMOSA	100	T	T	T
MERTENSIA PLATYPHYLLA	50	30	30	.
HERACLEUM LANATUM	50	20	.	20
VICIA AMERICANA	50	5	.	5
HYPERICUM FORMOSUM	50	3	.	3
POLEMONIUM CARNEUM	50	3	.	3

TABLE 4B. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 171	190
FORB SPECIES CONTINUED				
CIRSIUM CALLILEPIS OREGONENSE	50	2	.	2
ERIGERON ALICEAE	50	2	.	2
THALICTRUM OCCIDENTALE	50	1	.	1
LIGUSTICUM GRAYI	50	1	1	.
ACHILLEA MILLEFOLIUM	50	1	.	1
POLYGONUM BISTORTOIDES	50	1	.	1
ANAPHALIS MARGARITACEA	50	1	.	1
GALIUM OREGANUM	50	1	.	1
VERONICA SERPYLLIFOLIA	50	1	.	1
ERYTHRONIUM GRANDIFLORUM	50	T	T	.
DELPHINIUM MENZIESII	50	T	T	.
HYDROPHYLLUM OCCIDENTALE	50	T	.	T
CORYDALIS SCOULERI	50	T	.	T
ANEMONE DELTOIDEA	50	T	T	.
CRYPTANTHA	50	T	T	.
EPILOBIUM MINUTUM	50	T	.	T
DICENTRA FORMOSA	50	T	.	T
RANUNCULUS UNALASCHENSIS	50	T	.	T
POTENTILLA GLANDULOSA	50	T	.	T
TELLIMA GRANDIFLORA	50	T	.	T
BARBAREA ORTHOCERAS	50	T	T	.
MONTIA SIBIRICA	50	T	T	.
STELLARIA NITENS	50	T	T	.
PHACELIA HETEROPHYLLA	50	T	T	.

TABLE 5. STAND TABLE FOR THE RUOC C.T. .

SPECIES	PLOT LABELS 207
GRASS. SEDGE AND RUSH SPECIES	
BROMUS CARINATUS	15
BROMUS SITCHENSIS	1
CAREX MERTENSII	T
ELYMUS GLAUCUS	1
FORB SPECIES	
ACONITUM COLUMBIANUM	T
CASTILLEJA MINIATA	4
CRYPTANTHA	T
DELPHINIUM TROLLIIFOLIUM	4
ERYTHRONIUM GRANDIFLORUM	1
GALIUM BIFOLIUM	20
HABENARIA SACCATA	1
HERACLEUM LANATUM	1
MERTENSIA BELLA	1
MIMULUS MOSCHATUS	3
MYOSOTIS LAXA	4
OSMORHIZA CHILENSIS	2
PEDICULARIS BRACTEOSA	T
PHACELIA HETEROPHYLLA	T
POLYGONUM PHYTOLACCAEFOLIUM	7
RUDBECKIA OCCIDENTALIS	60
SENECIO TRIANGULARIS	1
VERATRUM	T
VICIA AMERICANA	2
VIOLA GLABELLA	1

TABLE 6. STAND TABLE FOR THE RUPA C.T. .

SPECIES	CONS	AVE COVER	PLOT LABELS 173	177	196	197	199	201	202	213
TOTAL OVERSTORY COVER										
ABIES AMABILIS	25	3	.	.	.	.	.	.	T	6
ABIES LASIOCARPA	13	1	.	.	.	.	.	.	.	1
1 - 3 DM DBH SIZE CLASS										
ABIES AMABILIS	13	2	.	.	.	.	.	.	.	2
ABIES LASIOCARPA	13	1	.	.	.	.	.	.	.	1
< 1DM DBH AND > 1M SIZE CLASS										
ABIES AMABILIS	13	3	.	.	.	.	.	.	.	3
< 1 M TALL SIZE CLASS										
ABIES AMABILIS	25	1	.	.	.	.	.	.	T	1
TALL SHRUB SPECIES										
RUBUS PARVIFLORUS	100	59	20	70	80	70	50	95	25	60
RIBES VISCOSISSIMUM	13	T	.	.	.	.	.	.	T	.
HOLODISCUS DISCOLOR	13	T	.	T	.	.	.	.	.	.
LOW SHRUB AND SUB-SHRUB SPECIES										
SYMPHORICARPOS MOLLIS	13	T	.	.	.	.	.	.	T	.
GRASS. SEDGE AND RUSH SPECIES										
ELYMUS GLAUCUS	100	15	55	1	13	10	6	2	1	35
BROMUS SITCHENSIS	75	10	.	.	7	10	4	18	20	1
CAREX PACHYSTACHYA	75	2	T	.	T	1	1	4	.	4
CAREX PENSYLVANICA	38	11	7	.	.	.	T	.	25	.
CAREX HOODII	38	2	.	T	.	.	.	.	1	4
LUZULA CAMPESTRIS	38	T	.	.	.	.	T	.	T	T
BROMUS CARINATUS	25	11	1	20	.	.	.	.	.	.
MELICA SUBULATA	25	T	T	.	T	.	.	.	.	.

TABLE 6. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 173	177	196	197	199	201	202	213
GRASS. SEDGE AND RUSH SPECIES CONTINUED										
CAREX APERTA	25	T	.	.	.	T	T	.	.	.
FESTUCA VIRIDULA	13	T	.	T	.	.	.	.	.	.
STIPA OCCIDENTALIS	13	T	.	.	.	.	.	.	T	.
AGROSTIS	13	T	T	.	.	.	.	.	.	.
POA TRIVIALIS	13	T	.	.	.	.	.	.	T	.
CAREX LENTICULARIS	13	T	.	.	.	.	.	T	.	.
CAREX MERTENSII	13	T	.	.	.	.	.	.	.	T
CAREX DEWEYANA	13	T	T	.	.	.	.	.	.	.
POA	13	T	.	.	.	.	T	.	.	.
FERN. LYCOPOD AND MOSS SPECIES										
PTERIDIUM AQUILINUM	88	18	7	.	26	30	9	20	28	4
FORB SPECIES										
LATHYRUS NEVADENSIS	100	4	1	3	T	3	4	3	1	15
CIRSIUM CALLILEPIS OREGONENSE	100	2	T	T	T	5	1	T	5	3
PHACELIA HETEROPHYLLA	100	T	T	T	T	T	T	T	2	T
VICIA AMERICANA	88	3	.	2	4	4	1	1	1	7
DELPHINIUM MENZIESII	88	1	T	T	T	T	.	T	1	3
GALIUM BIFOLIUM	75	5	T	2	25	2	T	.	.	1
POLYGONUM PHYTOLACCAEFOLIUM	75	5	T	1	20	7	1	.	.	1
ERYSIMUM ARENICOLA	75	1	T	1	.	2	T	T	.	T
CRYPTANTHA	75	T	T	T	.	.	T	T	2	T
MIMULUS MOSCHATUS	63	12	.	15	.	25	20	.	1	1
LIGUSTICUM GRAYI	63	8	T	.	T	.	35	.	1	3
STELLARIA MEDIA	63	6	.	2	5	.	T	17	7	.
ERIGERON ALICEAE	63	3	T	1	.	.	1	.	13	1
MYOSOTIS LAXA	63	2	.	2	T	4	.	1	.	2
RUDBECKIA OCCIDENTALIS	50	6	.	7	10	2	.	.	.	6
LUPINUS LATIFOLIUS	50	4	.	5	T	.	2	.	.	7

TABLE 6. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 173	177	196	197	199	201	202	213
FORB SPECIES CONTINUED										
AQUILEGIA FORMOSA	50	T	.	T	T	.	T	.	.	T
RUMEX ACETOSELLA	38	5	.	.	.	.	3	2	10	.
ASTER FOLIACEUS	38	2	T	.	.	.	5	.	1	.
OSMORHIZA CHILENSIS	38	2	.	.	T	.	T	.	.	5
POLEMONIUM CARNEUM	38	1	.	T	.	.	.	T	.	4
HERACLEUM LANATUM	38	1	T	.	.	2	1	.	.	.
ANGELICA ARGUTA	38	1	.	.	.	.	2	.	T	T
ANAPHALIS MARGARITACEA	38	1	.	.	.	T	2	T	.	.
SMILACINA STELLATA	38	T	T	.	.	T	.	.	.	T
MERTENSIA PLATYPHYLLA	25	3	2	3	.	.	.	.	.	.
GILIA AGGREGATA	25	2	.	.	.	.	.	3	T	.
CASTILLEJA MINIATA	25	1	.	.	.	.	T	.	.	2
POLYGONUM MINIMUM	25	T	.	.	.	.	T	.	T	.
EPILOBIUM	25	T	.	T	.	.	.	T	.	.
COLLINSIA PARVIFLORA	25	T	.	.	.	.	T	T	.	.
HYDROPHYLLUM OCCIDENTALE	13	2	.	.	.	.	.	.	.	2
HYPERICUM PERFORATUM	13	2	.	.	.	.	.	.	2	.
FRAGARIA VESCA	13	2	.	.	.	.	2	.	.	.
SENECIO TRIANGULARIS	13	1	.	.	.	.	.	.	.	1
GNAPHALIUM MICROCEPHALUM	13	1	.	.	.	.	.	.	1	.
VIOLA GLABELLA	13	1	.	.	.	.	1	.	.	.
POTENTILLA GLANDULOSA	13	1	.	.	.	.	1	.	.	.
EPILOBIUM ANGUSTIFOLIUM	13	1	.	.	.	.	.	.	1	.
CLINTONIA UNIFLORA	13	T	.	.	.	.	.	.	.	T
VERATRUM	13	T	.	.	.	.	T	.	.	.
LILIUM COLUMBIANUM	13	T	.	.	.	T	.	.	.	.
EPILOBIUM MINUTUM	13	T	.	.	.	.	.	.	T	.
MITELLA BREWERI	13	T	.	.	.	.	T	.	.	.
ASTER LEDOPHYLLUS	13	T	.	.	.	.	.	.	T	.
MICROSTERIS GRACILIS	13	T	T	.	.	.	.	.	.	.

TABLE 6. CON

SPECIES	CONS	AVE COVER	PLOT LABELS 173	177	196	197	199	201	202	213
FORB SPECIES CO										
POLYGONUM DOUGLASII	13	T	.	.	.	.	.	T	.	.
ERYTHRONIUM GRANDIFL	13	T	.	.	.	.	.	.	.	T
GALIUM APARINE	13	T	.	.	.	.	.	T	.	.
ARABIS	13	T	.	.	.	.	.	.	T	.
SOLIDAGO CANADENSIS	13	T	.	.	.	.	.	T	.	.
THALICTRUM OCCIDENTA	13	T	.	.	.	.	.	.	.	T
ARENARIA MACROPHYLLA	13	T	.	.	.	.	.	.	.	T
STREPTOPUS AMPLEXIFO	13	T	.	.	.	.	.	T	.	.
PHLOX DIFFUSA	13	T	.	.	.	.	.	.	T	.
BARBAREA ORTHOCERAS	13	T	.	T	.	.	.	.	.	.
SPERGULA ARVENSIS	13	T	.	.	.	.	T	.	.	.
ACHILLEA MILLEFOLIUM	13	T	.	.	.	.	.	.	T	.
GILIA CAPITATA	13	T	.	T	.	.	.	.	.	.
ORTHOCARPUS IMBRICAT	13	T	.	.	.	.	.	.	T	.

TABLE 7. STAND TABLE FOR THE PTAQ- ELGL C.T. .

SPECIES	CONS	AVE COVER	PLOT LABELS 172	191
TOTAL OVERSTORY COVER				
ABIES LASIOCARPA	50	8	.	8
< 1DM DBH AND > 1M SIZE CLASS				
ABIES LASIOCARPA	50	8	.	8
TALL SHRUB SPECIES				
RUBUS PARVIFLORUS	50	4	4	.
GRASS. SEDGE AND RUSH SPECIES				
ELYMUS GLAUCUS	100	20	20	20
CAREX PACHYSTACHYA	100	3	3	2
LUZULA CAMPESTRIS	100	T	T	T
BROMUS CARINATUS	50	15	15	.
CAREX PENSYLVANICA	50	15	15	.
BROMUS SITCHENSIS	50	12	.	12
POA	50	1	.	1
CAREX DEWEYANA	50	T	T	.
MELICA SUBULATA	50	T	T	.
CAREX HOODII	50	T	.	T
FERN. LYCOPOD AND MOSS SPECIES				
PTERIDIUM AQUILINUM	100	80	75	85
FORB SPECIES				
LATHYRUS NEVADENSIS	100	4	2	5
GALIUM BIFOLIUM	100	3	T	5
DELPHINIUM MENZIESII	100	2	T	4
MIMULUS MOSCHATUS	100	2	T	3
CIRSIUM CALLILEPIS OREGONENSE	100	1	T	2
ASTER FOLIACEUS	100	1	T	1

TABLE 7. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 172	191
FORB SPECIES CONTINUED				
CALOCHORTUS SUBALPINUS	100	T	T	T
PHACELIA HETEROPHYLLA	100	T	T	T
ERIGERON ALICEAE	100	T	T	T
ERYSIMUM ARENICOLA	100	T	T	T
COLLINSIA PARVIFLORA	100	T	T	T
CRYPTANTHA	100	T	T	T
MERTENSIA PLATYPHYLLA	50	2	2	.
VICIA AMERICANA	50	1	.	1
SANICULA GRAVEOLENS	50	1	.	1
RUMEX ACETOSELLA	50	1	.	1
ANGELICA ARGUTA	50	1	.	1
EPILOBIUM	50	T	T	.
MYOSOTIS LAXA	50	T	.	T
MICROSTERIS GRACILIS	50	T	T	.
HERACLEUM LANATUM	50	T	T	.
POLYGONUM PHYTOLACCAEFOLIUM	50	T	T	.
EPILOBIUM MINUTUM	50	T	.	T
VIOLA NUTTALLII BAKERI	50	T	.	T
SMILACINA STELLATA	50	T	T	.
VERATRUM	50	T	T	.
ARALIA CALIFORNICA	50	T	.	T
LUPINUS LATIFOLIUS	50	T	T	.
POLYGONUM MINIMUM	50	T	.	T
LIGUSTICUM GRAYI	50	T	T	.
ALLIUM CRENULATUM	50	T	.	T
LILIUM COLUMBIANUM	50	T	T	.
MICROSERIS	50	T	T	.

TABLE 8A. STAND TABLE FOR THE CAPE5- BROMU C.T. .

SPECIES	CONS	AVE COVER	PLOT LABELS 174	175	176	189	198	304
TALL SHRUB SPECIES								
AMELANCHIER ALNIFOLIA	17	2	.	.	.	2	.	.
SAMBUCUS RACEMOSA	17	T	.	.	.	.	T	.
ACER GLABRUM DOUGLASII	17	T	.	T	.	.	.	.
LOW SHRUB AND SUB-SHRUB SPECIES								
COMANDRA UMBELLATA CALIFORNICA	33	T	.	.	T	T	.	.
GRASS. SEDGE AND RUSH SPECIES								
CAREX PENSYLVANICA	100	23	25	7	30	20	37	20
ELYMUS GLAUCUS	100	7	20	T	4	12	1	2
BROMUS CARINATUS	83	19	7	50	30	8	.	2
FESTUCA VIRIDULA	67	8	.	2	17	10	3	.
STIPA OCCIDENTALIS	67	2	5	T	2	.	.	T
CAREX PACHYSTACHYA	67	1	1	.	1	T	T	.
LUZULA CAMPESTRIS	33	1	.	.	1	.	T	.
BROMUS SITCHENSIS	17	17	.	.	.	.	17	.
CAREX HOODII	17	3	.	.	.	.	.	3
MELICA SUBULATA	17	1	.	.	.	.	1	.
POA	17	T	T	.	.	.	.	.
AGROSTIS	17	T	T	.	.	.	.	.
POA PRATENSIS	17	T	.	.	.	.	.	T
FERN. LYCOPOD AND MOSS SPECIES								
PTERIDIUM AQUILINUM	17	6	.	.	.	.	6	.
FORB SPECIES								
ERIGERON ALICEAE	83	26	14	7	4	.	12	95
LUPINUS LATIFOLIUS	83	4	4	2	6	.	5	1
CIRSIUM CALLILEPIS OREGONENSE	83	T	.	T	1	T	1	T
ASTER FOLIACEUS	67	5	.	7	6	7	T	.

TABLE 8A. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 174	175	176	189	198	304
FORB SPECIES CONTINUED								
LATHYRUS NEVADENSIS	67	4	2	10	2	.	1	.
POTENTILLA GLANDULOSA	67	3	.	.	T	12	T	1
RUMEX ACETOSELLA	67	3	.	.	3	1	6	2
ACHILLEA MILLEFOLIUM	67	2	.	.	2	2	T	2
CALOCHORTUS SUBALPINUS	67	1	1	T	1	1	.	.
PHACELIA HETEROPHYLLA	67	1	1	T	.	.	T	2
DELPHINIUM MENZIESII	67	1	T	T	2	.	T	.
PHLOX DIFFUSA	67	T	T	T	T	.	T	.
ASTER LEDOPHYLLUS	50	6	T	T	.	.	17	.
ERYSIMUM ARENICOLA	50	1	.	.	1	3	T	.
ORTHOCARPUS IMBRICATUS	50	T	.	T	1	T	.	.
EPILOBIUM MINUTUM	50	T	T	T	T	.	.	.
LIGUSTICUM GRAYI	33	12	.	.	.	.	22	1
FRAGARIA VESCA	33	2	.	.	4	.	T	.
CRYPTANTHA	33	2	.	T	.	.	3	.
VICIA AMERICANA	33	1	.	.	1	.	1	.
HIERACIUM CYNOGLOSSOIDES	33	1	.	.	1	1	.	.
ANTENNARIA MICROCEPHALA	33	1	.	.	1	T	.	.
SMILACINA STELLATA	33	1	.	.	1	.	T	.
SANICULA GRAVEOLENS	33	1	.	.	.	1	T	.
MIMULUS MOSCHATUS	33	T	.	.	T	.	T	.
ANGELICA ARGUTA	33	T	.	.	.	T	.	T
POLYGONUM PHYTOLACCAEFOLIUM	33	T	.	.	.	.	T	T
POLYGONUM DOUGLASII	33	T	.	.	.	.	T	T
LUPINUS	17	16	.	.	.	16	.	.
ANAPHALIS MARGARITACEA	17	2	.	.	.	2	.	.
GALIUM BIFOLIUM	17	1	.	.	.	.	1	.
ARNICA PARRYI	17	1	.	.	1	.	.	.
CASTILLEJA HISPIDA	17	1	.	.	.	1	.	.
SENECIO INTEGERRIMUS	17	1	.	.	1	.	.	.

ABLE 8A. CONTINUED.

PECIES	CONS	AVE COVER	PLOT LABELS 174	175	176	189	198	304
ORB SPECIES CONTINUED								
ERIS AURANTIACA	17	1	.	.	.	.	.	1
ECKIA OCCIDENTALIS	17	1	.	.	1	.	.	.
ERIS	17	1	.	.	1	.	.	.
OSTERIS GRACILIS	17	1	.	.	1	.	.	.
PHYLLUM TENAX	17	1	.	.	.	.	.	1
ERIS GRANDIFLORA	17	1	.	.	.	1	.	.
INSIA PARVIFLORA	17	T	.	.	.	.	T	.
OBIUM ANGUSTIFOLIUM	17	T	.	.	.	T	.	.
ARIA MACROPHYLLA	17	T	.	.	T	.	.	.
LLA BREWERI	17	T	.	.	.	.	T	.
OSERIS	17	T	.	T	.	.	.	.
TRUM	17	T	.	.	.	.	.	T
ENIA FUSIFORMIS	17	T	.	.	.	T	.	.
OTIS LAXA	17	T	.	T	.	.	.	.
MONIUM CARNEUM	17	T	T	.	.	.	.	.
DAGO CANADENSIS SALEBROSA	17	T	.	.	.	.	.	T

TABLE 8B. STAND TABLE FOR THE CAPE5- BROMU C.T.- HAGR PHASE .

SPECIES	CONS	AVE COVER	PLOT LABELS 204	205
TOTAL OVERSTORY COVER				
PINUS CONTORTA	100	16	25	6
ABIES AMABILIS	50	2	2	.
PINUS MONTICOLA	50	1	.	1
PSEUDOTSUGA MENZIESII	50	T	.	T
1 - 3 DM DBH SIZE CLASS				
PINUS MONTICOLA	50	1	.	1
PINUS CONTORTA	50	T	.	T
< 1DM DBH AND > 1M SIZE CLASS				
PINUS CONTORTA	100	15	24	6
ABIES AMABILIS	50	1	1	.
PSEUDOTSUGA MENZIESII	50	T	.	T
< 1 M TALL SIZE CLASS				
PINUS CONTORTA	100	1	1	T
ABIES AMABILIS	50	1	1	.
LOW SHRUB AND SUB-SHRUB SPECIES				
HAPLOPAPPUS GREENEI	100	27	45	8
GRASS. SEDGE AND RUSH SPECIES				
CAREX PENSYLVANICA	100	43	25	60
BROMUS SITCHENSIS	100	11	7	15
ELYMUS GLAUCUS	50	1	1	.
FESTUCA VIRIDULA	50	1	1	.
CAREX HOODII	50	1	1	.
FORB SPECIES				
RUMEX ACETOSELLA	100	5	8	2

TABLE 8B. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 204	205
FORB SPECIES CONTINUED				
GILIA AGGREGATA	100	5	7	2
ERIGERON ALICEAE	100	4	3	5
LUPINUS LATIFOLIUS	100	3	5	1
FRAGARIA VESCA	100	2	2	2
AGOSERIS AURANTIACA	100	2	2	1
CALOCHORTUS SUBALPINUS	100	2	2	1
DELPHINIUM MENZIESII	100	1	T	1
LIGUSTICUM GRAYI	50	7	7	.
VIOLA NUTTALLII BAKERI	50	2	.	2
HIERACIUM CYNOGLOSSOIDES	50	1	1	.
PHACELIA HETEROPHYLLA	50	T	.	T
ASTER FOLIACEUS	50	T	T	.
GNAPHALIUM MICROCEPHALUM	50	T	T	.
PRUNELLA VULGARIS	50	T	.	T
EPILOBIUM WATSONII	50	T	.	T
CIRSIUM CALLILEPIS OREGONENSE	50	T	T	.
LATHYRUS NEVADENSIS	50	T	T	.
ORTHOCARPUS IMBRICATUS	50	T	T	.
CALYPTRIDIUM UMBELLATUM	50	T	T	.
SMILACINA STELLATA	50	T	T	.
RUDBECKIA OCCIDENTALIS	50	T	T	.

TABLE 9. STAND TABLE FOR THE ARCA2 C.T. .

SPECIES	CONS	AVE COVER	PLOT LABELS 240	242
TOTAL OVERSTORY COVER				
TSUGA MERTENSIANA	50	25	.	25
ABIES LASIOCARPA	50	2	.	2
< 1DM DBH AND > 1M SIZE CLASS				
TSUGA MERTENSIANA	50	21	.	21
ABIES LASIOCARPA	50	1	.	1
< 1 M TALL SIZE CLASS				
TSUGA MERTENSIANA	50	6	.	6
ABIES LASIOCARPA	50	1	.	1
TALL SHRUB SPECIES				
SAMBUCUS RACEMOSA	50	T	.	T
SORBUS SITCHENSIS	50	T	.	T
AMELANCHIER ALNIFOLIA	50	T	.	T
LOW SHRUB AND SUB-SHRUB SPECIES				
RUBUS LASIOCOCCUS	50	T	.	T
ARCTOSTAPHYLOS NEVADENSIS	50	T	.	T
GRASS. SEDGE AND RUSH SPECIES				
JUNCUS PARRYI	100	1	1	T
DESCHAMPSIA ATROPURPUREA	50	T	.	T
CAREX PACHYSTACHYA	50	T	.	T
CAREX PENSYLVANICA	50	T	.	T
LUZULA PARVIFLORA	50	T	.	T
BROMUS SITCHENSIS	50	T	.	T
ELYMUS GLAUCUS	50	T	.	T

TABLE 9. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 240	242
FORB SPECIES				
ARENARIA CAPILLARIS	100	53	80	25
LUPINUS LATIFOLIUS	100	T	T	T
CALOCHORTUS SUBALPINUS	100	T	T	T
HIERACIUM GRACILE	50	T	.	T
CALYPTRIDIUM UMBELLATUM	50	T	T	.
LIGUSTICUM GRAYI	50	T	.	T
EPILOBIUM ANGUSTIFOLIUM	50	T	.	T
SENECIO TRIANGULARIS	50	T	.	T
RUMEX ACETOSELLA	50	T	.	T
VIOLA SEMPERVIRENS	50	T	.	T
MICROSERIS ALPESTRIS	50	T	.	T
ANAPHALIS MARGARITACEA	50	T	.	T
EPILOBIUM WATSONII	50	T	.	T

TABLE 10. STAND TABLE FOR THE FEID- AGDI C.T. .

SPECIES	CONS	AVE COVER	PLOT LABELS 302	303	306	308	309
TALL SHRUB SPECIES							
JUNIPERUS COMMUNIS	40	5	.	.	.	T	10
AMELANCHIER ALNIFOLIA	40	1	T	.	.	.	1
RUBUS PARVIFLORUS	20	T	T	.	.	.	.
LOW SHRUB AND SUB-SHRUB SPECIES							
HAPLOPAPPUS HALLII	40	2	.	.	3	.	1
RUBUS URSINUS	40	2	.	2	.	.	1
APOCYNUM ANDROSAEMIFOLIUM	20	10	.	.	10	.	.
ARCTOSTAPHYLOS NEVADENSIS	20	6	.	.	6	.	.
ERIOGONUM UMBELLATUM UMBELLATUM	20	T	.	.	T	.	.
PACHISTIMA MYRSINITES	20	T	.	.	.	.	T
ERIOGONUM COMPOSITUM	20	T	.	.	T	.	.
SYMPHORICARPOS MOLLIS	20	T	.	.	.	T	.
GRASS. SEDGE AND RUSH SPECIES							
FESTUCA IDAHOENSIS	100	26	40	35	1	25	30
AGROSTIS DIEGOENSIS	100	19	30	10	5	45	5
ELYMUS GLAUCUS	80	3	1	3	T	9	.
BROMUS CARINATUS	60	2	T	.	T	5	.
DANTHONIA INTERMEDIA	60	1	1	T	.	3	.
KOELERIA CRISTATA	40	4	.	.	.	5	3
CAREX PENSYLVANICA	40	3	.	.	2	.	3
CAREX MICROPTERA	40	T	.	.	T	.	T
STIPA OCCIDENTALIS	20	T	.	.	T	.	.
SITANION HYSTRIX	20	T	.	.	.	.	T
CAREX FRACTA	20	T	.	.	T	.	.
CAREX MERTENSII	20	T	.	.	T	.	.
MELICA	20	T	.	.	T	.	.
LUZULA PARVIFLORA	20	T	.	.	T	.	.
CAREX HOODII	20	T	.	.	.	T	.

TABLE 10. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 302	303	306	308	309
FERN. LYCOPOD AND MOSS SPECIES							
PTERIDIUM AQUILINUM	40	3	.	.	T	5	.
CRYPTOGRAMMA CRISPA	40	1	.	.	T	.	1
SELAGINELLA OREGANA	20	2	.	.	.	.	2
SELAGINELLA WALLACEI	20	2	.	.	.	.	2
CRYPTOGRAMMA DENSA	20	T	.	.	.	.	T
FORB SPECIES							
ACHILLEA MILLEFOLIUM	100	8	4	15	1	15	5
ERIOPHYLLUM LANATUM	100	8	8	7	5	3	15
LUPINUS LATIFOLIUS	100	6	18	5	2	2	1
CAMASSIA	100	1	T	2	T	1	3
LOMATIUM TRITERNATUM	80	8	7	7	.	16	3
POTENTILLA GLANDULOSA	80	4	12	2	2	1	.
PENSTEMON PROCERUS	80	3	8	1	1	.	1
LATHYRUS NEVADENSIS	80	1	1	T	T	1	.
SOLIDAGO CANADENSIS SALEBROSA	80	T	T	T	T	1	.
POTENTILLA GRACILIS	60	3	1	1	.	6	.
POLYGONUM MINIMUM	60	2	T	.	1	.	4
ORTHOCARPUS IMBRICATUS	60	1	1	.	2	T	.
CIRSIUM CALLILEPIS OREGONENSE	60	1	T	.	T	3	.
POLYGONUM DOUGLASII	60	T	T	.	1	T	.
EPILOBIUM PANICULATUM	60	T	.	T	.	T	T
CASTILLEJA HISPIDA	60	T	.	T	.	T	T
DELPHINIUM MENZIESII	40	1	.	.	1	.	1
SANICULA GRAVEOLENS	40	1	.	.	1	.	1
COLLINSIA PARVIFLORA	40	1	.	1	.	.	T
LIGUSTICUM GRAYI	40	T	T	.	.	T	.
LOTUS NEVADENSIS	40	T	.	.	T	T	.
CALOCHORTUS SUBALPINUS	40	T	T	.	T	.	.
POLYGONUM CASCADENSE	40	T	.	T	T	.	.

TABLE 10. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 302	303	306	308	309
FORB SPECIES CONTINUED							
ANGELICA ARGUTA	40	T	.	.	T	T	.
VERATRUM	40	T	.	.	T	T	.
RUMEX ACETOSELLA	40	T	T	.	.	T	.
HIERACIUM CYNOGLOSSOIDES	20	1	.	.	1	.	.
MICROSERIS	20	T	.	.	.	T	.
VICIA AMERICANA	20	T	.	.	.	T	.
MONTIA PARVIFOLIA	20	T	.	T	.	.	.
ARENARIA CAPILLARIS	20	T	.	.	T	.	.
STELLARIA JAMESIANA	20	T	.	.	.	T	.
MIMULUS GUTTATUS	20	T	.	T	.	.	.
PHLOX DIFFUSA	20	T	.	.	T	.	.
SPIRANTHES ROMANZOFFIANA	20	T	T	.	.	.	.
CASTILLEJA MINIATA	20	T	.	T	.	.	.
AGOSERIS AURANTIACA	20	T	.	.	.	.	T
MIMULUS MOSCHATUS	20	T	.	.	.	T	.
PHACELIA HETEROPHYLLA	20	T	.	.	T	.	.
ERIGERON ALICEAE	20	T	.	.	T	.	.
ANAPHALIS MARGARITACEA	20	T	.	.	T	.	.
SENECIO TRIANGULARIS	20	T	.	.	T	.	.
VIOLA GLABELLA	20	T	.	.	T	.	.
VALERIANA SITCHENSIS	20	T	.	.	T	.	.
ASTER FOLIACEUS	20	T	.	.	.	T	.
PRUNELLA VULGARIS	20	T	.	.	T	.	.
RUDBECKIA OCCIDENTALIS	20	T	.	.	T	.	.
GILIA CAPITATA	20	T	.	.	.	T	.
CAMPANULA SCOULERI	20	T	.	.	T	.	.
CIRSIUM VULGARE	20	T	.	.	T	.	.

TABLE 11. STAND TABLE FOR THE ERLA- GICA C.T. .

SPECIES	CONS	AVE COVER	PLOT LABELS 188	192	193	209
TALL SHRUB SPECIES						
HOLODISCUS DISCOLOR	50	1	1	.	.	1
AMELANCHIER ALNIFOLIA	50	1	T	.	.	1
RUBUS PARVIFLORUS	25	T	.	.	T	.
LOW SHRUB AND SUB-SHRUB SPECIES						
ERIOGONUM COMPOSITUM	75	6	.	6	6	5
ERIOGONUM UMBELLATUM UMBELLATUM	75	2	4	1	2	.
COMANDRA UMBELLATA CALIFORNICA	50	T	T	T	.	.
PACHISTIMA MYRSINITES	25	T	T	.	.	.
GRASS. SEDGE AND RUSH SPECIES						
BROMUS SITCHENSIS	75	3	.	5	T	3
CAREX PENSYLVANICA	50	6	12	.	.	T
BROMUS CARINATUS	50	6	8	.	3	.
KOELERIA CRISTATA	50	2	3	T	.	.
STIPA OCCIDENTALIS	50	1	2	T	.	.
CAREX PACHYSTACHYA	50	T	.	.	T	T
LUZULA CAMPESTRIS	50	T	T	.	T	.
POA PRATENSIS	25	12	12	.	.	.
ELYMUS GLAUCUS	25	2	2	.	.	.
POA	25	T	.	.	.	T
DANTHONIA UNISPICATA	25	T	T	.	.	.
FERN. LYCOPOD AND MOSS SPECIES						
CRYPTOGRAMMA DENSA	75	T	.	T	T	1
SELAGINELLA WALLACEI	25	1	.	1	.	.
POLYSTICHUM MUNITUM	25	T	.	T	.	.
CHEILANTHES GRACILLIMA	25	T	.	.	T	.

TABLE 11. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 188	192	193	209
FORB SPECIES						
GILIA CAPITATA	100	14	15	20	10	9
ACHILLEA MILLEFOLIUM	100	6	20	T	1	1
CASTILLEJA HISPIDA	100	2	4	1	2	2
EPILOBIUM MINUTUM	100	1	T	2	T	T
CALOCHORTUS SUBALPINUS	100	T	T	T	T	T
COLLINSIA PARVIFLORA	100	T	T	T	T	T
ERIOPHYLLUM LANATUM	75	22	.	10	35	20
SEDUM OREGANUM	75	3	2	5	.	1
LATHYRUS NEVADENSIS	75	1	4	T	T	.
POLYGONUM MINIMUM	75	1	.	2	1	T
SANICULA GRAVEOLENS	75	1	.	1	1	1
CRYPTANTHA	75	1	T	2	.	T
ARABIS HOLBOELLII	75	T	T	T	T	.
OROBANCHE UNIFLORA MINUTA	75	T	.	T	T	T
SEDUM STENOPETALUM	50	3	.	.	1	5
PENSTEMON PROCERUS	50	2	2	2	.	.
SILENE CAMPANULATA	50	1	.	T	2	.
FRAGARIA VESCA	50	1	.	.	T	2
POTENTILLA GLANDULOSA	50	1	.	1	.	1
SPERGULA ARVENSIS	50	1	.	1	T	.
PHACELIA HETEROPHYLLA	50	1	.	T	1	.
STELLARIA NITENS	50	1	.	T	.	1
ERYSIMUM ARENICOLA	50	T	T	.	T	.
EPILOBIUM ANGUSTIFOLIUM	50	T	T	.	T	.
ASTER LEDOPHYLLUS	25	12	.	.	12	.
DELPHINIUM MENZIESII	25	9	.	.	9	.
LUPINUS	25	4	4	.	.	.
PHLOX DIFFUSA	25	3	.	3	.	.
COLLINSIA GRANDIFLORA	25	2	.	.	2	.
RUMEX ACETOSELLA	25	1	1	.	.	.

TABLE 11. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 188	192	193	209
FORB SPECIES CONTINUED						
ARTEMISIA LUDOVICIANA	25	1	1	.	.	.
LOMATIUM NUDICAULE	25	1	.	.	1	.
VICIA AMERICANA	25	1	1	.	.	.
MIMULUS PULSIFERAE	25	T	.	T	.	.
MICROSERIS NUTANS	25	T	T	.	.	.
HIERACIUM CYNOGLOSSOIDES	25	T	T	.	.	.
UMBELLIFERAE	25	T	T	.	.	.
LOMATIUM	25	T	.	.	T	.
LITHOPHRAGMA PARVIFLORA	25	T	.	.	T	.
SIDALCEA CAMPESTRIS	25	T	T	.	.	.
CONVOLVULUS NYCTAGINEUS	25	T	.	.	.	T
STELLARIA CRISPA	25	T	T	.	.	.
ARENARIA CAPILLARIS	25	T	.	.	.	T
LIGUSTICUM GRAYI	25	T	T	.	.	.
ERIOGONUM NUDUM	25	T	T	.	.	.
GALIUM APARINE	25	T	T	.	.	.
PENSTEMON RUPICOLA	25	T	T	.	.	.
SILENE DOUGLASII	25	T	T	.	.	.
LUPINUS LATIFOLIUS	25	T	.	.	T	.
PENSTEMON CARDWELLII	25	T	.	.	T	.
ERIOGONUM	25	T	.	.	.	T
GILIA AGGREGATA	25	T	.	.	T	.
PHLOX ADSURGENS	25	T	.	.	T	.

TABLE 12. STAND TABLE FOR THE PEPR- SAGR C.T. .

SPECIES	CONS	AVE COVER	PLOT LABELS 170	206	208
TALL SHRUB SPECIES					
AMELANCHIER ALNIFOLIA	67	1	T	2	.
VACCINIUM MEMBRANACEUM	33	2	.	2	.
SORBUS SITCHENSIS	33	T	.	T	.
LOW SHRUB AND SUB-SHRUB SPECIES					
COMANDRA UMBELLATA CALIFORNICA	100	2	T	3	3
ERIOGONUM UMBELLATUM UMBELLATUM	67	2	.	2	2
ARCTOSTAPHYLOS NEVADENSIS	67	2	T	3	.
PACHISTIMA MYRSINITES	33	10	.	10	.
ERIOGONUM COMPOSITUM	33	1	.	.	1
GRASS. SEDGE AND RUSH SPECIES					
CAREX PENSYLVANICA	100	8	2	2	20
FESTUCA VIRIDULA	33	50	.	50	.
STIPA OCCIDENTALIS	33	T	.	.	T
ELYMUS GLAUCUS	33	T	.	.	T
LUZULA CAMPESTRIS	33	T	T	.	.
BROMUS	33	T	T	.	.
CAREX PACHYSTACHYA	33	T	T	.	.
BROMUS SITCHENSIS	33	T	.	.	T
POA	33	T	T	.	.
FERN. LYCOPOD AND MOSS SPECIES					
PTERIDIUM AQUILINUM	33	3	.	.	3
CHEILANTHES DENSA	33	1	.	1	.
CHEILANTHES GRACILLIMA	33	1	.	1	.
FORB SPECIES					
SANICULA GRAVEOLENS	100	5	2	7	5
CALOCHORTUS SUBALPINUS	100	T	T	1	T

TABLE 12. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 170	206	208
FORB SPECIES CONTINUED					
CRYPTANTHA	100	T	T	T	T
PENSTEMON PROCERUS	100	41	45	17	60
LIGUSTICUM GRAYI	67	2	.	T	3
DELPHINIUM MENZIESII	67	1	1	.	1
ARENARIA MACROPHYLLA	67	1	.	T	1
ERYSIMUM ARENICOLA	67	1	.	T	1
SENECIO INTEGERRIMUS	67	T	T	T	.
POTENTILLA GLANDULOSA	33	7	7	.	.
ERIGERON ALICEAE	33	4	.	4	.
LUPINUS	33	4	.	4	.
SEDUM OREGANUM	33	3	.	3	.
PHLOX DIFFUSA	33	3	3	.	.
ACHILLEA MILLEFOLIUM	33	3	3	.	.
HIERACIUM CYNOGLOSSOIDES	33	2	.	2	.
POLYGONUM DOUGLASII	33	2	.	.	2
EPILOBIUM MINUTUM	33	2	.	.	2
LATHYRUS NEVADENSIS	33	1	.	.	1
POLYGONUM MINIMUM	33	1	.	.	1
AGOSERIS GRANDIFLORA	33	1	.	1	.
POLYGONUM PHYTOLACCAEFOLIUM	33	T	T	.	.
MITELLA BREWERI	33	T	T	.	.
ARENARIA CAPILLARIS AMERICANA	33	T	T	.	.
RUMEX ACETOSELLA	33	T	.	.	T
GILIA CAPITATA	33	T	.	T	.
ORTHOCARPUS IMBRICATUS	33	T	.	.	T
ARABIS	33	T	.	.	T
ERYTHRONIUM GRANDIFLORUM	33	T	.	T	.
ASTER FOLIACEUS	33	T	.	T	.
ANTENNARIA MICROCEPHALA	33	T	.	T	.
LUPINUS LATIFOLIUS	33	T	.	.	T

TABLE 12. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 170	206	208
FORB SPECIES CONTINUED					
COLLINSIA PARVIFLORA	33	T	T	.	.
HIERACIUM ALBIFLORUM	33	T	T	.	.
SEDUM LANCEOLATUM	33	T	T	.	.
ZIGADENUS VENENOSUS	33	T	T	.	.
MONTIA PERFOLIATA	33	T	T	.	.
LEWISIA TRIPHYLLA	33	T	T	.	.
HYDROPHYLLUM OCCIDENTALE	33	T	.	.	T
LITHOPHRAGMA PARVIFLORA	33	T	T	.	.

TABLE 13. STAND TABLE FOR THE FEVI C.T. .

SPECIES	CONS	AVE COVER	PLOT LABELS 168	169	241	248	256	267	270	278
TOTAL OVERSTORY COVER										
ABIES LASIOCARPA	38	T	.	.	T	.	T	.	.	T
PINUS CONTORTA	13	1	.	.	.	.	.	.	.	1
TSUGA MERTENSIANA	13	T	.	.	.	.	T	.	.	.
< 1DM DBH AND > 1M SIZE CLASS										
PINUS CONTORTA	13	1	.	.	.	.	.	.	.	1
ABIES LASIOCARPA	13	T	.	.	.	.	.	.	.	T
< 1 M TALL SIZE CLASS										
ABIES LASIOCARPA	25	T	.	.	T	.	T	.	.	.
TSUGA MERTENSIANA	13	T	.	.	.	.	T	.	.	.
PINUS CONTORTA	13	T	.	.	.	.	.	.	.	T
TALL SHRUB SPECIES										
SPIRAEA DENSIFLORA	13	T	.	.	T	.	.	.	.	.
LOW SHRUB AND SUB-SHRUB SPECIES										
ERIOGONUM UMBELLATUM UMBELLATUM	50	2	.	.	.	1	1	.	3	1
ERIOGONUM PYROLAEFOLIUM	38	1	.	.	.	T	.	.	T	2
COMANDRA UMBELLATA CALIFORNICA	13	T	.	T	.	.	.	.	.	.
GRASS. SEDGE AND RUSH SPECIES										
FESTUCA VIRIDULA	100	47	80	65	45	45	40	40	42	20
CAREX PENSYLVANICA	75	8	12	7	T	20	8	.	1	.
JUNCUS PARRYI	38	3	.	.	3	.	7	.	.	T
STIPA OCCIDENTALIS	38	1	.	.	.	1	.	1	.	T
DANTHONIA CALIFORNICA	25	1	.	.	1	.	T	.	.	.
ELYMUS GLAUCUS	25	1	1	T	.	.	.	.	.	.
SITANION HYSTRIX	25	1	.	.	.	.	.	.	1	T
CAREX HOODII	25	T	T	T	.	.	.	.	.	.

TABLE 13. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 168	169	241	248	256	267	270	278
GRASS. SEDGE AND RUSH SPECIES	CONTINUED									
CAREX SCOPULORUM	13	7	.	.	.	7	.	.	.	.
CAREX SPECTABILIS	13	5	.	.	.	.	.	5	.	.
CAREX ROSSII	13	2	.	.	.	.	.	.	.	2
LUZULA CAMPESTRIS	13	1	.	.	1	.	.	.	.	.
CAREX BREWERI	13	T	.	.	.	.	.	.	.	T
FORB SPECIES										
LUPINUS LATIFOLIUS	75	11	17	5	5	1	.	40	T	.
CALOCHORTUS SUBALPINUS	75	2	T	1	1	7	2	.	2	.
MICROSERIS ALPESTRIS	75	2	.	.	8	T	1	1	1	1
POLYGONUM NEWBERRYI NEWBERRYI	63	4	.	.	.	3	T	7	7	3
ASTER FOLIACEUS	50	3	5	3	.	.	.	3	1	.
ASTER LEDOPHYLLUS	50	2	.	8	T	1	.	.	T	.
ERIGERON ALICEAE	38	3	3	5	.	T	.	.	.	.
HIERACIUM GRACILE	38	3	.	.	T	.	8	.	T	.
CALYPTRIDIUM UMBELLATUM	38	1	.	.	.	1	1	.	T	.
LIGUSTICUM GRAYI	38	1	T	T	2	.	.	.	.	.
VIOLA NUTTALLII BAKERI	25	1	.	.	.	1	T	.	.	.
ASTER ALPIGENUS	25	T	.	.	.	.	.	.	T	T
CASTILLEJA ARACHNOIDEA	25	T	.	.	.	.	.	.	T	T
AGOSERIS AURANTIACA	25	T	T	T	.	.	.	.	.	.
ANEMONE OCCIDENTALIS	13	15	.	.	.	.	.	15	.	.
ANTENNARIA	13	4	.	.	.	.	4	.	.	.
LUPINUS LEPIDUS	13	2	.	.	.	.	.	.	.	2
ARENARIA CAPILLARIS	13	T	.	.	T	.	.	.	.	.
LOMATIUM MARTINDALEI	13	T	.	.	.	T	.	.	.	.
PENSTEMON PROCERUS	13	T	.	.	.	.	.	.	T	.
ARABIS PLATYSPERMA	13	T	.	.	.	.	.	T	.	.
VERATRUM	13	T	.	.	T	.	.	.	.	.
ARENARIA MACROPHYLLA	13	T	.	T	.	.	.	.	.	.

TABLE 13. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 168	169	241	248	256	267	270	278
FORB SPECIES CONTINUED										
EPILOBIUM ANGUSTIFOLIUM	13	T	T	.	.	.	.	.	.	.
TARAXACUM OFFICINALE	13	T	.	.	.	.	.	.	T	.
ERYTHRONIUM GRANDIFLORUM	13	T	.	T	.	.	.	.	.	.

TABLE 14. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 245	247	254	258
FORB SPECIES CONTINUED						
POTENTILLA FLABELLIFOLIA	100	19	1	1	30	45
VERONICA WORMSKJOLDII	100	T	T	T	1	T
SENECIO TRIANGULARIS	100	T	T	T	T	T
LIGUSTICUM GRAYI	75	6	T	.	10	8
DODECATHEON JEFFREYI	75	1	1	T	.	1
ASTER ALPIGENUS	50	18	T	.	.	35
VERATRUM	50	T	.	.	T	T
POLYGONUM BISTORTOIDES	25	1	.	.	.	1
SENECIO CYMBALARIOIDES	25	T	.	.	.	T
CALTHA BIFLORA	25	T	.	.	.	T
POTENTILLA DRUMMONDII	25	T	T	.	.	.
CASTILLEJA	25	T	T	.	.	.
EPILOBIUM ALPINUM	25	T	T	.	.	.
SAXIFRAGA OREGANA	25	T	T	.	.	.
ANTENNARIA	25	T	.	.	.	T
HABENARIA SACCATA	25	T	.	.	.	T

TABLE 14. STAND TABLE FOR THE DECA- CASP C.T. .

SPECIES	CONS	AVE COVER	PLOT LABELS 245	247	254	258
TALL SHRUB SPECIES						
VACCINIUM OCCIDENTALE	50	T	T	.	.	T
VACCINIUM SCOPARIUM	25	T	.	.	.	T
SALIX MYRTILLIFOLIA	25	T	T	.	.	.
LOW SHRUB AND SUB-SHRUB SPECIES						
PHYLLODOCE EMPETRIFORMIS	50	T	T	.	.	T
GAULTHERIA HUMIFUSA	25	1	.	.	.	1
KALMIA OCCIDENTALIS	25	T	.	.	.	T
GRASS. SEDGE AND RUSH SPECIES						
DESCHAMPSIA CAESPITOSA	100	26	50	20	10	25
CAREX SPECTABILIS	75	47	16	29	95	.
DANTHONIA CALIFORNICA	50	13	5	.	.	20
CAREX NIGRICANS	50	11	11	.	.	10
MUHLENBERGIA FILIFORMIS	50	2	1	.	.	3
CAREX SCOPULORUM	25	11	.	.	.	11
CAREX MICROPTERA	25	5	.	.	5	.
CAREX LUZULINA	25	1	.	.	.	1
POA	25	T	.	.	T	.
CAREX JONESII	25	T	.	.	.	T
JUNCUS BALTICUS	25	T	.	.	.	T
JUNCUS PARRYI	25	T	.	T	.	.
LUZULA CAMPESTRIS	25	T	T	.	.	.
FERN. LYCOPOD AND MOSS SPECIES						
EQUISETUM ARVENSE	25	T	.	.	.	T
FORB SPECIES						
TRIFOLIUM LONGIPES	100	25	T	54	40	6
RANUNCULUS ALISMAEFOLIUS	100	24	34	30	20	10

TABLE 15. STA FOR THE CASP- LULA C.T. .

SPECIES	CONS	AVE COVER	PLOT LABELS 243	266
TOTAL OVERSTORY C				
TSUGA MERTENSIANA	50	T	T	.
LOW SHRUB AND SUBSPECIES				
LUETKEA PECTINATA	100	T	T	T
PHYLLODOCE EMPETRIFO	100	T	T	T
ERIOGONUM PYROLAEFOL	50	T	T	.
GRASS. SEDGE AND SPECIES				
CAREX SPECTABILIS	100	51	41	60
CAREX NIGRICANS	100	2	2	2
JUNCUS PARRYI	100	T	T	T
CAREX PACHYSTACHYA	50	T	T	.
TRISETUM CANESCENS	50	T	T	.
LUZULA HITCHCOCKII	50	T	.	T
DANTHONIA CALIFORNIC	50	T	T	.
SITANION HYSTRIX	50	T	T	.
FORB SPECIES				
LUPINUS LATIFOLIUS	100	33	32	33
MICROSERIS ALPESTRIS	100	2	2	1
POLYGONUM NEWBERRYI [	100	2	2	1
LIGUSTICUM GRAYI	100	1	1	T
ANTENNARIA	100	T	T	T
CASTILLEJA	100	T	T	T
POTENTILLA FLABELLIF	50	1	.	1
CALYPTRIDIUM UMBELLA	50	1	1	.
ARABIS PLATYSPERMA	50	1	1	.
ASTER LEDOPHYLLUS	50	T	T	.
POTENTILLA DRUMMONDI	50	T	T	.
ANEMONE OCCIDENTALIS	50	T	.	T

TABLE 16. STAND TABLE FOR THE PONE4 C.T. .

SPECIES	CONS	AVE COVER	PLOT LABELS 250	251	271	275	277	279
TOTAL OVERSTORY COVER								
PINUS CONTORTA	17	18	.	.	.	18	.	.
< 1DM DBH AND > 1M SIZE CLASS								
PINUS CONTORTA	17	15	.	.	.	15	.	.
< 1 M TALL SIZE CLASS								
PINUS CONTORTA	17	3	.	.	.	3	.	.
LOW SHRUB AND SUB-SHRUB SPECIES								
ERIOGONUM PYROLAEFOLIUM	67	8	15	3	10	.	.	5
ERIOGONUM UMBELLATUM UMBELLATUM	67	5	.	5	4	5	.	7
GRASS. SEDGE AND RUSH SPECIES								
SITANION HYSTRIX	83	4	T	15	T	.	T	3
FESTUCA VIRIDULA	50	5	T	10	.	.	.	5
JUNCUS PARRYI	50	3	.	T	.	.	7	2
AGROSTIS HUMILIS	50	2	.	.	.	1	3	1
DANTHONIA CALIFORNICA	33	8	.	15	.	.	T	.
CAREX MICROPTERA	33	T	T	T	.	.	.	.
CAREX ROSSII	33	T	.	.	.	T	.	T
CAREX	17	T	.	T	.	.	.	.
STIPA OCCIDENTALIS	17	T	.	.	.	.	.	T
CAREX NIGRICANS	17	T	.	.	.	.	T	.
CAREX BREVIOR	17	T	.	.	.	.	T	.
FORB SPECIES								
POLYGONUM NEWBERRYI NEWBERRYI	100	11	20	3	10	15	10	10
MICROSERIS ALPESTRIS	100	1	1	2	T	T	1	T
CALYPTRIDIUM UMBELLATUM	83	3	.	2	2	2	5	3
LOMATIUM MARTINDALEI	83	2	1	T	.	5	4	T

TABLE 16. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 250	251	271	275	277	279
FORB SPECIES CONTINUED								
CASTILLEJA ARACHNOIDEA	33	5	.	.	8	.	.	2
ANTENNARIA	33	3	.	T	.	.	5	.
LUPINUS LEPIDUS	33	2	.	.	.	.	1	2
HIERACIUM GRACILE	33	1	.	T	.	.	2	.
ASTER ALPIGENUS	33	1	.	T	.	.	2	.
SIBBALDIA PROCUMBENS	17	3	.	.	.	.	3	.
CASTILLEJA	17	1	1	.	.	.	.	.
CALOCHORTUS SUBALPINUS	17	T	.	T	.	.	.	.
TARAXACUM OFFICINALE	17	T	T	.	.	.	.	.
ARABIS PLATYSPERMA	17	T	.	T	.	.	.	.
LUPINUS LATIFOLIUS	17	T	.	T	.	.	.	.
CARDAMINE BELLIDIFOLIA	17	T	T	.	.	.	.	.
ASTER FOLIACEUS	17	T	.	T	.	.	.	.
TRIFOLIUM LONGIPES	17	T	.	T	.	.	.	.
POTENTILLA FLABELLIFOLIA	17	T	.	T	.	.	.	.

TABLE 17. STAND TABLE FOR THE JUPA C.T. .

SPECIES	PLOT LABELS 280
LOW SHRUB AND SUB-SHRUB SPECIES	
ERIOGONUM PYROLAEFOLIUM	T
ERIOGONUM UMBELLATUM UMBELLATUM	T
GRASS. SEDGE AND RUSH SPECIES	
CAREX BREWERI	1
JUNCUS PARRYI	25
FORB SPECIES	
ANTENNARIA	T
ASTER ALPIGENUS	T
MICROSERIS ALPESTRIS	T
POLYGONUM NEWBERRYI NEWBERRYI	T

TABLE 18. STAND TABLE FOR THE LUPE C.T. .

SPECIES	PLOT LABELS 262
LOW SHRUB AND SUB-SHRUB SPECIES	
RIOGONUM PYROLAEFOLIUM	7
RIOGONUM UMBELLATUM UMBELLATUM	2
JETKEA PECTINATA	10
HYLLODOCE EMPETRIFORMIS	T
GRASS. SEDGE AND RUSH SPECIES	
ARREX NIGRICANS	1
JNCUS PARRYI	7
JZULA CAMPESTRIS	T
RISETUM SPICATUM	T
FORB SPECIES	
STER ALPIGENUS	2
ASTILLEJA ARACHNOIDEA	T
ARDAMINE BELLIDIFOLIA	T
ASTILLEJA	T
JMATIUM MARTINDALEI	T
[CROSERIS ALPESTRIS	T
DLYGONUM NEWBERRYI NEWBERRYI	1

TABLE 19. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 261	263	264	265
FORB SPECIES CONTINUED						
CASTILLEJA	100	1	1	1	1	T
LIGUSTICUM GRAYI	75	8	.	10	10	3
MICROSERIS ALPESTRIS	75	3	1	4	.	3
POLYGONUM NEWBERRYI NEWBERRYI	75	2	4	1	.	1
POTENTILLA FLABELLIFOLIA	50	1	.	1	1	.
ANTENNARIA	50	1	.	1	.	1
CASTILLEJA ARACHNOIDEA	50	T	T	.	.	T
ANEMONE OCCIDENTALIS	50	T	.	T	.	T
LUPINUS LATIFOLIUS	25	1	.	.	.	1
LOMATIUM MARTINDALEI	25	1	1	.	.	.
CALYPTRIDIUM UMBELLATUM	25	1	1	.	.	.
HIERACIUM GRACILE	25	T	.	.	T	.

LE 19. STAND TABLE FOR THE PHEM- CAME C.T. .

CIES	CONS	AVE COVER	PLOT LABELS 261	263	264	265
AL OVERSTORY COVER						
MERTENSIANA	50	1	T	2	.	.
ALBICAULIS	25	T	T	.	.	.
M TALL SIZE CLASS						
MERTENSIANA	25	2	.	2	.	.
L SHRUB SPECIES						
IUM SCOPARIUM	50	3	.	.	1	4
SHRUB AND SUB-SHRUB SPECIES						
DOCE EMPETRIFORMIS	100	39	60	20	15	60
PE MERTENSIANA	75	40	.	55	60	5
A PECTINATA	75	7	1	15	.	5
NUM PYROLAEFOLIUM	50	3	T	.	.	5
IUM DELICIOSUM	50	1	.	.	T	1
NUM UMBELLATUM UMBELLATUM	25	2	.	.	.	2
ERIA HUMIFUSA	25	T	.	.	T	.
SS. SEDGE AND RUSH SPECIES						
PARRYI	100	5	13	2	1	5
NIGRICANS	50	5	8	2	.	.
SPECTABILIS	50	1	1	.	T	.
CAMPESTRIS	50	1	1	.	T	.
HITCHCOCKII	50	1	.	.	T	1
UM SPICATUM	50	T	.	.	T	T
SCOPULORUM	25	T	.	T	.	.
NIA CALIFORNICA	25	T	.	T	.	.
B SPECIES						
ALPIGENUS	100	5	1	10	1	6

TABLE 20A. STAND TABLE FOR THE CASC5 C.T. .

SPECIES	CONS	AVE COVER	PLOT LABELS 246	253
TOTAL OVERSTORY COVER				
TSUGA MERTENSIANA	50	T	.	T
< 1 M TALL SIZE CLASS				
TSUGA MERTENSIANA	50	T	.	T
TALL SHRUB SPECIES				
SALIX COMMUTATA	50	4	4	.
VACCINIUM OCCIDENTALE	50	2	.	2
SALIX MYRTILLIFOLIA	50	1	1	.
LOW SHRUB AND SUB-SHRUB SPECIES				
KALMIA MICROPHYLLA	50	5	.	5
PHYLLODOCE EMPETRIFORMIS	50	T	.	T
GRASS. SEDGE AND RUSH SPECIES				
CAREX SCOPULORUM	100	63	90	35
ELEOCHARIS PAUCIFLORA	100	20	T	40
CAREX NIGRICANS	100	13	5	20
CAREX CANESCENS	100	3	T	5
CAREX MICROPTERA	100	1	1	1
MUHLENBERGIA FILIFORMIS	50	2	2	.
DANTHONIA CALIFORNICA	50	1	.	1
CAREX LUZULINA	50	T	.	T
DESCHAMPSIA CAESPITOSA	50	T	T	.
JUNCUS PARRYI	50	T	.	T
FERN. LYCOPOD AND MOSS SPECIES				
SPHAGNUM	100	50	20	80
LYCOPODIUM	50	10	.	10
EQUISETUM ARVENSE	50	1	1	.

TABLE 20A. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 246	253
FORB SPECIES				
RANUNCULUS ALISMAEFOLIUS	100	9	3	15
DODECATHEON JEFFREYI	100	2	2	2
LIGUSTICUM GRAYI	100	1	2	T
VERONICA WORMSKJOLDII	100	T	T	T
ASTER ALPIGENUS	50	60	.	60
SENECIO CYMBALARIOIDES	50	10	.	10
POTENTILLA FLABELLIFOLIA	50	6	6	.
SAXIFRAGA OREGANA	50	4	4	.
TRIFOLIUM LONGIPES	50	3	3	.
POTENTILLA PALUSTRIS	50	2	.	2
HYPERICUM ANAGALLOIDES	50	1	.	1
PEDICULARIS GROENLANDICA	50	1	.	1
CALTHA LEPTOSEPALA	50	1	.	1
LUPINUS LATIFOLIUS	50	T	T	.
SENECIO TRIANGULARIS	50	T	T	.
POTENTILLA DRUMMONDII	50	T	.	T
POLYGONUM BISTORTOIDES	50	T	.	T
CASTILLEJA	50	T	T	.

20B. STAND TABLE FOR THE CASC5 C.T.- DECA PHASE .

:S	CONS	AVE COVER	PLOT LABELS 285	286	287
;HRUB SPECIES					
;MUTATA	33	T	.	.	T
. SEDGE AND RUSH SPECIES					
;IA CAESPITOSA	100	40	25	70	25
0PULORUM	100	33	20	50	30
;GIA FILIFORMIS	100	17	15	25	10
[S PAUCIFLORA	100	14	20	7	15
(ULINA	100	2	3	2	2
;RICANS	33	20	20	.	.
(OTA	33	12	.	12	.
0DII	33	5	5	.	.
(ICATA	33	1	.	1	.
:ONGDONII	33	T	.	T	.
;TRATA	33	T	T	.	.
) CALIFORNICA	33	T	.	T	.
;MPESTRIS	33	T	.	.	T
;SIFOLIUS	33	T	.	T	.
LYCOPOD AND MOSS SPECIES					
:	67	35	.	30	40
; ARVENSE	67	T	.	T	T
;PECIES					
?IGENUS	100	15	T	4	40
; LONGIPES	100	7	20	T	T
:S ROMANZOFFIANA	100	1	1	T	1
:YMBALARIOIDES	100	T	T	T	T
0S ALISMAEFOLIUS	67	9	10	.	7
:PTOSEPALA	67	3	.	T	5
NEWBERRYI	67	1	.	T	2

TABLE 20B. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 285	286	287
FORB SPECIES CONTINUED					
HYPERICUM ANAGALLOIDES	67	1	.	T	1
VIOLA MACLOSKEYI	33	5	.	5	.
EPILOBIUM ALPINUM	33	T	.	T	.
POTENTILLA DRUMMONDII	33	T	T	.	.
MIMULUS PRIMULOIDES	33	T	.	T	.
DODECATHEON JEFFREYI	33	T	.	T	.
LIGUSTICUM GRAYI	33	T	.	T	.
TOFIELDIA GLUTINOSA BREVISTYLA	33	T	.	T	.
ARNICA MOLLIS	33	T	.	.	T

TABLE 21A. STAND TABLE FOR THE CANI2 C.T.- CASC5 PHASE .

SPECIES	CONS	AVE COVER	PLOT LABELS 281	283	284
TALL SHRUB SPECIES					
SALIX COMMUTATA	100	16	1	45	2
LOW SHRUB AND SUB-SHRUB SPECIES					
KALMIA MICROPHYLLA	67	3	.	5	1
PHYLLODOCE EMPETRIFORMIS	33	T	.	T	.
GRASS. SEDGE AND RUSH SPECIES					
CAREX SCOPULORUM	100	30	60	15	15
CAREX NIGRICANS	100	15	20	20	6
ELEOCHARIS PAUCIFLORA	100	15	20	10	15
MUHLENBERGIA FILIFORMIS	33	12	.	12	.
DESCHAMPSIA CAESPITOSA	33	3	.	.	3
LUZULA CAMPESTRIS	33	T	.	.	T
JUNCUS PARRYI	33	T	.	T	.
FERN, LYCOPOD AND MOSS SPECIES					
SPHAGNUM	100	53	40	40	80
FORB SPECIES					
ASTER ALPIGENUS	67	15	.	T	30
SENECIO CYMBALARIOIDES	67	10	.	T	20
PEDICULARIS GROENLANDICA	67	4	3	4	.
TOFIELDIA GLUTINOSA BREVISTYLA	67	3	.	3	2
PEDICULARIS ATTOLLENS	67	1	.	1	T
LIGUSTICUM GRAYI	67	T	.	T	T
TRIFOLIUM LONGIPES	33	T	.	.	T
ANTENNARIA MICROCEPHALA	33	T	.	T	.
LUPINUS LEPIDUS	33	T	.	T	.

TABLE 21B. STAND TABLE FOR THE CANI2 C.T.- ASAL PHASE .

SPECIES	CONS	AVE COVER	PLOT LABELS 289	290
GRASS. SEDGE AND RUSH SPECIES				
CAREX NIGRICANS	100	55	50	60
DESCHAMPSIA CAESPITOSA	100	13	25	T
CAREX SCOPULORUM	100	3	5	T
DANTHONIA CALIFORNICA	50	1	.	1
LUZULA CAMPESTRIS	50	T	.	T
JUNCUS PARRYI	50	T	.	T
CAREX BREWERI	50	T	.	T
CAREX ILLOTA	50	T	.	T
FERN, LYCOPOD AND MOSS SPECIES				
SPHAGNUM	100	8	5	10
FORB SPECIES				
RANUNCULUS ALISMAEFOLIUS	100	25	50	T
CALTHA LEPTOSEPALA	100	21	1	40
TRIFOLIUM LONGIPES	100	15	20	10
ASTER ALPIGENUS	100	14	20	7
ANTENNARIA	100	5	10	T
GENTIANA NEWBERRYI	100	2	1	2
POTENTILLA FLABELLIFOLIA	50	10	.	10
SENECIO CYMBALARIOIDES	50	7	.	7

TABLE 21C. STAND TABLE FOR THE CANI2 C.T.- POFL PHASE .

SPECIES	CONS	AVE COVER	PLOT LABELS 244	268	269	276
LOW SHRUB AND SUB-SHRUB SPECIES						
PHYLLODOCE EMPETRIFORMIS	75	T	T	1	T	.
LUETKEA PECTINATA	25	T	.	T	.	.
GRASS. SEDGE AND RUSH SPECIES						
CAREX NIGRICANS	100	51	55	20	80	50
CAREX SPECTABILIS	75	19	35	20	1	.
JUNCUS PARRYI	75	1	.	1	3	T
DANTHONIA CALIFORNICA	25	4	.	.	.	4
DESCHAMPSIA CAESPITOSA	25	2	.	.	.	2
LUZULA PARVIFLORA	25	T	T	.	.	.
CAREX ROSSII	25	T	.	.	.	T
JUNCUS	25	T	T	.	.	.
AGROSTIS HUMILIS	25	T	.	T	.	.
KOELERIA CRISTATA	25	T	.	T	.	.
FORB SPECIES						
POTENTILLA FLABELLIFOLIA	100	14	30	20	1	4
ASTER ALPIGENUS	75	12	.	1	T	35
MICROSERIS ALPESTRIS	75	5	T	4	10	.
CASTILLEJA	75	1	2	1	1	.
ANTENNARIA	75	1	T	1	1	.
POLYGONUM NEWBERRYI NEWBERRYI	75	T	T	T	T	.
LUPINUS LATIFOLIUS	50	2	4	T	.	.
EPILOBIUM	50	T	.	T	T	.
ANTENNARIA MICROCEPHALA	25	15	.	.	.	15
ANEMONE OCCIDENTALIS	25	4	.	.	4	.
LIGUSTICUM GRAYI	25	1	1	.	.	.
SENECIO TRIANGULARIS	25	1	1	.	.	.
RANUNCULUS	25	1	1	.	.	.
SENECIO CYMBALARIOIDES	25	T	T	.	.	.

TABLE 21C. CONTINUED.

SPECIES	CONS	AVE COVER	PLOT LABELS 244	268	269	276
FORB SPECIES CONTINUED						
HIERACIUM GRACILE	25	T	.	T	.	.
CALOCHORTUS SUBALPINUS	25	T	.	T	.	.
EPILOBIUM ALPINUM	25	T	T	.	.	.
RANUNCULUS UNALASCHENSIS	25	T	T	.	.	.
PENSTEMON PROCERUS	25	T	.	.	.	T

TABLE 21D. STAND TABLE FOR THE CANI2 C.T.- KAMI PHASE .

SPECIES	PLOT LABELS 282
TOTAL OVERSTORY COVER	
PINUS CONTORTA	T
< 1 M TALL SIZE CLASS	
PINUS CONTORTA	T
TALL SHRUB SPECIES	
SALIX COMMUTATA	15
VACCINIUM OCCIDENTALE	1
LOW SHRUB AND SUB-SHRUB SPECIES	
GAULTHERIA HUMIFUSA	T
KALMIA MICROPHYLLA	50
PHYLLODOCE EMPETRIFORMIS	6
GRASS. SEDGE AND RUSH SPECIES	
CAREX NIGRICANS	25
CAREX SCOPULORUM	T
FORB SPECIES	
ANTENNARIA	2
ASTER ALPIGENUS	T
HIERACIUM GRACILE	1
LUPINUS LEPIDUS	1
PEDICULARIS ATTOLLENS	2

Table F1.

	Rudbeckia occidentalis C.T.	Veratrum-Senecio triangularis C.T.-Elymus glaucus Phase	Veratrum-Senecio triangularis C.T.	Rubus parviflorus C.T.	Pteridium aquilinum-Elymus glaucus C.T.	Festuca idahoensis-Agrostis diegoensis C.T.	Eriophyllum lanatum-Gilia capitata C.T.	Penstemon procerus-Sanicula graveolens C.T.	Carex pensylvanica-Bromus C.T.	Carex pensylvanica-Bromus C.T.-Haplopappus greenei Phase	Festuca viridula C.T.	Carex spectabilis-Lupinus latifolius C.T.	Polygonum newberryi C.T.	Phyllodoce empetriformis-Cassiope mertensiana C.T.	Lutkea pectinata C.T.	Juncus parryi C.T.	Carex nigricans C.T.-Potentilla flabellifolia Phase	Carex nigricans C.T.-Aster alpigenus Phase	Carex nigricans C.T.-Kalmia microphylla Phase	Carex nigricans C.T.-Carex scopulorum Phase	Arenaria capillaris C.T.
n:	1	2	2	8	2	5	4	3	5	2	8	2	6	4	1	1	4	2	1	3	2
TREE COVER				0.5	4.0			1.0	0.5	13			1.2	0.8			T				
TALL SHRUB COVER		1.5					0.5				T									15	
LOW SHRUB COVER		1.5		58	2.0	7.6	7.5	50	0.4	23	0.9	T	6.7	73	20	0.1	0.3		65	3.0	
HERB COVER	96	99	99	74	93	66	64	57	93	88	69	86	31	19	10	27	85	93	32	72	58
MOSS COVER			15		T	2.6	0.1	10	0.4	0.5	4.0		1.0	0.5		1.0	18	7.5	20	53	11
LICHEN COVER							0.5							0.5					1.0		
REPRODUCTION COVER				0.3				T	T	4.5	0.2	0.1	5.2	1.3	0.1		0.8		0.1		10

Table F1. (continued)

	Carex scopulorum C.T.	Carex scopulorum C.T.-Deschampsia caespitosa Phase	Deschampsia caespitosa-Hypericum anagalloides-Muhlenbergia filiformis C.T.	Deschampsia caespitosa C.T.-Carex aquatilis/Carex buxbaumii Phase	Deschampsia caespitosa C.T.-Carex buxbaumii/Carex lanuginosa Phase	Deschampsia caespitosa C.T.-Carex vesicaria Phase	Deschampsia caespitosa C.T.-Juncus balticus Phase	Deschampsia caespitosa-Trifolium longipes C.T.	Deschampsia caespitosa-Trifolium longipes C.T.-Ranunculus gormanii Phase	Deschampsia caespitosa-Carex spectabilis C.T.	Carex sitchensis C.T.	Carex sitchensis C.T.-Lysichitum americanum Phase	Carex sitchensis C.T.-Salix Phase	Eleocharis pauciflora C.T.
n:	2	3	11	2	2	2	3	9	4	4	9	2	3	6
TREE COVER														
TALL SHRUB COVER		T	0.6	2.0							14	2.0	65	1.2
LOW SHRUB COVER	6.0		3.4	2.5		0.5	0.3	3.6		0.3	12	0.5	1.0	9.3
HERB COVER	97	97	96	95	90	99	98	91	93	97	96	95	71	93
MOSS COVER	50	23	40	8.5	1.0		26	1.3	1.0	2.0	24	11	2.3	34
LICHEN COVER														
REPRODUCTION COVER			0.4								0.1			0.6

Table F2.

	Rudbeckia occidentalis C.T.	Veratrum-Senecio triangularis C.T.-Elymus glaucus Phase	Veratrum-Senecio triangularis C.T.	Rubus parviflorus C.T.	Pteridium aquilinum-Elymus glaucus C.T.	Festuca idahoensis-Agrostis diegoensis C.T.	Eriophyllum lanatum-Gilia capitata C.T.	Penstemon procerus-Sanicula graveolens C.T.	Carex pensylvanica-Bromus C.T.	Carex pensylvanica-Bromus C.T.-Haplopappus greenei Phase	Festuca viridula C.T.	Carex spectabilis-Lupinus latifolius C.T.	Polygonum newberryi C.T.	Phyllodoce empetriformis-Cassiope mertensiana C.T.	Lutkea pectinata C.T.	Juncus parryi C.T.	Carex nigricans C.T.-Potentilla flabellifolia Phase	Carex nigricans C.T.-Aster alpigenus Phase	Carex nigricans C.T.-Kalmia microphylla Phase	Carex nigricans C.T.-Carex scopulorum Phase	Arenaria capillaris C.T.
n:	1	2	2	8	2	5	4	3	5	2	8	2	6	4	1	1	4	2	1	3	2
SPECIES RICHNESS:																					
TREE				0.4	0.5					2.5	0.6	0.5	0.2	0.8					1.0		1.0
TALL SHRUB		1.5		1.4	0.5	1.8	1.3	2.0	0.5	1.0	0.1	1.0		3.0	1.0		0.8		5.0	2.0	2.0
LOW SHRUB						0.2	0.3	0.3													0.5
HERB	24	31	33	27	30	30	33	24	25	19	13	16	12	13	14	8	13	13	7	9	12
MOSS																		1.0		1.0	
UNDERSTORY	24	32	33	28	31	32	34	26	26	20	13	17	12	16	15	8	14	14	12	12	15
TOTAL	24	32	33	29	31	32	34	27	26	22	14	18	13	17	15	8	14	14	13	12	16

Table F2. (continued)

	Carex scopulorum C.T.	Carex scopulorum C.T.-Deschampsia caespitosa Phase	Deschampsia caespitosa-Hypericum anagalloides-Muhlenbergia filiformis C.T.	Deschampsia caespitosa C.T.-Carex aquatilis/Carex buxbaumii Phase	Deschampsia caespitosa C.T.-Carex buxbaumii/Carex lanuginosa Phase	Deschampsia caespitosa C.T.-Carex vesicaria Phase	Deschampsia caespitosa C.T.-Juncus balticus Phase	Deschampsia caespitosa-Trifolium longipes C.T.	Deschampsia caespitosa-Trifolium longipes C.T.-Ranunculus gormanii Phase	Deschampsia caespitosa-Carex spectabilis C.T.	Carex sitchensis C.T.	Carex sitchensis C.T.-Lysichitum americanum Phase	Carex sitchensis C.T.-Salix Phase	Eleocharis pauciflora C.T.
n:	2	3	11	2	2	2	3	9	4	4	9	2	3	6
SPECIES RICHNESS:														
TREE	0.5		0.4			1.5								1.5
TALL SHRUB	2.5	0.3	2.2	3.0		2.0	1.0	0.4		2.0	1.6	1.0	4.0	4.3
LOW SHRUB														
HERB	20	18	22	14	8.0	5.0	14	15	22	15	13	18	13	28
MOSS	1.0	0.7	0.8	1.0			0.7	0.1			0.9	0.5		1.0
UNDERSTORY	23	19	25	18	8.0	7.0	15	16	22	17	15	19	17	33
TOTAL	24	19	25	18	8.0	8.5	15	16	22	17	15	19	17	35

Table F3.

	Rudbeckia occidentalis C.T.	Veratrum-Senecio triangularis C.T.-Elymus glaucus Phase	Veratrum-Senecio triangularis C.T.	Rubus parviflorus C.T.	Pteridium aquilinum-Elymus glaucus C.T.	Festuca idahoensis-Agrostis diegoensis C.T.	Eriophyllum lanatum-Gilia capitata C.T.	Penstemon procerus-Sanicula graveolens C.T.	Carex pensylvanica-Bromus C.T.	Carex pensylvanica-Bromus C.T.-Haplopappus greenei Phase	Festuca viridula C.T.	Carex spectabilis-Lupinus latifolius C.T.	Polygonum newberryi C.T.	Phyllodoce empetriformis-Cassiope mertensiana C.T.	Lutkea pectinata C.T.	Juncus parryi C.T.	Carex nigricans C.T.-Potentilla flabellifolia Phase	Carex nigricans C.T.-Aster alpigenus Phase	Carex nigricans C.T.-Kalmia microphylla Phase	Carex nigricans C.T.-Carex scopulorum Phase	Arenaria capillaris C.T.
n:	1	2	2	8	2	5	4	3	5	2	8	2	6	4	1	1	4	2	1	3	2
N1 DIVERSITY:																					
TREE				0.3	0.5					1.4	0.6	0.5	0.2	0.5					1.0		0.7
TALL SHRUBS		1.5		1.0	0.5	1.0	1.3	1.1	0.5	1.0	0.1	1.0		1.6	1.0		0.8		2.4	1.4	0.5
LOW SHRUBS						0.2	0.3	0.3													0.5
HERBS	6.7	9.1	9.1	8.4	4.6	9.2	10	4.5	7.8	6.2	3.7	2.9	5.9	6.3	5.7	1.4	3.7	5.3	2.2	4.6	1.2
UNDERSTORY	6.7	9.7	9.1	7.2	4.7	9.8	10	5.2	7.9	5.9	3.7	2.9	5.9	4.5	5.7	1.4	3.8	5.9	4.3	5.3	1.2
TOTAL	6.7	9.7	9.1	7.3	5.0	9.8	10	5.2	7.9	6.9	3.8	2.9	6.0	4.6	5.7	1.4	3.8	5.9	4.3	5.3	1.8
N2 DIVERSITY:																					
TREE				0.3	0.5					1.3	0.5		0.2	0.3					1.0		0.6
TALL SHRUBS		1.5		1.0	0.5	0.9	1.0	0.6	0.3	1.0	0.1			1.4			0.8		1.9	1.3	
LOW SHRUBS						0.2	0.3	0.3													
HERBS	3.8	6.2	6.1	5.7	2.8	6.2	6.5	2.4	5.3	4.1	2.5	2.3	4.9	4.8	4.5	1.1	3.0	4.3	1.5	3.9	1.0
UNDERSTORY	3.8	6.4	6.1	4.6	2.8	6.6	6.6	2.8	5.4	3.7	2.5	2.3	4.9	2.8	4.5	1.1	3.0	4.6	3.1	4.2	1.0
TOTAL	3.8	6.4	6.1	4.6	3.0	6.6	6.6	2.8	5.4	4.4	2.5	2.3	5.0	2.8	4.5	1.1	3.0	4.6	3.1	4.2	1.6

Table F3. (continued)

	Carex scopulorum C.T.	Carex scopulorum C.T.-Deschampsia caespitosa Phase	Deschampsia caespitosa-Hypericum anagalloides-Muhlenbergia filiformis C.T.	Deschampsia caespitosa C.T.-Carex aquatilis/Carex buxbaumii Phase	Deschampsia caespitosa C.T.-Carex buxbaumii/Carex lanuginosa Phase	Deschampsia caespitosa C.T.-Carex vesicaria Phase	Deschampsia caespitosa C.T.-Juncus balticus Phase	Deschampsia caespitosa-Trifolium longipes C.T.	Deschampsia caespitosa-Trifolium longipes C.T.-Ranunculus gormanii Phase	Deschampsia caespitosa-Carex spectabilis C.T.	Carex sitchensis C.T.	Carex sitchensis C.T.-Lysichitum americanum Phase	Carex sitchensis C.T.-Salix Phase	Eleocharis pauciflora C.T.
n:	2	3	11	2	2	2	3	9	4	4	9	2	3	6
N1 DIVERSITY:														
TREE	0.5		0.4			1.0								0.7
TALL SHRUBS	1.8	0.3	1.3	2.1		1.0	0.3	0.2		0.8	1.2	0.8	2.6	1.6
LOW SHRUBS														
HERBS	5.3	6.6	7.9	4.7	4.3	2.1	4.2	5.5	5.7	5.4	3.4	7.1	3.0	6.7
UNDERSTORY	6.4	7.2	8.7	5.9	4.3	2.1	4.8	5.5	5.7	5.5	4.7	8.0	5.5	7.2
TOTAL	6.4	7.2	8.7	5.9	4.3	2.1	4.8	5.5	5.7	5.5	4.7	8.0	5.5	7.3
N2 DIVERSITY:														
TREE	0.5		0.3			0.5								0.4
TALL SHRUBS	1.6	0.3	1.2	1.4		0.5	0.3	0.1		0.4	1.1	0.8	2.3	1.4
LOW SHRUBS														
HERBS	3.7	5.6	5.6	3.8	3.4	1.8	2.9	4.0	3.6	4.4	2.3	5.0	1.8	4.5
UNDERSTORY	4.3	6.1	6.2	4.4	3.4	1.8	3.4	4.0	3.6	4.4	3.3	5.6	3.9	4.7
TOTAL	4.3	6.1	6.2	4.4	3.4	1.8	3.4	4.0	3.6	4.4	3.3	5.6	3.9	4.7

Table F4.

	Rudbeckia occidentalis C.T.	Veratrum-Senecio triangularis C.T.-Elymus glaucus Phase	Veratrum-Senecio triangularis C.T.	Rubus parviflorus C.T.	Pteridium aquilinum-Elymus glaucus C.T.	Festuca idahoensis-Agrostis diegoensis C.T.	Eriophyllum lanatum-Gilia capitata C.T.	Penstemon procerus-Sanicula graveolens C.T.	Carex pensylvanica-Bromus C.T.	Carex pensylvanica-Bromus C.T.-Haplopappus greenei Phase	Festuca viridula C.T.	Carex spectabilis-Lupinus latifolius C.T.	Polygonum newberryi C.T.	Phyllodoce empetriformis-Cassiope mertensiana C.T.	Lutkea pectinata C.T.	Juncus parryi C.T.	Carex nigricans C.T.-Potentilla flabellifolia Phase	Carex nigricans C.T.-Aster alpigenus Phase	Carex nigricans C.T.-Kalmia microphylla Phase	Carex nigricans C.T.-Carex scopulorum Phase	Arenaria capillaris C.T.
n:	1	2	2	8	2	5	4	3	5	2	8	2	6	4	1	1	4	2	1	3	2
MEAN ASPECT (degrees)	0	44	36	178	184	207	191	70	207	165	242	-	-	266	-	-	272	-	-	-	-
r	-	.19	.96	.75	.52	.91	.94	.87	.56	.99	.72	-	-	.44	-	-	.71	-	-	-	-
MEAN ELEVATION (m)	1659	1506	1295	1546	1569	1483	1571	1676	1605	1541	1779	2011	1823	1945	2048	1999	1917	2010	1999	1999	1674
min.	1659	1475	1295	1511	1554	1460	1500	1615	1487	1536	1584	2000	1766	1884	2048	1999	1829	2010	1999	1999	1673
max.	1659	1536	1295	1676	1584	1536	1706	1732	1682	1546	2023	2023	1880	2020	2048	1999	1987	2011	1999	1999	1676
MEAN SLOPE (%)	25	17	3.5	51	43	48	48	37	41	14	-	2.5	1.0	11	11	0.0	4.3	0.0	0.0	0.0	9.0
min.	25	12	3.0	38	36	37	36	1.0	18	13	0.0	0.0	0.0	0.0	11	0.0	0.0	0.0	0.0	0.0	5.0
max.	25	21	4.0	65	50	60	62	60	62	14	-	5.0	6.0	33	11	0.0	6.0	0.0	0.0	0.0	13
MEAN INSOLATION INDEX	274	253	262	304	286	306	314	217	286	287	-	268	263	243	265	-	266	-	-	-	266
min.	-	231	262	276	283	282	303	171	236	286	-	-	-	206	-	-	259	-	-	-	265
max.	-	276	262	323	290	319	324	263	317	288	-	-	-	280	-	-	275	-	-	-	267
MEAN MOISTURE INDEX	13	14	11	31	27	31	34	21	31	26	-	15	10	26	15	-	21	-	-	-	20
min.	-	13	11	27	25	26	31	20	23	25	-	-	-	20	-	-	19	-	-	-	19
max.	-	14	11	35	29	36	37	22	37	27	-	-	-	31	-	-	25	-	-	-	20

Table F4. (continued)

	Carex scopulorum C.T.	Carex scopulorum C.T.-Deschampsia caespitosa Phase	Deschampsia caespitosa-Hypericum anagalloides-Muhlenbergia filiformis C.T.	Deschampsia caespitosa C.T.-Carex aquatilis/Carex buxbaumii Phase	Deschampsia caespitosa C.T.-Carex buxbaumii/Carex lanuginosa Phase	Deschampsia caespitosa C.T.-Carex vesicaria Phase	Deschampsia caespitoa C.T.-Juncus balticus Phase	Deschampsia caespitosa-Trifolium longipes C.T.	Deschampsia caespitosa-Trifolium longipes C.T.-Ranunculus gormanii Phase	Deschampsia caespitosa-Carex spectabilis C.T.	Carex sitchensis C.T.	Carex sitchensis C.T.-Lysichitum americanum Phase	Carex sitchensis C.T.-Salix Phase	Eleocharis pauciflora C.T.
n:	2	3	11	2	2	2	3	9	4	4	9	2	3	6
MEAN ASPECT (degrees)	-	-	28	-	-	-	-	-	-	-	-	-	-	45
r	-	-	.86	-	-	-	-	-	-	-	-	-	-	.82
MEAN ELEVATION (m)	1789	1832	1403	1519	1448	1429	1598	1665	1574	1778	1445	1364	1340	1452
min.	1786	1792	1244	1508	1448	1426	1408	1342	1451	1745	1292	1364	1292	1342
max.	1792	1865	1655	1530	1448	1433	1926	2023	1615	1792	1655	1364	1364	1554
MEAN SLOPE (%)	1.5		0.8							3.0		1.0	1.7	0.7
min.														
max.	3.0		3.0							12.0		2.0	5.0	2.0
MEAN INSOLATION INDEX	270	-	263	-	-	-	-	-	-	265	-	265	274	265
min.	-	-	262	-	-	-	-	-		-	-	-	-	264
max.	-	-	265	-	-	-	-	-	-	-	-	-	-	267
MEAN MOISTURE INDEX	10	-	7.7	-	-	-	-	-	-	27	-	8.0	10	15
min.	-	-	5.0	-	-	-	-	-	-	-	-	-	-	11
max.	-	-	13.0	-	-	-	-	-	-	-	-	-	-	19

Table F5.

	Rudbeckia occidentalis C.T.	Veratrum-Senecio triangularis C.T.-Elymus glaucus Phase	Veratrum-Senecio triangularis C.T.	Rubus parviflorus C.T.	Pteridium aquilinum-Elymus glaucus C.T.	Festuca idahoensis-Agrostis diegoensis C.T.	Eriophyllum lanatum-Gilia capitata C.T.	Penstemon procerus-Sanicula graveolens C.T.	Carex pensylvanica-Bromus C.T.	Carex pensylvanica-Bromus C.T.-Haplopappus greenei Phase	Festuca viridula C.T.	Carex spectabilis-Lupinus latifolius C.T.	Polygonum newberryi C.T.	Phyllodoce empetriformis-Cassiope mertensiana C.T.	Luetkea pectinata C.T.	Juncus parryi C.T.	Carex nigricans C.T.-Potentilla flabellifolia Phase	Carex nigricans C.T.-Aster alpigenus Phase	Carex nigricans C.T.-Kalmia microphylla Phase	Carex nigricans C.T.-Carex scopulorum Phase	Arenaria capillaris C.T.
n:	1	2	2	8	2	5	4	3	5	2	8	2	6	4	1	1	4	2	1	3	2
BEDROCK COVER	1.0	T	0.0	1.0	1.0	16	20	3.7	T	2.5	0.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0	0.0	0.0	0.1
ROCK COVER	0.0	0.0	0.0	0.3	0.5	5.4	6.5	17	0.2	0.0	0.3	7.1	6.3	7.8	45	20	0.3	0.0	0.0	0.0	3.5
BARE SOIL COVER	4.0	3.5	5.0	6.8	2.5	13	25	13	5.3	7.0	38	7.0	73	21	50	73	10	2.6	10	12	30
COARSE LITTER COVER	0.0	3.0	0.0	0.0	0.0	0.2	0.0	1.3	0.3	1.1	T	0.0	0.0	T	0.0	0.0	T	0.0	2.0	0.0	0.5
FINE LITTER COVER	95	94	35	91	96	65	49	54	93	92	59	85	22	80	7	5	71	93	67	40	56
LITTER DEPTH (cm)	0.0	1.5	0.0	0.9	-	0.2	0.3	0.7	0.7	1.5	1.3	0.5	0.0	0.3	0.0	0.0	0.5	1.0	0.0	0.5	0.0
COARSE FRAGMENTS (%)	14	18	11	16	9.5	21	29	52	3.3	1.0	5.8	30	25	2.0	3.0	35	11	6.0	60	0.0	2.5
GRAVEL (%)	4.0	7.5	11	15	9.5	21	20	36	2.8	1.0	5.8	30	25	1.5	3.0	35	11	6.0	55	0.0	2.5
COBBLE (%)	0.0	10	0.0	1.0	0.0	0.0	3.8	16	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0

Table F5. (continued)

	Carex scopulorum C.T.	Carex scopulorum C.T.-Deschampsia caespitosa Phase	Deschampsia caespitosa-Hypericum anagalloides-Muhlenbergia filiformis C.T.	Deschampsia caespitosa C.T.-Carex aquatilis/Carex buxbaumii Phase	Deschampsia caespitosa C.T.-Carex buxbaumii/Carex lanuginosa Phase	Deschampsia caespitosa C.T.-Carex vesicaria Phase	Deschampsia caespitosa C.T.-Juncus balticus Phase	Deschampsia caespitosa-Trifolium longipes C.T.	Deschampsia caespitosa-Trifolium longipes C.T.-Ranunculus gormanii Phase	Deschampsia caespitosa-Carex spectabilis C.T.	Carex sitchensis C.T.	Carex sitchensis C.T.-Lysichitum americanum Phase	Carex sitchensis C.T.-Salix Phase	Eleocharis pauciflora C.T.
n:	2	3	11	2	2	2	3	9	4	4	9	2	3	6
BEDROCK COVER						T		0.1						
ROCK COVER	T									T				
BARE SOIL COVER	2.5	2.3	1.4	1.0			0.7	8.3	7.0	3.3	3.5		0.3	0.7
COARSE LITTER COVER		T		T				0.1	T		0.1	0.5	0.3	0.9
FINE LITTER COVER	85	74	72	98	99	99	74	90	92	97	76	92	97	64
LITTER DEPTH (cm)	-	1.0	1.4	2.0	-	1.0	2.0	1.0	1.3	1.3	2.3	3.0	2.0	
COARSE FRAGMENTS (%)	-	-	2.2	7.5	-	1.5	0.5	16	0.3	0.5			-	-
GRAVEL (%)	-	-	2.0	0.5	-	1.5	0.5	11	0.3	0.5			-	-
COBBLE(%)	-	-			-								-	-

APPENDIX H

A Key to Forest Communities in the Separation Creek Drainage
Three Sisters Wilderness Area/ Biosphere Reserve

KEY TO FOREST COMMUNITIES IN THE SEPARATION CREEK DRAINAGE THREE SISTERS WILDERNESS AREA/BIOSPHERE RESERVE

Ø. Abies amabilis reproduction < 2% cover or absent
TSHE and TSHE/ABAM SERIES

Ø. Abies amabilis reproduction > 3% cover or Tsuga mertensiana reproduction > 2% cover
ABAM and ABAM/TSME SERIES

TSHE and TSHE/ABAM SERIES

1. Tsuga heterophylla reproduction < 1% and Calocedrus decurrens reproduction present — **PSME - CADE3- SYMO C.T.**
1. Tsuga heterophylla reproduction > 1% — **2.**

2. Acer circinatum > 1Ø% cover — **3.**
2. Acer circinatum < 9% cover — **4.**

3. Polystichum munitum > 3Ø% cover
TSHE - ACCI - POMU C.T.
3. Polystichum munitum < 25% cover
TSHE - ACCI - BENE C.T.

4. Xerophyllum tenax > 15% cover — **5.**
4. Xerophyllum tenax < 14% cover — **6.**

5. Rhododendron macrophyllum present, usually > 1Ø% cover
TSHE/ABAM - RHMA - XETE C.T.
5. Rhododendron macrophyllum < 2% cover, usually absent
TSHE/ABAM - XETE C.T.

6. Rhododendron macrophyllum > 15% cover — **7.**
6. Rhododendron macrophyylum < 14% cover — **9.**

7. Berberis nervosa < 5% cover — **8.**
7. Berberis nervosa > 5% cover
TSHE - RHMA - BENE C.T.

8. Gaultheria shallon < 1% cover
TSHE - RHMA - LIBO2 C.T.
8. Gaultheria shallon > 2% cover
TSHE - RHMA - GASH C.T.

9. Berberis nervosa > 5% cover — **1Ø.**
9. Berberis nervosa < 4% cover
TSHE - MIXED HERB C.T.

KEY TO FOREST COMMUNITIES OF THE SEPARATION CREEK DRAINAGE

10. Herbaceous understory with one or more of the following herbs present with > 3% cover: Achlys triphylla, Smilacena stellata, Clintonia uniflora, Cornus canadensis
TSHE - BENE C.T. - HERB RICH PHASE

10. Herbaceous understory with none of the herbs above with > 2% cover
TSHE - BENE C.T.

ABAM/TSME and TSME SERIES

11. Abies amabilis reproduction < 2% cover, or < Tsuga mertensiana reproduction cover **12.**

11. Abies amabilis reproduction > 2% cover, or > or equal Tsuga mertensiana reproduction cover **14.**

12. Vaccinium scoparium > 5% cover, or Luzula hitchcockii present
TSME - VASC C.T.

12. Vaccinium scoparium < 5% cover and Luzula hitchcockii absent **13.**

13. Pinus contorta > 20% cover
TSME - XETE C.T. - PICO PHASE

13. Pinus contorta < 20% cover
TSME - XETE C.T.

14. Xerophyllum tenax > 5% cover, usually > 10% cover
ABAM/TSME - VAME C.T. - XETE PHASE

14. Xerophyllum tenax < 5% cover **15.**

15. Rubus lasiococcus > 10% cover
ABAM/TSME - RULA C.T.

15. Rubus lasiococcus < 9% cover **16.**

16. Total Vaccinium membranaceum and Vaccinium scoparium < 3% cover; herbaceous understory with two or more of the following herbs with combined cover > 2%: Achlys triophylla, Clintonia uniflora, Tiarella trifoliata, Cornus canadensis, and Trillium ovatum
ABAM/TSME - ACTR C.T.

16. Total Vaccinium membranaceum and Vaccinium scoparium > 4% cover **17.**

17. Vaccinium scoparium > 3% cover or > Vaccinium membranaceum cover
ABAM/TSME - VASC - VAME C.T.

17. Vaccinium scoparium < 3% cover or < or equal Vaccinium membranaceum cover
ABAM/TSME - VAME C.T.

APPENDIX I

Species Lists with Acronyms for Separation Creek Drainage Forest Communities and Meadow Communities of the Three Sisters Wilderness Area/ Biosphere Reserve

Note: Species list based on species occurring in reconnaissance sample plots only, and alphabetized by acronym.

THREE SISTERS WILDERNESS FOREST AND MEADOW
SPECIES LIST

TREE SPECIES

CONU	CORNUS NUTTALLII
PIEN	PICEA ENGELMANNII
TABR	TAXUS BREVIFOLIA
PIAL	PINUS ALBICAULIS
PILA	PINUS LAMBERTIANA
ACGLD2	ACER GLABRUM DOUGLASII
PSME	PSEUDOTSUGA MENZIESII
CHCH2	CHRYSOLEPIS CHRYSOPHYLLA
ALRU	ALNUS RUBRA
ARME	ARBUTUS MENZIESII
CADE3	CALOCEDRUS DECURRENS
PIMO	PINUS MONTICOLA
ABLA2	ABIES LASIOCARPA
ABGR	ABIES GRANDIS
ABPR	ABIES PROCERA
PICO	PINUS CONTORTA
ABAM	ABIES AMABILIS
ACMA	ACER MACROPHYLLUM
THPL	THUJA PLICATA
TSHE	TSUGA HETEROPHYLLA
TSME	TSUGA MERTENSIANA
RHPU	RHAMNUS PURSHIANA

TALL SHRUB SPECIES

ACCI	ACER CIRCINATUM
ACGLD	ACER GLABRUM DOUGLASII
ALIN	ALNUS INCANA
ALSI	ALNUS SINUATA
AMAL	AMELANCHIER ALNIFOLIA
AMELA	AMELANCHIER
BEGL	BETULA GLANDULOSA
COCOC	CORYLUS CORNUTA CALIFORNICA
HODI	HOLODISCUS DISCOLOR
JUCO4	JUNIPERUS COMMUNIS
RHMA	RHODODENDRON MACROPHYLLUM
RIBES	RIBES SPECIES
RIBR	RIBES BRACTEOSUM
RILA	RIBES LACUSTRE
RISA	RIBES SANGUINEUM
RIVI	RIBES VISCOSISSIMUM
ROGY	ROSA GYMNOCARPA
RUPA	RUBUS PARVIFLORUS
RUSP	RUBUS SPECTABILIS
SACO2	SALIX COMMUTATA
SAGE	SALIX GEYERIANA
SALIX	SALIX SPECIES

SAMBU	SAMBUCUS SPECIES
SAMY	SALIX MYRTILLIFOLIA
SARA	SAMBUCUS RACEMOSA
SASI2	SALIX SITCHENSIS
SASC	SALIX SCOULERIANA
SORBU	SORBUS SPECIES
SOSI	SORBUS SITCHENSIS
SPDED	SPIRAEA DENSIFLORA
SPDO	SPIRAEA DOUGLASII
VAME	VACCINIUM MEMBRANACEUM
VAOC2	VACCINIUM OCCIDENTALE
VAOV	VACCINIUM OVALIFOLIUM
VAPA	VACCINIUM PARVIFOLIUM
VASC	VACCINIUM SCOPARIUM

LOW SHRUB AND SUB-SHRUB SPECIES

APAN	APOCYNUM ANDROSAEMAEFOLIUM
APOCY	APOCYNUM SPECIES
COUMC	COMANDRA UMBELLATA CALIFORNICA
ERPY	ERIOGONUM PYROLAEFOLIUM
ERUMU	ERIOGONUM UMBELLATUM UMBELLATUM
ERCO5	ERIOGONUM COMPOSITUM
HAHA	HAPLOPAPPUS HALLII
LUPE	LUETKEA PECTINATA
ARNE	ARCTOSTAPHYLOS NEVADENSIS
BEAQ	BERBERIS AQUIFOLIUM
BENE	BERBERIS NERVOSA
CAME	CASSIOPE MERTENSIANA
CHME	CHIMAPHILA MENZIESII
CHUMO	CHIMAPHILA UMBELLATA OCCIDENTALIS
GAHU	GAULTHERIA HUMIFUSA
GAOV	GAULTHERIA OVATIFOLIA
GASH	GAULTHERIA SHALLON
HAGR	HAPLOPAPPUS GREENEI
KAMI	KALMIA MICROPHYLLA
KAOC	KALMIA OCCIDENTALIS
LIBO2	LINNAEA BOREALIS
LOCI	LONICERA CILIOSA
LOIN	LONICERA INVOLUCRATA
PAMY	PACHISTIMA MYRSINITES
PHEM	PHYLLODOCE EMPETRIFORMIS
RULA	RUBUS LASIOCOCCUS
RUNI	RUBUS NIVALIS
RUUR	RUBUS URSINUS
SYMO	SYMPHORICARPOS MOLLIS
SYMOH	SYMPHORICARPOS MOLLIS HESPERIUS
VADE	VACCINIUM DELICIOSUM

GRASS, SEDGE AND RUSH SPECIES

AGDI	AGROSTIS DIEGOENSIS
AGEX	AGROSTIS EXARATA
AGHU	AGROSTIS HUMILIS
AGROS	AGROSTIS SPECIES
AGTE	AGROSTIS TENUIS
AGTH	AGROSTIS THURBERIANA
BRCA	BROMUS CARINATUS
BROMU	BROMUS SPECIES
BRSI	BROMUS SITCHENSIS
CAAP3	CAREX APERTA
CAAQ	CAREX AQUATILIS
CABR	CAREX BREWERI
CABU3	CAREX BUXBAUMII
CACA	CALAMAGROSTIS CANADENSIS
CACA4	CAREX CANESCENS
CACA7	CAREX CAPITATA
CADE	CAREX DEWEYANA
CAFR	CAREX FRACTA
CAHO	CAREX HOODII
CAIL	CAREX ILLOTA
CAINI	CALAMAGROSTIS INEXPANSA
CAJO	CAREX JONESII
CALA3	CAREX LANUGINOSA
CALA4	CAREX LASIOCARPA
CALE3	CAREX LEPORINELLA
CALE5	CAREX LENTICULARIS
CALU	CAREX LUZULINA
CAME2	CAREX MERTENSII
CAMI	CAREX MICROPTERA
CAMU2	CAREX MURICATA
CANI2	CAREX NIGRICANS
CAPA	CAREX PACHYSTACHYA
CAPE5	CAREX PENSYLVANICA
CAREX	CAREX SPECIES
CARO	CAREX ROSSII
CARO2	CAREX ROSTRATA
CASC5	CAREX SCOPULORUM
CASI2	CAREX SIMULATA
CASI3	CAREX SITCHENSIS
CASP	CAREX SPECTABILIS
CAST2	CAREX STRAMINIFORMIS
CASU4	CAREX SUBFUSCA
CATU	CAREX TUMULICOLA
CAVE	CAREX VESICARIA
DACA	DANTHONIA CALIFORNICA
DAIN	DANTHONIA INTERMEDIA
DAUN	DANTHONIA UNISPICATA
DEAT	DESCHAMPSIA ATROPURPUREA
DECA	DESCHAMPSIA CAESPITOSA
ELGL	ELYMUS GLAUCUS
ELPA	ELEOCHARIS PALUSTRIS

ELPA2	ELEOCHARIS PAUCIFLORA
FEID	FESTUCA IDAHOENSIS
FERU	FESTUCA VIRIDULA
GLEL	GLYCERIA ELATA
HOBR	HORDEUM BRACHYANTHERUM
JUBA	JUNCUS BALTICUS
JUEF	JUNCUS EFFUSUS
JUEN	JUNCUS ENSIFOLIUS
JUNCU	JUNCUS SPECIES
JUNEN	JUNCUS NEVADENSIS NEVADENSIS
JUOR	JUNCUS ORTHOPHYLLUS
JUPA	JUNCUS PARRYI
KOCR	KOELERIA CRISTATA
LUCA2	LUZULA CAMPESTRIS
LUHI	LUZULA HITCHCOCKII
LUPA	LUZULA PARVIFLORA
MELIC	MELICA SPECIES
MESU	MELICA SUBULATA
MUFI	MUHLENBERGIA FILIFORMIS
PHAL	PHLEUM ALPINUM
PHAR	PHALARIS ARUNDINACEA
PHPR	PHLEUM PRATENSE
POA	POA SPECIES
POACEA	POACEAE
POCU	POA CUSICKII
POPA	POA PALUSTRIS
POPR	POA PRATENSIS
POTR3	POA TRIVIALIS
PUPA	PUCCINELLIA PAUCIFLORA
SCCO	SCIRPUS CONGDONII
SIHY	SITANION HYSTRIX
STOC	STIPA OCCIDENTALIS
TRCA	TRISETUM CANESCENS
TRCE	TRISETUM CERNUUM
TRSP	TRISETUM SPICATUM

FERN, LYCOPOD AND MOSS SPECIES

AULAC	AULACOMNIUM SPECIES
PHILO	PHILONOTIS SPECIES
SPHAG	SPHAGNUM SPECIES
ASDE	ASPIDOTIS DENSA
ATFI	ATHYRIUM FILIX-FEMINA
BLSP	BLECHNUM SPICANT
CHDE	CHEILANTHES DENSA
CHGR	CHEILANTHES GRACILLIMA
CRDE	CRYPTOGRAMMA DENSA
EQAR	EQUISETUM ARVENSE
LYCOP	LYCOPODIUM SPECIES
POMU	POLYSTICHUM MUNITUM
PTAQ	PTERIDIUM AQUILINUM
SELAG	SELAGINELLA SPECIES

SEOR	SELAGINELLA OREGANA
SEWA2	SELAGINELLA WALLACEI

FORB SPECIES

ACCO	ACONITUM COLUMBIANUM
ACMI	ACHILLEA MILLEFOLIUM
ACRU	ACTAEA RUBRA
ACTR	ACHLYS TRIPHYLLA
ADBI	ADENOCAULON BICOLOR
AGAU	AGOSERIS AURANTIACA
AGGR	AGOSERIS GRANDIFLORA
AGOSE	AGOSERIS SPECIES
ALCR	ALLIUM CRENULATUM
ALVI	ALLOTROPA VIRGATA
ANAL	ANTENNARIA ALPINA
ANAR	ANTENNARIA ARGENTEA
ANDE	ANEMONE DELTOIDEA
ANLA	ANTENNARIA LANATA
ANLY2	ANEMONE LYALLII
ANMA	ANAPHALIS MARGARITACEA
ANMI	ANTENNARIA MICROCEPHALA
ANOC	ANEMONE OCCIDENTALIS
ANOR	ANEMONE OREGANA
ANTEN	ANTENNARIA SPECIES
APIACE	APIACEAE
AQFO	AQUILEGIA FORMOSA
ARABI	ARABIS SPECIES
ARCA2	ARENARIA CAPILLARIS
ARCA3	ARALIA CALIFORNICA
ARCAA	ARENARIA CAPILLARIS AMERICANA
ARCO	ARNICA CORDIFOLIA
ARHO	ARABIS HOLBOELLII
ARLU	ARTEMISIA LUDOVICIANA
ARMA3	ARENARIA MACROPHYLLA
ARMO	ARNICA MOLLIS
ARPA3	ARNICA PARRYI
ARPL	ARABIS PLATYSPERMA
ARSY	ARUNCUS SYLVESTER
ASAL	ASTER ALPIGENUS
ASCA3	ASARUM CAUDATUM
ASFO	ASTER FOLIACEUS
ASLE2	ASTER LEDOPHYLLUS
ASOC	ASTER OCCIDENTALIS
ASRA	ASTER RADULINUS
ASTERA	ASTERACEAE
BAOR	BARBAREA ORTHOCERAS
BAVU	BARBAREA VULGARIS
BOEL	BOYKINIA ELATA
CAAR	CASTILLEJA ARACHNOIDEA
CABE2	CARDAMINE BELLIDIFOLIA
CABI	CALTHA BIFLORA

CABR2	CARDAMINE BREWERI
CABU	CAPSELLA BURSA-PASTORIS
CAHI2	CASTILLEJA HISPIDA
CALE2	CALTHA LEPTOSEPALA
CAMAS	CAMASSIA SPECIES
CAMI2	CASTILLEJA MINIATA
CASC2	CAMPANULA SCOULERI
CASTI	CASTILLEJA SPECIES
CASU6	CALOCHORTUS SUBALPINUS
CIAL	CIRCAEA ALPINA
CICA0	CIRSIUM CALLILEPIS OREGONENSE
CIDO	CICUTA DOUGLASII
CIVU	CIRSIUM VULGARE
CLUN	CLINTONIA UNIFLORA
COCA	CORNUS CANADENSIS
COGR	COLLINSIA GRANDIFLORA
COHE	COLLOMIA HETEROPHYLLA
COMA2	CONIUM MACULATUM
COMA3	CORALLORHIZA MACULATA
COME	CORALLORHIZA MERTENSIANA
CONY	CONVOLVULUS NYCTAGINEUS
COPA	COLLINSIA PARVIFLORA
COSC	CORYDALIS SCOULERI
COST2	CORALLORHIZA STRIATA
CRYPT2	CRYPTANTHA SPECIES
DEME	DELPHINIUM MENZIESII
DETR	DELPHINIUM TROLLIIFOLIUM
DIFO	DICENTRA FORMOSA
DIHO	DISPORUM HOOKERI
DISM	DISPORUM SMITHII
DOJE	DODECATHEON JEFFREYI
DRAN	DROSERA ANGLICA
DRRO	DROSERA ROTUNDIFOLIA
EBAU	EBUROPHYTON AUSTINIAE
ELCA3	ELODEA CANADENSIS
EPAL	EPILOBIUM ALPINUM
EPAN	EPILOBIUM ANGUSTIFOLIUM
EPGL	EPILOBIUM GLABERRIMUM
EPILO	EPILOBIUM SPECIES
EPMI	EPILOBIUM MINUTUM
EPPA	EPILOBIUM PANICULATUM
EPWA	EPILOBIUM WATSONII
ERAL	ERIGERON ALICEAE
ERAR2	ERYSIMUM ARENICOLA
ERGR	ERYTHRONIUM GRANDIFLORUM
ERIOG	ERIOGONUM SPECIES
ERLA	ERIOPHYLLUM LANATUM
ERNU	ERIOGONUM NUDUM
FRVE	FRAGARIA VESCA
FRVI	FRAGARIA VIRGINIANA
GAAP	GALIUM APARINE
GABI	GALIUM BIFOLIUM
GALIU	GALIUM SPECIES

GAOR	GALIUM OREGANUM
GATR	GALIUM TRIFLORUM
GEMAM	GEUM MACROPHYLLUM MACROPHYLLUM
GENE	GENTIANA NEWBERRYI
GESI	GENTIANA SIMPLEX
GIAG	GILIA AGGREGATA
GICA	GILIA CAPITATA
GNMI	GNAPHALIUM MICROCEPHALUM
GOOB	GOODYERA OBLONGIFOLIA
HABEN	HABENARIA SPECIES
HADI2	HABENARIA DILATATA
HASA	HABENARIA SACCATA
HECO	HEMITOMES CONGESTUM
HELA	HERACLEUM LANATUM
HIAL	HIERACIUM ALBIFLORUM
HICY	HIERACIUM CYNOGLOSSOIDES
HIGR	HIERACIUM GRACILE
HYAN	HYPERICUM ANAGALLOIDES
HYFE	HYDROPHYLLUM FENDLERI
HYFO	HYPERICUM FORMOSUM
HYOC	HYDROPHYLLUM OCCIDENTALE
HYPE	HYPERICUM PERFORATUM
IRTE	IRIS TENAX
LANE	LATHYRUS NEVADENSIS
LETR	LEWISIA TRIPHYLLA
LICA3	LISTERA CAURINA
LICO3	LISTERA CORDATA
LICO4	LILIUM COLUMBIANUM
LIGR	LIGUSTICUM GRAYI
LILIU	LILIUM SPECIES
LIPA	LITHOPHRAGMA PARVIFLORA
LIPE	LINUM PERENNE
LOMA2	LOMATIUM MARTINDALEI
LOMAT	LOMATIUM SPECIES
LONE2	LOTUS NEVADENSIS
LONU	LOMATIUM NUDICAULE
LOTR	LOMATIUM TRITERNATUM
LOTUS	LOTUS SPECIES
LULA	LUPINUS LATIFOLIUS
LULE2	LUPINUS LEPIDUS
LUPIN	LUPINUS SPECIES
LYAM	LYSICHITUM AMERICANUM
MEBE	MERTENSIA BELLA
MEPL	MERTENSIA PLATYPHYLLA
METR	MENYANTHES TRIFOLIATA
MIAL2	MICROSERIS ALPESTRIS
MIBO	MICROSERIS BOREALE
MIBR	MITELLA BREWERI
MICRO3	MICROSERIS SPECIES
MIGR	MICROSTERIS GRACILIS
MIGU	MIMULUS GUTTATUS
MILE	MIMULUS LEWISII
MIMO	MIMULUS MOSCHATUS

MINU	MICROSERIS NUTANS
MIOV	MITELLA OVALIS
MIPR	MIMULUS PRIMULOIDES
MIPU	MIMULUS PULSIFERAE
MOCH	MONTIA CHAMISSOI
MOHY	MONOTROPA HYPOPITYS
MOPA	MONTIA PARVIFOLIA
MOPE	MONTIA PERFOLIATA
MOSI	MONTIA SIBIRICA
MOSP	MONTIA SPATHULATA
MYLA	MYOSOTIS LAXA
ORFU	OROGENIA FUSIFORMIS
ORIM	ORTHOCARPUS IMBRICATUS
ORUNM	OROBANCHE UNIFLORA MINUTA
OSCH	OSMORHIZA CHILENSIS
OSOC	OSMORHIZA OCCIDENTALIS
OXOR	OXALIS OREGANA
PEAT3	PEDICULARIS ATTOLLENS
PEBR	PEDICULARIS BRACTEOSA
PECA3	PENSTEMON CARDWELLII
PEDA	PENSTEMON DAVIDSONII
PEFRS	PENSTEMON FRUITICOSUS SCOULERI
PEGA2	PERIDERIDIA GAIRDNERI
PEGR	PEDICULARIS GROENLANDICA
PEPR	PENSTEMON PROCERUS
PERA	PEDICULARIS RACEMOSA
PERU	PENSTEMON RUPICOLA
PESE	PENSTEMON SERRULATUS
PHAD	PHLOX ADSURGENS
PHDI	PHLOX DIFFUSA
PHHE	PHACELIA HETEROPHYLLA
PLFI	PLAGIOBOTHRYS FIGURATUS
PLFI2	PLEURICOSPORA FIMBRIOLATA
POBI	POLYGONUM BISTORTOIDES
POCA2	POLEMONIUM CARNEUM
POCA5	POLYGONUM CASCADENSE
PODO	POLYGONUM DOUGLASII
PODR	POTENTILLA DRUMMONDII
POFL2	POTENTILLA FLABELLIFOLIA
POGL	POTENTILLA GLANDULOSA
POGR	POTENTILLA GRACILIS
POGRF	POTENTILLA GRACILIS FLABELLIFORMIS
POLYG	POLYGONUM SPECIES
POMI2	POLYGONUM MINIMUM
PONE4	POLYGONUM NEWBERRYI
PONEN	POLYGONUM NEWBERRYI NEWBERRYI
POPA3	POTENTILLA PALUSTRIS
POPH	POLYGONUM PHYTOLACCAEFOLIUM
PRVU	PRUNELLA VULGARIS
PYAP	PYROLA APHYLLA
PYAS	PYROLA ASARIFOLIA
PYPI	PYROLA PICTA
PYSE	PYROLA SECUNDA

RAAL	RANUNCULUS ALISMAEFOLIUS
RAGO	RANUNCULUS GORMANII
RANUN	RANUNCULUS SPECIES
RAUN	RANUNCULUS UNALASCHENSIS
RUAC	RUMEX ACETOSELLA
RUOC	RUDBECKIA OCCIDENTALIS
SADO	SATUREJA DOUGLASII
SAGR	SANICULA GRAVEOLENS
SAOC	SANGUISORBA OCCIDENTALIS
SAOR	SAXIFRAGA OREGANA
SEBO	SENECIO BOLANDERI
SECY	SENECIO CYMBALARIOIDES
SEIN	SENECIO INTEGERRIMUS
SELA2	SEDUM LANCEOLATUM
SEOR2	SEDUM OREGANUM
SESP2	SENECIO SPHAEROCEPHALUS
SEST	SEDUM STENOPETALUM
SETR	SENECIO TRIANGULARIS
SIAN	SISYRINCHIUM ANGUSTIFOLIUM
SICA	SIDALCEA CAMPESTRIS
SICA2	SILENE CAMPANULATA
SIDO	SISYRINCHIUM DOUGLASII
SIDO2	SILENE DOUGLASII
SIPR	SIBBALDIA PROCUMBENS
SMRA	SMILACINA RACEMOSA
SMST	SMILACINA STELLATA
SOCAS	SOLIDAGO CANADENSIS SALEBROSA
SPAR2	SPERGULA ARVENSIS
SPCA	SPHENOSCIADIUM CAPITELLATUM
SPRO	SPIRANTHES ROMANZOFFIANA
SPUM	SPRAGUEA UMBELLATA
STAM	STREPTOPUS AMPLEXIFOLIUS
STCO4	STACHYS COOLEYAE
STCR	STELLARIA CRISPA
STJA	STELLARIA JAMESIANA
STME	STELLARIA MEDIA
STNI	STELLARIA NITENS
STROC	STREPTOPUS ROSEUS CURVIPES
SYRE	SYNTHYRIS RENIFORMIS
TAOF	TARAXACUM OFFICINALE
TEGR	TELLIMA GRANDIFLORA
THOC	THALICTRUM OCCIDENTALE
TITRU	TIARELLA TRIFOLIATA UNIFOLIATA
TOGLB	TOFIELDIA GLUTINOSA BREVISTYLA
TRAR2	TRIENTALIS ARCTICA
TRCAO	TRAUTVETTERIA CAROLINIENSIS OCCIDENTALIS
TRLA2	TRIENTALIS LATIFOLIA
TRLO	TRIFOLIUM LONGIPES
TROV	TRILLIUM OVATUM
UMBELL	UMBELLIFERAE
UTVU	UTRICULARIA VULGARIS
VAHE	VANCOUVERIA HEXANDRA

VASI	VALERIANA SITCHENSIS
VEAM	VERONICA AMERICANA
VERAT	VERATRUM SPECIES
VERON	VERONICA SPECIES
VESC	VERONICA SCUTELLATA
VESE	VERONICA SERPYLLIFOLIA
VEWO	VERONICA WORMSKJOLDII
VIAD	VIOLA ADUNCA
VIAM	VICIA AMERICANA
VIGL	VIOLA GLABELLA
VIMA	VIOLA MACLOSKEYI
VINUB	VIOLA NUTTALLII BAKERI
VIOLA	VIOLA SPECIES
VIOR2	VIOLA ORBICULATA
VIPA2	VIOLA PALUSTRIS
VISE	VIOLA SEMPERVIRENS
XETE	XEROPHYLLUM TENAX
ZIVE	ZIGADENUS VENENOSUS
UNKN	UNKNOWN SPECIES